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An analysis of the primary corporate bond distribution process: building an orderbook, selecting bookrunners and determining allocations

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‘This thesis is the result of the author’s original research. It has been composed by the author and has not been previously submitted for examination which has led to the award of a degree.’

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Abstract

This thesis studies three aspects of the primary corporate bond distribution process, being the level of investor demand generated, the performance of bookrunners and the composition of allocations. These are important areas for a corporate treasurer to understand in order to minimise his firm's at-issue funding costs. They are also relevant for financial intermediaries seeking to optimise their syndication and competitive strategies. Moreover this study benefits financial regulators, given growing concerns around lack of transparency in the bond distribution process.

My research is focused on an overall sample of 1,224 euro-denominated Western European investment grade public bond tranches issued between 2001 and 2012. I analyse the level of investor demand through the tranche orderbook oversubscription, a variable obtained from practitioners' sources. This is regressed against hypotheses informed by debt sourcing, agency costs and portfolio choice theories. Bookrunner performance is analysed through studying the ability of different bookrunner group formations to lower the at-issue credit spread. This includes bookrunner variables that proxy for syndicate size, allocation of responsibilities, reputation and geography. The allocation composition, being a relatively new area of research, is analysed through a subsample of tranche-level investor geography and

type allocation percentages. I explore the impact that issuer, tranche, firm, investor demand and bookrunner parameters have on these statistics.

These studies has important implications for various strands of academic literature. It contributes to the debate on the role and impact of financial intermediaries with my results suggesting domestic bookrunners and smaller bookrunner syndicate sizes perform the highest quality services. It also has implications for the public-private debt sourcing literature; my findings highlight that bond investors do purchase more risky instruments from less frequent issuers, suggesting the hurdle for obtaining bond market financing is lower than previously theorised. They also contribute to bond portfolio management discussions, as I find in Europe investors on the whole are more comfortable spreading their holdings by rating category than by geography. My results also have implications for the debate on domestic versus foreign bond market issuance, as I find that only firms with highly oversubscribed transactions or those from mid-tier economies increase their reliance on international bond markets.

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"Twenty years from now, you will be more disappointed by the things you didn't do than by the ones you did do."
Mark Twain

"The mind is a superb instrument if used rightly."
Eckhart Tolle

To my parents, Paula and Johan,

with love and gratitude

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1 Introduction

This thesis analyses three distinct aspects of the primary corporate bond distribution process, namely the level of investor demand generated, the performance of bookrunners and the composition of allocations. These aspects are of importance to treasurers seeking to minimise their cost of funding and maximise their bond market access. Through obtaining strong investor demand they can negotiate more advantageous terms and maintain sufficient flexibility to re-enter the market for further funding (Cherney, 2014). Similarly by targeting the right investor geographic and type mix issuers can improve pricing terms and the strength of their market access (Massa et al., 2013; Massa and Zalkodas, 2014). And by selecting the optimal combination of bookrunners it is more likely a firm achieves the desired pricing and market access outcomes from the primary distribution process (Butler, 2008; Fang, 2005).

These aspects are also of interest to financial intermediaries. In practice they often struggle to obtain sufficient reliable investor feedback before a transaction is announced, rendering it challenging to anticipate the quantum and composition of investor demand. Amidst heightened competition amongst bookrunners (Cowie, 2009) intermediaries have also started to become more selective in their competitive strategy, targeting transactions where they can offer a higher quality of service so as to win a larger share of available business.

In addition this study is beneficial for financial regulators. They have become increasingly focused on understanding the corporate bond distribution process, being particularly concerned that it is insufficiently transparent for issuers and affected by bookrunner conflicts of interest (Helgren, 2015).

My research into the corporate bond distribution process also has important implications for various strands of academic literature, including financial intermediation, debt sourcing, portfolio choice, agency theory and credit spreads. I explore the specific contributions in each of the chapter-specific subsections from Section 1.2 through to Section 1.4.

This study uses a sample of 1,224 Western European euro-denominated investment grade corporate bond tranches priced between 2001 and 2012. Theoretically this sample of low-risk securities should display limited heterogeneity in investor interest and bookrunner performance (Andres et al., 2014; Denis and Mihov, 2003). It therefore makes for a strong test of the drivers of investor demand and allocations as well as quality of bookrunner services. Its Western European origin allows me to analyse geographic effects on the distribution process, as this market consists of a range of countries with common bond market legislation and a single dominant currency.

To assemble my sample I have supplemented data from the customary corporate finance databases (such as Dealogic and Worldscope) with variables obtained from practitioners' sources. In order to directly test variables that impact debt investor demand I have hand collected data on the orderbook size of each tranche from financial press articles. This allows me to calculate the tranche oversubscription, an empirical proxy for investor demand with proven utility in equity market research (Cornelli and Goldreich, 2003; Derrien, 2005). In addition in order to study the allocation of responsibilities between bookrunners I have sourced information from press articles on the banks that acted as active and passive bookrunners on each tranche. This distinction is used with increasing frequency (Cowie, 2009) and entails

that active bookrunners perform both the certification and placement role while passive bookrunners only perform the certification role. I have also consulted a unique bond allocations database of Informa, a debt market news outlet, to allow me to study the heterogeneity in investor geography and type.

These empirical data points enable me to establish a range of important findings on the workings of the primary corporate bond distribution process. I conclude that investor demand, as proxied by orderbook oversubscription, is positively related to credit spread and negatively related to credit rating and leverage. Firms seeking to maintain strong bond market access should hence not target a specific investment grade rating, i.e. attempt to maintain a "A" rating, but maintain conservative credit metrics. I also find that demand is lower for both debut and highly frequent bond issuers suggesting bookrunners on such transactions should consider a more extensive marketing and pre-sounding process.

My results for bookrunner services show that the highest quality bookrunner syndicate has a modest size, thereby limiting the scope for agency costs, and consists largely of domestic bookrunners who can best certify and advise the issuer. This provides clear guidance for corporate treasurers in their bookrunner selection process. I also find that where an issuer is compelled to mandate a large number of banks due to pressures exerted from its relationship banks, the overall quality of the bookrunner services is improved by relegating certain less trusted banks to a passive status.

My findings for bond allocations highlight a high degree of home selection bias in the European corporate bond market. For corporate treasurers this implies that the size of their home economy should dictate the degree of investor marketing they should engage in. Regular bond issuers from mid-tier economies such as Italy, Spain

and the Netherlands are for instance required to actively market to international investors due to an insufficiently large domestic pool of liquidity. These results could also be of interest to regulators as it could suggest domestic bookrunners rewarding their investor clients and also points to ongoing barriers to further integration of the European capital markets.

The remainder of this chapter is organised as follows. Section 1.1 sets out the motivation for the study of the primary corporate bond distribution process. Section 1.2, 1.3 and 1.4 introduce the three empirical chapters, being the level of investor interest, the quality of bookrunner services and the allocation composition respectively. For each chapter I set out the research topics, main results and contributions. Section 1.5 presents the structure of the thesis.

1.1 European primary corporate bond market

There are a number of unique features to the European corporate bond markets that render it an important area of study with broader implications. These relate to the nature of the bond product, the issuers, investors, bookrunners and the specific European context. I explore each of these elements in this section.

1.1.1 Product

The corporate bond product is worthwhile to study as it is a strong proxy for the overall debt market, relatively transparent and characterised by a high degree of heterogeneity in its key parameters. It can therefore be studied in greater detail than

other debt products while also having important implications for the overall debt market.

A corporate bond is amongst the least complex of any debt instrument (see Section 2.1) rendering it a more effective proxy for the overall debt market than the other major debt classifications, being non-bank private placements, bank loans and securitisations. These other products have more complex terms, including individualised covenants and collateral arrangements, making cross-tranche analysis challenging. Studying the supply and demand for corporate bonds does allow one to obtain an initial understanding of the broader corporate debt markets.

The corporate bond market is also more transparent than other debt markets. Due to its public characteristics a relatively large amount of data is available on the corporate bond distribution process, which is recorded by the financial press. In addition the prospectus of a bond is freely accessible through the stock exchange on which it is listed. The terms of most private debt instruments are more challenging to obtain as both issuers and investors in these markets seek to preserve a degree of confidentiality.

There is a relatively high level of heterogeneity in the key terms of corporate bonds, being their tenor, size and price. This can be seen in Charts 1.1, 1.2 and 1.3 which show the distribution of euro-denominated investment grade corporate bonds issued between 2001 and 2012 by years to maturity, amount issued in EUR millions and the at-issue credit spread (source: Dealogic). The tenor of these issues ranges from 1 to 100 years with the most common categories being 3 to 4.9 years and 5 to 6.9 years. This is of theoretical interest given the broad range of papers written on the determinants of a firm's debt maturity (Antoniou et al., 2008). The issuance amount

differs from EUR 100 to 5,250 million, albeit Chart 1.2 shows that a large portion of issuance is between EUR 500 and 1,500m. This suggests that firms utilise issue bonds for a broad range of financing requirements (Julio et al., 2008). The at-issue credit spread over midswaps ranges from 0 to over 700 basis points, or 0 to 7%, with the majority of issuance being associated with an at-issue credit spread of 200 basis points or less. Hence even though the European bond markets are dominated by investment grade firms (Dealogic, 2015) the inherent credit risk is subject to meaningful differences.

1.1.2 Issuers

The growing importance of the bond market to issuers makes it an important area of study. It is amongst the largest and most regularly accessed source of funding for companies and has attracted a broad range of new issuers in the years following the recent financial crisis (Kaya and Meyer, 2013). Understanding the corporate bond distribution process is hence valuable for a growing group of corporate treasurers and financial intermediaries.

As highlighted by Chart 1.4 Western European corporates issue considerably larger volumes of bonds than equities. This differential has become particularly pronounced since the 2008 financial crisis, with in 2014 Western European firms issuing EUR 378.9bn and EUR 139.1bn of bonds and equities respectively. This is consistent with US-focused literature with Massa et al. (2014) noting that US firms mostly rely on the debt markets for their external financing and that corporate bonds constitute over half of all outstanding external debt. Denis and Mihov (2003) point out that for US firms net new issues of equities are negligible.

This substantial volume is raised through relatively regular issuance. Table 1.1 shows the most frequent euro-denominated corporate bond issuers for 2001 to 2012. Even the number 20 of this list German utility E.On accessed the market 12 times in this time period or equivalent to an average of one issue per year.

The issuer base of the corporate bond market is becoming increasingly diverse (Wigglesworth, 2012), with 129 companies issuing their debut bond in the euro-denominated market between 2009 and 2012 (source: Dealogic). This development is largely triggered by the 2008 financial crisis. Companies realised the fragility of the banking system and became more focused on diversifying their debt financing providers through accessing the capital markets (Kaya and Meyer, 2013).

The necessity of European issuers to access capital markets financing is expected to increase. It is argued by practitioners that providing a greater range of issuers access to capital markets financing will help increase European economic growth as well as the stability of Europe's financial infrastructure (Gallo, 2015).

1.1.3 Investors

The bond market has the most heterogeneous mix of investors of any debt market. It is therefore important for both treasurers and intermediaries to understand how to most effectively distribute a tranche to this broad range of buyers with differing preferences.

There are relatively low barriers to entry for organisations seeking to invest in bonds. The instruments have a fairly low denomination, as low as EUR 1,000 in the euro-denominated market, have a relatively liquid and transparent secondary market

and standardised documentation. As a result of this the bond market investor universe encompasses a broad range of individuals and institutions who manage financial assets. Individuals investing in bonds include high net worth individuals as well as middle class households, typically operating through a private bank; for instance the retail bond investor base in Belgium is typically described as the "Belgian dentist" (Lyon, 2005). As I explore further in Chapter 5 institutions that purchase bonds include central banks, pension funds, insurers, fund managers, hedge funds, corporate treasuries and charities; to name but a few (Choudhry, 2010; Massa et al., 2013).[1]

1.1.4 Bookrunners

The market for corporate bond bookrunner roles has become increasingly crowded and competitive in the past decade, resulting in noteworthy changes to bookrunner syndicate compositions. It is therefore increasingly important for issuers to consider how to optimally structure their syndicate and for bookrunners to rethink their competitive strategy.

The period following the financial crisis saw an increase in the number of European banks offering bookrunner services as well as the level of aggressiveness in their competitive strategy. This came as a response to the post-2008 growth in the debt capital markets (see Section 1.1.2). A large number of new banks entered the market for bookrunners so as to compete for a share of the growing volume of underwriting fees (Cowie, 2009). They also became more aggressive in their origination strategy

[1] These investor classes differ in a range of crucial aspects. They have different amounts of funds at their disposal, investment horizons, levels of sophistication in due diligence, investment strategies, degrees of risk aversion, relationships with issuers and so on (Massa et al., 2013).

with more banks linking lending commitments to bond bookrunner roles and a rise in the number of bookrunners.[2] Dealogic data shows that the average number of total bookrunners on a European bond tranche has grown from 3.01 in 2007 to 4.85 in 2012.

These post-financial crisis developments also led to innovation in the composition of bond bookrunner roles, with issuers distinguishing between the placement and certification roles of a bookrunner through an active-passive split. I explore this further in Section 4.3.2.

1.1.5 European context

The European market combines a range of different countries under a common currency and capital market legislation, making it an interesting geographic region to study. It allows me to readily test investor home bias and diversification theories. These will be beneficial for both bookrunners and intermediaries in helping them understand the degree of market integration and identify the need for international investor marketing.

Europe's national heterogeneity is likely to have important implications on the nature of bond distribution. There are major differences in the sizes of the different national economies, suggesting that any home selection bias in investor appetite will benefit issuers from larger European economies more than those from smaller economies (Chan et al., 2005; Kang and Stulz, 1997). There are also noteworthy distinctions in the institutional make-up of the investor base. Germany for instance has

[2] The increased competitive aggressiveness is driven by stricter bank capital regulation that developed after the financial crisis. This forced banks to obtain higher ancillary business from their clients in order to ensure the relationship remained commercially viable.

a unique group of public savings banks (Simpson, 2013), a topic I explore further in Section 5.5.4. Finally there are differences in the level of government involvement in the private sector which could influence both issuance and investment decisions.[3]

The distinctions amongst Eurozone members can be readily analysed due to their common currency as well as the common set of bond market legislation set out in particular in the EU Prospectus Directive. I can therefore largely ignore foreign exchange and legal considerations related to the product and focus on cross-national differences.[4]

1.2 Investor demand

The first aspect of the corporate bond distribution process I consider is the bookbuilding phase, which I analyse through studying the determinants of orderbook oversubscription in Chapter 3. This is of considerable importance to issuers accessing the corporate bond markets. As I discuss in Section 1.1.3 the corporate bond investor base and hence the make-up of an orderbook is highly heterogeneous. It is therefore not obvious which types of offerings are expected to generate more demand. Yet the ability to attract greater interest offers an issuer added flexibility in setting the terms and conditions of their bond tranches (Cherney, 2014). It also helps the issuer obtain a broader spread of bond investors, as I analyse in Chapter 5, which helps strengthen its future bond market access (Massa et al., 2013).

[3] France's government in particular has been found to be more interventionist (Borisova et al., 2015).
[4] This has implications for research into other regional or global financial markets which are more disparate in their technical characteristics.

The main theoretical elements I consider in this regard are risk of default, information costs and bond market presence. I derive stylised predictions on these factors from debt sourcing, agency costs and portfolio choice literature. These classical strands of finance have in the past tended to consider bond investors as a relatively homogeneous group, resulting in relatively strong and differing predictions on investor preferences.

Classical debt sourcing and agency literature has tended to argue that risk of default is negatively related to investor demand as a result of concerns surrounding inefficient liquidation and agency costs (Berlin and Loeys, 1988; Myers, 1977). Portfolio choice theory on the other hand starts from the premise that a bond's expected returns, variance and correlation with other bonds are central to its use in an investors' overall broader portfolio and should hence drive demand (Markowitz, 1952). In this context both low and high risk bonds are valuable to an investor seeking a mean-variance efficient bond portfolio (Blume et al., 1991).

Classical agency cost research can be used to claim that bond investors purchase a lower volume of bond tranches from higher information cost companies as they are concerned about increased adverse selection and asset substitution risks (Harris and Raviv, 1991; Leland and Pyle, 1977). Portfolio choice theory however states that no such linear relation should exist; the tranches of both higher and lower information cost firms are useful in a portfolio as they are partially uncorrelated (Heston and Rouwenhorst, 1994).

Moreover debt sourcing research has suggested that bond market presence should be positively related to bond investor demand as firms with a long track record in the bond markets should pose lower adverse selection risks (Cantillo and Wright,

2000). This is again contrary to portfolio choice literature. Firms with a sizeable number of bonds outstanding are expected to receive lower marginal demand from bond investors due to investors' need to maintain a portfolio diversified across a range of companies (Pieterse-Bloem and Mahieu, 2013).

I test these predictions through ordinary least squares regressions on orderbook oversubscription, complemented by several alternative model specifications as robustness tests. Orderbook oversubscription is a highly effective variable for this purpose as it provides a direct proxy for demand for a bond at a uniquely liquid point in its lifecycle (Asquith et al., 2013; Hotchkiss and Ronen, 2002). This makes it a more effective measure of investor demand than indirect proxies such as public debt ratio or quantum of bonds issued, which rely on investor demand being a broadly similar proportion to the amount issued (Denis and Mihov, 2003; Johnson, 1997). This assumption is however fallacious as I find oversubscription levels differing from 0.67x to 17.50x. Moreover oversubscription has been successfully applied in equity market literature (Cornelli and Goldreich, 2003; Derrien, 2005).

My testing on this variable provides a range of significant results on the nature of corporate bond investor demand. I find that oversubscription levels are positively related to credit spread and negatively related to credit rating, suggesting a preference for higher risk assets. I conclude that the relative scarcity of these higher risk offerings makes them a valuable asset for investors seeking to optimise the risk-return characteristics of their portfolio (Blume et al., 1991). Investors are however concerned about firms taking on excessive financial risk as I also find that oversubscription levels are negatively related to leverage. This suggests concerns around managerial agency costs and the risks of underinvestment (Myers, 1977).

My results also show that oversubscription levels are higher for firms domiciled outside of Germany, France and the United Kingdom, being the dominant three economies in my sample and therefore subject to the least information costs for most investors. This has both a demand-led and supply-led explanation. It could suggest that investors' seek to obtain a geographically well-diversified portfolio and that such issuers are required to engage in more active marketing to overcome embedded familiarity biases (Pieterse-Bloem and Mahieu, 2013). My results of Chapter 5 on bond allocations suggest the latter is the correct interpretation.

My results also show that bond market presence is non-linearly related to orderbook oversubscription. Investor demand is weak for debut issuers, strong for moderately frequent established issuers and weak(er) again for highly frequent established issuers. This provides partial confirmation of the perspectives derived from both the agency cost and portfolio choice literature. Investors are concerned about the risk of adverse selection associated with purchasing debut bond tranches (Cantillo and Wright, 2000) as well as the portfolio exposure issues caused by buying too many tranches from highly frequent issuers (Pieterse-Bloem and Mahieu, 2013).

My testing on orderbook oversubscription contributes to a range of research areas. The results point to several new variables for corporate debt sourcing studies to consider when incorporating bond investor demand in their models on an issuer's optimal public debt ratio (Berlin and Loeys 1988; Diamond, 1991). These relate in particular to portfolio diversification benefits resulting from an issuer's business risk profile and low frequency of bond issues. Given that much of corporate funding is financed through different debt products it is highly beneficial to better understand these investor-driven factors that determine this make-up.

My findings also contribute to the literature on other debt instruments, such as bank loans and non-bank private debt (Black, 1975; Carey et al., 1993; Fama, 1985). My results for bond investor preferences can be considered as a benchmark for the investors in these products for which there is more limited empirical data available. They are also expected to be concerned about reduced managerial investment incentives caused by excessive leverage. Also these investors are likely to be focused on diversifying their portfolio away from any one company. This is noteworthy as these private debt markets are particularly valuable to smaller to mid-size companies who have not yet reached the threshold characteristics to enter the bond market.

In addition this chapter adds to the portfolio choice literature (Blume et al., 1991; Korn and Koziol, 2006). I find several areas where investors deviate in their purchases from the mean-variance efficient portfolio. Most notably they prefer to purchase less bonds from higher levered issuers as opposed to having a balanced spread across firms with different levels of financial risk. They also demand a lower amount of debut bonds even though such issuers could offer valuable diversification benefits. This is relevant as these portfolio management theories are central to the trading strategies of many products offered by fund managers.

Moreover these findings contribute to the research on initial public bonds (Datta et al. 1999; Hale and Santos, 2008). My results help identify the types of firms that are likely to receive sufficient demand to issue their debut tranche. These companies are likely to be those with higher business risk, as this is a relatively scarce commodity, as well as those who have maintained a modest leverage position, therefore ensuring the management is deemed to be able to act in the interest of debt

investors. This is of value as obtaining bond market access substantially increases a firm's available financial resources.

1.3 Bookrunner performance

My second empirical chapter concerns the bookrunner selection process. In this study I test the performance of different types of bookrunner syndicate compositions through the at-issue credit spread they are able to achieve for an issuer. This is of interest as prior papers find that bookrunner selection can have a significant impact on this variable (Andres et al., 2014; Fang, 2005). Also bookrunner selection has become more complicated, resulting from trends I discuss in Section 1.1.4. A greater number of banks now offer these services, meaning issuers have more service providers to choose from, and issuers have also started constructing larger bookrunner syndicates, resulting in more permutations of bookrunners becoming possible (Abramowicz, 2014).

In my testing I consider four parameters of bookrunner syndicate formation, namely bookrunner syndicate size, allocation of bookrunner responsibilities, reputation and geography. Bookrunner syndicate size can be argued to be positively related to performance as employing more bookrunners offers greater investor search benefits (Kessel, 1971). Alternatively one could ascribe a negative relation as a result of growing inter-bookrunner agency costs in the form of free rider incentives (Diamond, 1996; Shivdasani and Song, 2006).

The allocation of bookrunner responsibilities has emerged through issuers introducing an active-passive split where a group of banks is relegated to only

performing a certification role and not being responsible for the marketing and distribution (Cowie, 2009). From an agency cost perspective utilising such passive bookrunners can be seen to reduce free rider issues within a bookrunner syndicate, given that these arise mostly within the marketing and distribution role.

The reputation of a bookrunner can also be seen to impact the quality of performance. Chemmanur and Fulghieri (1994) argue that higher reputation intermediaries perform higher quality services as a way to maintain a strong reputation while on the other hand Chemmanur and Krishnan (2012) see higher reputation bookrunners as being less effective in distribution as they are distrusted by investors because of their tendency to exploit their market reputation.

Bookrunner geography is an additional selection criterion, being particularly important in the European context. A domestic bank can be argued to offer a higher quality of service as a result of its stronger relationship with the issuer, allowing it to provide more effective due diligence and advice on the issuance strategy (Butler, 2008). Alternatively a domestic bank is potentially less able to attract more international investors to an offering, thereby weakening its ability to perform the marketing and distribution role (Massa and Zalkodas, 2014).

I test this range of predictions through two-stage regression models on the at-issue credit spread, thereby accounting for bookrunner selection endogeneity. This is in line with precedent papers in this field (Fang, 2005). I argue that credit spread is the most suitable proxy for quality of bookrunner services as it can be both directly influenced by the efforts made by the bookrunners and it is also a clear criterion for the success of the transaction from the perspective of the issuer, with issuers' profit-seeking goal clearly dictating a preference for a lower at-issue credit spread. My

sample in particular should make for a strong test of the performance of bookrunners. The investment grade offerings I focus on are very low risk securities and should have highly predictable at-issue credit spreads, leaving little room for bookrunner influence. Any results I find for this group hence has very clear implications for the performance of financial intermediaries in higher-risk offerings.

My strongest and most consistent results are for bookrunner geography. I conclude that domestic banks offer the highest quality bookrunner services, even when compared to non-domestic banks who should offer strong search benefits or the benefit of a high reputation. This is in line with Butler's (2008) findings for the US municipal bond market. I argue that this reflects the existence of insider and outsider bookrunners, with insiders being able to leverage their information and relationship to improve the overall quality of bookrunner service. This is valuable as precedent literature has largely focused on the relationship between the bookrunner and investors (Chemmanur and Krishnan, 2012). Amidst growing competition for a relatively commoditised financial product such as bonds I find that actually the relationship between the bookrunners and the issuer is crucial.

Bookrunner reputation plays a secondary role. My results show that employing a higher proportion of higher reputation bookrunner leads to an improvement in the quality of services when ignoring for geographic effects. Hence when selecting amongst domestic banks an issuer is advised to appoint one with a higher league table ranking. This is noteworthy as it suggests more tailored measures of reputation, such as an issuer's domestic bank league table, should be utilised to determine expected quality of service.

I also find that bookrunner syndicate size is negatively related to performance. This reflects co-ordination and free rider issues and emphasises the importance for an issuer of managing inter-bookrunner agency costs (Diamond, 1996). The usage of passive bookrunners can mitigate these costs. Tranches with passive bookrunners tend to have a lower at-issue credit spread, suggesting that the active-passive split innovation has been economically beneficial for issuers and should be considered by firms who feel compelled to mandate a large group of banks. This is relevant in the context of todays capital markets as the rise in bookrunners is a recent trend that many bond issuers are faced with; most international firms now have a sizeable group of relationship banks that expect bond bookrunner roles.

In separate pre- and post-financial crisis testing I find that the significance of my results largely stems from the post-financial crisis period. This is unsurprising in light of the growing complexity of bookrunner syndicates seen since the 2008 global financial crisis. It highlights that this complexity should be taken into account by studies seeking to understand the quality of bookrunner services.

The findings in this chapter contribute to several research fields. They further the literature on bond financial intermediation (Andres et al., 2014; Fang, 2005) through identifying the importance of bookrunner roles and inter-bookrunner agency costs in an issuer's selection of its financial intermediaries. Understanding these areas is of growing importance as firms are faced with increasingly complex choices when appointing bookrunner syndicates.

My results also contribute to the credit spread literature (Guo, 2013; Longstaff et al., 2005) through setting out the bookrunner parameters that determine the at-issue credit spread. This is expected to become an increasingly important field of research

given the growing illiquidity of the secondary bond markets (ICMA Secondary Market Practices Committee, 2014).

Moreover the findings of this chapter add to the study of debt market agency costs (Diamond, 1996; Jensen and Meckling, 1976; Myers and Majlif, 1984). It highlights the importance of modelling inter-bookrunner agency costs as a driver of a firm's cost of debt funding. This is important as these costs are rising due to the growth in bookrunner syndicate sizes.

1.4 Allocation composition

My third empirical chapter centres on the allocation phase, which is studied through exploratory analysis on a bond's at-issue investor geographic and type composition. This is a worthwhile area of study as bond investors are a highly heterogeneous group (see Section 1.1.3), allowing for a broad range of possible allocation decisions. While recent literature has found that the nature of a firm's bond investor base can impact the strength of its market access as well as its debt funding costs (Massa et al., 2013; Massa and Zalkodas, 2014) very little research has been done into the determinants of a firm's bondholders.

In order to address this shortcoming I consult a range of literature on possible drivers of a bond's at-issue investor geography and type mix. From the literature on home selection bias I derive the notion that issuer country determines the investor geographic composition with European investors' purchasing a relatively large share of securities issued by domestic firms (Chan et al., 2005: Kang and Stulz, 1997). As a result this should mostly benefit firms in larger economies such as Germany France

and the UK who are likely to be content to rely more on their domestic investors than firms from economies with less available financial resources. Portfolio diversification on the other hand states that investors across Europe should seek to obtain a geographically well-diversified portfolio (Markowitz, 1952; Pieterse-Bloem and Mahieu, 2013). They obtain greater diversification benefits from purchasing tranches from non-domestic firms and therefore are expected to be more price-competitive and receive larger allocations of these transactions (Massa and Zalkodas, 2014).

Different claims can also be made on the drivers of investor type. Selected debt sourcing papers argue that the management of bond issuers prefer to allocate more to smaller non-institutional investors as a way of avoiding greater scrutiny (Denis and Mihov, 2003). Yet corporate debt investor papers claim that institutional investors are more beneficial for an issuer due to their longer term investment horizon and larger asset base and should therefore receive greater allocations (Massa et al., 2013).

My investor geography and type analysis is focused on a novel data set derived from bookrunner allocation reporting. I find this to be reliably reported as it corroborates several well-established notions on investor preferences, for instance I find that pension funds and insurers purchase more longer dated and higher rated instruments (Chen et al., 2007; Massa et al., 2013). I test the factors that determine the allocation statistics through a Heckman two-stage regression that controls for the availability of allocation data.

My results show that issuer geography, orderbook size and the bookrunner syndicate composition impact the final distribution of a bond's allocations. I find that the size of an issuer's home economy is non-linearly related to the proportion of domestic allocations, being higher for top and lower tier economies and lower for mid-

tier economies respectively. This is in line with the notion from home selection bias that investors' bond holdings are skewed towards domestic companies (Chan et al., 2005: Kang and Stulz, 1997). Firms from the top tier economies Germany, France and the UK benefit the most from this bias, as it gives them ready access to a large domestic investor base, while those from mid-tier economies Italy, Spain and the Netherlands outgrow their domestic market and are required to actively market their tranche to non-domestic investors (Cheng, 2011). Firms from lower tier economies are fairly small and infrequent funders and are hence more similar to their top tier counterparts in relying more on domestic investors.[5] An issuer's country is also found to impact the investor type composition, suggesting that cross-country legal, political and cultural differences can drive both a firm's public debt ratio and the identity of its public debt holders. German issuers appear to allocate more to local public savings banks (Simpson, 2013) while French issuers benefit from partly state-influenced pension funds and insurers (Borisova et al., 2015) and UK issuers have access to a range of institutional investors based in the City of London.

Orderbook oversubscription is found to be negatively related to domestic allocations. This suggests that regardless of nationality companies appreciate the market access and pricing benefits of developing a geographically well diversified investor base (Massa and Zalkodas, 2014). However these benefits are more pressing for those with less domestic liquidity available; firms who have a sufficiently sizeable domestic market may only broaden their investor reach when issuing in strong market conditions (Derrien, 2005; Foley, 2012). Higher oversubscribed trades are also associated with less pension fund and insurer allocations, which can be explained by

[5] Reflecting back on the finding in Chapter 3 that tranches form firms from outside of Germany, France and the UK (GFU) attract greater orderbooks, this is probably due more to these issuers conducting a more extensive marketing effort than portfolio diversification concerns.

issuers seeking a more dispersed group of bondholders for price bargaining and managerial control purposes (Denis and Mihov, 2003).

The bookrunner syndicate plays a central role in the bookbuilding and allocation process, with my results showing that the proportion of higher reputation bookrunners is positively related to the percentage allocated to pension funds and insurers. This suggests the existence of embedded relationships with these sizeable and regular investors resulting in preferential treatment (Chemmanur and Krishnan, 2012). I also find that appointing more non-domestic bookrunners does not lead to greater non-domestic allocations but does result in more allocations to non-institutional investors. This suggests that non-domestic bookrunners with weaker issuer relationships seek to compete by offering novel distribution channels.

These findings contribute to several areas of study. They add to bond portfolio literature (Pieterse-Bloem and Mahieu, 2013), highlighting the importance of incorporating deeply embedded home selection biases. Even amongst highly commoditised debt products issued by low risk firms it is important to model familiarity factors that limit an investor's willingness to pursue a well-diversified portfolio.

The results also further the primary market oversubscription papers (Brennan and Franks, 1997; Cornelli and Goldreich, 2003; Derrien, 2005) through highlighting the impact of oversubscription on a firm's bond allocation decision. This is valuable as much of the prior oversubscription literature has centred on equity markets, a relatively less frequently used source of financing.

Moreover the findings help develop the study of corporate debt sourcing by illustrating the importance of a firm's nationality on its ability to increase its public-debt ratio as well as issue an inaugural bond (Denis and Mihov, 2003; Johnson, 1997). This is of interest as it suggests that certain firms by virtue of their location can more quickly tap into one of the largest sources of corporate financing, which could constitute an important competitive advantage.

In addition the results contribute to the literature on financial intermediation by providing new evidence for the market power hypothesis of higher-reputation bookrunners leveraging their stronger relationships with major institutional investors (Chemmanur and Fulghieri, 1994; Chemmanur and Krishnan, 2012; Diamond, 1996). Moreover the finding that non-domestic bookrunners generate more interest from alternative investor classes suggests that growing bookrunner competition could result in a more fragmented market for intermediation, where different bookrunners specialise in selling into divergent investor niches.

1.5 Structure of the Thesis

The remainder of the thesis is organised as follows. In Chapter 2 I introduce the corporate bond market and the corporate bond distribution process and also set out the process by which I have gathered the data for my empirical analysis. Chapter 3 presents my empirical analysis on orderbook oversubscription. In Chapter 4 I set out my study into the quality of bookrunner services. Chapter 5 presents my findings on bond allocations. Chapter 6 concludes.

Table 1.1. Most frequent issuers in the euro-denominated corporate bond market

Results of a Dealogic search of all euro-denominated corporate bond issuance priced between 2001 and 2012. Ranking based on number of tranches priced by a particular company during this time period, including both public and privately placed bonds.

Rank	Issuer	Number of tranches
1	Ford Motor Co	99
2	General Electric Co	67
3	Renault	53
4	Volkswagen	49
5	Daimler AG	45
6	PSA Peugeot Citroen	35
7	Deutsche Telekom AG	32
8	Liberty Global plc	31
9	Electricite de France SA – EDF	30
10	BMW	28
11	Orange SA	26
12	Vodafone Group plc	25
13	Telecom Italia SpA	24
14	ENGIE	23
15	Telefonica SA	20
16	ENEL	17
17	Koninklijke KPN NV	16
18	Fiat Chrysler Automobiles NV	15
19	RWE AG	14
20	E.ON SE	12

Chart 1.1: Euro-denominated corporate bond issuance by tenor

Results of a Dealogic search of all euro-denominated corporate bond issuance priced between 2001 and 2012. Tranches are grouped in categories based year to maturity.

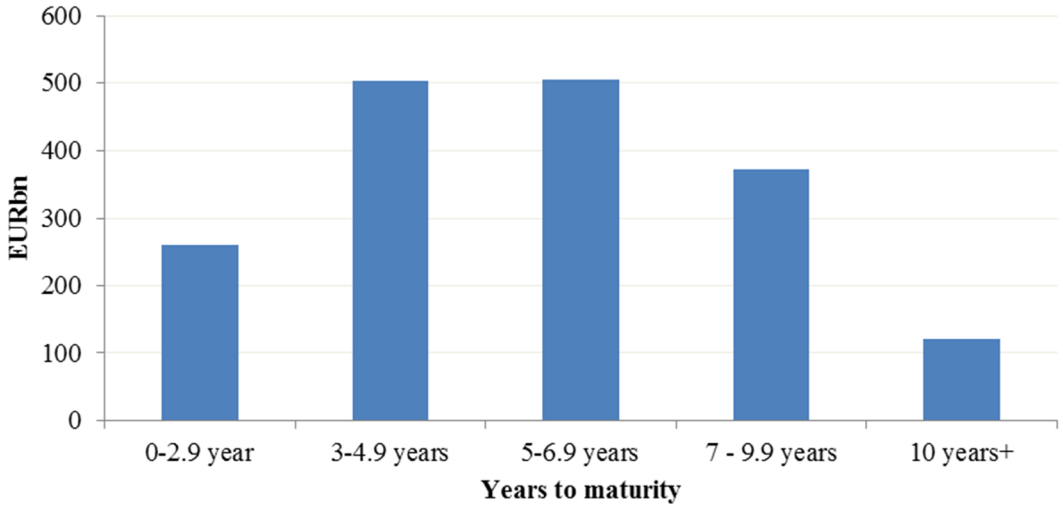


Chart 1.2: Euro-denominated corporate bond issuance by size

Results of a Dealogic search of all euro-denominated corporate bond issuance priced between 2001 and 2012. Tranche sizes are rounded to the nearest EUR 0.5bn.

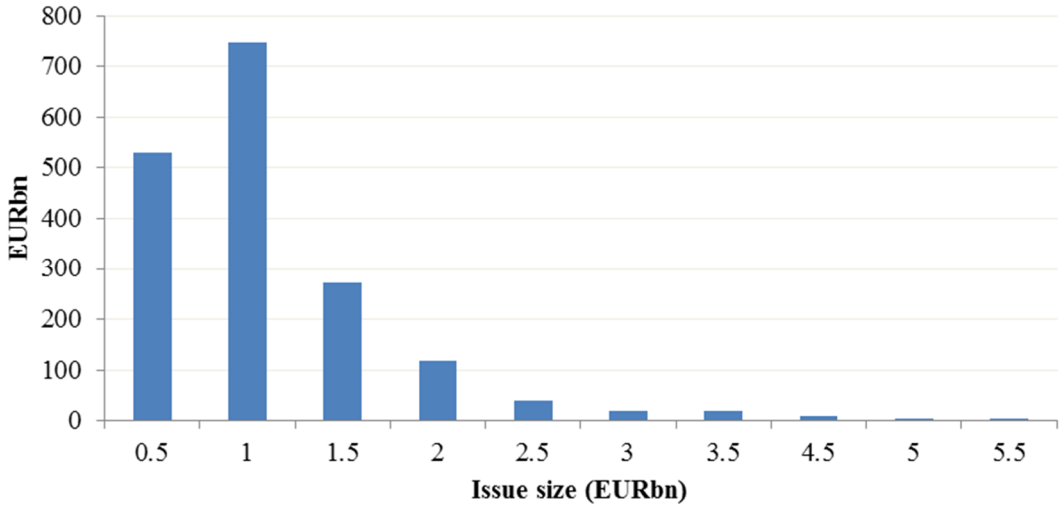


Chart 1.3: Euro-denominated corporate bond issuance by launch spread

Results of a Dealogic search of all euro-denominated corporate bond issuance priced between 2001 and 2012. Credit spreads are rounded to the nearest 0.5% or 50 basis points.

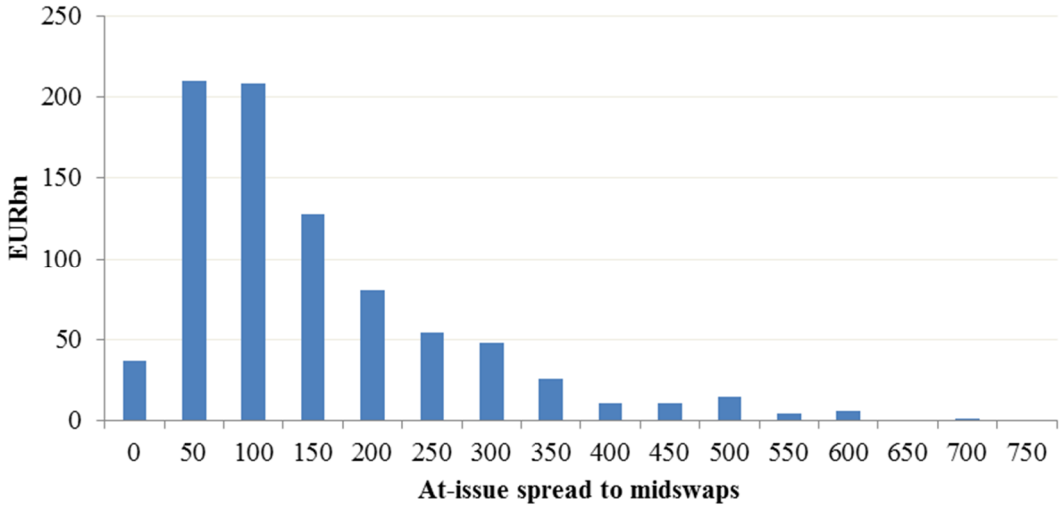
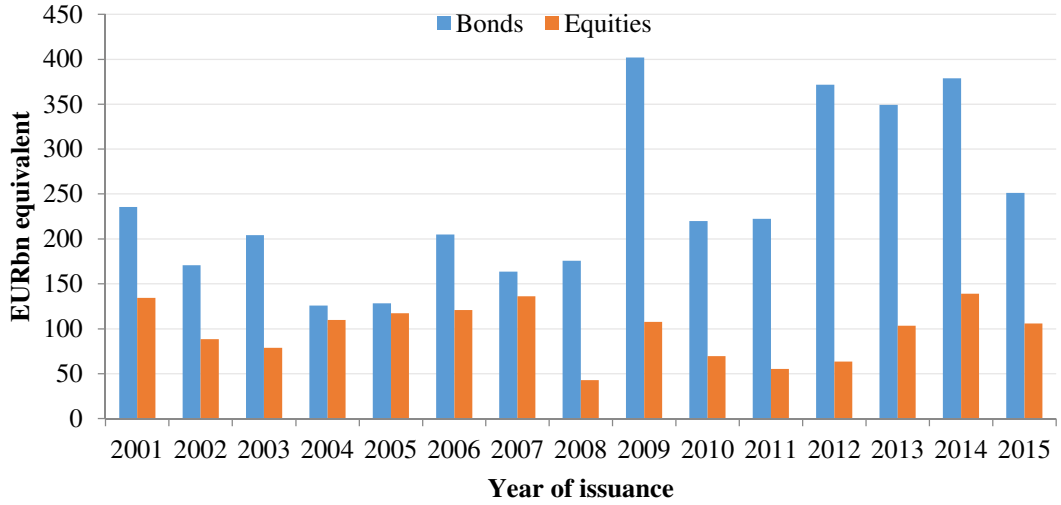


Chart 1.4: Western European corporate bond and equity issuance by year

Results of a Dealogic search of all Western European corporate bond and equity issuance priced during 2001 and 2014. Non-euro denominated bond and equity tranches are converted to euro as of the date of issuance.



2 Institutional setting

In this chapter I provide a general overview of the corporate bond market and my data set. It is constructed as follows. Section 2.1 discusses the key features of the bond product. Section 2.2 sets out the primary market distribution process. Section 2.3 discusses the secondary market. Section 2.4 explains how I collected my sample of Western European euro-denominated investment grade corporate bond tranches, while Section 2.5 describes the development of key sample statistics across the time period.

2.1 Bond product

A bond is one of the more standardised debt instruments available to a corporate, committing the issuer to a fixed set of cash payoffs consisting of an interest payment, also known as a coupon, and the principal amount repaid at maturity. Table 2.1 compares the typical features of a European euro-denominated bond, bank loan and non-bank private placement based on a sizeable corporate issuer with assets of at least EUR 1 billion. These concern the issue size, tenor, documentation, covenants, seniority, security, coupon type, rating, investor base, primary distribution process and the secondary market.

The typical issue size of a bond in the euro-denominated market is EUR 300 million or more. This is substantially larger than bank loans and non-bank private placements which can be as low as EUR 50 million and EUR 100 million respectively (source: Dealogic). It is reflective of the greater depth available in the bond market when compared to these other sources of financing as well as the

typically larger number of investors that participate in a single bond offering. Euro-denominated corporate bonds with a tranche size greater than EUR 500 million are considered benchmark size as they are included in the Markit iBoxx Euro benchmark indices, which are the main indices for European corporate bonds (Markit, 2013).

As discussed in Chapter 1 the typical tenors for bonds are between 3 to 10 years. A bank loan by contrast tends to be between 1 to 5 years and a non-bank private placement often ranges from 3 to 15 years. This product differential is driven by both issuer and investor preferences. Issuers in these three debt markets will have a different credit quality, asset and project life cycle, access to liquidity, amongst others, while typical investors in each market have divergent investment horizons, monitoring capabilities and liquidity requirements (Antoniou et al., 2006).

The documentation of a bond is highly standardised; the elements required to be included in a European-targeted bond prospectus are all set out in the European Union prospectus directive. The prospectus drafting is typically done in accordance with the templates produced by the International Capital Markets Association, an industry body with representatives from issuers, bookrunner and investors (International Capital Markets Association, 2014). This contrasts with bank loans and non-bank private placements which are tailored to each particular transaction and hence a lower degree of standardisation. A bond prospectus can take the form of a Euro Medium Term Note programme, or EMTN, or a standalone prospectus. An EMTN programme functions as a prospectus for all their subsequent bond offerings

for a full year[6] while a standalone prospectus only covers a single bond offering (Euromoney, 2006).

As with most other major forms of debt bonds are senior claims on a company, i.e. in the event of bankruptcy they are paid out ahead of junior claims such as subordinated debt. They are also typically unsecured (Allen et al., 2008), unlike bank loans which tend to have collateral assigned to them.

A bond is relatively unique in its lack of restrictive covenants, in contrast to bank loans and non-bank private placements which tend to have a broad range of tailored covenants. The main covenants found in a euro-denominated bond contract are the negative pledge, cross-default and change of control.

A negative pledge restricts the issuer from assigning security to other debt without then assigning equal security to the bondholders. This restriction typically only applies to the issuance of other bonds, i.e. an issuer is still allowed to grant security to bank loans. It ensures that the bond investors do not become subordinated due to other debt investors being able to claim certain assets of a company upon default of its payment obligations (International Capital Markets Association, 2006).

A cross default entails that a default under the bond contract is triggered when the issuer defaults on any of its other indebtedness. This ensures that bond holders can immediately demand repayment should the issuer be in financial distress, as signalled by defaulting on another debt obligation, rather than wait until a non-payment occurs on the actual bond contract. In order to avoid an accidental default of an insignificant portion of debt triggering this clause it is typically coupled with a

[6] An EMTN programme is somewhat similar to a shelf filing in the US capital markets.

minimum threshold, for instance a default on EUR 50 million or more of other indebtedness (Ferran, 2008).

A change of control allows the investor to sell the bond at its principal value back to the issuer should the issuer be downgraded to sub-investment grade as a result of a take-over. This investor put option became increasingly popular in 2007 amidst a rise in private equity-led leveraged buy-out transactions. It protects investors from these types of take-over transactions having a material impact on the credit quality of the issuer (Davies, 2007).

Bond contracts have either fixed or floating rate coupons with the latter being relatively less common (Melnik and Nissim, 2006). In the Euro-denominated market fixed rate bonds are priced over the Euro mid-swap[7] while floating rate notes are priced over the Euro Interbank Offered Rate, abbreviated as Euribor. Euribor is a measurement of the average interest rate in the Eurozone interbank market. In the bank loan market most contracts are floating rate and priced over Euribor, being the average level at which banks can fund themselves.

Unlike issuers in the bank loan and non-bank private placement market most European bond issuers are rated. Bonds are therefore often categorised by their credit rating, a measure of the probability the issuer will default on its payment obligations. The three most influential agencies that assign such ratings are Moody's, Standard and Poor's and Fitch. Bonds with a minimum credit rating of Baa3, in the case of Moody's or BBB- in the case of S&P and Fitch are referred to as investment grade,

[7] The Euro mid-swap is the fixed annual percentage yield one party is willing to pay to receive the prevailing 6 months Euribor rate for a pre-determined number of years. This interest rate swap is actively quoted by financial intermediaries for a wide range of tenors, known collectively as the swap curve. Note that this benchmark differs from the US bond market, where bonds are priced over US Treasuries.

as they have a relatively low probability of default assigned to them. Bonds with a credit rating up to Ba1 or BB+ have a non-trivial probability of default and are known as high yield or junk bonds.

Certain bonds include an issuer call option (Julio et al., 2008). This feature is of limited relevance in the euro-denominated investment grade bond market and hence will not be considered in my empirical analysis. It has become more commonplace to be included in bond contracts from 2013 onwards, i.e. outside the scope of my sample period, and typically only includes a so-called make-whole call option. This is a call option effective for the life of the bond and priced at a relatively low spread over the underlying German government bond, or Bund, typically equivalent to approximately 20% of the at-issue spread over Bunds. For example assume a bond is priced at 80 basis points over Euro midswaps, which is on the issue date determined to be equivalent to 100 basis points over Bunds.[8] The make-whole call option would be set at 20 basis points over Bunds. This is clearly a highly punitive price and tends only to be exercised by an issuer in the final 3 to 6 months of a bond to facilitate an earlier refinancing. Practitioners therefore note that it tends to have no bearing on investor interest in the bond or its at-issue pricing.

As discussed in Chapter 1 the bond market attracts a broad range of institutional and retail investors. This contrasts with the non-bank private market, which is dominated by insurers, and the bank loan market, whose investors are mostly banks.

[8] While the euro-denominated corporate bond primary market pricing is set over midswaps, the equivalent level over Bunds is calculated to assist secondary trading as traders tend to quote over Bunds.

The primary market distribution process of a bond follows several distinct phases, which I explore in Section 2.2, and is led by bookrunners. Domestic bonds are sold into the home country of the issuer, foreign bonds into another country and Eurobonds into a number of foreign countries. Bank loans tend to be bilaterally placed, meaning the process is less standardised and typically dictated by the degree of negotiation required between the banks and the issuer. The non-bank private placement issuance process is often substantially longer than that of the bond market, involving an extensive negotiation and due diligence process (Carey et al., 1993).

The bond market is also distinctive in having a secondary market (see Section 2.3). While this makes the instrument more liquid than other forms of corporate debt, most trading actually takes place in the first days after a corporate bond is issued (Asquith et al., 2013; Hotchkiss and Ronen, 2002).

2.2 Primary market

The key features of the primary market distribution process are set out in Table 2.2. This process involves bookrunners, legal advisers, paying agent, clearing system and trustee (London Stock Exchange, 2013). The bookrunners are responsible for managing the overall issue process as well as marketing and selling the bond to investors. Occasionally they commit to a standby underwriting commitment whereby they agree to purchase any residual bonds at a pre-agreed price if there is insufficient demand,[9] albeit increased market volatility in the years after

[9] Note that this differs from the equity markets where intermediaries typically offer a firm commitment. This requires the investment bank to purchase all securities at a pre-agreed price before selling them to investors (Armitage, 2000).

the Lehman Brother's collapse has rendered this practice relatively rare (S&P, 2013).[10] The role of bookrunners is typically fulfilled by investment banks. The legal advisers are responsible for drafting the bond contract and supporting documentation. The paying agent receives the interest payments stipulated in the bond contract from the issuer and pays these out to bondholders. The clearing system is responsible for enacting the actual transfer of bonds (London Stock Exchange, 2013). In the euro-denominated bond market this role is almost always assumed by Euroclear and Clearstream. A trustee is a representative of bondholders who is responsible for ensuring the terms of the bond are being followed.

The issue process of a bond follows several distinct stages, being prospecting, preparation, marketing, bookbuilding and closing (Carey et al., 1993; Choudhry, 2010; London Stock Exchange, 2013). During the prospecting stage investment banks identify corporate clients who could benefit from bond market funding and compete amongst each other to act as bookrunners on the envisioned bond issue. It ends with an issuer mandating its bookrunners as well as the other necessary parties for a bond contract.[11]

In the preparation stage the bond contract and supporting documentation are drafted and receive approval from the regulator of the stock exchange on which the issuer intends to list the securities.[12] This is only required for bonds issued under a standalone prospect, for which this stage can last six to eight weeks. For bonds

[10] For instance in June 2013 China Huaneng Group demanded that a number of its bookrunners offer a standby commitment for its envisioned USD bond offering. Financial press described this as "extraordinary measures" (IFR, 2013).
[11] There is a considerable body of research on the determinants of an issuer's bookrunner selection, relating it to factors such as an investment bank's geographical proximity to the issuer, its league table ranking and its existing lending relationships with the issuer (Yasuda, 2005; Lau and Yu, 2010; Butler, 2008).
[12] For instance the UK Listing Authority performs this role for the London Stock Exchange.

issued under an EMTN programme the prospectus has necessarily already been approved and this stage can take as little as half a day. During the preparation stage bookrunners also perform their due diligence of the issuer on behalf of investors. Given the large and dispersed group of investors who purchase a bond offering this avoids an inefficient process whereby each investor conducts their own due diligence.

In the marketing stage the bookrunners organise a series of bond investor meetings for the issuer during which the issuer presents itself and the envisaged terms and conditions of the offering (Choudhry, 2010; Saito and Tsukazan, 2010). For European-targeted bond issues these so-called roadshows tend to include meetings in Germany, United Kingdom, France and the Netherlands. Tranches issued by well-established companies may omit this stage or engage in a more limited form of marketing, i.e. through selected conference calls.

The bookbuilding stage commences with bookrunners collect orders from investors and recording these in a joint orderbook (Saito and Tsukazan, 2010). This orderbook typically ends up being larger than the envisaged offering size (Choudhry, 2010), which allows an issuer to adjust the price and size of the offering pending advice of its bookrunners. Typically this is done through intensive discussions during the course of the day when bookbuilding takes place. Through conference calls with the issuer the bookrunners seek to give further transparency around key orders in the orderbook, in particular their the price sensitivities, as well as provide information on feedback from non-participating investors and investors still expected to place orders. This is then utilised to advise the issuer on the appropriate price and

size of the transaction and on the necessary market communications to achieve these goals.

After the final price and size has been set bookrunners determine the amount of bonds each investor should be allocated (Saito and Tsukazan, 2010) and discuss these proposed allocations with the issuer. Once these allocations have been agreed, they are released to investors and the bookrunners proceed to pricing the new instrument. During a pricing call, which is attended by the bookrunners and the issuer, the level of the underlying Euro mid-swap rate is agreed and is used to calculate the resulting at-issue yield, being the sum of the credit spread and the midswap rate, as well as the price and coupon. Once priced investors are able to trade the bond.

During the closing stage the bond documentation is signed by the issuer and the bookrunners, resulting in the legal creation of the bond contract. This generally occurs three working days after pricing. Two working days after signing the bond is settled, which entails that the issuer receives the proceeds of the offering (Choudhry, 2010; London Stock Exchange, 2013).

2.3 Secondary market

The main parties involved in the trading of a bond contract are investors, market makers, brokers and the clearing system. The investors are staffed by credit analysts and portfolio managers. Credit analysts formulate investment views through analysing the companies, sectors and geographies in which their firm invests. Portfolio managers use this intelligence to determine the holdings of their portfolio

and adjusting these through buy and sell transactions (PIMCO, 2015). The main market makers in the secondary markets are investment banks. They employ both bond traders and salesmen. The traders are responsible for the buying and selling of a specific range of bonds and are often categorised by credit rating, industry and currency. Sales people assist in this process through finding buyers and sellers of bonds amongst their client base of investors. Brokers tend to be intermediaries between market makers and investors, executing trades on behalf of both retail and institutional investors (Scott-Quinn and Cano, 2013). As with the primary market the clearing system organises the physical transfer of the bonds once a trade has been agreed.

The process of a simple secondary bond market trade consist of inquiring, execution and settlement. Once an investor has identified a bond it is keen to buy or sell it will inquire with various market makers into the likely price of this transaction. It does this either through a broker or directly through the market maker, while typically utilising an electronic platform such as Bloomberg. The trader being contacted will give a price indication, being either a bid price, namely the price at which the trader will buy a particular bond, or an offer price, the price for selling this bond. Most investors will make such inquiries with four to five different traders to obtain a sense of the market price.

Having received the indications, the investor will select the most competitive quote and the trade will be executed. This can happen within the span of a few minutes. Smaller-sized trade inquiries, i.e. those from retail investors, are typically completely electronic and based on live bid and offer quotes from traders. It would

clearly be inefficient for a trader to provide specific quotes for each of these inquiries.

Upon execution a trade is registered in the market maker's internal systems. These are connected with Euroclear, which arranges the actual transfer of the bonds and the cash. This typically occurs two business days after the day of trade execution.

The trade inquiry stage is often also initiated by the market makers themselves. Traders regularly quote axes, being volumes of particular bonds they are actively looking to buy or sell. Their sales people will contact investors and brokers to gauge whether they have any bonds listed on the buy axis or are willing to purchase any of the bonds listed on the sell axis.

2.4 Sample construction

The steps I took to construct my sample are summarised in Table 2.3. I commence with a Dealogic Debt Capital Marketa Analytics search of all euro-denominated senior unsecured bond tranches by Western European corporate issuers from the 1st January 2001 up to 31st December 2012. Dealogic defines the region Western Europe as including Austria, Belgium, France, Germany, Greece, Ireland, Luxembourg, Netherlands, Portugal, Spain, Switzerland and UK.

This search includes several filters. I exclude secured tranches due to their distinct credit risk profile. As analysed by Stulz and Johnson (1985) the value of secured debt is largely linked to the value of the collateral assigned to the bond as opposed to the overall creditworthiness of the firm.

In line with other corporate debt studies I also exclude financial institutions (Denis and Mihov 2003). The sample does include captive finance companies, which are issuers whose main line of business is to provide lending services to customers of their industrial corporate parent. Examples include Volkswagen Financial Services and Renault Credit International Banque.

I also exclude domestically placed tranches. For my research I am interested in bonds that have been marketed internationally across the European investor base for corporate bonds. Almost all bonds are distributed in this way (source: Dealogic) and hence this form of syndication is the most relevant to study. This applies in particular to my research on bond investors' demand. Only through analysing widely marketed bonds can I approximate for demand from the full population of European bond investors.[13]

I also do not include tranches that are privately placed, single bookrunner-led, smaller than EUR 200m, fungible and with a maturity of less than 1 year. This is driven by feedback from practitioners, who note that tranches with these types of characteristics are likely to have been sold to a small number of investors and hence not be reflective of the typical pan-European distribution process I am interested in. Single bookrunner-led tranches are typically referred to by practitioners as club deals as they are placed with a small number of investors.[14] Tranches smaller than EUR 200 million are insufficiently large to have been broadly distributed. Fungible notes are often referred to by practitioners as taps. They have the same terms and

[13] This would also lead me to exclude foreign tranches, for instance a German corporate issuer selling a euro-denominated bond solely to French investors. I found no such tranches in my sample, which likely reflects the harmonisation of bond documentation rules across the European Union (see EU Prospectus Directive).

[14] My results for bookrunner syndicate performance in Chapter 4 hence only directly apply for tranches where banks choose to employ multiple bookrunners. In practice this applies to almost all public bond offerings.

conditions as one of an issuer's existing bonds and hence effectively represent an increase in the outstanding amount of this original bond. They typically arise as a result of one or a small group of investors expressing interest in increasing their holdings of a particular bond.[15] Bonds with a tenor of less than 1 year tend to be sold to a select group of fund managers with specific investment mandates that are restricted to this tenor.

This restricted Dealogic search provides me a sample of 1,601 tranches. I remove 121 tranches from this sample due to inaccuracies in the Dealogic data base, i.e. tranches that appeared erroneously as they did not meet my search filters.

In order to focus on the investment grade market I exclude all sub-investment grade rated, or high yield, tranches. High yield tranches differ in multiple aspects from the investment grade market, including their product characteristics, distribution process and bookrunner roles. The product characteristics of the sub-investment grade market is better compared to bank loans and non-bank private placements as they tend to incorporate a range of restrictive covenants and tend to have smaller tenors and issue sizes (see Section 2.1). The distribution process of sub-investment grade tranches is also distinct, which is why banks tend to employ separate origination and syndication professionals for the sub- investment grade market. Being a market that is more dominated by first-time issuers this process for instance often involves a 2 to 3 months long credit rating establishment process.[16].

[15] These investor expressions of interest in a new bond offering are often referred to by practitioners as reverse enquiries.

[16] While an inaugural credit rating process of an investment grade company can be equally lengthy, it is not a process most of them are required to engage in as in practice nearly all investment grade bond issuers have existing credit ratings. For investment grade issuers any credit rating process is also often strictly segregated from the bond issuance process, with the rating advisory and bookrunner roles being awarded as separate mandates.

Sub-investment grade bookrunners also tend to provide a standby underwriting commitment as a result of the heightened execution risk associated with distributing these instruments. These bookrunners therefore also conduct a lengthier due diligence phase as well as more detailed negotiations around the terms and conditions of the bonds. Banks in effect take on the role of the investor, performing their own in-depth credit analysis.

Incorporating high yield tranches would hence complicate the analysis of investor demand, bookrunner performance and bond allocations. Given the distinct nature of the product the high yield investor base tends to be quite distinct from the investment grade investor base (Madich et al., 2010), meaning it would not be possible to draw overarching conclusions from a combined sample.[17] As the bookrunner workstreams are also different, the group of reputable high yield bookrunners is different from that for the investment grade market (source: Dealogic). Bookrunner structures often also deviate. For instance there is the concept of a lead-left bookrunner, the main organising bank, which does not appear in the investment grade market (Harrison, 2013). And given the distinct high yield investor base the geographic and type make-up of allocations are expected to differ substantially.

The exclusion of high yield tranches only has a marginal impact on the practical relevance of my study given that the European high yield market is still

[17] Moreover the reporting rate of orderbook information amongst high yield tranches is quite low, with orderbook size being available for approximately only half of all tranches. Practitioners suggest that high yield orderbook information has a distinct competitive advantage due to the smaller and more volatile nature of this investor base.

small. Only 3.2% of overall European bond issuance during my sample period are high yield rated, compared to 10.5% in the US capital markets (Source: Dealogic).

I am left with a sample of 1,268 investment grade tranches, or a reduction of 212 data points. From this sample I filter out 28 tranches that have been targeted at retail bond investors. These are not of interest as I am focused on analysing the distribution process inherent in tranches that have been marketed to a wide range of European investors. Selling purely to retail investors typically involves a multiple weeks-long bookbuilding process, which is quite distinct from the intra-day norm for regular pan-European distributions (see Section 2.2). Retail tranches also tend to be executed by a subset of investment banks that have sizeable in-house private banking networks.

Finally I exclude tranches sold through a retention system, which results in the removal of a further 16 tranches. The retention system was common in the euro-denominated market in 1999 and 2000 and entails that each bookrunner provides a firm commitment to purchase their proportionate share of the bond tranche. Bookrunners hence end up in competition in the bookbuilding process to sell this share in the bookbuilding process, resulting in separate orderbooks and greater secrecy around the end-investor base. This differs from the pot-based system which has become the market norm in Europe since 2002 and in which I am therefore interested (see Section 2.2).

Together these exclusions produce a final sample of 1,224 euro-denominated bond tranches made by 324 Western European firms. The country split of this data set is shown in Table 2.4. Approximately two thirds of the issuance is from France, Germany and the United Kingdom, accounting individually for 30.47%, 24.84% and

12.66% respectively. The least prevalent countries are Luxembourg, Greece and Ireland, who constitute 1.06%, 1.06% and 0.65% of the sample. Subsamples are extracted from this main sample for the purposes of the different empirical chapters.

2.5 Sample description

My sample period tracks the formative years of the euro-denominated bond market, which emerged in the years following the introduction of the euro in 1999. In this section I consider how key sample statistics developed over this time period, focusing on the volume and cost of issuance. I analyse this through time series charts showing quarterly statistics, with Chart 2.1 showing the number of tranches issued, Chart 2.2 the volume of issuance and Chart 2.3 the at-issue credit spread.

The volume issued throughout my sample period is subject to a degree of seasonality as is apparent from Charts 2.1 and 2.2. The fourth quarter has relatively less supply with an average of 3.5 tranches and EUR 2.60 billion issued in comparison to a cross-sample quarterly average of 25.5 tranches and EUR 20.80 billion respectively. Practitioners note that corporate bond markets tend to shut between the middle of November and early January. Investors tend to close their portfolios from the middle of November onwards; institutional investors in particular will be reluctant to take on substantial new risk in the weeks leading up to year end as this could negatively impact the overall full-year performance of their portfolios. This concern is accentuated by the growing illiquidity in the secondary markets in the weeks leading up to Christmas, making it more challenging for investors to reduce their holdings in underperforming new bond issues. As a result issuers tend to

fulfil their funding requirements for the second half of the year between September and early November.

The busiest single quarters by number of tranches are Q3-12, Q2-09 and Q1-09 with 85, 70 and 67 tranches respectively. The ranking is relatively similar for volume of issuance, where the top three are Q1-09, Q2-09 and Q3-12 with EUR 82.65bn, EUR 61.96bn and EUR 59.00bn of issuance. The sizeable volumes in 2009 reflect the rapid expansion of the European bond markets following the 2008 financial crisis (see Section 1.1.2). During this period a growing number of companies sought to access bond markets in order to diversify their funding sources away from the then fragile banking market (Kaya and Meyer, 2013). The heightened level of activity in the third quarter of 2012 came after a volatile and relatively quiet first half of 2012. The European sovereign debt crisis had escalated with market makers increasingly concerned around the debt sustainability of the so-called periphery countries of Greece, Ireland, Portugal, Italy and Spain, resulting in increasing speculation that the euro would cease to exist (Neely, 2012). This market volatility ended in July after the president of the European Central Bank Mario Draghi pledged to do "whatever it takes" to save the euro (Draghi, 2012).

The graphical representation of volumes highlights that the post-2008 growth in bond market activity marks a structural shift. Whereas between 2001 and 2008 there was an average of 19.3 tranches and EUR 16.42bn of issuance per quarter, this rose to 38.0 tranches and EUR 29.55bn of issuance for the years 2009 to 2012. The financial crisis has arguably had a fundamental impact on how European companies finance themselves, consistent with the notion of Europe moving to a more US-style form of disintermediated corporate financing (Hill, 2015).

European firms have had to pay up for accessing the capital markets in this period. It is clear from Chart 2.3 that the at-issue credit spreads for my sample period were highest in late 2008 and early 2009. The most expensive quarters for issuers to access the markets were Q4-08, Q1-09 and Q2-09 with average at-issue spreads of 4.03%, 3.06% and 2.52%. This is due to the financial market stress following the collapse of Lehman Brothers on 15th September 2008. The sell-off of banking assets spilled off into corporate bonds, resulting in substantial widening of secondary market credit spreads. The primary market at-issue credit spreads widened even further as investors demanded increased concessions for investing in new corporate debt.[18] As is apparent from Chart 2.3 these spreads did not return to the pre-financial crisis levels within my sample period, reflecting ongoing heightened market volatility resulting primarily from the European sovereign debt crisis in 2010 through to 2012. The average at-issue spreads for 2009 to 2012 was 1.87% in comparison to 0.89% for the years 2001 to 2008. Credit spreads did fall back to their 2007 lows around 2014 or 2015 for most investment grade corporates as a result of the unprecedented volumes of quantitative easing instigated by the ECB.

[18] For instance Volkswagen may have had to pay a 1.50% spread for a new 5 year when its outstanding 5 year bonds were trading at 1.10%. This differential is often referred to by practitioners as the new issue premium and is broadly similar to the discount to current trading price concept used in rights issues (Armitage, 2000).

Table 2.1: Typical features of a European bond, bank loan and non-bank private placement

Based on a sizeable European non-financial firm with assets of at least EUR 1 billion or more. Sourced from Choudhry (2010), Dealogic, Euro-PP (2015).

Feature	Bond	Bank loan	Non-bank private placement
Issue size	EUR 300m+, benchmark size is EUR 500m+	EUR 50m+	EUR 100m+
Tenor	3 – 10 years	1 – 5 years	3 – 15 years
Documentation	Standardised, EMTN programme or standalone	Tailored, standalone loan	Tailored, standalone loan or note
Covenants	Limited and standardised, main ones being negative pledge, cross-default, change of control	Extensive and tailored, range of financial, operational and information covenants	Extensive and tailored, range of financial, operational and information covenants
Seniority	Senior	Senior	Senior
Security	No	Often	Sometimes
Coupon	Fixed	Floating	Fixed
Credit rating	Yes, mostly investment grade	Sometimes	Sometimes
Investors	Institutional and retail	Bank loans	Institutional, mostly insurers
Primary distribution process	Intermediated through bookrunner banks	Bilateral or syndicated through arranger banks	Intermediated through agent banks
Secondary market	Yes	No	No

Table 2.2: Stages of corporate bond issuance

High level stages of a corporate bond issuance process. Based on Source Carey et al., (1993); Choudhry (2010) and London Stock Exchange (2013).

Stage	Activities and events
Prospecting	Issuer identification Competition amongst investment banks Mandate of bookrunners and other parties
Preparation	Bond contract and supporting documentation written Regulatory approval Due diligence by bookrunners
Marketing	Investor roadshow and/or conference calls
Bookbuilding	Bookbuilding Determination of size and price Allocation
Closing	Documentation signed Settlement

Table 2.3: Sample construction process

Stage	Change in sample size	Residual sample
Dealogic search		1,601
Data clean-up	(121)	1,480
Exclude high yield	(212)	1,268
Exclude retail-targeted bonds	(28)	1,240
Exclude bonds sold through retention system	(16)	1,224

Table 2.4: Sample breakdown by issuer country

Country	Number of tranches	%
France	373	30.47
Germany	304	24.84
United Kingdom	155	12.66
Italy	104	8.50
Netherlands	73	5.96
Spain	66	5.39
Switzerland	39	3.19
Austria	29	2.37
Portugal	26	2.12
Belgium	21	1.72
Luxembourg	13	1.06
Greece	13	1.06
Ireland	8	0.65

Chart 2.1: Number of sample tranches by quarter of issuance

Based on a sample of 1,224 euro-denominated public bond tranches made by 324 Western European firms during 2001-2012.

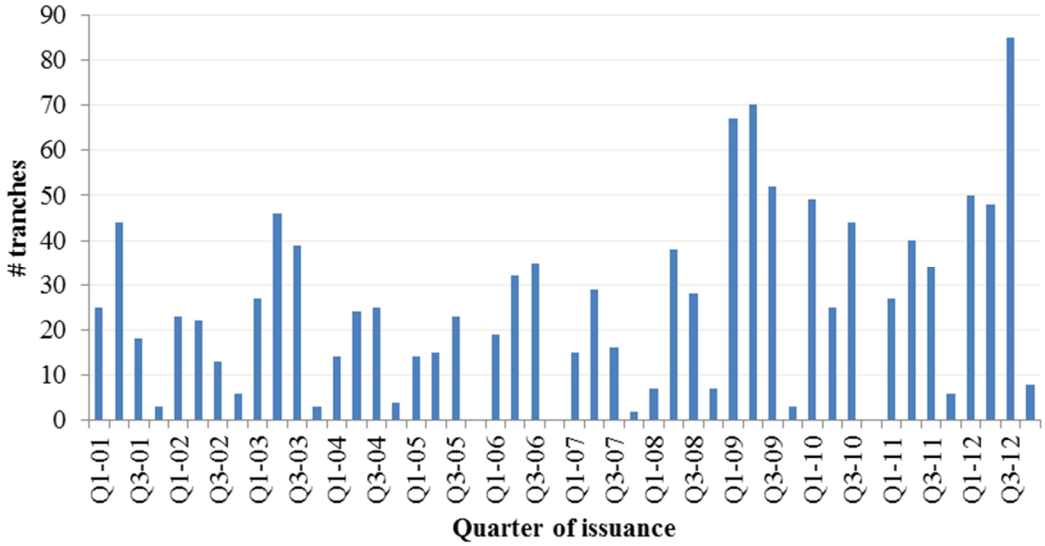


Chart 2.2: Sample volume of issuance by quarter of issuance

Based on a sample of 1,224 euro-denominated public bond tranches made by 324 Western European firms during 2001-2012.

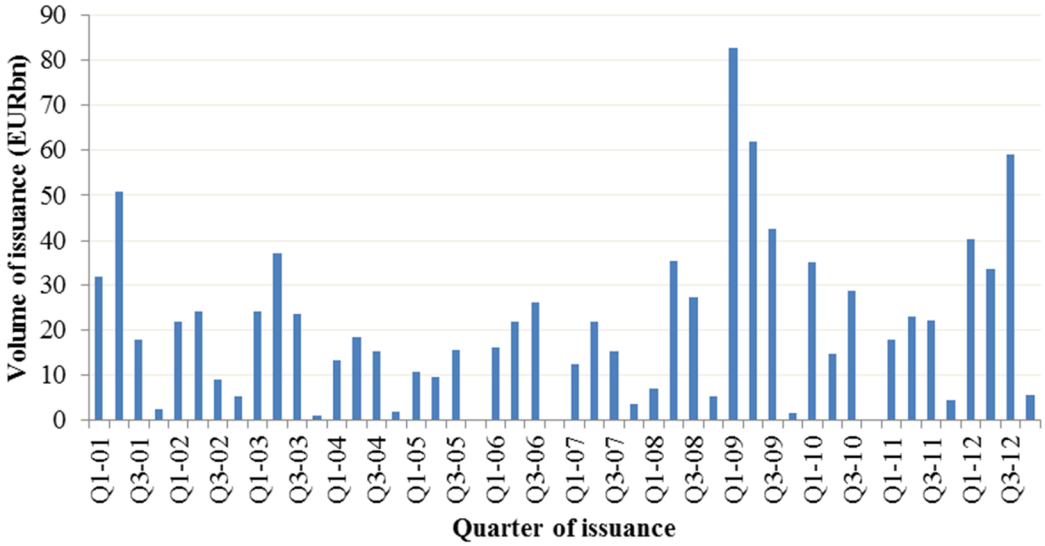
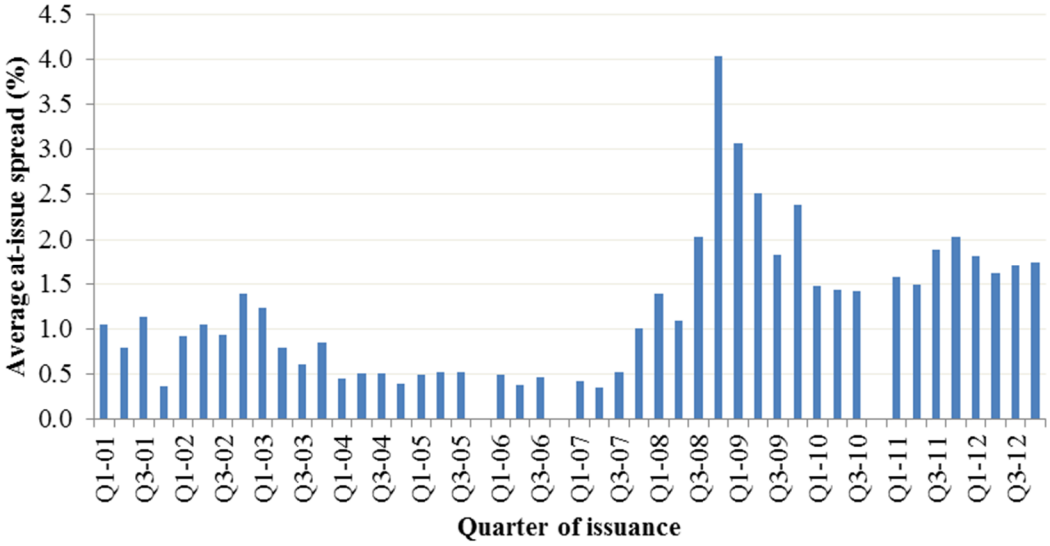


Chart 2.3: Average sample at-issue spread by quarter of issuance

Based on a sample of 1,224 euro-denominated public bond tranches made by 324 Western European firms during 2001-2012. Quarters with no tranche data are blank.



3 Investor demand

3.1 Introduction

The global financial crisis of 2008 has resulted in bond investors becoming an increasingly important provider of funding for companies. Global corporate bond issuance has more than doubled in the 5 years following the crisis, rising from USD 1.08 trillion in 2007 to USD 2.24 trillion in 2013 (Source: Dealogic). Obtaining strong bond investor demand provides firms with greater flexibility in setting the terms and conditions of their bond tranches (Cherney, 2014). Yet the corporate bond investor base is heterogeneous (Massa et al., 2013) and, being at arms' length, difficult for firms to comprehend (Fama, 1985). Analysing corporate bond investors is therefore of increasing importance.

Competing claims can be made about corporate bond investors. Debt sourcing literature argues that bond investors demand less higher risk bonds due to greater concerns about inefficient liquidation and agency costs (Berlin and Loeys, 1988; Myers, 1977). On the other hand portfolio choice theory states that a bond's expected returns, variance and correlation with other bonds determines its benefit to a portfolio and should therefore drive demand (Markowitz, 1952). Given that the returns of bonds with differing risk of default are partially uncorrelated, both low- and high risk bonds are important in obtaining a mean-variance efficient bond portfolio (Blume et al., 1991). Secondly, agency cost theories claims that bond investors buy fewer bonds from higher information cost companies given higher adverse selection and asset substitution risks (Harris and Raviv, 1991; Leland and Pyle, 1977). Yet portfolio choice considerations can be used to argue that investors purchase a similar amount of bonds from higher information cost firms as their

returns are partially uncorrelated with lower information cost firms (Heston and Rouwenhorst, 1994). Finally, debt sourcing theorists argue that bond investors purchase more bonds from issuers with greater bond market presence due to reduced adverse selection concerns (Cantillo and Wright, 2000). Portfolio choice theorists state the contrary, namely that bond investors pursuing a diversification strategy should purchase less bonds from issuers with greater bond market presence (Pieterse-Bloem and Mahieu, 2013).

This chapter seeks to compare these differing predictions that can be made on corporate bond investors' purchases, thereby provide a clearer understanding of the drivers of this. I am able to do this through utilising orderbook oversubscription, a relatively underused proxy for debt investor demand. I source this variable for a sample of 1,103 euro-denominated primary public bond tranches made by 285 firms from 2001 until 2012. Orderbook oversubscription is commonly used in equity market research (Cornelli and Goldreich, 2003; Derrien, 2005) but has, to my knowledge, not yet been applied to the bond markets. It is arguably the most reliable proxy for bond investor demand as the primary syndication of a corporate bond is a uniquely liquid point in its lifecycle; once a bond has been issued it becomes illiquid fairly quickly (Asquith et al., 2013; Hotchkiss and Ronen, 2002). Having a reliable proxy is crucial in this regard. Existing evidence on bond investors is largely based on empirical research that use indirect proxies, such as a firm's public debt ratio or quantum of bonds issued (Denis and Mihov, 2003; Johnson, 1997). Yet the degree of oversubscription of such bond tranches can differ substantially, with oversubscription levels in my sample ranging from 0.67x to 17.50x. And with average oversubscription levels in my sample of 3.71x, the actual tranche size is better regarded as a proxy for an issuer's intended supply.

It is therefore unsurprising that my paper reaches several conclusions at odds with existing corporate bond market research. Contrary to the findings of most debt sourcing studies (eg. Cantillo and Wright, 2000), my results show that corporate bond investors demand more bonds from lower rated and higher credit spread companies. Such higher-risk bonds are a scarce resource in the European bond markets and are required to optimise the risk-return characteristics of a bond portfolio (Blume et al., 1991).

I also find that bond investors demand less bonds from higher levered companies, which also goes against the results of previous empirical bond market studies (Denis and Mihov, 2003). Higher levered firms are less attractive investments as their management is less incentivised to invest in profitable projects (Myers, 1977).

My results for information costs show that investors demand more bonds from firms outside of Germany, France and the United Kingdom - the main domiciles for most European capital markets investors. This suggests either that firms from smaller economies offer valuable geographic diversification or that they engage in more extensive international investor marketing exercises (Pieterse-Bloem and Mahieu, 2013).

Finally I find that investors demand less bonds from both debut issuers and frequent issuers. Debut issuers are unattractive investments due to the risk of adverse selection (Cantillo and Wright, 2000). Frequent issuers on the other hand pose single name concentration risks (Ødegaard, 2009).

My findings contribute to several research areas. They enable corporate debt sourcing studies to incorporate factors that are pertinent to bond investor demand when modelling an issuer's optimal public debt ratio (Berlin and Loeys (1988; Diamond, 1991). This is likely to result in more nuanced predictions when analysing a firm's risk profile.

They also relate to research on bank loans (Black, 1975; Fama, 1985) as well as non-bank private debt instruments (Carey et al., 1993). My findings can be considered a benchmark for demand for these other debt products, before their distinctive structural features are taken into account.

Furthermore my results help further the portfolio choice literature (Blume et al., 1991; Korn and Koziol, 2006) by identifying areas where bond portfolios are not mean-variance efficient. Most obviously this relates to investing in debut bonds and bonds issued by higher levered firms.

Finally my findings contribute to the initial public bond market literature (Datta et al. 1999; Hale and Santos, 2008) through identifying the types of firms that are best positioned to place an inaugural tranche, namely those with higher business risk and lower financial risk. This is particularly beneficial considering the lower average demand for debut tranches increases their execution risks. In practice bookrunners are aware of these heightened execution risks and have more stringent processes associated with debut offerings. These include lengthier internal approval process, a more thorough issuer due diligence and a more extensive investor presounding and marketing effort.

The remainder of the chapter is organised as follows. Section 3.2 sets out the differing theories on bond investor demand and my proposed hypotheses. Section 3.3 provides the empirical proxies used and sets out the sample selection process. Results of the univariate analysis are given in Section 3.4 and the multivariate analysis is in Section 3.5. Robustness tests are set out in Section 3.6. Section 3.7 concludes.

3.2 Research design

My hypotheses on bond investor demand are drawn from a range of theories derived from classical papers in the debt sourcing, agency costs and portfolio choice literature. They are split across three different explanatory variables concerning bond issuers, namely their risk of default, information costs and bond market presence.

3.2.1 Risk of default

A company's risk of default is defined as the likelihood of it not being able to meet the payment obligations on its outstanding debt. I consider three corporate debt theories related to this variable and their implications on the volume of debt investor demand. These are the inefficient liquidation, underinvestment and portfolio choice theories.

The inefficient liquidation theory predicts that bond investors purchase a lower amount of bonds from companies with a higher risk of default. In their bond versus bank loan debt sourcing model, Berlin and Loeys (1988) find that firms with a

lower credit rating generate higher risk-adjusted returns if they finance their projects with bank loans. In their model financing such firms through bond contracts with restrictive and ill-defined covenants is likely to lead to many false negatives, being instances where there is a covenant breach and as a result liquidation occurs, even though continuing the project would have been more profitable.[19] Such an outcome is known as an inefficient liquidation. Assuming it is challenging to word covenants in a way that accurately reflects a firm's actual prospects, these companies benefit from hiring a financial intermediary to closely monitor their projects and determine whether to liquidate. While Berlin and Loeys focus on the issuer's debt sourcing decision, the corollary of their results is that bond investors' risk-adjusted return from investing in higher-risk companies is comparatively worse to investing in lower-risk companies as a result of inefficient liquidation.

The underinvestment theory also predicts that bond investors purchase less securities from companies with a higher risk of default. In Myers' model (1977) a debt-financed firm's shareholders do not pursue a subset of moderately profitable projects, being those whose expected return is more than the required investment but less than the sum of the investment and principal of debt outstanding. This is known as underinvestment. It arises because all the profits of these projects accrue to debtholders; only projects that also generate returns for shareholders are pursued, which are those whose returns are larger than the sum of the investment and principal of debt outstanding.

[19] Berlin and Loeys' theoretical assumption that a bond covenant breach will immediately trigger a liquidation is validated in other research. Gilson et al. (1990) find that financial restructuring of firms under financial distress is less likely to be successful if they are largely bond-financed (Gilson et al., 1990). Bond restructurings requires the approval of hundred percent of bondholders when a change in maturity date or principal amount is proposed (Smith and Warner, 1979). This is of course challenging given that bonds are widely held and relatively actively traded. In practice, bond-financed companies under financial distress tend to conduct an exchange of existing debt into new debt with a lower principal amount or a longer tenor as this does not require a minimum participation rate. An example of this is ITV's EUR bond exchange conducted in June 2009 (ITV, 2009).

Underinvestment is expected to occur more frequently with riskier firms as their returns are more likely to be insufficient to fully repay their debtholders. Myers suggests that such firms should develop a "continuing, intimate and flexible relationship" with their debtholders in order to be able to renegotiate the terms of their debt contract and thereby reduce the risk of underinvestment. As Denis and Mihov (2003) point out this is less likely to occur with bond investors than with private debt investors, as their holdings are less concentrated and more transient. The implication of Myers' model is that bond investors in particular run a larger risk of underinvestment when purchasing debt from riskier firms, suggesting that they should purchase more bonds from less risky firms.[20]

The classical portfolio choice theory predicts that bond investors purchase a similar amount of securities from companies with a higher risk of default. Markowitz (1952) argues that investors should look to achieve a mean-variance efficient portfolio of securities, which is equal to the portfolio that offers the lowest volatility for a given return. A bond's expected returns, variance and correlation with other bonds determines its overall contribution towards achieving such a portfolio and should therefore drive investor demand.

Blume et al. (1991) study the volatility and returns of sub-investment grade corporate bonds for the years 1977 to 1989. They find that the returns of these bonds are higher than investment grade bonds while their volatility is also higher.[21] The returns of the two types of bonds are also partially uncorrelated with a correlation co-efficient of p=0.75. This suggests that a portfolio without higher-risk bonds will not be mean-variance efficient, i.e. adding at least one higher-risk corporate bond will

[20] Other agency-based theories have been developed whose implications are similar to underinvestment with regards to bond investor demand and the riskiness of a firm. The most prominent of these is asset substitution.

[21] After accounting for their coupon and maturity differences.

result in a portfolio with a higher expected return for the same volatility. Similarly a portfolio with only higher-risk bonds will not be mean-variance efficient.

The proportion of lower and higher-risk bonds in a portfolio hence depends on an investor's target return and risk tolerance. Given the substantial heterogeneity amongst bond investors (Massa et al., 2013), it is reasonable to assume that there is a widespread distribution of these. Portfolio choice theory can therefore be interpreted to predict that on the whole investors will purchase a similar amount of lower- and higher risk bonds.

The empirical research that is closest to analysing bond investor demand and a company's risk of default are firm debt sourcing studies. These analyse the extent to which companies rely on the public and private debt markets. They tend to find that frequent bond issuers have a lower risk of default, being better rated and more profitable than firms that rely more on private debt markets (Cantillo and Wright, 2000; Denis and Mihov, 2003; Fu and Ligon, 2007).

Lower risk companies hence make up a large share of corporate bond issuance. Market data shows that this is particularly true for the European bond markets, where for the years 2001 to 2012 only 7% of all investment grade issuance was issued by BBB category rated firms, i.e. those with a rating of BBB-, BBB or BBB+. The same figure is 12% for the US bond markets (Dealogic, 2013).

The non-financial corporate bond market is more evenly distributed. 33% of tranches in my overall sample[22] are issued by BBB category firms. Issuance of financial institutions bonds has a greater skew towards low-risk institutions, with only 4% of 2001 to 2012 investment grade issuance coming from BBB category issuers (Dealogic, 2013). However this difference is not expected to matter for my

[22] Not filtered for orderbook availability.

research. In practice most institutional investment grade corporate bond investors also purchase financial institutions bonds (Fidelity, 2014).

European corporate bond investors on the whole are therefore expected to purchase a relatively large amount of lower-risk bonds. I assume that this is mean-variance inefficient; i.e. corporate bond investors that purchase a larger share of BBB instruments than typically on offer in the market will outperform those that have market-weight portfolios. I also posit that this outperformance outweighs growing risks of inefficient liquidation and agency costs. This leads me to hypothesise that investors demand more bonds from companies with a higher risk of default. I arrive at Hypothesis 1.

H1: Investors demand more bonds from firms with a higher risk of default than from firms with a lower risk of default

3.2.2 Information costs

A firm's information costs are defined as the amount of time and resources a typical bond investor would be required to spend to analyse and value the company's activities. The theories I consider in relation to this variable are information asymmetry, asset substitution and portfolio choice.

The information asymmetry theory predicts that bond investors purchase a lower amount of securities from firms with higher information costs. Leland and Pyle (1977) propose that an entrepreneur with an informationally opaque, higher risk project will finance a greater share of this project with his own funds. Being an insider the entrepreneur's personal investment will increase the market's perception

of the quality of the project, reducing the costs of external financing. Fama (1985) argues that issuing bank loans has similar benefits. Banks have an informational advantage over bond investors as a result of transaction services and regular monitoring of their clients (Black, 1975; Fama, 1985; Nakamura, 1993).

The implication is that higher quality firms with greater information costs will rely more on bank loans, while lower quality firms with greater information costs will look to issue more bonds as banks will refuse to lend to them. Bond investors anticipate this and are predicted to charge an above average price for firms with greater information costs or refuse to invest.

The asset substitution theory also predicts that bond investors purchase a lower amount of securities from firms with higher information costs. In Jensen and Meckling's model (1976) a manager has the option to issue bonds before selecting between a low-risk positive net present value ("NPV") and a high-risk negative NPV project. His optimal strategy is to convince bondholders that he will pursue the first type of project, raise funding relatively cheaply and then pursue the latter project. Although it has a negative NPV, this project increases the value of the manager's equity stake as it offers a small chance of a high pay off if it succeeds while possible losses are largely borne by bondholders. This process is known as asset substitution.

Jensen and Meckling (1976) argue that bond investors who anticipate the selection of the second project can prevent asset substitution by increasing their price to reflect the reduced value of their claims under the second project. Yet this can be challenging for higher information cost firms as bondholders have a weaker understanding of their business model (Fama, 1985). Harris and Raviv (1991) therefore argue that bond investors invest less in these companies.

Classical portfolio choice theory can be seen to predict that bond investors purchase an equal amount of securities from firms with higher information costs. Pieterse-Bloem and Mahieu (2013) apply Markowitz' theory of portfolio selection to the European corporate bond markets, studying the performance of different portfolios between 1991 and 2008. They find that the returns of bonds from different countries as well as different industries are partially uncorrelated.[23] They conclude that applying country and industry diversification to a portfolio makes it more mean-variance efficient.

Investors should hence purchase a similar amount of bonds from companies from a range of countries or industries. They should not restrict themselves to lower information cost companies, being those from their home country or more transparent industries [24], but purchase bonds from both lower and higher information cost issuers.

Debt sourcing studies on this subject have tended to find that frequent public bond issuers have lower amounts of intangible assets and growth options, both direct proxies for information costs. They are also more likely to be rated, an inverse proxy (Denis and Mihov, 2003; Esho et al., 2001; Hadlock and James, 2002). This suggests that low information cost companies issue most bonds.

Market data confirms this skew. For the years 2001 through to 2012 only 3.4% comes from unrated issuers. 38.8% of tranches are issued by firms outside of Germany, UK and France; an additional proxy I use for information costs given the concentration of investors in these three economies (source: Dealogic). Corporate

[23] In line with prior equity portfolio research (Heston and Rouwenhorst, 1994).
[24] A number of modern portfolio management studies find investors can increase their returns by skewing their holdings towards familiar companies (e.g. Fedenia et al., 2013).

bond investors on the whole hence purchase only a limited amount of higher information cost bonds.

However in the context of the European market I consider information costs to be relatively manageable for investors. European financial markets have become increasingly integrated following the introduction of the Euro, suggesting information transfers fairly quickly and information costs are therefore generally lower. Also European bond markets are dominated by institutional investors who are expected to have more resources to analyse their investments than retail accounts. For the years 2001 to 2012, only 33.3% of European bond issuance was eligible for retail investors.[25]

Higher information cost investments are hence both scarce and attractive for institutional investors seeking to optimise the mean-variance of their portfolio. I therefore hypothesise that European investors demand more of these types of bonds. This leads me to hypothesis 2.

H2: Investors demand more bonds from higher information cost companies than from lower information cost companies

3.2.3 Bond market presence

A firm's bond market presence is measured by the amount of public debt it has outstanding. I proxy this with the number of times a company appears in my sample, whether a bond is the company's debut EUR bond and whether the bond is

[25] These are bonds whose minimum denomination is EUR 1,000; i.e. trading can take place in multiples of EUR 1,000 starting from EUR 1,000 (Source: Dealogic).

issued off an EMTN programme (see Section 3.3.3.3). The theories I consider to develop my hypothesis for this variable are information asymmetry and portfolio choice.

The information asymmetry theory can be seen to predict that bond investors purchase a higher amount of securities from firms with greater bond market presence. Using a dataset of bond and bank loan issuance from 291 US companies between 1975 and 1992, Cantillo and Wright (2000) analyse the probability a company will issue a bond rather than a bank loan. Their regressions includes a asymmetric threshold dummy which captures all repeat bond issuers. They find that this variable is positive, implying that established bond market issuers are more likely to be able to re-access the bond markets. This suggests that bond investors are more comfortable investing in existing as opposed to new bond issuers.

Cantillo and Wright argue that this reflects the greater amount of information available about existing bond issuers, reducing investors' adverse selection concerns. Bond market regulators require issuers to publish an extensive amount of information both in the initial bond prospectus and on an ongoing basis[26] (see EU Transparency directive). In addition market efficiency suggests that there is valuable information inherent in the price movements of the outstanding bond tranches.

Portfolio choice theory arguably predicts that bond investors purchase a lower amount of securities from firms with greater bond market presence. As discussed in Section 3.2.1 investors can obtain a mean-variance efficient portfolio by diversifying across a broad range of issuers (Pieterse-Bloem and Mahieu, 2013).

[26] The European Union Transparency Directive sets out these requirements for bonds listed on a regulated European exchange.

Portfolios concentrated towards one particular company's bonds are therefore highly unlikely to be mean-variance efficient. Using data on equity ownership in Oslo Stock Exchange listed companies between 1989 and 2006, Ødegaard (2009) finds that each firm's largest shareholder would have increased the expected return of their portfolio by an average of 13% annually through re-investing the full amount in a value-weighted equity market index. Similar results are expected to apply to the bond market. Companies with a large number of bonds outstanding will be part of most investors' portfolios, therefore lowering the diversification benefits from investing in a new tranche.

Several initial public bond offering studies provide credibility to the information asymmetry notion that having existing exposure to the broader debt markets makes it easier to sell an inaugural bond offering. Using a sample of 98 US initial public bond tranches made between 1971 and 1994, Datta et al. (1999) find that firms with an existing bank relationship price their bond at issue at a 68 basis point lower yield. Hale and Santos (2008) study 566 US initial public bond offerings made between 1972 and 2002. They observe that firms with an outstanding privately placed bond or syndicated loan are able to issue their initial public bond offering earlier than those without proven access to these markets. These findings suggest that having a presence in other types of debt markets can reduce information asymmetries with bond investors and therefore increase bond investor demand.

This research however does not consider the effects of having multiple bonds outstanding. In practice bond investors do actively consider how diversified their portfolios are across issuers and monitor single name concentration risk (Hedge Fund Monthly, 2004). Such concentration risk concerns are likely to be more

pronounced in my sample given that it is skewed towards frequent issuers. Out of the 285 firms in my sample, the most frequent 10 issuers account for 24.1% of issuance volume. This is approximately the same proportion as the least frequent 201 issuers.

I assume that bond portfolios with market weightings of frequent issuers are not mean-variance efficient. In addition I posit that investors' diversification concerns outweigh their information asymmetry concerns for my sample. This leads me to the following hypothesis:

H3: Investors demand less bonds from companies with greater bond market presence than from companies with lesser bond market presence

3.3 Data

In this section I justify my choice of dependent variable, describe the orderbook sample filtering process as well as the proxies for the explanatory variables. Summary statistics for the sample are shown in Table 3.1.

3.3.1 Orderbook oversubscription

In this chapter I measure the degree of bond investor demand through the orderbook oversubscription of primary corporate bond offerings. This is superior to prior debt sourcing studies which utilise a firm's actual issuance, an indirect and misleading proxy for bond investor demand. It is also more effective than direct proxies based on secondary market trading due to the illiquidity of the secondary

corporate bond market. Finally, orderbook oversubscription has been extensively used in equity market studies.

While not part of the main focus of their research, prior debt sourcing studies have drawn conclusions about corporate bond demand through analysing a firm's actual bond market issuance (Cantillo and Wright, 2000; Denis and Mihov, 2003). Actual bond issuance is clearly a function of both a firm's intended issuance and investor demand and is therefore only an indirect proxy for the latter. Orderbook oversubscription in my sample is not uniformly distributed; it has a mean of 3.71x, median of 3.00x and ranges from 0.67x to 17.50x. Actual issuance is therefore likely to give a highly inaccurate view of the degree of bond investor demand.

Alternative proxies based on secondary corporate bond market trading are also likely to be inaccurate as this market is highly illiquid. Massa et al. (2013) note that on average USD 15bn worth of US corporate bonds are traded each day; equal to around 10% of the average daily trading volume of US equities. To put this into context in 2008 there were USD 6.3 trillion of US corporate bonds and only USD 5.3 trillion of US equities outstanding. Many institutional bond investors such as insurers trade infrequently, holding on to their securities for longer timespans (Choudhry, 2010; Massa et al., 2013). Once syndicated a growing portion of a bond ends up in these so-called buy and hold portfolios. Asquith et al.'s (2013) research into the costs of borrowing corporate bonds finds that this dependent variable, which is an inverse proxy for liquidity, is positively related to the time elapsed since syndication. Hotchkiss and Ronen (2012) note a high disparity in liquidity between US high yield bonds with one of the bonds in their sample trading on only 8.4% of business days. The primary market syndication is therefore a uniquely liquid point in

a bond's lifecycle. It is the only point at which investors are able to purchase a sizeable amount of the bond. It can be assumed that investors have become cognisant of this and that the volume demanded during the primary market is the most accurate measure of overall demand.

The usage of orderbook oversubscription has empirical precedents in the equity market literature. Derrien (2005) uses retail investor orderbook size and oversubscription data as a proxy for investor sentiment in his study of French IPOs between 1999 and 2001. Cornelli and Goldreich (2003) analyse the impact of orderbook oversubscription on the ultimate offer price and first-day aftermarket performance of a set of international equity issues. Amihud, Hauser and Kirsh (2002) study the distribution of orderbook oversubscriptions of initial public offerings. Other equity market papers use detailed orderbook data to study the allocation policy applied by underwriters (Bubna and Prabhala, 2011; Cornelli and Goldreich, 2001; Jenkinson and Jones, 2004).

The main drawback of using orderbook oversubscription is that realistically it can only comprehensively be obtained through secondary sources such as press articles. Chowdry and Sherman (1996) describe the ability of newspapers to source orderbook information about nearly all transactions in the IPO market, while practitioners note that similar information leakage mechanisms hold true for the bond market. I conduct several robustness tests in Section 3.6 to ensure that the oversubscription level is both reliably reported in the press and reported for a sufficiently representative subsample of tranches.

3.3.2 Sample selection

The process for collecting the overall sample is set out in Section 2.4. I search for the orderbook sizes of these tranches in the online archives of International Financing Review and GlobalCapital.[27] Their journalists obtain this information through post-pricing interviews with the involved bookrunners. I treat a multi-tranche transaction as separate tranches, i.e. a dual-tranche transaction counts as two tranches. For such transactions each tranche will be sold through a separate orderbook and bookrunners will therefore typically report the individual orderbook size for each tranche.[28] Where this is not reported, I split the orderbook size for the entire transaction across each tranche, proportioned by the individual tranche size.

I end up with a sample of 1,103 tranches that have reported orderbook sizes. These constitute 90.1% of the initial 1,224 tranches.

3.3.3 Proxies for explanatory variables

Explanatory and control variables are derived from a mixture of data sources. I use Datastream for company accounting data and sector classification, Dealogic for bond offering data, Bloomberg for exchange rates[29] and S&P, Moody's and Fitch for credit ratings. Accounting variables are taken for the reporting year preceding

[27] Both are publications focused on the bond markets. GlobalCapital was called Euroweek before a name change in May 2014. In Section 4.5.4 I defend the usage of these secondary sources against criticisms that reported orderbook sizes are not reliable and that tranches with reported orderbook sizes are not representative of the overall population.
[28] I conduct a separate robustness test in which I group all the tranches of multi-tranche transactions. The results, not reported in this chapter, are qualitatively unchanged from my main model.
[29] To convert non-EUR accounting data into EUR.

issuance. A full list of proxies and sources is given in Table 3.1, and summary statistics of the explanatory variables are shown in Table 3.2.

3.3.3.1 Risk of default

I measure the risk of default of a bond issuer through the credit rating and credit spread of its offering, as well as its leverage.

For credit rating I assign a numeric value of the S&P rating given to the bond offering; ascending from 1 for AAA up to 10 for BBB- and 11 for unrated tranches. This approach is similar to that applied by Agca and Mansi (2008) in their study on company leverage and Santos' (2006) research on split bond ratings. I rely on an S&P-only metric as this agency rates 90.7% of my sample in comparison to 80.8% for Moody's and 54.7% for Fitch.[30] As shown in Table 3.2, the mean rating of the sample is 7.4, i.e. between an A- and a BBB+, while the median is 7.0 or A-. This is two notches higher than the BBB median rating reported by Denis and Mihov (2003) for their subsample of bond tranches, which probably reflects their inclusion of sub-investment grade tranches.

Credit spread is measured as follows:

$$\text{Credit spread} = \text{At-issue yield} - \text{Euro mid-swap rate} \quad (1)$$

[30] Using an S&P and Moody's numeric average, similar to Santos (2006), would result in only 67 transactions being marked as unrated; 36 less than through just using S&P. However, it would also create an upward skew in average rating number being assigned to the 145 transactions that are rated by S&P but not by Moody's.

This proxies for the risk premium offered to investors over the interbank cost of funding. The euro mid-swap rate reflects the market's expectation of future values of the 6 month Euribor. In order to calculate an equivalent figure for floating rate note tranches, which are typically priced off 3 month Euribor, I deduct the applicable 6v3 basis[31] from their credit spread.

The at-issue credit spread is used regularly in primary corporate bond studies including Blackwell and Kidwell (1988), Datta et al. (1999) and Gande et al. (1999).[32] Even though these USD-focused studies extract the spread over the government bonds, their observed credit spread levels are broadly similar to the ones in my sample. My sample average credit spread is 1.41% and median is 1.00%. The median for AA category tranches is 0.59%, for A 0.80% and for BBB 1.40%; which compares to Datta et al.'s (1999) levels of 0.63%, 0.82% and 1.29% respectively.

Leverage is calculated as follows:

$$\text{Leverage} = \frac{\text{Total Debt}}{\text{Total Assets}} \qquad (2)$$

Total debt includes both long and short-term debt. This calculation reflects the notion that the risk of default of a company's volume of debt is best considered in proportion to its total assets, as larger companies tend to be better able to repay debt than smaller companies.[33] The mean leverage for my sample is 0.34 and the median is also 0.34. This is in line with the samples of existing US bond issuers of

[31] This is equal to the value of a two-party swap for a specific number of years whereby one party agrees to pay 6 month Euribor and the other 3 month Euribor. It is a fairly plain vanilla instrument, quoted by a range of market makers for a variety of tenors. I have sufficient data to calculate the mid-swap equivalent credit spread for 52 out of the 70 floating rate bonds.

[32] Albeit that these studies focus on the spread over US treasuries, being the benchmark for the US corporate bond market.

[33] Either through the cash flow generated by their assets or through selling off assets.

Denis and Mihov (2003) and Massa et al. (2013). They report a median leverage of 0.33 and 0.30 respectively.

3.3.3.2 Information costs

I proxy for a bond issuer's information costs through its intangible assets, growth opportunities, whether it is rated and whether it is based in Germany, France or UK.

A firm's intangible assets are measured as a proportion of its total assets:

$$\text{Intangible assets} = 1 - \frac{\text{Net property, plant and equipment}}{\text{Total Assets}} \quad (4)$$

Intangible assets are a positive proxy for information costs as they are more challenging to value than tangible assets. Dublin (2007) notes for instances that econometric models seeking to value trademarks are often "fraught with imprecision". His own model for valuing coffee brands relies on a complex mixture of variables relating to such factors as demographics, macroeconomics, coffee consumption, seasonality and advertising.

My calculation considers intangibles as a residual item, taking all assets that are not reported as being tangible. This approach is used in most debt sourcing studies (Cantillo and Wright, 2000; Denis and Mihov, 2003; Esho et al., 2001).[34]

[34] Complementary proxies for intangible assets have emerged based on research and development expenditure (Denis and Mihov 2003), advertising expenditure (Easterwood and Kadapakkam 1991) and selling, general and administrative expenditure (Hovakimian et al., 2012). I have not included these as a result of limited data availability. Information on research and development expenditure is available

My sample has an average intangible assets ratio of 0.65. This figure is close to other corporate debt issuer samples; Massa et al. (2013) report a mean of 0.64 and Antoniou et al. (2008) a mean of 0.67.[35]

Growth opportunities are measured through the market to book ratio:

$$\text{Growth opportunities} = \frac{\text{Total assets} + \text{market value of equity} - \text{book value of equity}}{\text{Total Assets}} \quad (5)$$

The market value of equity captures the cash flow stream the equity market believes a firm is able to generate in the future. Such future value inherent in a company is challenging for a debt investor to evaluate. It requires an in-depth study of a firm's project pipeline[36], necessitating high information costs. The ratio over total assets provides me with the relative magnitude of this future value as a proportion of current value. This market to book ratio for my sample is on average 1.34x; this is equivalent to the mean reported by Massa et al. (2013).

A dummy variable for credit rating distinguishes the 94.0% of tranches with a credit rating from either S&P, Moody's or Fitch. These firms are likely to be easier to evaluate due to the regular publications of rating agency reports. Denis and Mihov (2003) report that 73.0% of their sample of US public bond issuers has an S&P rating. This compares to 90.7% for my sample. The difference reflects the larger firm

for 62.7% of the sample, marketing expenditure for 13.3% of the sample (being the Datastream equivalent for advertising expenditure) and selling, general and administrative expenses is available for 66.1% of the sample. This compares to 90.8% for net property, plant and equipment.

[35] Taking the inverse of the fixed assets ratio reported in both studies.

[36] Firms are typically reluctant to disclose a lot of information on this for competitive reasons (Yosha, 1995).

size of my sample (see Section 3.3.4), which is expected to positively affect probability of a credit rating having been assigned (Cantillo and Wright, 2000).[37]

A dummy variable identifies the companies whose head office is in Germany, France or the United Kingdom.[38] These are Europe's largest three economies, suggesting that their investors have a greater amount of financial resources and are hence typically the largest investors in new euro-denominated bond tranches.[39] The existence of a degree of information immobility between national markets would suggest it is relatively easier for them to value companies from their home markets (see Fedenia et al., 2013), hence making this a suitable proxy for information costs. 66.9% of my sample originates from German, French and UK corporates. France and Germany have the highest number of tranches in the sample, 30.0% and 24.4% respectively, in comparison to 12.4% for the UK.[40]

3.3.3.3 Bond market presence

I measure an issuer's bond market presence through its issue frequency, whether its offering is debut and whether it is issued off an EMTN programme.

Issue frequency is calculated as a count of the total number of tranches of an issuer in my sample. While this is relatively generic proxy, not accounting for

[37] This could be attributed to larger firms having higher funding requirements or, following the information asymmetry theory, to them being more familiar and therefore having stronger access to bond investors.
[38] In my sample the remaining countries are Austria, Belgium, Greece, Ireland, Luxembourg, Netherlands, Portugal, Spain and Switzerland.
[39] Although the euro is not legal tender in the UK, practitioners note that London's role as Europe's financial capital means it is home to a large number of investors in euro-denominated bond offerings.
[40] Besides lower information costs, the dominance of these three countries in my sample could reflect their larger corporate sectors and associated larger funding needs.

companies adjusting their issuance frequency, it does provide an indication of the amount of public debt a company tends to have outstanding throughout the sample period. As discussed in Section 3.2.3. there is a positive skew in my sample, with a median and average issue frequency of 6 and 8 respectively.

A dummy variable distinguishes debut tranches, which I define as a company's first appearance in the euro-denominated bond market.[41] Prior offerings in pre-euro currencies are excluded as these would have been sold to a subset of European bond investors, e.g. a Deutsche Mark bond predominantly to German investors. 22.8% of my sample or 251 tranches are debut. Considering that there are 285 firms in my sample, this suggests that my sample captures the debut trade of most firms. This is unsurprising given the infancy of the euro-denominated bond market.

Another dummy variable identifies tranches that are issued off an EMTN Programme. Issuers of such tranches typically have greater bond market presence as establishing this document entails considerable upfront costs, rendering it only economical for regular bond issuers (Euromoney, 2006). 76.4% of my sample is issued off an EMTN programme. Several US-focused corporate debt studies have made similar distinctions through separating shelf and non-shelf offerings (Blackwell et al., 1990; Santos, 2006). 59.6% of Santos' (2006) US bond sample is issued under an SEC shelf filing. This relatively lower percentage likely reflects that more onerous US legislation makes an SEC shelf filing more expensive to set up than an EMTN programme.

[41] Using my extended sample going back to 1999. If the first transaction is multi-tranche, all tranches are labelled as debut.

3.3.4 Control factors

The company-specific variables I control for are its size, profitability and whether it is publicly owned.

Company size is measured as the book value of total assets. I prefer this to total sales (Cantillo and Wright, 2000) as this metric underestimates the size of asset-intensive sectors such as real estate.[42] My sample consists of large firms with average and median total assets of EUR 57.3bn and EUR 34.4bn. By way of comparison Denis and Mihov's (2003) sample of public debt issuers has a median of USD 3.5bn of assets (equivalent to c. EUR 3.0bn[43]). The high values means that marginal company size differences are unlikely to have a pronounced effect in my analysis, albeit they are worth including for consistency with prior corporate debt studies (eg. Denis and Mihov, 2003). The upwards skew in the distribution of total assets (see Figure 3.1) merits using a natural logarithm function for this proxy in the main regression models.

Profitability is measured as follows:

$$\text{Profitability} = \frac{\text{EBITDA}}{\text{Total Assets}} \tag{3}$$

[42] For these sectors the underlying assets generate a relatively small revenue stream over a longer period of time Robustness tests in Section 4.7.1 are run using total sales. The results are qualitatively unchanged.

[43] Taking Denis and Mihov's (2003) subsample of issuers with previous public and non-bank private debt outstanding and using the USDEUR exchange rate as of 1st January 1999, the first available recording.

This commonly used metric measures the ability of a company's existing assets to generate profits. The mean profitability of my sample is 0.12 and the median is 0.11. This is similar to the sample of US bond issuers studied by Massa et al. (2013) and the sample of UK and German listed firms analysed by Antoniou et al. (2008); both articles report a mean and median profitability of 0.12 and 0.12 respectively.

Public ownership is proxied by a dummy variable taking the value of 1 if 50% or more of the shares of the bond issuer are held by its national government or a combination of governmental bodies.[44] Such companies are expected to have differing business profiles as a result of government influence on their activities (Hossain et al., 2013). 46 firms in my sample are publicly owned and their tranches account for 12.9% of overall issuance.[45]

I also employ a range of tranche variables. I proxy for the volume issued through the tranche size in EUR billion, a benchmark size dummy and a multi-tranche dummy. The mean tranche size of my sample EUR 0.84bn. This is relatively high in comparison to other studies, with Denis and Mihov (2003) for instance reporting an average of USD 0.31bn (EUR eq. 0.26bn[46]) for their subsample of public bond tranches. This probably reflects the comparatively larger firm size of my sample and hence associated larger funding requirements. 66.9% of my sample tranches are benchmark size, i.e. EUR 500 million or larger, and 31.4% of tranches are part of multi-tranche offerings.

[44] Information on company ownership is sourced from both rating agency and company reports.
[45] To my knowledge this dummy metric has not been used in previous debt market studies, in all likelihood because many precedent papers have focused on US corporates where there are considerably fewer state-owned companies than in Europe (La Porta et al., 1999).
[46] Using the USDEUR exchange rate as of 1st January 1999, the first available recording.

I also control for the tenor of the tranche. The average tenor of my sample is 7.3 years. This is substantially lower to Denis and Mihov (2003) who report an average of 15.6 years, the difference likely reflecting that US capital markets are relatively more developed for very long dated tranches.[47] In my main regression model I control for tenor through five categoric variables for different tenor ranges, starting from tranches with less than 3 years to maturity and ending with those with 12 years or more to maturity. This takes into account bond investor heterogeneity in portfolio turnover which practitioners suggest results in different tenors appealing to divergent investor types (see Chapter 5).[48]

In addition I incorporate five different categoric variables for the firm's sector. Out of these the most dominant in my sample are consumer, industrial and utilities, accounting for 33.0%, 27.4% and 20.0% of tranches respectively.

My final tranche variable concerns the coupon structure, separating those with a floating rate coupon through a category variable. 6.4% of tranches have floating rate coupons. This coupon type is most widespread amongst consumer sector issuers, who account for 41.4% of floating rate note offerings in my sample.

3.3.5 Robustness tests on orderbook oversubscription

As orderbook oversubscription is derived from secondary sources I conduct robustness tests to validate its reliability. These concern the accuracy of the reported

[47] These place a substantial upwards skew on Denis and Mihov's sample, given the median tenor of their sample is only 10.0 years.
[48] This is somewhat different to previous corporate debt studies, which tend to either use the years to maturity as a continuous variable (Santos 2006) or split the sample two-ways into shorter and longer dated transactions (Julio, Kim and Weisbach 2007).

orderbook sizes and the representativeness of tranches for which reported orderbook sizes are available.

For the first test I use a sample of actual orderbook size statistics obtained from a leading European investment bank (IB). This sample of 241 tranches is a subset of my sample and, as is clear from the univariate comparison in Table 3.3, it is generally representative of overall issuer and tranche characteristics.[49] The Pearson correlation coefficient between the actual and reported orderbook size is 0.994, suggesting the reported statistic is a highly reliable proxy.[50]

To consider the representativeness of the reported orderbook sample I conduct a univariate comparison between this subsample and the 123 tranches for which no orderbook size was reported. The results, shown in Table 3.4, indicate that unreported tranches tend to be higher rated by Moody's and S&P, have higher tranche sizes and lower credit spreads and tend to be issued by higher-levered companies. Assuming that tranches with these characteristics are likely to have lower subscription rates and are hence less regularly reported, this suggests my analysis overestimates investor demand for these tranches. For instance a lack of lower subscribed tranches from higher levered issuers could imply my sample underestimates the negative impact of leverage on investor demand.

[49] The significant statistical difference is that issues in the investment bank sample have a marginally lower Fitch rating and a marginally higher credit spread. Fitch rating is arguably an inappropriate metric, given that the rating agency only rates 54.7% of the overall sample. The credit spread represents a multitude of factors, many of which are outside of the control of the investment bank, such as the market conditions and trading levels of a company's existing bonds. Hence, it cannot be argued that the investment bank specialises in a particular kind of bond offering.

[50] It could be argued that other investment banks may not be as accurate in their reporting. However bookrunner computations are constantly different: 49 different banks are involved in the transactions in the investment bank sub-sample, with an average of 4.54 bookrunners per transaction. This is reassuring as these 49 other banks were also involved in 99.9% of the non-IB sub-sample transactions, increasing the likelihood that their orderbook sizes were accurately reported.

3.4 Univariate Analysis

In this section I present the results of univariate analysis on bond investor demand. Table 3.5 provides summary orderbook oversubscription statistics across subsamples dictated by the empirical proxies and control factors. These subsamples are created as follows. For S&P rating I take the alphabetic rating category. For tenor I use the assigned tenor categories and for sector the assigned sector groupings. For the other non-categoric variables I analyse across tertiles. The categoric variables ascribe a binary division.

3.4.1 Risk of default

Univariate results for the proxies for risk of default are largely in agreement with Hypothesis 1. The largest differentials in mean and median orderbook oversubscription are amongst the S&P bracket and credit spread tertiles with both suggesting greater demand for higher risk offerings. Average oversubscription levels for the S&P BBB and unrated category tranches are 3.99x and 4.46x whereas they are 3.30x and 3.42x for AA and A category tranches. This is consistent with Blume et al.'s (1991) portfolio choice notion of investors requiring weaker rated bonds in order to improve the mean-variance efficiency of their portfolio. Their relative scarcity results in demand for individual offerings being higher. The 16 AAA rated tranches in my sample are only 1.70x oversubscribed on average. This could reflect an oversupply of issuance in the broader public bond markets, particularly from

sovereigns, with AAA rated issuers accounting for 44% of European investment grade issuance in my sample period (Dealogic, 2013).

Average oversubscription levels for low, medium and high-credit spread tranches are 2.74x, 3.77x and 4.68x respectively. This differential is also in line with the portfolio choice view of investors seeking to maximise their return for an acceptable level of volatility (Markowitz, 1952). Higher credit spread bonds contribute towards this purpose and are relatively rare in the overall investment grade markets, given the earlier observed dominance of highly rated issuers.

The univariate results for the leverage tertiles in my sample appear inconsistent with Hypothesis 1. The average oversubscription levels for low, medium and high-leverage tertiles are 3.94x, 3.67x and 3.47x, suggesting a negative relation. This is in line with Myers' (1977) underinvestment theory. Management of highly levered issuers have low personal financial incentives to invest in profitable projects, making them less attractive bond investments. It is also consistent with the notion that bond investors are concerned around the greater inefficient liquidation risks of purchasing debt from highly levered companies (Berlin and Loeys, 1988).

3.4.2 Information costs

The results for both rated and GFU are consistent with Hypothesis 2 on information costs. Average oversubscription levels for rated and unrated tranches are 3.65x and 4.53x respectively. This could suggest that investors seek to improve their portfolio's risk-weighted return by purchasing more unrated bonds. However this would imply that the absence of a credit rating necessarily results in reduced

correlation with other bonds as opposed to other factors potentially correlated with the presence of a credit rating, such as firm size or issuance frequency.[51]

Average oversubscription levels for GFU and non-GFU tranches are 3.53x and 4.06x. This seems to confirm Pieterse-Bloem and Mahieu's (2013) findings that bond investors can achieve a more mean-variance efficient portfolio by diversifying across different countries.

Contrary to Hypothesis 2 the intangible assets variable suggests a non-linear relation with the low, medium and high tertiles being on average 3.70x, 3.41x and 3.97x oversubscribed. The results of the low and medium tertiles suggest a negative relation, potentially reflecting that investing in firms with a moderate amount of intangible assets can give rise to greater adverse selection (Akerlof, 1970) and asset substitution risks (Jensen and Meckling, 1976). The subsequent positive relation between medium and high tertiles however suggests beneficial features of certain intangible assets, eg. brand recognition could improve bond investor demand. Alternatively the apparent non-linear relation could be driven by another variable partly correlated with intangible assets.

3.4.3 Bond market presence

Amongst the proxies for bond market presence only issue frequency produces significant results. These are consistent with Hypothesis 3 with tranches from low,

[51] Smaller firms are expected to have a lower funding requirement and are hence less pressured to obtain a credit rating for broader capital markets access. The same applies for firms with a lower bond issuance frequency.

medium and high-frequent borrowers being on average 4.17x, 4.01x and 3.06x oversubscribed respectively. This is in agreement with the portfolio choice view of investors diversifying holdings across multiple issuers to achieve more mean-variance efficient returns (Ødegaard, 2009). While the magnitude of the differentials appears to suggest a marginally increasing negative relation, there is an upwards skew in the distribution of issue frequency. The mean issue frequency of the tranches in the low and medium tertiles are 1.88 and 5.81 while the average for the high tertile is 14.52. This leads me to believe that the actual relation is more likely to be linear.

3.4.4 Control factors

With the exception of the sector categories I obtain significant univariate results for all the control factors. The oversubscription levels across the total assets tertiles appear to suggest a negative logarithmic relation with the mean levels being 3.98x, 4.18x and 2.94x for the small, medium and large tertiles. This can be argued to be consistent with portfolio choice theory. Larger firms are amongst the most frequent public bond issuers (Cantillo and Wright, 2000) and their individual tranches are hence less valuable for investors seeking a diversified portfolio. However given that my sample is made up almost exclusively of large companies (see Section 3.3.4), it is also possible that a variable correlated with company size is driving the sizeable drop in demand between the medium and large tertiles.

Larger tranches also appear to attract lower investor interest. The low, medium and high tranche size tertiles are on average 4.14x, 3.77x and 3.24x oversubscribed. Benchmark size tranches are on average less oversubscribed on

average than sub-benchmark size tranches. This is in line with my argument in Section 3.3.1 that the issuance amount is not a reliable direct proxy for investor demand. It could reflect investors' diversification concerns causing them to demand a relatively lower share of a large tranche (Markowitz, 1952) or be the result of variables partly correlated to tranche size.

The results for tenor category appear to reflect a non-linear relation with 6.0-8.9yr tranches receiving the highest level of oversubscription. Tranches that are part of a multi-tranche offering generate smaller orderbooks, potentially signalling a degree of cannibalisation of demand amongst the tranches. Finally tranches with a floating rate coupon are associated with lower typical investor interest.

To summarise my univariate analysis provides mixed support for Hypothesis 1, with higher oversubscription levels apparent for lower-rated and higher-credit spread issuers, yet also for lower-levered issuers. Hypothesis 2 is corroborated by greater demand for tranches from unrated and non-GFU borrowers. And the observed higher oversubscription levels for firms with a low issuance frequency is in agreement with Hypothesis 3.

3.5 Multivariate analysis

The results for the main ordinary least squares regression models on investor demand are shown in Table 3.8. Models 1 to 3 contain the regressions on each of the sets of empirical proxies while Model 4 combines these sets.

As is clear from the correlation matrix on Table 3.6, each of the 9 non-categoric variables in my data set has a significant correlation with at least 3 other variables.[52] In order to test whether multicollinearity impacts my results I run single-variable ordinary least squares regressions for each non-categoric variable. Their coefficients, shown in Table 3.7, are either not significant or qualitatively similar to those in the main regression models, suggesting my results are not affected by multicollinearity.

3.5.1 Risk of default

The results for the proxies for risk of default are broadly in agreement with the univariate analysis discussed in Section 3.4.1. The coefficients for both S&P number and credit spread are positive in both Model 1 and Model 4, with both being significant in the latter model, i.e. after excluding the effects for proxies of information costs and bond market presence. This corroborates Hypothesis 1 and hence also the portfolio choice notion of investors requiring higher-risk bonds to enhance the risk-adjusted return of their portfolio (Blume et al., 1991). It is not consistent with the observations of most precedent corporate debt studies (Cantillo and Wright, 2000; Denis and Mihov, 2003), namely that the predominance of higher rated corporate bond issuance suggests that such firms necessarily have strong bond market access. By contrast my results suggest European bond investors want to

[52] Note that this is common in empirical corporate debt studies. The samples of Barnes and Cahill (2005) and Esho, Lam and Sharpe (2001) also include a range of correlated variables.

purchase more lower-rated bond tranches and that other factors likely prevent growth in this segment of the bond market.

Contrary to Hypothesis 1 the coefficient for leverage is negative. This supports Myers' (1977) underinvestment theory, with investors being concerned that the management of higher levered firms are less incentivised to invest in profitable projects. It is not necessarily in agreement with inefficient liquidation concerns given earlier findings for the S&P and credit spread variables. Precedent debt sourcing papers tend to observe a positive relation between leverage and a firm's likelihood to issue public debt (Denis and Mihov, 2003; Johnson, 1997). My results confirm that this is largely driven by company-related factors, such as economies of scale achieved through public debt issuance, as opposed to investor demand factors.

3.5.2 Information costs

The only significant proxy for information costs in Model 4 is the GFU dummy. This takes a negative coefficient and therefore lends tentative support for Hypothesis 2. Assuming the buyer base of GFU and non-GFU tranches is broadly similar this could be explained by the portfolio choice notion of geographic diversification of a bond portfolio (Pieterse-Bloem and Mahieu, 2013). However should GFU tranches attract more domestic demand, as a result of information costs considerations (Leland and Pyle, 1977), my findings could reflect non-GFU issuers engaging in more aggressive international marketing to increase investor demand. I investigate this further in my study of a bond's geographic allocations in Chapter 5.

The Rated dummy is insignificant, suggesting that the observed differential in the univariate analysis is driven by correlated variables. Not having a credit rating is in itself not a factor that is related to bond investor demand. This suggests that taken together the hypothesised information costs and portfolio benefits of investing in unrated firms are not significant. Similarly the coefficients for the intangible assets are not significant, again suggesting the influence of other variables in the univariate analysis.

Finally the coefficient for market-to-book ratio is negative but only significant in Model 2. Investor interest for high growth firms is hence similar to that for lower growth firms when accounting for differences in risk of default and bond market presence.

3.5.3 Bond market presence

Consistent with Hypothesis 3 the proxy for issuance frequency is negative. This is in agreement with the notion of portfolio diversification as well as investor concerns around firm concentration risks (Ødegaard, 2009). It is not consistent with the information asymmetry notion (Cantillo and Wright, 2000) of regular bond issuers having stronger bond market access as a result of investors having access to more information about these companies. By contrast highly frequent bond issuers have weaker bond market access, suggesting that their decision to continue to issue more bonds is driven by the lack of attractive alternative funding options.

My result for the debut dummy is however negative and therefore not in agreement with Hypothesis 3. This follows Cantillo and Wright's (2000) findings of

an asymmetric threshold between existing issuers and non-issuers. My combined results for bond market presence suggest that adverse selection concerns determine investment behaviour in inaugural tranches while portfolio choice concerns drive investments in tranches from existing borrowers. This non-linear relation explains the broadly similar demand for debut and non-debut tranches observed in the univariate analysis, with the latter category including both highly oversubscribed lower frequency issuers and lower oversubscribed higher frequency issuers.

3.5.4 Control factors

Amongst the control factors only the 6.0-8.9yr tenor dummy and the FRN dummy are significant in Model 4. The 6.0-8.9 year tenor dummy has a positive coefficient, meaning that this tenor range attracts higher oversubscription levels than the reference 3.0-5.9 year range. Separate unreported regressions confirm that 6.0-8.9 year tranches are preferred to all other possible tenors.[53] This suggests that although there are considerable differences between the investment horizons of different bond investors (Massa et al., 2013), the issuance of a 6, 7 or 8 year tranche is likely to be most suitable for the largest share of euro-denominated bond portfolios.

The FRN dummy is negatively related to investor demand. This is noteworthy as in an efficient and frictionless market investors should be indifferent between purchasing a fixed rate bond or a floating rate bond with a floating to fixed

[53] Results from an unreported separate regression, an all-proxy model where only the 6.0-8.9yr tenor bracket is excluded, show that this tenor bracket is preferred to all other tenor brackets with the exception of the <3yr bracket. The coefficient for the latter is negative but not significant, which may be due to limited data availability as only 50 out of the 1,103 tranches fall in this bracket.

hedge. I attribute this finding to investor portfolio restrictions which set out the extent to which a fund manager can purchase floating rate tranches.

The coefficient for the natural logarithm of total assets is negative but not significant in Model 4. This contrasts with the strong positive relation apparent in the univariate analysis, suggesting the influence of correlated variables.[54]

To conclude my multivariate analysis reaches an inconclusive outcome on Hypothesis 1. I find strong bond investor demand for weaker-rated and higher-credit spread borrowers as well as for lower-levered issuers. Investors are hence comfortable with having greater business risk exposure in their portfolios, given associated performance benefits (Blume et al., 1991), while being concerned around a firm's financial risk, as forecast by Myers' (1977) underinvestment theory. Hypothesis 2 is corroborated by stronger demand for non-GFU issuers, which could reflect portfolio choice theory's prediction that investors' look to achieve a geographically diversified portfolio or be the result of non-GFU issuers engaging in more substantial international marketing efforts (Pieterse-Bloem and Mahieu, 2013). Finally the results on Hypothesis 3 are inconclusive given the higher oversubscription levels for both less frequent firms and debut firms. This suggests that adverse selection concerns are dominant amongst debut tranches while concentration risks influence an investors' willingness to buy from existing issuers.

[54] Separate regressions show that the univariate results for total assets were mostly driven by the GFU and issuance frequency variables. Removing either of these variables from Model 4 results in the total assets variable regaining its statistical significance at the 5% level.

3.6 Robustness tests

As robustness tests I consider alternative model specifications, sample exclusions and alternative proxies. Results for these tests are shown in Table 3.9.

3.6.1 Alternative model specifications

Although it is rare for bookrunners to commit to a standby underwriting commitment, as discussed in Section 2.2, it is possible that bookrunners of undersubscribed and lowly oversubscribed tranches end up placing a proprietary order for reputational reasons.[55] In order to test that my results are robust to this form of artificial inflation I conduct tobit regressions censored at 1x and 1.25x.[56]

A tobit model is more effective than an ordinary least squares regression at studying samples with an artificial limit on the observed data. Should this be the case in my sample as a result of proprietary orders being placed by bookrunners then through applying left-hand censors the tobit model gives a more accurate assessment of true third party demand for the excluded tranches.[57] This is due to the tobit specification taking into account the existence of these not directly observable data points of lower oversubscribed transactions, i.e. those below the censor applied, when assessing the coefficients of the drivers of oversubscription for the full sample.

[55] These bookrunners would want to avoid the negative publicity associated with "failed" tranches and help their client end up close to or at their targeted issue size.
[56] In doing so I assume that the orderbook oversubscription levels of weaker transactions is unreliable and therefore exclude them. The tobit model then predicts the level of orderbook oversubscription for the entire sample based purely on the higher oversubscribed transactions.
[57] A tobit model is also more effective at analysing samples with a large number of zero data points than an ordinary least squares model that is based off normal distribution assumptions. I therefore also apply this model in my study of allocations to specific groupings of investors in Chapter 5, which in some cases are frequently 0%.

By contrast the ordinary least squares regression is uncensored, and therefore could provide biased results by assuming the orderbook levels of these weakly oversubscribed tranches are a true reflection of third party demand.

The results of the tobit regressions, shown in Models 1 and 2 of Table 3.9, are qualitatively similar to my main model confirming that any bookrunner inflation of the orderbook has not affected my results.[58]

Another potential risk in my analysis is caused by the positive skew in the distribution of orderbook sizes, which could lead to my results being driven by a small number of highly oversubscribed tranches.[59] The average oversubscription level for my sample is 3.71x whereas the median is only 3.00x. In order to test that my results are robust to outliers I conduct a median quantile regression, the results of which are shown in Model 3.[60] Both S&P and issue frequency lose their significance while keeping the same sign as in the main model. This suggests that demand across these parameters is less uniformly distributed with tranches from lower rated and less frequent issuers more likely to receive very high oversubscription levels.

[58] The assumption of normality inherent in the tobit model is confirmed through a skewness-kurtosis test on the censored oversubscription variables (Holden, 2004). The associated p-values are significant at the 1% level. Furthermore the assumption of homoscedasticity is confirmed through the rejection of the alternative Multiplicative Heteroscedasticity Tobit model, again with a 1% level of significance.

[59] Such highly oversubscribed transactions occur infrequently and are likely to have unique causes such as particularly strong market conditions. It is therefore instructive to also understand what drives investor demand in moderately oversubscribed transactions.

[60] The estimator of a median quantile regression is the conditional median of the sample. Its value is clearly less affected by highly oversubscribed outliers than that of the conditional mean of the sample, which is used in the ordinary least squares regressions.

3.6.2 Sample exclusions

It can be argued that the captive finance and real estate firms in my sample require a distinct set of explanatory firm variables.[61] Their inclusion could therefore have influenced the results for the proxies taken from company-specific data. I therefore perform my main OLS model excluding each of these categories, resulting in the removal of 117 captive finance and 21 real estate tranches. The results are shown in Models 4 and 5; They remain qualitatively unchanged.

3.6.3 Alternative proxies

In Models 6, 7 and 8 I use plausible alternative proxies for the price of a bond tranche as well as an issuer's leverage and size. In Model 6 I employ the at-issue yield in order to assess whether the preference for high-credit spread issuance is driven by the higher absolute yield these tend to offer as opposed to the relative credit spread on offer.[62] This alternative variable is insignificant, suggesting this is not the case. Models 7 and 8 test whether the observed relations for leverage and company size still hold when using net debt[63] and total sales as proxies. Results for these regressions are qualitatively unchanged from the main model.

[61] For instance, credit rating agency S&P has distinct reports on rating methodology for real estate companies and captive finance companies (S&P, 2008 & 2013).

[62] If this were to be the case then lower risk bonds issued at a time of higher mid-swap rates would also receive greater demand, which would clearly complicate the observed increase in demand for higher-risk bonds.

[63] Net debt is calculated as total debt minus cash and short term investments. As this figure can be negative I adjust the calculation used for leverage:

$$LN\left(1+\frac{\text{Net debt}}{\text{Total assets}}\right)$$

3.7 Conclusion

In this chapter I analyse the determinants of orderbook oversubscription for a sample of 1,103 euro-denominated public bond tranches issued by 285 Western European firms from 2001 to 2012. This allows me to directly test differing implications for investor demand from a range of debt sourcing, agency costs and portfolio choice papers. To my knowledge no previous debt study has performed these types of tests. Most prior papers have interpreted indirect proxies, such as a a firm's public debt ratio (Denis and Mihov, 2003; Johnson, 1997).

My results show that corporate bond investors demand more bonds from lower rated and higher credit spread companies. Given that these are relatively scarce assets in Europe this is consistent with the portfolio choice notion of investors seeking to optimise the risk-return characteristics of their portfolio (Blume et al., 1991). It is not in agreement with the assumption made in classical debt sourcing papers of bond investors demanding more lower risk tranches due to concerns around inefficient liquidation and agency costs (Berlin and Loeys, 1988; Myers, 1977).

However I also find lower oversubscription levels for bonds from higher levered companies. This corroborates Myers' underinvestment theory; investors are concerned of growing managerial agency costs of investing in such higher levered companies (Myers, 1977). Taken jointly with the results for credit rating and credit spread this suggests that companies seeking bond investments should be more concerned with reducing their financial risk rather than their business risk profile.

Firms with a higher beta are able to issue more bonds as long as they demonstrate an ability to maintain strong credit metrics.

My results for information costs show that investors demand more bonds from firms outside of Germany, France and the United Kingdom, the main domiciles of most European investors. This appears consistent with the portfolio choice notion of geographic diversification (Pieterse-Bloem and Mahieu, 2013). However further testing on the geographic make-up of bond investors in GFU and non-GFU tranches is required to validate this interpretation (see Chapter 5).

My findings also show that oversubscription levels are lower for tranches from both debut and frequent issuers. The result for debut issuers is consistent with the information asymmetry theory and confirms Cantillo and Wright's (2000) findings of an asymmetric bond market entry-exit threshold. And the reduced demand for frequent issuers is in agreement with the portfolio choice notion of diversification across multiple companies (Markowitz, 1952). These relations suggest firms are advised to issue a relatively small inaugural bond tranche. And after they have grown their outstanding volume of public bonds to levels in line with their industry and country average, they should start to issue in alternative debt markets in order to maintain strong bond market access.[64]

[64] Such new sources of funding could be through accessing new bond markets, for instance the USD or CHF market.

Table 3.1.: Sources and calculations for empirical proxies

The Table presents variable definitions for the proxies of investor demand, information costs, bond market presence as well as the control factors for a sample of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012.

Variable	Proxy	Calculation	Source
Investor demand	Orderbook oversubscription	Orderbook size divided by issue size.	GlobalCapital, IFR
Risk of default	Credit rating	The numeric value for the S&P, Moody's or Fitch rating, descending from 1 for AAA/Aaa down to 10 for BBB-/Baa3 and 11 for unrated tranches.	Dealogic, S&P
	Credit spread	At-issue yield to maturity minus the benchmark euro midswap rate for the equivalent tenor.	Dealogic, IFR, GlobalCapital
	Leverage	Book value of total debt divided by total assets.	Datastream
Information costs	Intangible assets	One minus the ratio of net property, plant, and equipment divided by the book value of total assets.	Datastream
	Growth opportunities	Book value of total assets plus market value of equity minus book value of equity, divided by the book value of total assets.	Datastream
	Rated	An indicator variable equal to one if the bond is rated by at least S&P, Moody's or Fitch, zero otherwise.	S&P, Moody's, Fitch
	Germany, UK or France	Indicator variable equal to one if the firm's head office is in Germany, France or UK, zero otherwise	Dealogic, company reports
Bond market presence	Frequency	Total number of tranches issued by the borrowing firm during the sample period.	Dealogic
	Debut	An indicator variable set equal to one if the bond represents the firm's first syndicated public bond in the euro-denominated market, and zero otherwise.	Dealogic
	EMTN	An indicator variable equal to one if the bond is issued off an EMTN programme, zero otherwise.	Dealogic
Control factors	Firm size	The natural logarithm of the issuer's book value of total assets in EUR billions.	Datastream
	Profitability	Earnings before interest, taxes, depreciation and amortization (EBITDA) divided by book value of total assets.	Datastream
	Publicly owned	An indicator variable equal to one if 50% or more of the firm's shares are owned by the national government, and zero otherwise.	S&P, Moody's, Fitch, company reports
	Tranche size	The amount issued in EUR billions.	Dealogic
	Tenor	The year to maturity of the tranche, grouped in 3 year buckets starting from <3.0 years up to ≥12.0 years.	Dealogic
	Multi-tranche	An indicator variable equal to one if the issuer sells 2 or more tranches in the same currency on the same day, and zero otherwise.	Dealogic
	Benchmark size	An indicator variable equal to one if the bond's issue size is 500 million euros or more, zero otherwise.	Dealogic
	FRN	An indicator variable equal to one if the bond has a floating rate coupon, zero otherwise.	Dealogic
	Sector	The industry classification of the issuer, being consumer, industrial, telecom, transportation or utility.	Datastream, company reports

Table 3.2.: Summary statistics of explanatory variables and control factors

Summary statistics of the characteristics of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012. All variables are defined in Table 3.1.

Variable		#	%	Mean	Median
Proxies for risk of default					
Credit rating					
S&P		1103	100.00	7.35	7.00
Moody's		1103	100.00	7.74	8.00
Fitch		1103	100.00	8.69	9.00
Rated					
S&P		1000	90.66		
Moody's		891	80.78		
Fitch		603	54.67		
any agency		1037	94.02		
Credit spread		1085	98.37	1.41	1.00
Leverage		1001	90.75	0.34	0.34
Proxies for information costs					
Intangible assets		1001	90.75	0.65	0.68
Market-to-book ratio		961	87.13	1.34	1.20
Rated	y	1037	94.02		
	n	66	5.98		
GFU	y	738	66.91		
	n	365	33.09		
Proxies for bond market presence					
Issuance frequency		1103	100.00	8.00	6.00
Debut	y	251	22.76		
	n	853	77.33		
EMTN	y	843	76.43		
	n	260	23.57		
Control factors					
Total assets		1001	90.75	57.27	34.38
Profitability		1001	90.75	0.12	0.11
Publicly owned	y	142	12.87		
	n	961	87.13		
Issue size		1103	100.00	0.84	0.75
Tenor		1103	100.00	7.26	7.00
Multi-tranche	y	346	31.37		
	n	757	68.63		
Benchmark size	y	738	66.91		
	n	365	33.09		
FRN	y	70	6.35		
	n	1033	93.65		
Sector	Consumer	364	33.00		
	Industrial	302	27.38		
	Telecom	145	13.15		
	Transportation	72	6.53		
	Utilities	220	19.95		

Table 3.3.: Analysis of distinctive characteristics of investment bank-sourced orderbook sub-sample

Univariate analysis of the mean and median statistics of the subsample of 241 public bond tranches for which actual orderbook statistics have been received by a leading European investment bank, the IB sample, compared with the remaining 862 tranches, the non-IB sample. All variables are defined in Table 3.1. Results for the T-tests for the comparison of means are also reported. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	IB sample		Non-IB sample		T-test for difference	
Variable	**Mean**	**Median**	**Mean**	**Median**	**T-statistic**	**p value**
Credit rating						
S&P	7.45	8.00	7.32	7.00	-0.810	0.418
Moody's	7.77	8.00	7.73	8.00	-0.230	0.818
Fitch	8.40	8.00	8.78	9.00	2.008**	0.045
Leverage	0.33	0.34	0.34	0.34	0.391	0.696
Total assets	54.90	32.90	57.92	34.73	0.690	0.490
Profitability	0.12	0.11	0.12	0.11	-0.062	0.951
Intangible assets	0.65	0.68	0.65	0.58	0.048	0.962
Market-to-book ratio	1.35	1.22	1.34	1.19	-0.312	0.755
Issuance frequency	8.36	7.00	7.90	6.00	-1.073	0.283
Issue size	828.63	750.00	839.03	750.00	0.285	0.775
Tenor	7.24	7.00	7.27	7.00	0.110	0.913
Credit spread	1.56	1.25	1.37	0.95	-2.240**	0.025

Table 3.4: Analysis of distinctive characteristics of bond issues without reported orderbook data

Univariate analysis of the mean and median statistics of the sample of 1,103 tranches for which reported orderbook statistics have been obtained, the orderbook sample, compared with the remaining 123 tranches, the non-orderbook sample. All variables are defined in Table 3.1. Results for the T-tests for the comparison of means are also reported. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

	Orderbook sample		Non-Orderbook		T-test for difference	
Variable	**Mean**	**Median**	**Mean**	**Median**	**T-statistic**	**p value**
Credit rating						
S&P	7.35	7.00	6.25	7.00	-4.993***	0.000
Moody's	7.74	8.00	6.89	7.00	-3.501***	0.001
Fitch	8.69	9.00	8.78	11.00	0.344	0.731
Leverage	0.34	0.34	0.39	0.40	3.007***	0.003
Total assets	56.97	35.42	67.36	57.28	1.728*	0.084
Profitability	0.15	0.11	0.12	0.11	-0.335	0.737
Intangible assets	0.65	0.68	0.62	0.64	-1.498	0.134
Market-to-book ratio	1.34	1.20	1.38	1.17	0.836	0.403
Issuance frequency	8.72	7.00	9.68	7.00	1.461	0.144
Issue size	836.76	750.00	615.15	500.00	-4.693***	0.000
Tenor	7.26	7.00	7.58	5.00	0.681	0.496
Credit spread	1.41	1.00	0.95	0.53	-3.905***	0.000

Table 3.5.: Univariate analysis of orderbook oversubscription levels for full sample of bond issues

Univariate analysis of the level of orderbook oversubscription of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012. The sample is split into subsamples based on the independent variables, with tertiles applied for most of the continuous variables. All variables are defined in Table 3.1. Mean and median values are reported, as well as the p-values for the ANOVA test for equality of means across sub-samples and the Kruskal-Wallis test for equality of medians across sub-samples.

Variable		#	%	Mean	Median	ANOVA	kruskal-wallis
Proxies for risk of default							
S&P category	AAA	16	1.45	1.70	1.39	0.000	0.000
	AA	100	9.07	3.30	2.73		
	A	446	40.44	3.42	2.85		
	BBB	438	39.71	3.99	3.23		
	unrated	103	9.34	4.46	3.70		
Credit spread	Low	361	32.73	2.74	2.24	0.000	0.000
	Medium	358	32.46	3.77	3.00		
	High	366	33.18	4.68	4.00		
Leverage	Low	334	30.28	3.94	3.20	0.041	0.020
	Medium	333	30.19	3.67	3.00		
	High	334	30.28	3.47	2.67		
Proxies for information costs							
Intangible assets	Low	333	30.19	3.70	3.00	0.012	0.044
	Medium	334	30.28	3.41	2.67		
	High	334	30.28	3.97	3.20		
Market-to-book ratio	Low	318	28.83	3.62	2.83	0.166	0.160
	Medium	322	29.19	3.92	3.25		
	High	321	29.10	3.59	2.88		
Rated	y	1037	94.02	3.65	3.00	0.005	0.003
	n	66	5.98	4.53	3.68		
GFU	y	738	66.91	3.53	2.80	0.001	0.000
	n	365	33.09	4.06	3.33		
Proxies for bond market presence							
Issuance frequency	Low	272	24.66	4.17	3.40	0.000	0.000
	Medium	432	39.17	4.01	3.33		
	High	399	36.17	3.06	2.50		
Debut	y	251	22.76	3.73	3.00	0.86	0.59
	n	853	77.33	3.70	3.00		
EMTN	y	843	76.43	3.65	3.00	0.17	0.26
	n	260	23.57	3.89	3.07		

Table 3.5: Univariate analysis of orderbook oversubscription levels for full sample of bond issues (continued)

Control factors							
Total assets	Low	334	30.28	4.18	3.40	0.000	0.000
	Medium	330	29.92	3.98	3.25		
	High	337	30.55	2.94	2.50		
Profitability	Low	334	30.28	3.62	3.00	0.766	0.903
	Medium	333	30.19	3.75	3.00		
	High	334	30.28	3.71	3.00		
Publicly owned	y	142	12.87	3.66	2.90	0.826	0.571
	n	961	87.13	3.71	3.00		
Issue size	Low	366	33.18	4.14	3.19	0.000	0.015
	Medium	352	31.91	3.77	3.20		
	High	385	34.90	3.24	2.67		
Tenor	<3.0 yr	50	4.53	2.62	1.85	0.000	0.000
	3.0-5.9 yr	395	35.81	3.69	2.93		
	6.0-8.9 yr	349	31.64	4.28	3.75		
	9.0-11.9 yr	208	18.86	3.22	2.67		
	≥12.0 yr	101	9.16	3.31	2.56		
Multi-tranche	y	346	31.37	3.40	2.78	0.005	0.062
	n	757	68.63	3.84	3.00		
Benchmark size	y	738	66.91	3.49	2.93	0.000	0.117
	n	365	33.09	4.14	3.17		
FRN	y	70	6.35	2.12	1.59	0.000	0.000
	n	1033	93.65	3.81	3.00		
Sector	Consumer	364	33.00	3.60	2.72	0.507	0.239
	Industrial	302	27.38	3.87	3.28		
	Telecom	145	13.15	3.54	3.00		
	Transportation	72	6.53	3.56	2.97		
	Utility	220	19.95	3.80	3.00		

Table 3.6: Correlation matrix of explanatory variables

Pearson's Correlation coefficients for the independent issuer and security variables of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012. All variables are defined in Table 3.1. P-values in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	S&P number	Credit spread	Leverage	LN(total assets)	Profitability	Intangible assets	Market-to-book	Issue freq.	Issue size
S&P	1.000								
Credit spread	0.378***	1.000							
	(0.000)								
Leverage	0.192***	0.145	1.000						
	(0.000)	(0.000)							
LN(total assets)	-0.301***	-0.021	0.010	1.000					
	(0.000)	(0.508)	(0.747)						
Profitability	-0.147***	-0.154***	-0.022	-0.203***	1.000				
	(0.000)	(0.000)	(0.496)	(0.000)					
Intangible assets	0.268***	0.083***	0.126***	0.079**	-0.050	1.000			
	(0.000)	(0.010)	(0.000)	(0.012)	(0.115)				
Market-to-book	0.172***	0.235***	-0.048	-0.299***	0.652***	0.113***	1.000		
	(0.000)	(0.000)	(0.133)	(0.000)	(0.000)	(0.000)			
Issuance frequency	-0.019	0.018	0.301***	0.673	-0.088***	0.031	-0.217***	1.000	
	(0.534)	(0.548)	(0.000)	(0.000)	(0.005)	(0.331)	(0.000)		
Issue size	-0.208***	0.022	0.052	0.444***	0.049	0.012	0.017	0.345***	1.000
	(0.000)	(0.464)	(0.102)	(0.000)	(0.125)	(0.702)	(0.609)	(0.000)	

Table 3.7: Coefficients of explanatory variables in individual ordinary least squares regressions on orderbook oversubscription

Estimates from ordinary least squares regressions predicting the orderbook oversubscription of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012, using a single regression for each of the non-categoric variables reported. All variables are defined in Table 3.1. P-values in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Constant		Coefficient	
Proxies for risk of default				
S&P	2.102	(0.252)	0.218**	(0.033)
Credit spread	2.862	(0.110)	0.616*	(0.060)
Leverage	4.180	(0.186)	-1.44	(0.505)
Proxies for information costs				
Intangible assets	4.295	(0.471)	-3.430	(1.649)
Intangible assets^2			3.501	
Market-to-book ratio	3.824	(0.227)	-0.086	(0.160)
Proxies for bond market presence				
Issuance frequency	4.383	(0.122)	-0.085**	(0.012)
Control factors				
LN(Total assets)	8.314	(0.674)	-0.445	(0.064)
Profitability	3.662	(0.166)	0.258	(1.221)
Issue size	4.316	(0.142)	-0.730	(0.145)

Table 3.8: Ordinary least squares regressions predicting orderbook oversubscription

Estimates from ordinary least squares regressions predicting the orderbook oversubscription of 1,103 euro-denominated public bond tranches made by 285 Western European firms during 2001-2012. All variables are defined in Table 3.1. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1		Model 2		Model 3		Model 4	
Constant	5.978***	(0.000)	7.650***	(0.000)	7.649***	(0.000)	5.545***	(0.000)
Proxies for risk of default								
S&P	0.059	(0.207)					0.122**	(0.025)
Credit spread	0.566***	(0.000)					0.493***	(0.000)
Leverage	-2.254***	(0.000)					-2.191***	(0.000)
Proxies for information costs								
Intangible assets			-0.427	(0.820)			-1.996	(0.277)
Intangible assets^2			1.649	(0.303)			2.471	(0.112)
Market-to-book ratio			-0.504**	(0.024)			-0.145	(0.515)
Rated			-0.173	(0.603)			0.224	(0.547)
GFU			-0.585***	(0.001)			-0.519***	(0.003)
Proxies for bond market presence								
Issuance frequency					-0.062***	(0.001)	-0.046**	(0.021)
Debut					-0.733***	(0.001)	-0.688***	(0.001)
EMTN					0.092	(0.654)	0.270	(0.210)
Control factors								
Total assets	-0.252***	(0.002)	-0.291***	(0.002)	-0.264***	(0.010)	-0.178	(0.125)
Profitability	1.443	(0.270)	2.027	(0.252)	-1.459	(0.252)	2.332	(0.179)
Publicly owned	0.056	(0.861)	0.423	(0.225)	0.021	(0.945)	0.418	(0.228)
Issue size	-0.405**	(0.023)	-0.366**	(0.044)	-0.370**	(0.041)	-0.243	(0.175)
<3 yr tenor	-0.328	(0.390)	-0.224	(0.549)	-0.238	(0.518)	-0.335	(0.382)
6.0-8.9 yr tenor	0.441**	(0.012)	0.317*	(0.080)	0.244	(0.175)	0.373**	(0.035)
9.0-11.9 yr tenor	-0.245	(0.260)	-0.688*	(0.002)	-0.678*	(0.002)	-0.343	(0.124)
≥12.0 yr tenor	-0.173	(0.558)	-0.512	(0.102)	-0.640**	(0.033)	-0.261	(0.389)
Multi-tranche	-0.100	(0.543)	-0.191	(0.266)	-0.081	(0.628)	-0.160	(0.337)
Benchmark size	-0.061	(0.749)	-0.063	(0.756)	0.031	(0.876)	-0.227	(0.251)
FRN	-0.879**	(0.012)	-1.638***	(0.000)	-1.662***	(0.000)	-0.999***	(0.004)
Industrial	-0.001	(0.998)	0.226	(0.270)	0.086	(0.660)	-0.064	(0.759)
Telecom	0.169	(0.487)	0.138	(0.588)	0.474*	(0.056)	0.114	(0.658)
Transportation	0.464	(0.210)	0.368	(0.360)	0.099	(0.788)	0.467	(0.242)
Utility	0.226	(0.337)	0.314	(0.251)	0.136	(0.564)	0.296	(0.264)
R^2	0.177		0.129		0.121		0.209	
F-statistic	11.520		6.950		7.510		9.320	

Table 3.9: Robustness tests on regressions predicting orderbook oversubscription

Estimates from ordinary least squares, tobit and quantile regressions predicting the orderbook oversubscription of 1,103 euro-denominated public bond tranches made by 285 firms during 2001-2012. All variables are defined in Table 3.1. P-values in parenthesis. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 Tobit, 1x		Model 2 Tobit, 1.25x		Model 3 Quantile		Model 4 OLS, excl captives	
Constant	5.526***	(0.000)	5.581***	(0.000)	4.945***	(0.000)	4.820***	(0.004)
Proxies for risk of default								
S&P	0.123**	(0.024)	0.127**	(0.024)	0.056	(0.298)	0.120**	(0.050)
Credit spread	0.503***	(0.000)	0.524***	(0.000)	0.622***	(0.000)	0.537***	(0.000)
Leverage	-2.233***	(0.000)	-2.324***	(0.000)	-1.463**	(0.018)	-1.833***	(0.008)
Proxies for information costs								
Intangible assets	-1.939	(0.291)	-2.336	(0.216)	-2.379	(0.241)	-2.211	(0.251)
Intangible assets^2	2.461	(0.114)	2.785	(0.082)	2.035	(0.228)	2.798	(0.088)
Market-to-book ratio	-0.147	(0.509)	-0.129	(0.575)	-0.213	(0.380)	-0.208	(0.392)
Rated	0.206	(0.579)	0.199	(0.602)			0.304	(0.449)
GFU	-0.529***	(0.003)	-0.573***	(0.002)			-0.492***	(0.008)
Proxies for bond market presence								
Issuance frequency	-0.048**	(0.016)	-0.052**	(0.012)	-0.024	(0.249)	-0.064**	(0.008)
Debut	-0.724***	(0.001)	-0.808***	(0.000)			-0.697***	(0.002)
EMTN	0.250	(0.248)	0.223	(0.317)			0.318	(0.169)
Control factors								
Total assets	-0.183	(0.115)	-0.182	(0.129)	-0.156	(0.191)	-0.103	(0.435)
Profitability	2.363	(0.173)	2.458	(0.169)	2.763	(0.123)	2.700	(0.145)
Publicly owned	0.441	(0.204)	0.499	(0.162)			0.489	(0.179)
Issue size	-0.229	(0.202)	-0.244	(0.190)	-0.192	(0.296)	-0.307	(0.121)
<3 yr tenor	-0.319	(0.406)	-0.396	(0.323)			-0.399	(0.419)
6.0-8.9 yr tenor	0.390**	(0.027)	0.420**	(0.021)			0.357	(0.070)
9.0-11.9 yr tenor	-0.329	(0.140)	-0.345	(0.135)			-0.368	(0.132)
≥12.0 yr tenor	-0.220	(0.469)	-0.184	(0.557)			-0.295	(0.369)
Multi-tranche	-0.158	(0.343)	-0.182	(0.293)			-0.116	(0.534)
Benchmark size	-0.155	(0.435)	-0.080	(0.696)			-0.267	(0.214)
FRN	-1.034***	(0.003)	-1.196***	(0.001)			-1.137***	(0.004)
Industrial	-0.069	(0.743)	-0.061	(0.779)			-0.136	(0.558)
Telecom	0.114	(0.659)	0.134	(0.614)			0.080	(0.789)
Transportation	0.481	(0.227)	0.482	(0.240)			0.306	(0.478)
Utility	0.301	(0.257)	0.286	(0.297)			0.222	(0.467)
R^2							0.202	
F-statistic							7.820	
Pseudo R^2	0.051		0.053		0.104			
LR chi^2	220.470		229.490					
Excluded observations	17		54				117	

Table 3.9: Robustness tests on regressions predicting orderbook oversubscription (continued)

Variable	Model 5 OLS, excl REITs		Model 6 OLS, At-issue yield		Model 7 OLS, LN(1+Net debt/assets)		Model 8 OLS, LN(Total sales)	
Constant	5.334	(0.001)	5.565	(0.001)	5.108	(0.001)	4.950	(0.000)
Proxies for risk of default								
S&P	0.144***	(0.010)	0.215***	(0.000)	0.106*	(0.052)	0.129**	(0.015)
Credit spread	0.489***	(0.000)	-0.026	(0.666)	0.482***	(0.000)	0.495***	(0.000)
Leverage	-2.142***	(0.000)	-1.993***	(0.002)	-1.436**	(0.025)	-2.356***	(0.000)
Proxies for information costs								
Intangible assets	-2.867	(0.299)	-0.330	(0.867)	-1.859	(0.314)	-0.730	(0.733)
Intangible assets^2	3.087	(0.150)	1.380	(0.411)	2.380	(0.127)	1.500	(0.396)
Market-to-book ratio	-0.141	(0.529)	-0.370	(0.114)	-0.206	(0.355)	-0.134	(0.543)
Rated	0.293	(0.435)	0.202	(0.611)	0.191	(0.610)	0.213	(0.568)
GFU	-0.509***	(0.004)	-0.698***	(0.000)	-0.482***	(0.006)	-0.506***	(0.004)
Proxies for bond market presence								
Issuance frequency	-0.049**	(0.014)	-0.060***	(0.006)	-0.056***	(0.005)	-0.047**	(0.015)
Debut	-0.706***	(0.001)	-0.816***	(0.000)	-0.695***	(0.001)	-0.689***	(0.001)
EMTN	0.243	(0.268)	0.228	(0.321)	0.242	(0.264)	0.272	(0.207)
Control factors								
Total assets	-0.153	(0.192)	-0.169	(0.174)	-0.153	(0.187)	-0.163	(0.111)
Profitability	2.503	(0.152)	2.163	(0.253)	2.474	(0.156)	2.634	(0.126)
Publicly owned	0.448	(0.197)	0.457	(0.217)	0.506	(0.146)	0.373	(0.288)
Issue size	-0.211	(0.240)	-0.115	(0.549)	-0.259	(0.150)	-0.257	(0.148)
<3 yr tenor	-0.276	(0.470)	0.283	(0.546)	-0.326	(0.397)	-0.349	(0.362)
6.0-8.9 yr tenor	0.393**	(0.028)	0.247	(0.185)	0.390**	(0.028)	0.369**	(0.037)
9.0-11.9 yr tenor	-0.326	(0.145)	-0.682***	(0.003)	-0.328	(0.143)	-0.341	(0.126)
≥12.0 yr tenor	-0.238	(0.433)	-0.527	(0.096)	-0.252	(0.408)	-0.272	(0.369)
Multi-tranche	-0.200	(0.232)	-0.268	(0.138)	-0.133	(0.429)	-0.168	(0.325)
Benchmark size	-0.233	(0.246)	-0.172	(0.418)	-0.230	(0.248)	-0.243	(0.213)
FRN	-1.162***	(0.001)			-1.000***	(0.004)	-0.991***	(0.004)
Industrial	-0.048	(0.819)	-0.031	(0.891)	0.030	(0.884)	-0.074	(0.724)
Telecom	0.110	(0.668)	0.212	(0.452)	0.102	(0.693)	0.041	(0.875)
Transportation	0.423	(0.301)	0.642	(0.128)	0.287	(0.468)	0.431	(0.282)
Utility	0.293	(0.277)	0.451	(0.109)	0.296	(0.266)	0.254	(0.342)
R^2	0.218		0.148		0.202		0.209	
F-statistic	9.610		6.050		8.940		9.330	
Pseudo R^2								
LR chi^2								
Excluded observations	21							

Figure 3.1: Company size distribution across sample

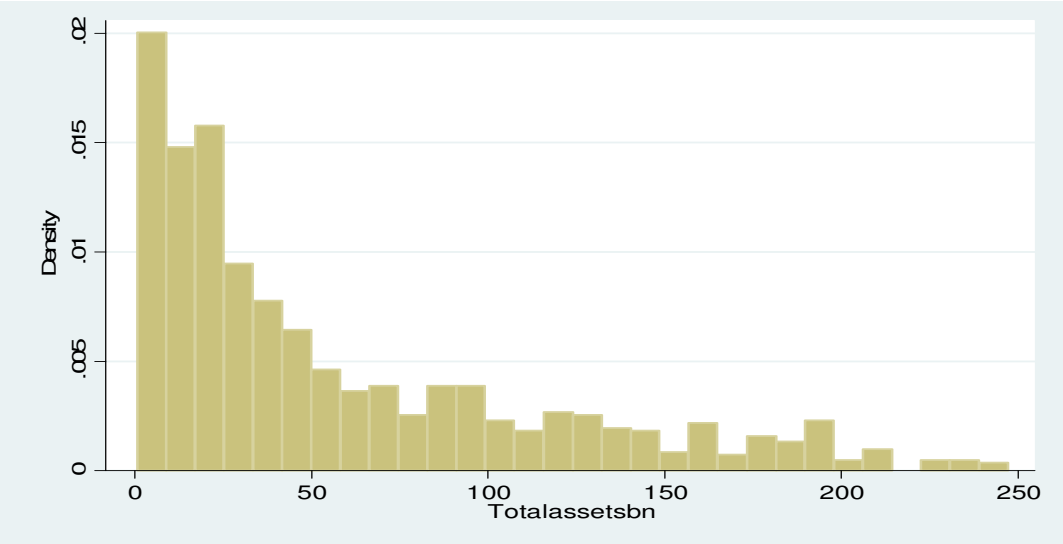


Figure 3.2: Distribution of orderbook oversubscription levels for different S&P rating brackets

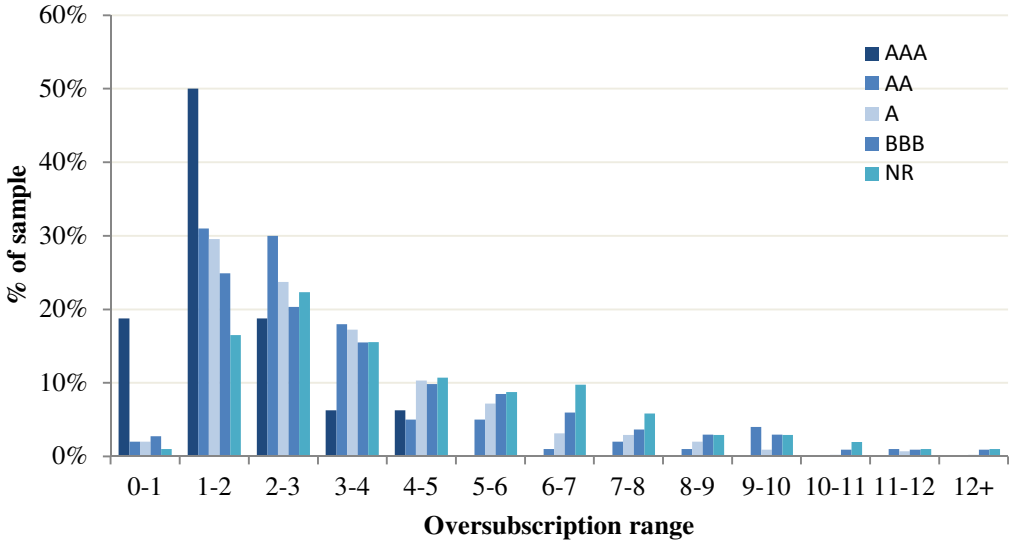


Figure 3.3.: Distribution of orderbook oversubscription levels for different company size tertiles

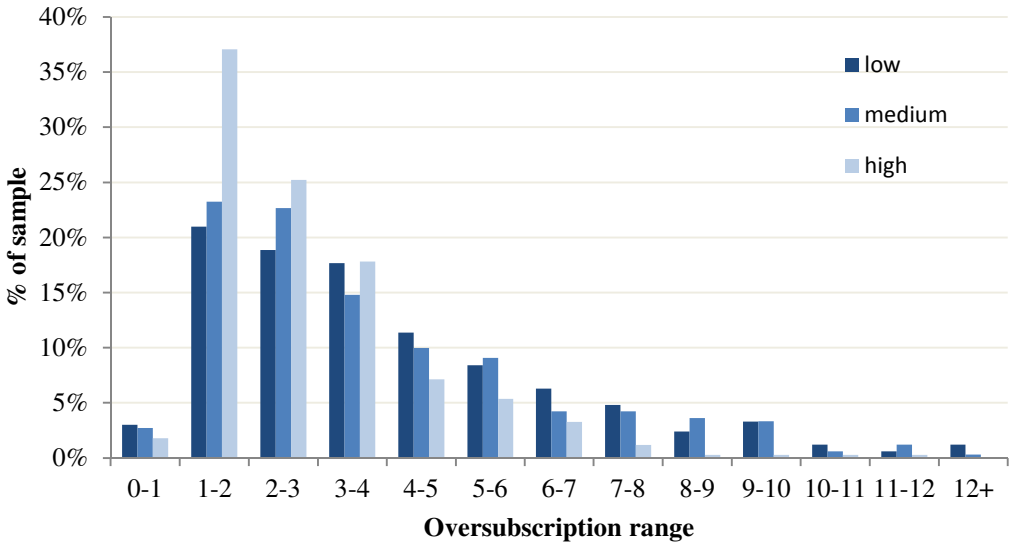
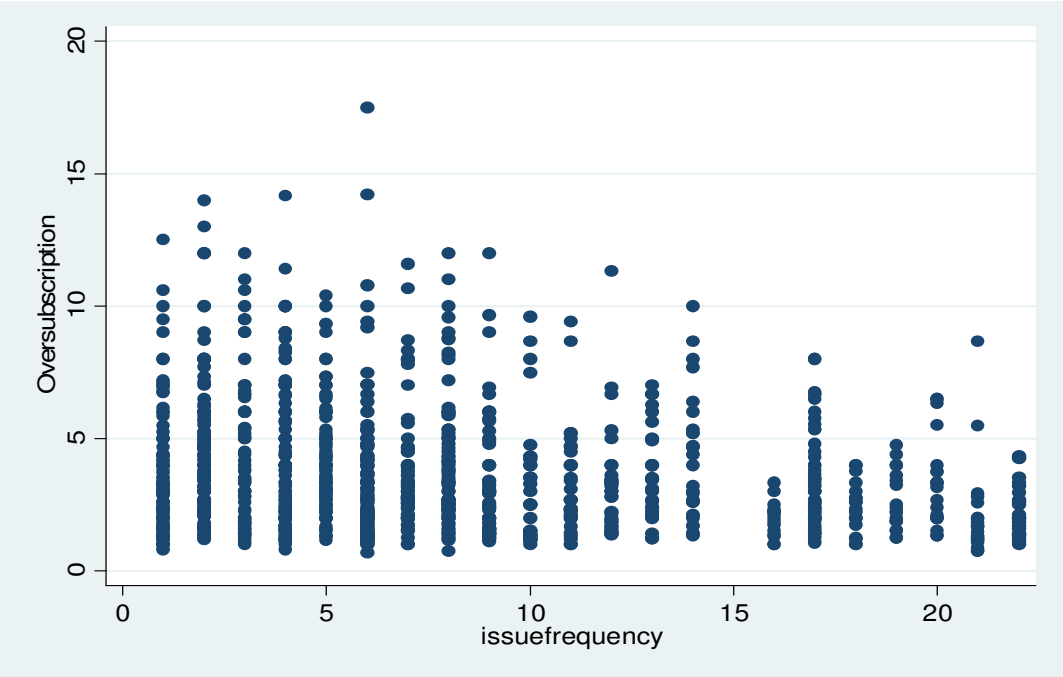


Figure 3.4: Scatter chart overview of orderbook oversubscription and issuance frequency observations across sample



4 Bookrunner performance

4.1 Introduction

The role of financial intermediaries as bookrunners[65] on corporate bond tranches should be relatively uncontentious. Bond bookrunners perform two main functions: they have a certification role, evaluating the issuer and its prospects on behalf of investors, and a placement role, which involves marketing and distributing the securities (Chemmanur and Fulghieri, 1994; Kessel, 1971; Yasuda, 2005). The corporate bond market is dominated by large and well-rated firms (Denis and Mihov 2003), who issue off documentation that is for the most part standardised and devoid of any complex structures or covenants. And corporate bond buyers tend to be highly sophisticated institutional investors (Choudhry, 2010).

Nonetheless research on financial intermediaries concludes that there is substantial heterogeneity in the quality of their services. Papers such as Andres et al. (2014), Butler (2008) and Fang (2005) find that factors such as the reputation and location of an issuer's lead bookrunner can have a significant impact on the quality of services provided, as measured by the at-issue credit spread.

This chapter further develops this relatively new literature, considering the influence of a broad range of bookrunner variables that could influence the performance of the entire bookrunner syndicate. My analysis thereby helps firms consider which criteria to use when compiling their bookrunner syndicate. As larger

[65] The term bookrunner is more commonly used in European markets to describe the role an investment bank takes when acting as an intermediary in the placement of bonds.

European companies move closer towards a capital markets based model of funding (see Section 1.1.2) this selection process is becoming increasingly important.

It is also becoming more complex. European borrowers have substantially more bookrunner candidates to choose from with more banks establishing dedicated debt capital markets functions after the last financial crisis (Abramowicz, 2014). And they also have more permutations of candidates to consider as typical bookrunner syndicate sizes have increased. This has resulted from banks, faced with more penalising capital requirements following the financial crisis, applying greater pressure on their debtors to be awarded bookrunner mandates. The average number of bookrunner syndicate sizes in Europe rose from 2.18 in 2001 to 4.85 in 2012 (source: Dealogic[66]).

How then can firms optimise their bookrunner syndicate selection? The simplest adjustment is through quantity. Growing the bookrunner syndicate could be seen to provide search benefits through greater investor reach (Kessel, 1971) but can also increase agency costs as a result of free rider problems (Diamond, 1996; Shivdasani and Song, 2006).

They could also distinguish in terms of bookrunner responsibilities. A subset of trusted banks can retain active bookrunner status, performing both a certification and placement role. Other less well-regarded banks are relegated to a less involved passive bookrunner status, accountable only for certification. As the placement role involves higher potential co-ordination inefficiencies and free rider risks, limiting the banks involved with this workstream is expected to reduce bookrunner agency costs.

[66] Based on default Dealogic criteria for corporate bond issuance and excluding privately placed bonds.

Who should issuers select as active bookrunners? They could choose reputable bookrunners, namely those highest in the corporate bond league table. These banks are arguably incentivised to perform better quality services so as to maintain a strong reputation and hence win more debt capital markets business (Chemmanur and Fulghieri, 1994). Yet they could also be deemed to be oligopolistic, distrusted by investors as they are seen to be inclined to sell high-risk tranches in order to accumulate more fees (Chemmanur and Krishnan, 2012).

Alternatively bookrunners could select banks based on their home jurisdiction. The European Union has a relatively high degree of information, cultural and linguistic barriers when compared to the United States. A domestic bank is arguably better able to gather information on an issuer for its certification role and understand an issuer's preferences with regards to the placement role (Butler, 2008). However a domestic bank could also be seen to perform a lower quality placement role as they are likely to have less strong relationships with non-domestic investors (Massa and Zalkodas, 2014).

I study this array of decision parameters through a sample of 1,193 euro-denominated public bond tranches made by 324 Western European investment grade firms between 2001 and 2012. In line with precedent papers (Andres et al., 2014; Fang, 2005) I test the quality of bookrunner services through the at-issue credit spread. In the European primary bond markets this is measured as the credit spread over the euro mid-swaps, which is equivalent to the market's expectations of the return generated through the Euribor interbank market over the same tenor (see Section 2.1). Credit spread is the most effective proxy for quality as it is directly

influenced by the efforts made by the bookrunner syndicate and subject to relatively homogeneous issuer preferences.[67]

The credit spread for my specific sample is expected to be highly predictable, making it a particularly strong test of the residual influence of bookrunner characteristics. My set of borrowers is larger and more homogeneous than precedent bond market papers (Fang, 2005; Julio et al., 2007). My sample issuer has a mean book value of assets of EUR 57.3bn and issues in the euro-denominated public bond markets on average every 18 months. Theoretically the differences between credit spread should be limited and almost fully explainable by tranche characteristics such as rating, tenor and issue size, and firm characteristics such as size, leverage and profitability (Longstaff et al., 2005).

In line with precedent papers I utilise two-stage regression models to account for the endogenous matching of issuers and bookrunners (Andres et al., 2014; Fang, 2005; Golubov et al., 2012). I use a Heckman's two-stage estimation method (Heckman, 1979) for categorical explanatory variables and ordinary two-stage least squares regression for non-category explanatory variables. My unique bookrunner instrumental variables are a Southern Europe dummy, a debut dummy and issue frequency.

My overall analysis is supplemented by subsample testing for the period before and after the 2008 global financial crisis. I consider if the relation between bookrunner syndicate structure and the quality of service has changed as a result of this exogenous event. The financial crisis had a direct impact on the explanatory

[67] All firms can be assumed to want to pay the lowest credit spread out of a desire to minimise their cost of capital.

variables in my sample as it led to a significant increase in bookrunner syndicate size as well as an increased propensity to appoint passive bookrunners (Cowie, 2009). It also affects my dependent variable with corporate bond credit spreads rising considerably in the period immediately following the financial crisis (see Section 2.5).

I find that domestic banks perform the highest quality bookrunner services. The at-issue credit spread is positively related to the proportion of active non-domestic banks, even if those banks could offer access to larger capital markets, such as France, Germany or the UK, or are of a high reputation, being a top 10 bank. This result is in line with Butler's (2008) findings for a sample of single-bookrunner led US municipal bond issues. It highlights the existence of insider and outsider bookrunners, with insiders able to offer higher quality services by virtue of having stronger srelationship and being more informed about the issuer.

Reputation is of secondary importance to domicile. Excluding geographic effects I find that higher reputation bookrunners offer better quality services. This is consistent with the results of Fang's (2005) US corporate bond bookrunner study. Hence my results suggests that reputable banks are particularly skilled at servicing their domestic client base. A high volume of issuance from this domestic client base helps them reach a top tier league table position.

My results also show that the trend of growing bookrunner syndicate size is detrimental to the quality of service. Larger bookrunner syndicates tend to price tranches at higher at-issue credit spreads, reflecting co-ordination and free rider problems (Diamond, 1996). This is contrary to earlier bookrunner papers with smaller average group sizes (Andres et al., 2014).

Issuers can reduce these agency costs by introducing active-passive bookrunner distinctions. Bookrunner syndicates with a subset of passive bookrunners perform higher quality services. This suggests issuers should consider both who they appoint as bookrunner and what bookrunner role they assign for each bank.

The significance of my results is largely driven by tranches issued after the 2008 global financial crisis. For the period prior to the crisis I find no relation between bookrunner syndicates and quality of service. The post crisis period is characterized by larger bookrunner syndicates and increased segregation in bookrunner roles between active and passive. This makes within syndicate coordination and free rider costs more of a concern and strengthens the benefits from introducing passive bookrunners to the syndicate.

My findings contribute to several strands of literature. They add to the literature on corporate bond financial intermediation (Andres et al., 2014; Fang, 2005), highlighting the growing importance of intermediary relationships and roles amidst an increasingly competitive market for bond underwriting. Bookrunners seeking a sustainable business model are likely to increasingly focus on a particular set of clients with whom they enjoy a strong relationship, such as a particular geography or industry. And the growth in bookrunner syndicate sizes will make agency problems and the resulting need for clear role differentiation increasingly relevant for issuers.

My study also adds to the debt market agency literature (Diamond, 1996; Jensen and Meckling, 1976; Myers and Majlif, 1984) which has typically focused on debtholder-shareholder conflicts. I find that the size and role split of a bookrunner

syndicate have a significant impact on an issuer's at-issue credit spread and interpret this as evidence of intra-bookrunner agency costs. As European funding markets become more reliant on intermediated sources of capital (Cimilluca and Schaefer Muñoz, 2012) managing such agency costs becomes increasingly pertinent.

My findings contribute to the literature on the impact of the global financial crisis on the role of financial intermediary syndicates. The relation between syndicate structure and credit spreads in the post crisis period highlights that the relative importance of the bookrunner syndicate composition varies over time with changing financial market conditions.

Finally my results add to the literature on the determinants of bond credit spreads (Guo, 2013; Longstaff et al., 2005). Post-financial crisis bank capital legislation has led to the secondary market for corporate bonds becoming increasingly illiquid (International Capital Markets Association, 2014) and has hence made the determinants of the primary market credit spread increasingly relevant for investors. My findings suggest that models seeking to comprehensively evaluate the at-issue credit spread should incorporate various facets of the bookrunner syndicate composition.

The rest of this chapter is organised as follows. In Section 4.2 I provide a general overview of the at-issue credit spread and justify its use as a proxy for quality of bookrunner services. The literature review and hypotheses are set out in Section 4.3. In Section 4.4 I outline the sample selection process and examine the explanatory proxies and regression models employed. Section 4.5 contains the results of the regression analysis. In Section 4.6 I tests for the impact of the 2008 global financial crisis. Section 4.7 concludes.

4.2 Dependent variable

In my analysis I utilise the at-issue credit spread in order to measure the quality of bookrunner services. In this section I justify the use of this variable.

The literature on the quality of financial intermediary services typically uses the price of the intermediated asset as a proxy for quality. Equity bookrunner studies analyse the degree of underpricing of a share offering, or the relative price of new shares in comparison to the trading levels of existing shares (Logue et al., 2002). Loan and bond studies tend to use the at-issue spread (Andres et al., 2014; McCahery and Schwienbacher, 2010; Fang, 2005), an inverse proxy for the price obtained.[68]

In the context of the primary euro-denominated bond market the benchmark at-issue spread is the spread over the euro mid-swap rate (see Section 2.1).[69] This is hence a potential proxy for the quality of bookrunner services, alongside tenor and size. These are typically the three distinguishing factors amongst investment grade bond tranches because as discussed in Section 2.1 terms and conditions are highly standardised and covenant-light to facilitate secondary trading and maximise issuer flexibility. Both size and tenor are ill-equipped proxies as these would entail additional analysis into an issuer's desired size and tenor, neither of which are easily retrievable or necessarily uniform across issuers.[70] For credit spread on the other

[68] For mergers and acquisitions, where the asset intermediated is a firm or division that becomes part of the bidder's balance sheet, the bidder's cumulative abnormal returns post-announcement are utilised. This accounts for the market's appraisal of the value of the purchased asset to the bidder (Golubov et al., 2012).

[69] In the secondary euro-denominated bond market the benchmark spread is typically the spread over the German government bond.

[70] For instance, Diamond (1991) argues that both low and high credit quality issuers would want to issuer shorter term debt.

hand all firms are expected to target as low a level as possible in order to minimise the yield on their debt and hence improve their profitability.[71]

Alternatively one could consider employing the level of bookrunner fees as a proxy. Fee information is however not required to be reported for euro-denominated tranches sold off an EMTN programme and is hence only available for a small subset of my sample. Fee details are also likely to be uninformative for my sample tranches because bond market fees are typically negotiated in advance and are more closely related to borrower and tranche parameters such as credit quality and tenor (Melnik and Nissim, 2003). Practitioners suggest that for plain vanilla investment grade bond tranches from repeat borrowers, bookrunner fees are typically given by the issuer on a take it or leave it basis. This means higher quality intermediaries are not necessarily in a stronger bargaining position as may be the case in the mergers and acquisition market (Fang, 2005).

In summary the at-issue credit spread is an effective proxy for the quality of services of bookrunners as it is one of the few parameters directly influenced by their effort, subject to relatively homogeneous issuer preferences and easily collectible. In using this as a proxy for the quality of bookrunner services my criterion therefore becomes: if an issuer had changed the bookrunner syndicate composition, eg. appointed more banks or a different type of bank, would it have achieved a lower at-issue credit spread?

[71] Note that the direct link between the credit spread and the at-issue yield on a bond does not depend on the coupon assigned to a bond. The at-issue yield is made up of the coupon yield and the redemption yield. In the case of a zero coupon bond a high at-issue yield would have to be reflected in a high redemption yield meaning the bond would be priced substantially below par. In practice most corporate bonds are priced close to par, with the coupon being the nearest 1/8 of a percentage below the at-issue yield.

When utilising the at-issue credit spread it is of course important to account for the non-performance related variables that are expected to affect its level. Credit spread literature suggests that the key explanatory drivers of this variable are a combination of firm and tranche variables that relate to the risk of default (Longstaff et al., 2005). The main firm variables typically employed in such studies are firm size, profitability, the intangible assets ratio, leverage and growth opportunities. The major tranche variables utilised include credit rating, tenor and size.

These variables are expected to be particularly relevant for my sample of investment grade companies. Unlike sub-investment grade rated issuers, investment grade firms are typically publicly listed and highly visible. There is substantial information available about their operations, financials and prospects (Andres et al., 2014). Being larger issuers one would also expect them to make greater use of the bond markets (Denis and Mihov, 2003) and hence institutional investors in this market are expected to have dedicated more resources towards evaluating them.

In theory the influence of the financial intermediaries should therefore be very limited for these tranches. Prior literature predicts that the end-pricing of investment grade corporate tranches should be largely driven by non-bookrunner variables. The effect of bookrunner selection should be minimal. My sample hence makes for a useful setting to test our understanding of credit spreads and the impact of financial intermediaries.

4.3 Research design

I develop six hypotheses on how the characteristics of the bookrunner syndicate can influence the at-issue credit spread. These concern the bookrunner syndicate size, allocation of bookrunner responsibilities, reputation, geography and the financial crisis.

4.3.1 Bookrunner syndicate size

The impact of the number of financial intermediaries on the quality of service rendered to capital markets issuers is a well-established debate within the literature on financial intermediation.

Favouring the use of larger groups of intermediaries are the envisaged search benefits. Kessel (1971) applies information search theory to the market for hard underwritten US municipal bond tranches. He finds that increases in the number of bookrunners offering price bids results in lower at-issue clearing credit spreads. Kessel argues that this reflects a more extensive search across the pool of possible end-buyers, resulting in a higher likelihood that the issuer is able to sell to the subset of the pool that is willing to offer the highest price for these securities. Corwin and Schultz (2005) obtain similar results in a study of number of US equity Initial Public Offerings where having a larger syndicate of underwriters is more likely to result in positive price revisions.

Bond-focused studies tend to find results consistent with search benefits. Andres et al. (2014) document a significantly negative relation between the total

number of bookrunners and the at-issue credit spread in their sample of US high yield corporate bonds issued between 2000 and 2008.

Using a larger syndicate size is however expected to result in increased agency costs. As bookrunner syndicates grow, the degree of co-ordination required increases and free rider incentives also grow. Shivdasani and Song (2006) study the impact of the growth in bond bookrunner syndicates in the US following the repeal of the Glass-Steagall Act, allowing commercial banks to perform such roles. They find evidence of bookrunner free rider problems in periods of strong economic growth.

In practice the European bond market is considerably smaller than the US bond market and dominated by a limited number of relatively well known institutional investors (Choudhry, 2010). I therefore conjecture that marginal search benefits are relatively low in comparison to marginal agency costs, which leads me to the following hypothesis:

H1: There is a negative relation between the bookrunner syndicate size and quality of service.

4.3.2 Allocation of bookrunner responsibilities

The corporate bond market has led other capital markets in bookrunner role innovation, developing novel ways of dividing workloads amongst intermediaries. One of the more recent developments is the split between so-called active and

passive bookrunners, which has so far not been explored by empirical studies into financial intermediaries.

This role split distinguishes between the two main roles bookrunners are appointed for. The first is the certification role, which entails conducting a thorough evaluation of the issuer and its prospects on behalf of investors (Chemmanur and Fulghieri, 1994). The second is the placement role, which involves marketing and distributing the bond securities to investors (Kessel, 1971). Active bookrunners are mandated for both roles and passive bookrunners only for the certification role.[72]

There is no de jure difference between these two classes of bookrunners, necessitating a similar degree of commitment to the certification role. This role entails both legal and reputational risks for a bank. A bond's legal documentation does not distinguish between active and passive bookrunners, hence the legal risks are similar. Any losses incurred by investors through insufficient diligence on the part of the bookrunners can be recuperated from the entire bookrunner syndicate.

Reputational risks arise through insufficient investor interest in the tranche. These can emerge when the orderbook built up before the bond is priced is less than the target amount communicated to the market resulting in an issue being downsized or withdrawn. This impacts both active and passive bookrunners; both are highlighted in external communication on the tranche and hence both classes are associated with the failed offering.

Unlike the equity market (Slovin, 2000) the actual underwriting risk typically taken by active and passive bond bookrunners is negligible. In practice issues are normally sold on a best efforts basis entailing that bookrunners only commit to

[72] Note that this distinction is different from the practice of selecting lead bookrunners (Andres et al, 2014) as lead bookrunners purely co-ordinate the placement role, they do not perform it exclusively.

purchasing the securities after they have engaged in public bookbuilding (S&P, 2013). During this process orders are taken, a clearing price is determined and the bonds are allocated to investors. Bookrunners are hence only required to purchase bonds should an investor cancel its order in the five days between the end of the public bookbuilding and the settlement of the tranche. This is a rare occurrence given the investor commitment made and the relative stability of the business profile of most investment grade issuers.

As a result of the equal legal and reputational risk profile, both active and passive bookrunners can be assumed to be broadly equally concerned with the certification workstreams. Investment banks tend to have near-identical internal approval and control procedures for accepting an active or a passive bookrunner role.[73] In both cases they are required to conduct close due diligence of the bond terms and the issuer. Given that these are parallel workstreams performed independently by each investment bank it can be argued that co-ordination risks are largely absent from this role.

The placement role on the other hand is made up of workstreams managed jointly and exclusively by the active bookrunners. It incorporates pre-announcement strategic discussions, investor marketing, managing of the orderbook and price setting. As the number of bookrunners increases these workstreams arguably become increasingly difficult to co-ordinate. Agreeing a strategy amongst two bookrunners is less time-consuming than amongst five bookrunners. Free rider incentives grow as each active bookrunners' individual contribution becomes harder to assess for the

[73] In the context of a best efforts issue this risk cannot be eliminated by adding more bookrunners as none are expected to contribute to the orderbook by way of a pre-announcement underwriting commitment.

issuer. At the same time as discussed in Section 4.3.1 search benefits increase as more banks engage in this function (Kessel, 1971).

Given that active bookrunners perform both bookrunner roles my theoretical considerations with regards to their quantity are similar to those set out for bookrunner syndicate size in Section 4.3.1, leading me to propose a similar hypothesis:

H2: There is a negative relation between the number of active bookrunners and quality of service.

As I expect agency costs to be a relatively more important driver of the quality of bookrunner service, I envisage that the inclusion of passive bookrunners is generally beneficial. The usage of passive bookrunners was developed deliberately to improve the overall quality of service, i.e. it would have been done in instances where the resulting agency cost reduction outweighs the search benefits decrease.

Not all practitioners agree with this expectation. Some note that the adoption of passive bookrunners risks demotivating active bookrunners as their workload remains similar while their expected underwriting fees decreases (IFLR, 2014). However in practice issuers who feel compelled to use passive bookrunners typically have larger groups of relationship banks and are therefore mostly large, well-established companies with a strong capital markets track record. This suggests they are better able to monitor their active bookrunners. It is also not uncommon for active bookrunners to receive a relatively larger share of the overall economics of a bond tranche. In Verizon Wireless' USD 49bn multi-tranche bond issue priced in

September 2013 the company paid the four active bookrunners combined fees of $166.57m and the seven passive bookrunners total fees of $89.1m (O'Malley, 2015).

When studying passive bookrunner decisions it is important to note that the practice of including passive bookrunners is still relatively infrequent. I therefore account for their presence in a bookrunner syndicate through a dummy variable as opposed to a count. This leads me to the following hypothesis:

H3: There is positive relation between the inclusion of passive bookrunners in a bookrunner syndicate and quality of service.

4.3.3 Bookrunner reputation

Prior economic literature has written extensively on the impact of a producer's reputation on the quality of a product. This is highly relevant for bond issuers, who are able to choose between bookrunners with a strong reputation for their services and those with a weak reputation.

Classic product market models conclude that a producer's reputation is positively related to the quality of its goods. These models assume a market with multiple competing producers with an insignificant market share, repeated interaction between producers and consumers and a product whose quality is not observable ex ante. In this market an equilibrium emerges with differing pricing points dictating quality. Products with a higher price are characterised by superior quality as their producers are incentivised to maintain a reputation for selling such type of goods. Forfeiting this reputation for short term profit generates lower returns

in the long run due to price drops and customer desertion. This is referred to as the reputation mechanism (Allen 1984).

Chemmanur and Fulghieri (1994) adapt these classical models to the reputation of bookrunners for equity offerings, arguing that more reputable bookrunners consistently offer higher quality bookrunner services allowing the firm to sell its shares at a higher price. Empirical support for this prediction has been mixed (Logue et al., 2002), leading Fang (2005) to argue that it is more likely to hold for the quality of bond bookrunner services. While both markets are characterised by repeated interactions firms typically issue more frequently in the bond market (Denis and Mihov, 2003). And although both markets have a top tier of bookrunners with significant market shares, the relative bargaining position of bond issuers is likely to be higher as these are typically larger and more established companies (Fang, 2005).

Fang (2005) consequently finds support for the certification hypothesis in her empirical analysis on a sample of investment grade and high yield bond tranches. She measures reputation in a binary fashion, demarcating the top 8 banks in her sample as high reputation and the rest as low reputation. Controlling for issuer-bookrunner endogenous matching she finds that tranches led by high reputation bookrunners have lower at-issue credit spreads.

More recent studies have documented a different relation. Andres et al.'s (2014) analysis of US high yield bond tranches concludes that tranches led by the top 3 US high yield bookrunners have higher at-issue credit spreads. They find no significant relation for the top 4 to 10 bookrunners. They suggest that these results reflect changes to high reputation bookrunners' incentives following the repeal of the Glass-Steagall Act in the United States in the 1990s. The resulting growth in

bookrunner competition led to reduced bookrunner fees resulting in the premium fee for offering higher quality services diminishing.

Their findings are in line with Chemmanur and Krishnan's (2012) market power hypothesis. This states that the reputation mechanism is weak amongst financial intermediaries as their reputation is established largely through their unique long-term relationships with investors, not merely the quality of their bookrunner services. High reputation bookrunners are therefore incentivised to reduce the quality of their bookrunner services while simply leveraging their embedded network of end-investors to ensure successful placement.

While potentially appealing for US high yield issues the market power hypothesis is less likely to explain behaviour amongst European bond bookrunners. The European bond market is less well developed, being dominated by large and well established borrowers (Choudhry, 2010). Higher reputation bookrunners are strongly incentivised to perform high quality bookrunner services for these issuers as they envisage multiple repeated interactions in the future. In practice these investment banks seek to maximise their share of the debt capital markets wallet of these issuers, winning more than their proportionate share of bond business when compared to other relationship banks.

I therefore hypothesise that reputable bookrunners are incentivised to offer higher quality bookrunner services. In the European context of large bookrunners syndicates this suggests that firms should seek to appoint a larger proportion of higher reputation active bookrunners. A single reputable bookrunner will arguably struggle to dominate a syndicate of five bookrunners. Having a higher proportion of top tier bookrunners allows them to take ownership of a greater share of the

workstreams, ensuring an increase in the average quality of service. This prediction can be tested through the following hypotheses:

H4: There is a positive relation between the proportion of top tier bookrunners and quality of service

4.3.4 Bookrunner geography

The influence of bookrunner geography on quality of service is a relatively underexplored area. One of the few papers to study this relation, Butler (2008), finds that for US municipal bonds bookrunners with a presence in the same state as the issuing municipality are able to achieve lower at-issue yield than non-local counterparts. The municipal bond market is however a relatively small portion of the global bond markets (source: Dealogic) with a highly homogeneous issuer type. Also in practice these securities are often bought by a somewhat different investor base than corporate bonds.

It is therefore worthwhile to analyse the effects of geographic proximity in the context of the corporate bond market. This applies particularly to Europe, being a lyless integrated capital market than the United States. Differences in culture and language within the European Union (Botterill, 2011) should lead to information barriers and higher information asymmetries for non-domestic bookrunners, reducing their ability to carry out the certification and placement role.

Conversely domestic bookrunners are expected to be able to perform both roles to a higher standard. They have access to more information about the issuer and can hence perform more comprehensive due diligence as part of the certification role. In addition they are expected to have a stronger relationship and understanding

of the issuer allowing them to more effectively advise on the optimal distribution strategy required for the placement role. Such relationship benefits have been documented in the corporate loan market. Do and Vu (2010) study the determinants of the at-issue credit spreads of a sample of 1,352 syndicated loans issued by US companies between 1990 and 2001. They find that credit spreads at issue are negatively related to the lead bank's relationship strength with the borrower, as measured through the amount of loans the company has previously borrowed from this bank.

Domestic bookrunners are however less able to provide investor search benefits in the form of strong access to non-domestic investors. This could weaken their ability to perform the placement role to a high standard. Massa and Zalkodas (2014) find that US firms with strong access to both the domestic and international bond markets tend to issue in the international bond market as a result of relatively lower at-issue credit spreads. They argue that international bond investors are able to offer competitive pricing due to the portfolio benefits they obtain through diversifying away from domestic firms. European bond portfolio studies confirm that pan-European geographic diversification leads to more mean-variance efficient returns (Pieterse-Bloem and Mahieu, 2013), as discussed in Section 3.2.2. Hiring non-domestic bookrunners should help the issuer attract a higher proportion of international demand and hence improve on the pricing on their bond tranche.

However I expect relationship benefits to typically outweigh search benefits. In practice there are only a limited number of sizeable European institutional bond investors with price-setting power, which most bookrunners will have relationships with. The quality of service offered by bookrunners are hence expected to be more driven by the relationship between the issuer and the bookrunner than between the

bookrunner and the investors. This suggests in line with Butler (2008) that firms should appoint a lower proportion of non-domestic bookrunners:

H5: There is a negative relation between the proportion of non-domestic bookrunners and quality of service

4.3.5 Impact of the global financial crisis

My sample period covers the 2008 global financial crisis, an event that had a major impact on the structure of bookrunner syndicates, in particular their size and allocation of responsibilities. I therefore intend to also study the pre- and post 2008 subsamples separately.

The stricter regulation developed after the crisis has forced banks to maintain higher capital ratios, increasing hurdle returns on their outstanding loans and the need for more ancillary business from their clients (Chivukula et al., 2014). Banks began to place greater commercial pressure on companies to be awarded bond bookrunner mandates, leading to a rise in bookrunner syndicate sizes. The average number of total bookrunners on a European bond tranche has grown from 3.01 in 2007 to 4.85 in 2012 (source: Dealogic). Issuers have recognised the potential agency costs arising from this and have started to more frequently adopt active-passive bookrunner distinctions. In addition the post-crisis period of market volatility saw a rapid increase in at-issue credit spreads, as discussed in Section 2.5. This has arguably led to greater marginal impact of compiling the optimal bookrunner syndicate structure.

I therefore expect the relations set out in Hypotheses 1 through 5 to be driven by the post-financial crisis period. The agency costs of appointing more bookrunners hypothesised in H1 and H2 is expected to be particularly clear amongst the large-bookrunner syndicates that became the norm after the crisis. And search benefits are likely to be less prevalent amongst such syndicates, given that this is arguably a marginally decreasing function of the number of bookrunners. The bookrunner appointed sixth is expected to be able to generate less new interest than the one appointed second. The agency benefits of employing passive bookrunners considered in H3 is expected to only be apparent in the post-crisis sample due to the limited number of pre-crisis trades with such a role distinction. The value of appointing reputable and domestic bookrunners tested through H4 and H5 is expected to only be clear in the post-2008 period as well given the more volatile nature of the at-issue credit spread. I end up with the following hypothesis:

H6: The relation between bookrunner syndicate structure and quality of service set out in hypotheses H1 to H5 is driven by the post-crisis period

4.4 Data

In this section I set out the dependent variable, the proxies for the explanatory variables and the construction of the empirical tests. An overview of the sources and calculations for each of the empirical determinants can be found in Table 4.1 and their summary statistics are displayed in Table 4.2.

4.4.1 Credit spread sample

To be able to test my hypotheses on bookrunner performance I source the at-issue credit spreads for the 1,224 tranches in my sample (see Section 2.4). For most of the tranches I am able to obtain this through Dealogic, which has records of the pricing details for bonds obtained directly from the final termsheets of each tranche. A termsheet is a one-page summary document produced by the involved bookrunners immediately following the pricing of a bond tranche. It includes inter alia the underlying mid-swap rate, the at-issue credit spread and the at-issue yield. For the fixed rate tranches where Dealogic did not record an at-issue credit spread I calculate this manually through retrieving the at-issue yield to maturity from the bond prospectus and deducting the benchmark midswap rate as of the date of issuance. This reverses the process of calculating the at-issue yield on a bond. The main difference between my manually obtained at-issue credit spread and the actual at-issue credit spread is due to timing, with my historic mid-swap data being based on end of business day quotes while bookrunners would rely on the mid-swap at the time of pricing. Public bonds are typically priced in the course of the afternoon, so the timing difference will in most cases be no more than 3 hours.

The spread over midswap is not available for the 101 floating rate note tranches in my sample. These are almost always priced over 3 month Euribor, whereas the euro midswap is based on market expectations of the 6 month Euribor. I approximate the spread over midswap for these tranches through manually swapping their 3 month Euribor based credit spread into a 6 month Euribor based credit spread.[74] This conversion is done through adding the applicable 6v3 basis swap

[74] Note that in practice one would also be required to take into account payment frequency differences to arrive at a fixed rate bond equivalent spread over midswaps. However such differences are minimal given that their average tenor is only 3.6 years.

spread to their at-issue spread over 3 month Euribor. The 6v3 basis swap spread is the price for a two-party swap for a specific number of years whereby one party agrees to pay 6 month Euribor and the other 3 month Euribor. As historic data on this swap is only available from Bloomberg from January 2004 I can apply this calculation to 71 out of the 101 floating rate tranches.

I end up with a credit spread sample of 1,193 tranches, constituting 97.5% of the overall sample. For these tranches the mean (median) at-issue credit spread is 1.370% (0.960%). Despite my sample period covering the global financial crisis the mean figure is comparable to the 1.35% treasury spread reported by Fang (2005) for her subsample of issues underwritten by high reputation bookrunners. As would be expected it is considerably lower than the 4.97% average spread for high yield bonds reported by Andres et al. (2014).

4.4.2 Proxies for explanatory variables

Having amassed my sample I collect the required explanatory variables related to the various bookrunner parameters. The focus of precedent bookrunner studies (Andres et al., 2014; Butler, 2008; Fang, 2005) has been fairly narrow in this regard, typically restricting themselves to a single characteristics of the lead bookrunner, i.e. its reputation or geography. To my knowledge my thesis is the first to draw on a broad range of bookrunner syndicate characteristics, encompassing syndicate size, allocation of responsibilities, reputation and geography, as well as a cross-analysis of these variables.

4.4.2.1 Bookrunner syndicate size

The total number of bookrunners is a count of each individual bank appointed to any bookrunner role in a bond offering, typically referred to in US studies as a lead underwriter (Andres et al., 2014). This variable is available in Dealogic which extracts this data from the final termsheets of each tranche. Where Dealogic data is lacking I consult the relevant bond prospectus.

As reported in Table 4.2 the sample average and median total number of bookrunners is 4.11 and 4.00 respectively. This is higher than the averages reported by earlier, predominantly US-focused studies. Andres et al. (2014) record an average of 3.13 bookrunners in their sample of US high yield tranches sold between 2000 and 2008, while Shivdasani and Song (2006) find for their subsample of US corporate bond issues sold between 2001 and 2006 that only 12.3% of these were intermediated by 4 or more bookrunners. This reflects the sample criteria of firms employing at least two bookrunners for each tranche, the trend of increasing bookrunner syndicates (see Section 4.3.5) and the relatively large tranche sizes of my sample, necessitating more bookrunners for effective distribution. My sample average tranche size of EUR 0.82bn is over three times larger than the EUR 0.26bn mean reported by Andres et al. (2014) for their sample.[75]

4.4.2.2 Allocation of bookrunner responsibilities

In order to test H2 I divide the total bookrunner syndicate between active and passive bookrunners. Information on the involvement of each bookrunner is obtained

[75] Converted from USD using the average USD-EUR exchange rate for the sample period of Andres et al.'s (2014) study.

through searching press articles on each tranche published in International Financing Review and GlobalCapital. Journalists from these financial news sources make clear distinctions between the banks with an active role and those with a passive role on the tranche. For instance IFR wrote on the SNAM dual-tranche issued in September 2012 that "(A)ctive bookrunners were Bank of America Merrill Lynch, Citigroup, HSBC, Mediobanca, Societe Generale and UBS, while passive bookrunners were Banca IMI, BNP Paribas, JP Morgan, Morgan Stanley and UniCredit." This information is sourced from the communication distributed by active bookrunners during the marketing phase of the bond syndication process. It is imperative for active bookrunners to make this distinction, both for marketing reasons, highlighting their closer involvement with a transaction, as well as for investor communication reasons. As only the active bookrunners take responsibility for the placement role only their bond sales force can actively market the tranche and source orders from investors. Investors interested in placing an order should hence know which bank salespersons they should speak to.[76]

Tranches in my sample have an average of 3.70 active and 0.40 passive bookrunners. 103 tranches have at least one passive bookrunner, or 8.6% of the overall sample. The usage of passive bookrunners is however gaining popularity amongst issuers, as discussed in Section 4.3.5. The average number of passive bookrunners in 2001 is 0.15 while for 2012 it is 1.29.

As explained in Section 4.3.2 in the empirical testing I utilise both a count of the number of active bookrunners in the syndicate as well as a dummy variable for those tranches that appoint at least one passive bookrunner to the syndicate.

[76] Should a salesperson at one of the passive bookrunners be approached by an investor seeking to invest they are required to refer him to the active bookrunners.

4.4.2.3 Bookrunner reputation

Following prior bookrunner studies I use league table rankings to proxy for bookrunner reputation (Andres et al., 2014; Fang, 2005). I construct both an any bookrunner role and an active bookrunner role league for the sample, both of which are reported in Table 4.3. Note that I do not create a league table for passive bookrunners given the smaller number of trades that utilise these and the more limited reputational benefits banks accrue through acting as passive bookrunners.

I mimic Bloomberg and Dealscan league table methodologies in assigning so-called league table credits equally across the bookrunner syndicate for each trade; either across the full syndicate or only across the active bookrunners. Assume for instance a EUR 500m tranche managed by 4 bookrunners, 2 of whom are active bookrunners. For the first league table each of the 4 bookrunners obtain EUR 125m of credits and for the second each active bookrunner obtains EUR 250m of credits. I treat mergers and mergers and acquisitions amongst competing bookrunners differently than Bloomberg and Dealscan as I do not retrospectively assign bookrunner credits from the acquiring bank to the target bank. This would result in artificially increasing the reputation of smaller banks.[77] The Top 10 banks in both the any role league table and the active role league table include Deutsche Bank, BNP Paribas, Société Générale, HSBC, Barclays, JPMorgan, Citi, RBS, Credit Agricole CIB and UniCredit.

[77] For instance, in the case of RBS' take-over of ABN AMRO's investment banking division in 2007, RBS does not obtain league table credits for ABN AMRO's earlier led transactions.

I utilise these league tables for both Top 10 and average ranking based measurements. I employ a percentual function for the involvement of Top 10 bookrunners, dividing the number of Top 10 bookrunners by the bookrunner syndicate size. This allows me to directly test the claim made in Hypothesis 3 that the proportionate number of high reputation bookrunners is expected to be negatively related to the at-issue credit spread. At least one of the Top 10 bookrunners in my sample is involved in 96.1% of tranches. The relatively large bookrunner syndicates mean that on average the Top 10 bookrunners only constitute 62.3% of the total bookrunners on a tranche. The near-uniform presence of a Top 10 bookrunner means an indicator variable, as used most commonly in prior literature (Andres et al., 2014; Do and Vu, 2010), would not be a helpful proxy. A percentual measurement on the other hand gives insight into the perceived overall reputation of a bookrunner syndicate as well as the relative influence of the Top 10 bookrunners.

It can be argued that the market share distribution of my sample dictates a Top 2 or Top 9 split given the relatively large drop in market share between numbers 2 and 3 and numbers 9 and 10 respectively. However the main justification for inclusion in the top tier is not just relative market share but the market's perception of them being a reputable bookrunner. Major financial news sources that cover the bond markets are important arbiters in this regard, eg. Fang (2005) focuses on the Investment Dealer's Digest to justify her reputable versus not reputable segregation. The main publishers of European bond league tables such as Dealogic and IFR publish almost exclusively rankings focused on the Top 10, justifying my use of this cut-off point for being a reputable bank.

As a complementary reputation measurement I calculate the average league table ranking for each bookrunner on a tranche. For instance assume a tranche led by

BNP Paribas, JPMorgan and Unicredit, equivalent to number 2, 6 and 11 of my any role league table respectively. The average any role ranking would be #6 for this tranche, or equivalent to JPMorgan. The average ranking across the sample is 11.30, or closest to the reputation of Commerzbank who are #11 in my any role league table. It is higher for the active bookrunner syndicate than for the passive bookrunner syndicate, at 10.99 and 16.70 respectively, suggesting reputable banks are more likely to be appointed to an active bookrunner role.

4.4.2.4 Bookrunner geography

Summary statistics for the proxies for bookrunner geography are displayed in Table 4.2. I use an inverse data point for geographic proximity of a bookrunner syndicate by studying the proportion of non-domestic bookrunners, with domicile based on the country of incorporation of the issuer and the bookrunner. As with my methodology for league table rankings I focus on the original bookrunner syndicate and do not retrospectively account for mergers and acquisitions amongst bookrunners or issuers.[78] In his study of the municipal bond market Butler (2008) utilises a categoric variable which takes the value one if the lead manager of a bookrunner syndicate has a major office in the same state as the issuing municipality. This is however not a suitable proxy for corporate bond issues given the appointment of multiple lead managers on a typical offering.

Issuers in my sample appoint an average of 2.74 non-domestic bookrunners, accounting for 65.9% of their total bookrunner syndicate. In terms of role split, the

[78] Again in the case of the RBS take-over of ABN AMRO, for the purpose of earlier ABN AMRO-led trades the bank is seen as based in the Netherlands, i.e. it is not retrospectively seen as a British bank.

average number of active and passive non-domestic bookrunners is 2.45 and 0.29, or 65.9% and 73.1% of the total number of active and passive bookrunners respectively. The mean tranche appoints 1.25 active non-domestic bookrunners from Germany, France or the United Kingdom, or approximately half of the total active non-domestic bookrunners. These should offer the most meaningful search benefits through providing access to investors in Europe's largest economies (source: Eurostat).

In order to consider the relative influence of geography and reputational effects I construct proxies for the number of active non-domestic Top 10 bookrunners on a tranche. An issuer in my sample appoints a mean of 1.63 active non-domestic Top 10 bookrunners, or 66.5% of the total number of active non-domestic bookrunners. I also create a dummy for issuers who do not have a domestic Top 10 bookrunner in their bookrunner syndicate. If reputational effects are the primary drivers of bookrunner syndicate selection these issuers would not want to be captive to their low reputation domestic banks. The benefit of a non-domestic top tier bookrunner should be most acute for them. For instance Spanish telecom firm Telefónica would not want to rely only on Spanish banks BBVA and Santander, being #18 and #16 in my any role league table respectively. They would be better off also appointing a top tier German bank such as Deutsche Bank, being #1 in my league table. 629 tranches do not have a domestic Top 10 bookrunner, or 52.7% of the total credit spread sample.

4.4.3 Construction of empirical tests

In this subsection I set out the type of empirical testing I perform on my credit spread sample, as well as the additional variables I source to be able to conduct these. These added variables are split between bookrunner syndicate explanatory variables and other control variables.

4.4.3.1 Model specification

I utilise two-stage regression specifications that account for expected endogeneity[79] in the matching between issuers and bookrunners (Andres et al., 2014; Fang, 2005; Golubov et al., 2012).[80] Heckman's model (Heckman, 1979) is employed for the passive bookrunner dummy, being the sole categorical explanatory variable. This model consists of a first-stage probit specification of this variable which is used to produce an inverse Mills ratio. This is then inserted in a second stage ordinary least squares regression of the dependent variable of interest. The inverse Mills ratio can be seen as incorporating the observed and unobserved factors that drive issuers to appoint passive bookrunners. It is a bias corrected form of the bookrunner characteristic.

[79] In separate regressions reported in Appendix 4.1 I conduct Durbin-Wu-Hausman tests for the endogeneity of the bookrunner syndicate parameters. These tests confirm the endogenous nature of allocation availability, being significantly correlated to percentage domestic allocations, percentage institutional allocations, percentage PB&R allocations and percentage fund manager allocations.

[80] Previous bookrunner reputation studies have found that the propensity to appoint top tier bookrunners is partly determined by issuer and tranche parameters. Fang (2005) concludes that investment grade and frequent issuers as well as those issuing longer tenors are more likely to appoint reputable banks, while Andres et al. (2014) find that the same holds for larger issues and those issued by publicly listed and repeat borrowers. These parameters have also been found to influence credit spread, eg. longer tenor bonds tend to have higher credit spreads (Blackwell and Kidwell, 1988). Hence a standard OLS regression is expected to produce fallacious conclusions as the bookrunner syndicate proxy cannot be taken as exogenously determined. For instance it could lead to the erroneous finding that top 3 banks offer lower quality services, i.e. provide issuers with higher credit spreads, simply because there are more likely to be more top 3 bookrunners on higher tenor tranches.

A standard OLS estimation would indicate the average spread differences between transactions with and without passive bookrunners, not taking into account the influences of the factors that tend to drive the appointment of passive bookrunners (McCahery and Schwienbacher, 2010). For instance I would expect firms issuing larger tranches to be able to appoint a larger bookrunner syndicate to support the offering and hence be more inclined to relegate certain investment banks to passive status. Larger tranches are also expected to be priced at a higher at-issue credit spread in order to attract sufficient investor demand. The Heckman process accounts for this endogeneity and thereby indicates marginal spread improvement an issuer can obtain from appointing a passive bookrunner.

For the non-categoric explanatory variables I utilise a two-stage instrumental variable regression. The first stage is an OLS model on the bookrunner explanatory variable, which is then used to create a predicted variable to replace the bookrunner explanatory variable in the second stage regression. As with the Inverse Mills ratio this fitted variable incorporates the factors that influence an issuer's bookrunner selection process.

Applying these types of two-stage model specifications to adjust for expected matching biases necessitates additional diagnostic testing. Firstly I am required to test for the existence of endogeneity, assessing whether the dependent variable, i.e. the at-issue credit spread, does indeed significantly affect one or more of the explanatory variables, such as the total number of bookrunners. If this is the case a two-stage model with instrumental variables is preferred to a single-stage model. I confirm this is the case through performing Durbin-Wu Hausman tests on the key bookrunner syndicate parameters of interest, the results of which are set out in Appendix 4.1.

Secondly I should test for weak instruments, analysing whether the instrumental variables that I employ are a significant driver of the endogenous explanatory variable without impacting the dependent variable of interest (Li and Prabhala, 2007). In other words this instrumental variable should be expected to determine the parameters of a bookrunner syndicate but not the at-issue credit spread. This ensures that the first stage regression, where the instrumental variables appear, is correctly defined. I discuss these tests in the following section in which I present my instrumental variables.

4.4.3.2 Instrumental variables

Given my focus on a wide variety of bookrunner syndicate parameters I utilise three instrumental variables that I expect are related to at least one aspect of the structure of the bookrunner syndicate. I use a Southern Europe dummy, a debut dummy and issue frequency.

The Southern Europe dummy takes the value one if the issuer's principal headquarters are in Greece, Italy, Portugal or Spain and zero otherwise.[81] Southern European banks tend to be smaller, reflecting more fragmented banking systems as well as lower GDP per capita levels (Cavalier, 2014). This suggests that holding constant the size of a company's funding and liquidity requirements Southern European issuers are expected to have a larger group of relationship banks. Many of these banks will lobby for bond bookrunner side business, resulting in larger average bookrunner syndicates and a greater likelihood of relegating some banks to a passive

[81] The other countries in my sample are Austria, Belgium, France, Germany, Ireland, Luxembourgh, the Netherlands and United Kingdom.

role. Smaller Southern European banks are also expected to be less able to distribute pan-European bond offerings, suggesting that Southern European issuers also have a propensity to employ more non-domestic banks.

The debut dummy takes the value of one if the tranche is the company's first appearance in the euro-denominated bond market (see Chapter 3). Prior research shows that debut bond issuers are likely to be smaller firms and are more likely to appoint their relationship banks to bookrunner roles (Yasuda, 2005). This suggests that bookrunner syndicates on debut tranches will be smaller and have a lower proportion of non-domestic banks.

Issue frequency is a count of the total number of euro-denominated tranches of an issuer in the sample. It is employed by Fang (2005) and captures the notion that more frequent bond issuers are also expected to have more dedicated in-house bond issuance expertise and hence require smaller bookrunner syndicates. Fang also finds that such issuers are more likely to appoint reputable banks, suggesting that these banks seek to build a long-term relationship with these borrowers. Moreover frequent issuers are expected to be better known by investors. This reduces the potential placement benefits of hiring non-domestic bookrunners and leads me to believe that their bookrunner syndicates are skewed more towards domestic banks.

In order to ensure none of these are weak instruments I perform separate ordinary least squares regressions where I test their impact on the at-issue credit spread. I confirm that none of these three instrumental variables in isolation significantly affects the at-issue credit spread when controlling for issuer, tranche and bookrunner variables. In my multivariate analysis in Section 4.5 I also find that each of these three variables significantly affects different aspects of the bookrunner

syndicate. I therefore conclude that these three instrumental variables in conjunction are appropriate for my model specification.

4.4.3.3 Control variables

I collect a range of other firm- and tranche-specific variables that prior studies have found to influence the at-issue credit spread as well as the choice of bookrunner parameters. Their calculations are set out in Table 4.1 and their summary statistics are displayed in Table 4.2. Collectively these summary statistics show that my sample firms are very large and low credit risk issuers.

The firm variables I employ are size, profitability, level of intangible assets, leverage, growth opportunities and whether it is publicly owned (see Chapter 3). My average issuer has EUR 57.89bn of assets, generates EUR 8.7bn of EBITDA, or 15% of its total assets, and has EUR 19.7bn of gross debt outstanding.

A number of the control variables are likely to be related to either bookrunner parameters or the at-issue credit spread. I expect both profitability and the publicly owned dummy to be negatively related to the proportion of non-domestic banks in a syndicate, while I envisage a positive relation for firm size. Traditionally more monopolistic and profitable industries have tended to also have a more domestic profile, such as utilities and telecommunications, likely leading them to appoint more domestic bookrunners. Publicly owned firms are expected to do the same as a result of political pressures. Larger firms on the other hand will probably tend to have a larger and more internationally diversified banking group, resulting in a more international bookrunner syndicate.

I also expect profitability and firm size to be negatively related to the at-issue credit spread, while leverage should have a positive relation. This expectation follows prior credit spread research (Longstaff et al., 2005), with more profitable, larger and less levered firms making for lower risk debt investments.

The tranche-specific parameters I employ are credit rating, maturity, size and whether the tranche is part of a multi-tranche offering (see Chapter 3).[82] The mean credit rating number of 7.3 lies between an A- and a BBB+. The average tranche tenor is 7.33 years and size is EUR 0.82bn. The tranche data is relatively evenly distributed with the sample median rating, tenor and size being 7.0, or A-, 7.00 years and EUR 0.75bn respectively.

I expect that tranche size and the multi-tranche dummy are positively related to the number of bookrunners, as larger offerings arguably require a more sizeable bookrunner syndicate to facilitate the placement process. The credit rating number should also be positively related to the number of bookrunners, as weaker rated firms will likely require more bookrunners for certification purposes.

I also envisage that maturity is positively related to a bookrunner syndicate's reputation. Information asymmetries associated with longer tenors are larger, given greater uncertainty around a firm's longer term prospects, arguably necessitating the support of more reputable bookrunners.

Credit spread is expected to be positively related to the credit rating number and the tranche size. The credit rating number is a negative proxy for the degree of credit risk a rating agency assigns to a tranche, suggesting investors will demand higher compensation for weaker rated tranches. And as the amount of bonds being

[82] While tranche size and the multi-tranche dummy are positively related, i.e. firms selling multi-tranche offerings are also more likely to have larger individual tranches, separate testing confirms that this does not affect the results in my multivariate models.

demanded increases the laws of supply dictate that investors will demand a higher price in the form of a higher at-issue credit spread.

4.5 Multivariate analysis

The results for my two-stage regressions on the at-issue credit spread are displayed on Tables 4.4, 4.5 and 4.6. These test hypotheses H1 to H5 which cover the full sample period. I discuss the findings for each bookrunner variable in turn in this section.

4.5.1 Bookrunner syndicate size

The results for bookrunner syndicate size are displayed in Model 1 on Table 4.4. The first panel contains the results of the first stage regressions on bookrunner syndicate size while the second panel incorporates the results of the second stage regression on credit spreads, including the predicted value of bookrunner syndicate size from the first stage regression as an explanatory variable.

All three instrumental variables are significant. Issuers from Southern Europe tend to appoint more bookrunners while debut and frequent issuers appoint fewer bookrunners. As discussed in Section 4.4.3.2 I expect Southern European issuers to appoint larger bookrunner syndicates given the smaller size of their domestic banking system and the limited ability of domestic banks to distribute large-scale offerings. Frequent issuers benefit from dedicated in-house financing groups as well as an established market reputation, reducing the need for larger syndicate sizes. My

finding that debut issuers use smaller bookrunner syndicates is consistent with Yasuda (2005), who finds that debut issuers are more likely to use a smaller pool of existing relationship banks to underwrite their debut issue.

My control variables are also broadly in line with expectations. Syndicate size is positively related to credit rating number as well as to the tranche size and multi-tranche dummy. It is also a negative function of the publicly owned dummy, suggesting that public ownership reduces the need for a large number of intermediaries.

Taking into account all issuer and tranche parameters that drive the bookrunner syndicate size[83] I find in the second stage regression of Model 1 that the predicted value of the bookrunner syndicate size positively impacts the at-issue credit spread. This confirms Hypothesis 1 that larger bookrunner syndicates tend to perform lower quality services. It is consistent with agency theory predictions on larger groups of financial intermediaries (Diamond, 1996). It also suggests that the growth in bookrunner syndicates in Europe over the 2000s has resulted in similar bookrunner agency conflicts as the repeal of the Glass Steagall Act in the US a decade earlier (Shivdasani and Song, 2006).

Second stage regression results for the control variables are largely consistent with my predictions. I find that profitability is negatively related to the at-issue credit spread while leverage and the credit rating number have positive coefficients. The credit spread is also a negative function of growth opportunities, likely reflecting that the market capitalisation inherent in this variable is a proxy to the brand value and

[83] With the exception of course of the at-issue credit spread.

investor familiarity with the issuer. The multi-tranche dummy is also negatively related, suggesting that firms who spread their issuance across various tranches tend to be better able to negotiate on price.

4.5.2 Allocation of bookrunner responsibilities

Models 2 and 3 in Table 4.4 test H2 and H3 on the number of active bookrunners and the inclusion of passive bookrunners. The determinants of the number of active bookrunners shown in the first panel results for Model 2 are largely similar to the determinants of the number of total bookrunners in Model 1. The main difference is that the debut dummy is not statistically significant, which suggests that although debut firms tend to have smaller overall bookrunner syndicates they appoint a comparable number of active bookrunners given the greater degree of support in placement activities they likely require.

I also find that my credit rating measure, tranche size and the multi-tranche dummy are positively related to the number of active bookrunners in the syndicate. In addition my results also show that firm size and leverage are positively related to the number of active bookrunners. It could be argued that larger firms tend to have more sizeable and complex internal operations, necessitating support from a larger number of active bookrunners. Offerings by higher levered firms present greater agency risks for debt investors and hence make for a more difficult placement process, again necessitating more active bookrunners.

Consistent with H2 I find in the second stage regression that the predicted number of active bookrunners is positively related to the at-issue credit spread. This

confirms the notion of agency costs inherent in larger numbers of banks performing the placement role. The control variables in Model 2 are qualitatively similar to Model 1.

The effects of passive bookrunners are studied in Model 3, a Heckman regression employing the passive bookrunner dummy. In the first stage regression results I find that Southern European firms are more likely to appoint passive bookrunners. This is consistent with my expectations and suggests that such issuers face the greatest pressure to compile a sizeable bookrunner syndicate because they engage with larger numbers of domestic relationship banks in the fragmented Southern European banking market. As a result they are more likely to create a role split in their bookrunner syndicate.

My results also show that larger tranches and multi-tranche offerings are more likely to have passive bookrunners in the syndicate. As bookrunner fees are proportionate to the overall issue size, these larger transactions offer firms an opportunity to compile a large bookrunner syndicate size while ensuring each involved bookrunner is sufficiently economically incentivised. While these tranches require a larger number of active bookrunners for placement reasons, as seen in Model 2, firms likely also appoint a number of passive bookrunners to enhance certification benefits and offer ancillary business to more of their relationship banks.

As discussed in Section 4.4.3.1 the parameters of the first-stage probit regression are used to create an inverse Mills ratio of the probability of appointing passive bookrunners. Consistent with H3 this variable is negatively related to the at-issue credit spread. This shows that firms can reduce the coordination and free-riding problems inherent in larger bookrunner groups by using passive bookrunners. These

banks perform a due diligence role independent of other bookrunners in the syndicate that allows the issuing firm to benefit from certification. They do not contribute to the distribution of the bond tranche where intragroup agency costs bring about a reduction in the quality of underwriting service (Shivdasani and Song, 2011).

Overall my results on the allocation of bookrunner responsibilities provide a strong and novel source of support for the agency theory perspective on groups of financial intermediaries (Diamond, 1996). Larger groups of bookrunners actively involved with the selling of a tranche offer a lower quality of service. Issuers who elect to relegate a number of these intermediaries to passive roles are able to reduce at least some of these agency costs by limiting the degree of co-ordination required and the scope for free-riding amongst the active bookrunners, while still accruing the benefits of the non-coordinated certification-related workstreams.

4.5.3 Bookrunner reputation

Table 4.5 contains the results of the regressions on bookrunner reputation. Model 1 shows the impact of the proportion of total bookrunners that are part of the sample Top 10 on the at-issue credit spread. In the first stage regression I find that Southern European firms appoint lower percentages of such higher reputation bookrunners, likely reflecting the relatively lower league table ranking of their domestic relationship banks.[84] Debut firms also tend to have a lower proportion of

[84] There is only one Southern European bank in my Top 10 any bookrunner role league table and in my Top 10 active bookrunner league table.

Top 10 bookrunners. This could be due to a preference for domestic banks regardless of league table position, which is consistent with Yasuda's (2005) finding that debut issuers are more likely to employ a small pool of existing relationship banks. It can also be explained by debut issues being smaller and less complex, hence placing less emphasis on the reputation benefits of Top 10 bookrunners.

I also find that larger and longer maturity tranches are more likely to involve the appointment of high reputation bookrunners. This is consistent with Fang's (2005) results and probably reflects the need to use reputable banks with a larger distribution network to raise larger amounts of funding at longer maturities. My results also show that the use of high reputation bookrunners is a positive function of firm profitability, suggesting that high reputation intermediaries are less likely to be associated with relatively poorer performing firms.

In line with H4 the predicted values of the percentage Top 10 is negative. This is consistent with the notion of notion of reputational benefits incentivising top tier bookrunners to perform higher quality services (Chemmanur and Fulghieri, 1994; Fang, 2005).

Amongst the control variables in Model 1 I obtain similar results to my earlier regressions with the main additional finding being a positive relation for the tranche size, which is in line with expectations.

Model 2 examines the proportion of active Top 10 bookrunners. In the first stage regression the results for this variable are in line with the proportion of Top 10 bookrunners. The major difference is that the publicly owned dummy in Model 2 is positive, probably reflecting strong relationships between government-owned firms

and their top tier domestic banks leading them to appoint more of these to active roles.

Consistent with H4 the proportion of active Top 10 bookrunners is negatively related to the at-issue credit spread, confirming reputational incentives hold independently for both the certification and the placement roles.

The final regressions on Table 4.5 employ the average ranking proxy. In Model 3 I find that the at-issue credit spread is a positive function of this variable. Hence bookrunner syndicates with higher average numeric league table positions tend to also be associated with lower quality of services. Model 4 performs the same regression for the average ranking of only the active bookrunners and comes to qualitatively similar results. Collectively these models complement and extend the earlier findings for lead investment bank reputation in the bond market by Andres et al. (2014) and Fang (2005) and in M&A advisory roles by Golubov et al. (2012).

4.5.4 Bookrunner geography

Table 4.6 contains the results of the bookrunner geography related variables, with Model 1 examining the proportion of non-domestic bookrunners in a tranche. In the first stage regression I find that foreign bookrunners are more likely to be appointed by Southern European firms and less likely to be mandated by both frequent and debut issuers. Southern European issuers tend to have local relationship banks with smaller distribution platforms, necessitating the support of non-domestic bookrunners. The observed relation of frequency likely reflects that some of the highest frequent issuers in the European corporate bond markets have partial

government stakes, such as Deutsche Telekom, Orange and EDF, and are hence likely to be subject to domestic political pressures around their bookrunner appointments, resulting in them relying more on domestic banks. This is somewhat surprising as these issuers arguably benefit from more support of non-domestic bookrunners in the placement of their sizeable bond funding programme. The observed relation for debut is likely due to inaugural issuers being more reliant on domestic relationship banks, whom they award bookrunner roles to (Yasuda, 2005).

My findings also show that more profitable and publicly owned firms tend to appoint less non-domestic banks, while the opposite relation holds for larger firms. These are all in line with my expectations as set out in Section 4.4.3.3. I also find that stronger rated firms use a smaller proportion of non-domestic bookrunners, suggesting lower risk issuers accrue less search benefits from these type of appointments. My results also show that multi-tranche offerings have a higher proportion of non-domestic bookrunners. This could reflect international heterogeneity in investor tenor preferences and hence the benefit of appointing a more internationally diversified syndicate to distribute multi-tranche offerings. For instance in practice French insurers tend to purchase a large share of longer tenor offerings while Swiss private banks are more prevalent in medium tenors. I further explore these cross-country differences in Chapter 5.

The proportion of non-domestic bookrunners is positive and weakly significant to the at-issue credit spread ($p=0.083$). This is in line with Butler (2008) and provides some support for the hypothesis that non-domestic banks offer lower quality bookrunner services. It is also consistent with the prediction that strong

banking relationships can provide valuable certification for issuing firms in debt markets (Datta et al. 1999; Drucker and Puri, 2005).

In Model 2 I find qualitatively similar results to Model 1 for the proportion of active non-domestic bookrunners. This suggests that relationship benefits tend to outweigh search benefits when considering domestic versus non-domestic appointments, given that only the subgroup of active bookrunners is involved in the placement of the bonds (Kessel, 1971).

Model 3 studies the proportion of active non-domestic bookrunners that are headquartered in the largest three economies and financial centres of Europe, being Germany, France and the United Kingdom. These bookrunners should offer the most tangible search benefits in the form of access to the continent's largest debt investors. The relation for this variable is positive and significant ($p = 0.031$), highlighting the relative strength of domestic bookrunners' relationship benefits.

The final models in the table consider the influence of bookrunner geographic proximity when measured against bookrunner reputation. Model 4 employs as explanatory variable the proportion of active non-domestic bookrunners that are part of the sample Top 10, and hence are expected to perform high quality services due to reputational incentives. I again find a positive and significant relation between this measure and at-issue credit spreads ($p=0.022$). This suggests that irrespective of whether a non-domestic bank is a high reputation bookrunner an issuer receives higher quality service from a domestic bookrunner. For instance a Spanish firm such as Telefónica can expect higher quality services from Santander and BBVA than from Deutsche Bank.

To further test the importance of these relationship benefits I add constraints to the reputation of the appointed domestic bookrunners. Model 5 analyses the subset of tranches amongst which the issuer has not selected a domestic active Top 10 bookrunner. This may have been the issuer's decision or simply the result of the issuer's jurisdiction, with countries such as Belgium, The Netherlands and Switzerland not being home to a Top 10 bookrunner. This subset encompasses 508 observations.

My results show that the proportion of active non-domestic bookrunners is still positive for this subsample albeit insignificant (p=0.118). This suggests that only issuers who do not employ a domestic Top 10 bank should be broadly indifferent between appointing a foreign top 10 bank or another domestic bank.

Amongst the control variables my results for the bookrunner geography regressions are qualitatively similar to those observed for bookrunner reputation. The at-issue credit spreads tend to be lower for larger, more profitable, lower levered and higher growth opportunities firms, as well as for offerings that are weaker rated, larger and consist of a single tranche.

The lack of competitiveness of high reputation banks when compared to smaller domestic rivals renders it surprising that these banks have amassed dominant league table positions. Combining my results of bookrunner reputation and geography I speculate that top tier bookrunners are particularly skilled at servicing their domestic client base, which is a proxy for the firms that they have the strongest business relationship. French companies are better served by BNP Paribas than Natixis and German companies should prefer Deutsche Bank to Commerzbank.

Amongst the 38 tranches that only appoint domestic bookrunners, which allow for a direct comparison based on reputation alone, I do indeed find that the at-issue credit spread is a negative function to the percentage of top 10 bookrunners. However the regression coefficient is not significant, likely reflecting the small subsample size.

4.6 Impact of financial crisis

In this Section I test H6 by examining the impact of the global financial crisis on the relation between bookrunner syndicate structure and quality of service. As I discuss in Section 2.5 there is a sharp spike in the at-issue credit spreads in Q3 2008. This clear demarcation point in the data supports a focus on two distinct pre- and post-crisis periods. I therefore conduct subsample tests for the period before and after the recent global financial crisis. The demarcation of 1 September 2008 as the start of the financial crisis is in line with prior literature (Godlewski, 2012).

Table 4.7 contains the summary statistics of the bookrunner characteristics, instrumental variables and tranche variables for the pre- and post-financial crisis subsamples. As expected I observe a significant increase in the size of bookrunner syndicates following the crisis. The mean (median) syndicate size increases from 3.24 (3.00) to 4.87 (4.00). The rise in syndicate size results from both an increase in the number of active bookrunners and increased use of passive bookrunners.

I find limited evidence of an increase in the proportion of active Top 10 bookrunners, but otherwise no evidence of issuers using more reputable bookrunners after Q3 2008. Focusing on geographical characteristics my results show no

significant increase in the propensity to use non-domestic bookrunners, either in an active or passive role.

The mean (median) at-issue credit spread increases from 0.71% (0.60%) pre-crisis to 1.95% (1.60%) for the post-crisis period. I find that firms issuing post-financial crisis were less frequent over the entire sample period, which likely reflects new issuers entering the market post-crisis as a way of switching out of bank financing (see Section 1.1.2). Debut issuers are less frequent in the latter time period, which is to be expected given the variable definition. My findings show a reduction of one grade in the mean and median credit rating from A- to BBB+ for tranches issued post-crisis, suggesting a reduction in the credit quality of firms during the financial crisis period. I also observe a decline in the average, but not the median, tranche size post-crisis and a reduction in the frequency of multi-tranche offerings. With the exception of increased credit spread, these summary statistics for tranche characteristics offer no evidence of increased tranche size or complexity that would necessitate the larger bookrunners syndicates.

I further examine the role of the financial crisis on the relation between bookrunner syndicates and at-issue credit spreads by estimating separate regressions for the pre- and post-crisis periods, repeating the tests shown in Tables 4.4, 4.5 and 4.6. Table 4.8 shows the results of these subsample regressions for bookrunner syndicate size and the allocation of responsibilities.[85] Panel A and B report results for the pre- and post-crisis period respectively. The observed positive relation for bookrunner syndicate size continues to hold for the post-crisis tests, as shown in Model

[85] I report only the coefficients for bookrunner characteristics in the second stage regressions of at-issue credit spread determinants. All first stage regressions and firm and tranche characteristics have been included in my analysis but are omitted for brevity.

1, which reflects that the post-crisis sample is characterized by larger bookrunner syndicate sizes that are more likely to be affected by free rider incentives (Diamond, 1996). The bookrunner syndicate size coefficient in the pre-crisis period is insignificant. This suggests that the smaller and more homogeneous syndicates of intermediaries from the pre-crisis period are less prone to agency costs, meaning that firms are better able to trade off the marginal search benefits against the agency costs of appointing an additional bookrunner.

The post-crisis results for allocation of bookrunner responsibilities, shown in Models 2 and 3, are also consistent with my main regressions. The number of active bookrunners is positively related to at-issue credit spreads (p=0.020) and the passive bookrunner Mills ratio has a weakly significant negative relation (p=0.093). No significant results however appear for the period leading up to Q3 2008. This finding is unsurprising since passive bookrunners are considerably less common in the period prior to the financial crisis given the more manageable bookrunner syndicate sizes.[86]

Table 4.9 shows the subsample regression results for bookrunner reputation. I find that the post-crisis results are weaker than for the earlier tests in Table 4.5. The proportion of Top 10 bookrunners is weakly and negatively related to issue spreads (p=0.072), as shown in Model 1. However, my measure of active bookrunner reputation in Model 2 is insignificant in the pre- and post-crisis period. This provides limited evidence in support of the reputation hypothesis of Fang (2005) and generally supports my finding for the full sample that bookrunner reputation is of secondary importance in the pricing of bond tranches.

[86] I report the coefficient on the passive bookrunner Mills ratio for the pre-crisis period in Table 9 for completeness, but note that meaningful interpretation of the variable is limited given the small number of my sample bond tranches used a passive bookrunner prior to the financial crisis.

Finally the pre- and post-crisis results for bookrunner geography are displayed in Table 4.10. The results are qualitatively in line with my earlier findings in Table 4.6. The coefficients on the post-crisis results are all in line with my main model, while I find no significant relation for the period before Q3 2008. The fact that these results are significant only for the post-crisis period suggests that the growth in bookrunner syndicate sizes and resulting higher costs of communication and information dissemination for the issuer increases the value of hiring a greater proportion of domestic banks with lower information frictions. Alternative explanations based on post-financial crisis changes in the frequency of using non-domestic bookrunners appear unconvincing. Table 4.7 highlights that the overall proportion of these types of bookrunners, active or otherwise, has not changed significantly from pre- to post-crisis.

Collectively I find that post-financial crisis tranches drive my earlier findings on the relation between bookrunner syndicate structure and quality of service for my sample of investment grade bond tranches issued by large European firms. This provides support for Hypothesis 6. My findings reflect the post-crisis structural trends in bookrunner syndicates highlighted in Table 4.7, most notably larger bookrunner syndicate sizes and increased use of passive bookrunner roles. Prior to the financial crisis bookrunner syndicate structure is unrelated to the pricing of my sample of low risk bond tranches. However these structural trends continue to impact the corporate bond markets and are hence relevant for bond issuers.

Moreover my results suggest that the relative importance of the certification and placement role of financial intermediaries in the bond market varies with financial market conditions. The heterogeneity of the at-issue spread primarily began in the

years following the financial crisis, indicating more volatile markets and strengthened the importance of bookrunner certification to investors.

4.7 Conclusion

In this chapter I test the impact of a range of bookrunner syndicate related parameters on the quality of bookrunner services through two-stage regression models on the at-issue credit spread. My sample in this chapter is made up of 1,193 euro-denominated investment grade public bond tranches issued by 324 Western European firms from 2001 to 2012.

This research extends prior evidence studying the influence of lead bookrunner reputation (Andres et al., 2014; Fang, 2005) and geography (Butler, 2008). I jointly analyse highly homogeneous issuers and heterogeneous bookrunner syndicate structures. My sample of investment grade rated tranches includes only large and well-established borrowers; firms who should in theory enjoy very limited benefits from the certification and placement services offered by their bookrunners. In addition the European euro-denominated bond market is characterised by a high degree of geographic dispersion amongst bookrunners as well as recent structural trends that have resulted in rapid changes in bookrunner syndicate sizes and roles.

I find that a broad range of bookrunner syndicate parameters are of importance to the pricing of corporate bond tranches. My findings show that the highest quality bookrunner services are offered by domestic banks, in line with Butler's (2008) study on the US municipal bond market. Non-domestic bookrunners should offer greater search benefits, but this is outweighed in my sample by the

improved servicing provided by domestic bookrunners. The result continues to hold when comparing domestic banks to foreign banks that are domiciled in the largest capital markets in Europe, namely France, Germany and the UK, and hence should offer sizeable search benefits (Kessel 1971), as well as those that have a Top 10 league table ranking and should therefore be more experienced (Chemmanur and Fulghieri, 1994). Assuming that geographic proximity reflects strength of relationship these results suggest that there is a pertinent distinction between insider and outsider bookrunners with the first group better able to perform their certification and placement responsibilities.

My findings show that reputation is of lesser importance. Top 10 bookrunners are only able to offer higher quality services when introduced as a domestic bookrunner. I conjecture that in a culturally diverse market such as the European Union higher reputation banks have risen to the top of the league table through winning a large share of domestic capital markets business. Given the larger number of capital markets issuers in UK, Germany and France this would reflect the high proportion of banks from these jurisdictions in my sample Top 10.

Syndicate structure becomes especially important amongst the larger post-financial crisis bookrunner syndicates, being associated with greater coordination and free rider costs (Diamond, 1996). Issuers are able to reduce such agency costs by relegating some of their bookrunners to a passive status, where they only perform the certification role, while a subset of trusted banks are maintained in an active capacity, responsible for both placement and certification workstreams. This allocation of responsibilities is a fairly recent innovation in the capital markets and is to my knowledge not yet studied in prior literature. It limits the degree of co-

ordination required for the placement related workstream without impacting the benefits received through the non-coordinated certification-related workstreams.

Table 4.1: Calculations and sources for bookrunner characteristics and other model variables

The table presents variable definitions for bookrunner, bond, and firm characteristics for a sample of 1,193 euro-denominated public bond tranches issued by 304 Western European firms during 2001-2012.

Variable	Calculation	Source
Panel A: Bookrunner (BR) characteristics		
Bookrunner quantity		
Total BR	A count of the total number of bookrunners on a tranche.	Dealogic, Bond prospectus
Bookrunner active-passive split		
Number of Active BRs	A count of the total number of active bookrunners on a tranche.	Dealogic, Bond prospectus, Financial press
Passive BR	An indicator variable taking the value of one if a tranche includes a passive bookrunner, and zero otherwise.	Dealogic, Bond prospectus, Financial press
Bookrunner reputation		
% of Top 10 BRs	The percentage of bookrunners on a tranche that are a Top 10 bank by deal value during the sample period.	Dealogic, Bond prospectus
% of Active Top 10 BRs	The percentage of active bookrunners on a tranche that are a Top 10 bank by deal value during the sample period.	Dealogic, Bond prospectus, Financial press
Bookrunner geography		
% of Non-domestic BRs	The percentage of bookrunners headquartered in a different country to the issuer.	Dealogic, Bond prospectus
% of Active Non-domestic BRs	The percentage of active bookrunners headquartered in a different country to the issuer.	Dealogic, Bond prospectus, Financial press
% of Active Non-domestic Top 10 BRs	The percentage of active bookrunners headquartered in a different country to the issuer and who are ranked as a Top 10 bank by deal value during the sample period.	Dealogic, Bond prospectus, Financial press

Panel B: Tranche and firm characteristics		
Dependent variable		
At-issue credit spread	At-issue yield to maturity minus the benchmark euro midswap rate for the equivalent tenor.	Dealogic, Bond prospectus
Instrumental variables		
Southern Europe	An indicator variable set equal to one if the issuer is domiciled in Greece, Italy, Portugal or Spain, and zero otherwise.	Company reports
Frequency	Total number of tranches issued by the borrowing firm during the sample period.	Dealogic
Debut	An indicator variable set equal to one if the bond represents the firm's first syndicated public bond in the euro-denominated market, and zero otherwise.	Dealogic
Control variables		
Firm size	The natural logarithm of the issuer's book value of total assets in EUR billions.	Worldscope
Profitability	Earnings before interest, taxes, depreciation and amortization (EBITDA) divided by book value of total assets.	Worldscope
Intangible assets	One minus the ratio of net property, plant, and equipment divided by the book value of total assets.	Worldscope
Leverage	Book value of total debt divided by total assets.	Worldscope
Growth opportunities	Book value of total assets plus market value of equity minus book value of equity, divided by the book value of total assets.	Worldscope
Publicly owned	An indicator variable equal to one if 50% or more of the firm's shares are owned by the national government, and zero otherwise.	Company reports
Credit rating	The numeric value for the S&P rating assigned to the bond tranche on the issue date, ascending from 1 for AAA to 10 for BBB- and 11 for unrated tranches.	S&P
Maturity	The natural logarithm of the tenor of the tranche in years.	Dealogic
Tranche size	The natural logarithm of the amount issued in EUR billions.	Dealogic
Multi-tranche	An indicator variable equal to one if the issuer sells 2 or more tranches in the same currency on the same day, and zero otherwise.	Dealogic

Table 4.2: Summary statistics of bookrunner, tranche and firm characteristics

Summary statistics of a sample of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. All variables are defined in Table 4.1.

Panel A : Bookrunner characteristics

	All Bookrunners					Active Bookrunners					Passive Bookrunners				
	#	Dummy	Mean (#)	Mean (%)	Median	#	dummy	Mean (#)	Mean (%)	Median	#	dummy	Mean (#)	Mean (%)	Median
Total	1193	1193	4.11	100.0%	4.00	1193	1193	3.70	100.0%	4.00	1193	103	0.40	100.0%	0.00
Top 10	1193	1147	2.50	62.3%	2.00	1193	1130	2.20	63.3%	2.00	1193	89	0.18	43.6%	0.00
Average ranking	1193		11.30		10.67	1193		10.99		10.20	103		16.70		15.40
Non-domestic	1193	1157	2.74	65.9%	2.00	1193	1155	2.45	65.8%	2.00	103	99	0.29	73.1%	0.00
Non-domestic GFU	1193	927	1.35	32.9%	1.00	1193	916	1.25	33.1%	1.00	1193	61	0.10	25.4%	0.00
Non-domestic Top 10	1193	1053	1.77	43.4%	2.00	1193	1051	1.63	44.0%	2.00	103	81	0.15	37.3%	0.00

Panel B : Tranche and firm characteristics

	All Tranches			
	#	Dummy	Mean (#)	Median
At-issue credit spread	1193		1.37	0.96
Southern Europe	1193	202		
Frequency	1193		8.73	7.00
Debut	1193	289		
Firm size	1066		57.31	35.86
Profitability	1066		0.15	0.11
Intangible assets	1066		0.65	0.68
Leverage	1066		0.34	0.35
Growth opportunities	1017		1.34	1.20
Publicly owned	1193	164		
Credit rating	1193		7.26	7.00
Maturity	1193		7.33	7.00
Tranche size	1193		0.82	0.75
Multi-tranche	1193	353		

Table 4.3: Top 25 Bookrunners in sample

The table ranks investment banks according to their activity as bookrunners for my sample of 1,193 euro-denominated public bond tranches issued by 324 Western European firms during 2001-2012. League table credits are assigned through splitting the tranche size equally amongst all the involved bookrunners for the any bookrunner role league table and amongst only the active bookrunners for the active bookrunner league table. In case of mergers and acquisitions amongst bookrunners league table credits are not transferred from the target bank to the acquirer bank. Banks marked with * are pre-acquisition/merger entities, i.e. the league table credits of ABN AMRO before the takeover of its investment banking activities by RBS.

	Any Bookrunner role					**Active Bookrunner roles**				
		Apportioned issuance					**Apportioned issuance**			
Ranking	**Bookrunner**	**EURbn**	**%**	**cum. %**	**Number of tranches**	**Bookrunner**	**EURbn**	**%**	**cum. %**	**Number of tranches**
1	Deutsche Bank	91.5	9.2%	9.2%	387	Deutsche Bank	99.3	10.0%	10.0%	376
2	BNP Paribas	89.9	9.0%	18.2%	427	BNP Paribas	92.2	9.2%	19.2%	407
3	SocGen	74.7	7.5%	25.7%	361	SocGen	71.4	7.2%	26.3%	341
4	HSBC	70.8	7.1%	32.7%	312	Barclays	64.3	6.4%	32.8%	269
5	Barclays	64.2	6.4%	39.2%	287	HSBC	63.6	6.4%	39.2%	291
6	JPMorgan	60.6	6.1%	45.3%	259	JPMorgan	63.2	6.3%	45.5%	238
7	Citi	60.1	6.0%	51.3%	274	Citi	56.5	5.7%	51.1%	239
8	RBS	57.8	5.8%	57.1%	288	RBS	55.5	5.6%	56.7%	264
9	Credit Agricole CIB	52.8	5.3%	62.4%	262	Credit Agricole CIB	49.5	5.0%	61.7%	243
10	UniCredit	34.7	3.5%	65.8%	166	UniCredit	29.4	2.9%	64.6%	143
11	Commerzbank	27.0	2.7%	68.5%	115	ABN AMRO*	26.6	2.7%	67.3%	94
12	ABN AMRO*	25.8	2.6%	71.1%	96	Commerzbank	25.1	2.5%	69.8%	110
13	ING	24.1	2.4%	73.5%	134	Credit Suisse	23.9	2.4%	72.2%	95
14	Natixis	24.1	2.4%	76.0%	139	Morgan Stanley	22.5	2.3%	74.4%	84
15	Credit Suisse	23.2	2.3%	78.3%	105	Santander	21.2	2.1%	76.6%	106
16	Santander	23.0	2.3%	80.6%	136	Natixis	20.7	2.1%	78.6%	128
17	Morgan Stanley	20.1	2.0%	82.6%	94	ING	20.0	2.0%	80.6%	117
18	BBVA	18.7	1.9%	84.5%	96	UBS	14.8	1.5%	82.1%	73
19	UBS	16.6	1.7%	86.1%	92	Dresdner Kleinwort	14.6	1.5%	83.6%	57
20	Goldman Sachs	16.1	1.6%	87.7%	74	Goldman Sachs	14.2	1.4%	85.0%	62
21	BoAML	15.5	1.6%	89.3%	92	BBVA	14.1	1.4%	86.4%	81
22	Dresdner Kleinwort	14.6	1.5%	90.8%	57	BoAML	13.8	1.4%	87.8%	73
23	Intesa Sanpaolo	12.5	1.3%	92.0%	78	Merrill Lynch*	12.2	1.2%	89.0%	41
24	Merrill Lynch*	10.8	1.1%	93.1%	41	Intesa Sanpaolo	10.5	1.0%	90.1%	65
25	Mitsubishi	10.6	1.1%	94.2%	63	Lehman Brothers	9.4	0.9%	91.0%	37

Table 4.4: Two-stage regression analysis on impact of bookrunner syndicate size and allocation of bookrunner responsibilities on quality of bookrunner services

Estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 324 Western European firms during 2001-2012. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 2SLS Total BR		Model 2 2SLS Total Active BR		Model 3 Heckman Passive BR dummy	
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Constant	-12.835***	0.535	-7.735***	-0.185	-10.611***	1.357
	(0.000)	(0.767)	(0.000)	(0.909)	(0.006)	(0.554)
Fitted BR char		0.180**		0.206**		
		(0.018)		(0.022)		
Inverse mills ratio						-0.326**
						(0.046)
Instrumental variables						
Southern Europe	0.950***		0.783***		0.484**	
	(0.000)		(0.000)		(0.011)	
Frequency	-0.046***		-0.045***		-0.018	
	(0.000)		(0.000)		(0.320)	
Debut	-0.337*		-0.127		-0.291	
	(0.053)		(0.270)		(0.212)	
Control variables						
Firm size	0.059	-0.038	0.188***	-0.058*	-0.091	-0.020
	(0.614)	(0.324)	(0.001)	(0.090)	(0.431)	(0.633)
Profitability	0.014	-0.072***	0.007	-0.071***	-0.033	-0.059***
	(0.104)	(0.000)	(0.257)	(0.000)	(0.270)	(0.000)
Intangible assets	-0.364	0.098	-0.131	0.056	-0.131	0.064
	(0.206)	(0.517)	(0.589)	(0.706)	(0.769)	(0.678)
Leverage	-0.556	0.733***	1.010***	0.454**	-0.899	0.856***
	(0.393)	(0.002)	(0.003)	(0.041)	(0.152)	(0.001)
Growth opportunities	0.028	-0.260***	-0.010	-0.254***	0.121	-0.289***
	(0.877)	(0.002)	(0.912)	(0.002)	(0.477)	(0.001)
Publicly owned	-0.544*	-0.007	-0.106	-0.086	-0.076	-0.102
	(0.071)	(0.967)	(0.603)	(0.545)	(0.801)	(0.469)
Credit rating	0.092**	0.174***	0.115***	0.166***	0.064	0.171***
	(0.026)	(0.000)	(0.000)	(0.000)	(0.172)	(0.000)
Maturity	-0.026	-0.021	0.109	-0.048	-0.035	-0.014
	(0.837)	(0.729)	(0.117)	(0.418)	(0.792)	(0.813)
Tranche size	0.816***	0.011	0.473***	0.059	0.454**	0.036
	(0.000)	(0.915)	(0.000)	(0.498)	(0.018)	(0.727)
Multi-tranche	1.057***	-0.306***	0.462***	-0.212***	0.608***	-0.281**
	(0.000)	(0.007)	(0.000)	(0.009)	(0.001)	(0.017)
Yr & Ind controls	yes		yes		yes	
Nobs	1017		1017		1017	
R2 / Pseudo R^2	0.386	0.474	0.404	0.498	0.261	0.496
Wald chi2		783.78***		841.90***	104.14***	
		(0.000)		(0.000)	(0.000)	
F-statistic	16.66***		23.18***			32.17***
	(0.000)		(0.000)			(0.000)

Table 4.5: Two-stage regression analysis on impact of bookrunner reputation on quality of bookrunner services

Estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 2SLS % BR in top 10		Model 2 2SLS % Active BR in top 10		Model 3 2SLS Average ranking BR		Model 4 2SLS Average ranking Active BR	
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Constant	-0.524	-2.887*	-0.781	-3.629*	-21.404**	-3.509**	31.461***	-4.549**
	(0.276)	(0.083)	(0.108)	(0.053)	(0.033)	(0.032)	(0.001)	(0.016)
Fitted BR char		-2.108**		-2.346**		0.083**		0.089**
		(0.025)		(0.048)		(0.018)		(0.030)
Instrumental Variables								
Southern Europe	-0.100***		-0.082***		2.868***		2.481***	
	(0.000)		(0.004)		(0.000)		(0.000)	
Frequency	-0.0003		0.0002		-0.023		-0.0386	
	(0.885)		(0.917)		(0.622)		(0.406)	
Debut	-0.049*		-0.047*		0.664		0.711	
	(0.072)		(0.089)		(0.252)		(0.219)	
Control variables								
Firm size	-0.019	-0.076*	-0.020	-0.079*	0.058	-0.035	0.267	-0.048
	(0.178)	(0.065)	(0.168)	(0.070)	(0.854)	(0.407)	(0.394)	(0.250)
Profitability	0.009***	-0.053***	0.009***	-0.052***	-0.113**	-0.062***	-0.101**	-0.062***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.018)	(0.000)	(0.039)	(0.000)
Intangible assets	-0.004	0.028	0.008	0.050	0.589	-0.010	0.176	0.020
	(0.945)	(0.883)	(0.893)	(0.801)	(0.580)	(0.953)	(0.875)	(0.914)
Leverage	-0.082	0.421	-0.093	0.399	2.915*	0.347	3.561**	0.297
	(0.261)	(0.109)	(0.217)	(0.155)	(0.072)	(0.180)	(0.027)	(0.282)
Growth opportunities	0.017	-0.207**	0.020	-0.198**	-0.986**	-0.160*	-0.941**	-0.161*
	(0.490)	(0.017)	(0.415)	(0.032)	(0.033)	(0.072)	(0.039)	(0.078)
Publicly owned	0.060	0.006	0.070*	0.040	0.308	-0.131	-0.442	-0.069
	(0.151)	(0.972)	(0.092)	(0.839)	(0.748)	(0.385)	(0.599)	(0.667)
Credit rating	0.006	0.200***	0.006	0.201***	0.011	0.187***	0.002	0.188***
	(0.302)	(0.000)	(0.304)	(0.000)	(0.929)	(0.000)	(0.988)	(0.000)
Maturity	0.032*	0.054	0.032*	0.059	-0.621*	0.033	-0.580*	0.032
	(0.051)	(0.448)	(0.064)	(0.436)	(0.072)	(0.615)	(0.094)	(0.632)
Tranche size	0.058**	0.277***	0.071***	0.321***	-0.537	0.197***	-1.071**	0.248***
	(0.015)	(0.002)	(0.003)	(0.003)	(0.284)	(0.010)	(0.027)	(0.003)
Multi-tranche	0.012	-0.091	0.010	-0.093	-0.022	-0.115	-0.087	-0.110
	(0.575)	(0.310)	(0.674)	(0.342)	(0.961)	(0.172)	(0.850)	(0.215)
Yr & Ind controls	yes		yes		yes		yes	
NObs	1017		1017		1017		1017	
R2 / Pseudo R^2	0.109	0.312	0.096	0.236	0.131	0.350	0.116	0.313
Wald chi2		539.30***		491.27***		561.44***		538.98***
		(0.000)		(0.000)		(0.000)		(0.000)
F-statistic	6.34***		4.62***		5.39***		4.35***	
	(0.000)		(0.000)		(0.000)		(0.000)	

Table 4.6: Two-stage regression analysis on relative impact of bookrunner geography on quality of bookrunner services

Estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 2SLS % non-domestic BR		Model 2 2SLS % Active Non-domestic BR		Model 3 2SLS % Active Non-domestic GFU BR	
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Constant	0.745*	-3.033*	0.783*	-1.784	-0.001	-1.578
	(0.080)	(0.059)	(0.078)	(0.242)	(0.999)	(0.320)
Fitted BR char		1.560*		1.644**		1.401**
		(0.083)		(0.039)		(0.031)
Instrumental variables						
Southern Europe	0.066***		0.088***		0.116***	
	(0.004)		(0.000)		(0.000)	
Frequency	-0.005**		-0.005**		-0.006***	
	(0.022)		(0.022)		(0.004)	
Debut	-0.062**		-0.055**		-0.047**	
	(0.017)		(0.038)		(0.049)	
Control variables						
Firm size	0.023*	-0.078**	0.024*	-0.0767**	0.035***	-0.055
	(0.071)	(0.044)	(0.061)	(0.041)	(0.009)	(0.157)
Profitability	-0.009***	-0.055***	-0.009***	-0.065***	-0.003**	-0.059***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.012)	(0.000)
Intangible assets	-0.049	0.105	-0.029	0.01858	0.01	0.0697
	(0.401)	(0.560)	(0.636)	(0.906)	(0.853)	(0.683)
Leverage	0.057	0.545**	0.075	0.550**	0.061	0.625**
	(0.445)	(0.036)	(0.326)	(0.025)	(0.373)	(0.015)
Growth opportunities	0.001	-0.263***	0.003	-0.271***	0.011	-0.240**
	(0.967)	(0.005)	(0.913)	(0.004)	(0.623)	(0.018)
Publicly owned	-0.139***	0.096	-0.148***	-0.119	0.010	-0.101
	(0.001)	(0.648)	(0.001)	(0.410)	(0.795)	(0.504)
Credit rating	-0.017***	0.216***	-0.020***	0.192***	-0.001	0.201***
	(0.006)	(0.000)	(0.002)	(0.000)	(0.858)	(0.000)
Maturity	-0.019	0.006	-0.024	-0.007	-0.013	-0.026
	(0.231)	(0.928)	(0.138)	(0.919)	(0.370)	(0.703)
Tranche size	0.001	0.163**	-0.001	0.138*	0.014	0.103
	(0.945)	(0.029)	(0.981)	(0.077)	(0.537)	(0.224)
Multi-tranche	0.047**	-0.187**	0.050**	-0.125	0.006	-0.195**
	(0.018)	(0.041)	(0.016)	(0.114)	(0.779)	(0.027)
Yr & Ind controls	yes		yes		yes	
Nobs	1017		1017		1017	
R2 / Pseudo R^2	0.127	0.407	0.138	0.401	0.119	0.418
Wald chi2		620.94***		613.58***		650.44***
		(0.000)		(0.000)		(0.000)
F-statistic	20.93***		24.49***		4.49***	
	(0.000)		(0.000)		(0.000)	

Table 4.6: Two-stage regression analysis on relative impact of bookrunner geography on quality of bookrunner services (continued)

Variable	Model 4 2SLS % Active Non-domestic Top 10 BR		Model 5 2SLS No Active domestic Top 10 BR, % Active Non-domestic Top 10 BR	
	Selection	**Outcome**	**Selection**	**Outcome**
Constant	-0.125	2.472	-0.896	-1.766
	(0.786)	(0.484)	(0.229)	(0.278)
Fitted BR char		1.676**		2.852
		(0.022)		(0.118)
Instrumental Variables				
Southern Europe	0.110***		0.088**	
	(0.000)		(0.034)	
Frequency	-0.002		0.001	
	(0.262)		(0.746)	
Debut	-0.062**		-0.041	
	(0.024)		(0.407)	
Control var				
Firm size	0.004	-0.027	-0.003	-0.085**
	(0.777)	(0.711)	(0.914)	(0.029)
Profitability	-0.005***	-0.549	-0.113	-0.065***
	(0.000)	(0.612)	(0.730)	(0.000)
Intangible assets	-0.018	0.231	0.031	0.045
	(0.751)	(0.581)	(0.792)	(0.787)
Leverage	-0.035	0.530	0.022	0.694***
	(0.642)	(0.318)	(0.867)	(0.006)
Growth opportunities	-0.007	-0.135	-0.004	-0.257***
	(0.773)	(0.578)	(0.949)	(0.003)
Publicly owned	-0.002	-0.466	0.175**	-0.175
	(0.966)	(0.154)	(0.048)	(0.263)
Credit rating	-0.007	0.179***	0.001	0.167***
	(0.288)	(0.000)	(0.926)	(0.000)
Maturity	0.002	-0.007	-0.005	-0.021
	(0.886)	(0.951)	(0.850)	(0.771)
Tranche size	0.035	-0.172	0.080**	0.179**
	(0.135)	(0.414)	(0.027)	(0.024)
Multi-tranche	0.048**	-0.056	0.017	-0.204**
	(0.039)	(0.703)	(0.620)	(0.015)
Yr & Ind controls	yes		yes	
Nobs	1017		508	
R2 / Pseudo R^2	0.107	0.385	0.139	0.012
Wald chi2		582.16***		199.26***
		(0.000)		(0.000)
F-statistic	6.94***		2.57***	
	(0.000)		(0.000)	

Table 4.7: Univariate comparison of pre and post financial crisis subsamples

Comparison of the summary statistics of the pre- and post-financial crisis subsamples of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. Pre-financial crisis includes all tranches priced before September 2008 while post-financial crisis includes all tranches priced after this date. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Pre-financial crisis			Post-financial crisis				
	#	Mean	Median	#	Mean	Median	ANOVA	kruskal-wallis
Bookrunner characteristics								
Total BR	556	3.24	3.00	637	4.87	4.00	0.000	0.000
Total Active BR	556	3.18	3.00	637	4.16	4.00	0.000	0.000
Passive BR dummy	556	0.02	0.00	637	0.15	0.00	0.000	0.000
% of BR in top 10	556	61.79	66.67	637	62.71	60.00	0.537	0.693
% of active BR in top 10	556	61.99	66.67	637	64.51	66.67	0.099	0.157
Average ranking	556	11.15	10.25	637	11.43	10.80	0.406	0.225
Average ranking active BR	556	11.06	10.25	637	10.93	10.00	0.683	0.833
% non-domestic BR	556	67.10	66.67	637	64.83	66.67	0.115	0.257
% Active non-domestic BR	556	67.17	66.67	637	64.63	66.67	0.085	0.143
% Active non-domestic GFU BR	556	29.51	33.33	637	36.15	33.33	0.000	0.000
% Active non-domestic Top 10 BR	556	42.94	40.00	637	44.94	50.00	0.180	0.202
No active domestic Top 10 BR, % Active non-domestic top 10	301	62.72	66.67	309	70.09	66.67	0.003	0.015
Instrumental variables								
Southern Europe	556	0.158	0.000	637	0.179	0.000	0.342	0.537
Frequency	556	9.27	7.00	637	8.26	7.00	0.012	0.158
Debut	556	0.33	0.00	637	0.17	0.00	0.000	0.000
Tranche characteristics								
Credit spread	556	0.71	0.60	637	1.95	1.60	0.000	0.000
Credit rating	556	6.82	7.00	637	7.65	8.00	0.000	0.000
Maturity	556	7.75	7.00	637	6.97	7.00	0.001	0.075
Tranche size	556	0.85	0.75	637	0.78	0.75	0.009	0.272
Multi-tranche	556	0.34	0.00	637	0.25	0.00	0.001	0.008

Table 4.8: Pre- and Post-Financial crisis impact of bookrunner syndicate size and allocation of bookrunner responsibilities on quality of bookrunner services

Selected estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. Pre-financial crisis includes all tranches priced before September 2008 while post-financial crisis includes all tranches priced after this date. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 2SLS Total BR		Model 2 2SLS Total Active BR		Model 3 Heckman Passive BR dummy	
Panel A. Pre-financial crisis						
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Fitted BR char		-0.004		0.010		
		(0.972)		(0.933)		
Inverse mills ratio						0.008
						(0.914)
Instrumental variables						
Southern Europe	0.695***		0.567***		0.870**	
	(0.001)		(0.005)		(0.026)	
Frequency	-0.027**		-0.024**		-0.079**	
	(0.011)		(0.020)		(0.013)	
Debut	-0.0748		-0.108		-0.225	
	(0.593)		(0.360)		(0.499)	
Nobs	474		474		474	
R2 / Pseudo R^2	0.3206	0.554	0.358	0.556	0.211	0.555
Wald chi2		343.27***		344.93***	74.67***	
		(0.000)		(0.000)	(0.000)	
F-statistic	7.09***		7.38***			14.94***
	(0.000)		(0.000)			(0.000)
Panel B. Post-financial crisis						
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Fitted BR char		0.232**		0.264**		-0.530*
		(0.017)		(0.020)		(0.093)
Instrumental variables						
Southern Europe	1.104***		0.829***		0.489**	
	(0.001)		(0.000)		(0.034)	
Frequency	-0.068***		-0.078***		0.005	
	(0.003)		(0.000)		(0.813)	
Debut	-0.641*		-0.197		-0.334	
	(0.054)		(0.319)		(0.257)	
NObs	543		543		543	
R2 / Pseudo R^2	0.350	0.370	0.337	0.412	0.206	0.415
Wald chi2		329.33***		362.79***	69.80***	
		(0.000)		(0.000)	(0.000)	
F-statistic	11.74***		10.17***			17.71***
	(0.000)		(0.000)			(0.000)

Table 4.9: Pre- and Post-Financial crisis impact of bookrunner reputation on quality of bookrunner services

Selected estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. Pre-financial crisis includes all tranches priced before September 2008 while post-financial crisis includes all tranches priced after this date. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1		Model 2	
	2SLS % of BR in top 10		2SLS % of active BR in top 10	
Panel A. Pre-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		0.353		0.404
		(0.381)		(0.362)
Instrumental variables				
Southern Europe	-0.150***		-0.237***	
	(0.001)		(0.002)	
Frequency	-0.003		-0.002	
	(0.414)		(0.464)	
Debut	-0.078*		-0.076*	
	(0.065)		(0.072)	
NObs	474		474	
R2 / Pseudo R^2	0.154	0.527	0.1495	0.521
Wald chi2		313.23***		309.66***
		(0.000)		(0.000)
F-statistic	3.43***		3.32***	
	(0.000)		(0.000)	
Panel B. Post-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		-4.246*		-3.404
		(0.072)		(0.170)
Instrumental variables				
Southern Europe	-0.051**		-0.003	
	(0.042)		(0.316)	
Frequency	0.005*		0.006*	
	(0.073)		(0.055)	
Debut	-0.004		-0.007	
	(0.896)		(0.843)	
NObs	543		543	
R2 / Pseudo R^2	0.164	0.000	0.1337	0.055
Wald chi2		188.88***		203.54***
		(0.000)		(0.000)
F-statistic	25.85***		13.79***	
	(0.000)		(0.000)	

Table 4.9: Pre- and Post-Financial crisis impact of bookrunner reputation on quality of bookrunner services (continued)

Variable	Model 3 2SLS Average ranking		Model 4 2SLS Average ranking active BR	
Panel A. Pre-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		-0.006		-0.007
		(0.652)		(0.638)
Instrumental variables				
Southern Europe	4.319***		3.907***	
	(0.000)		(0.000)	
Frequency	0.061		0.053	
	(0.325)		(0.395)	
Debut	1.015		0.951	
	(0.193)		(0.222)	
NObs	474		474	
R2 / Pseudo R^2	0.208	0.550	0.1967	0.551
Wald chi2		335.90***		337.43***
		(0.000)		(0.000)
F-statistic	4.70***		4.47***	
	(0.000)		(0.000)	
Panel B. Post-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		0.116		0.088
		(0.103)		(0.204)
Instrumental variables				
Southern Europe	1.200*		0.803	
	(0.052)		(0.263)	
Frequency	-0.177***		-0.201***	
	(0.006)		(0.002)	
Debut	-0.065		0.139	
	(0.937)		(0.863)	
NObs	543		543	
R2 / Pseudo R^2	0.167	0.192	0.158	0.360
Wald chi2		222.66***		249.77***
		(0.000)		(0.000)
F-statistic	9.57***		8.02***	
	(0.000)		(0.000)	

Table 4.10: Pre- and Post-Financial crisis impact of bookrunner geography on quality of bookrunner services

Selected estimates from two-stage regression analysis predicting the at-issue credit spread of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. Pre-financial crisis includes all tranches priced before September 2008 while post-financial crisis includes all tranches priced after this date. All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 2SLS % non-domestic BR		Model 2 2SLS % Active non-domestic BR		Model 3 2SLS % Active non-domestic GFU BR	
Panel A. Pre-financial crisis						
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Fitted BR char		1.175		1.004		0.082
		(0.228)		(0.251)		(0.924)
Instrumental variables						
Southern Europe	0.0503		0.059		0.072*	
	(0.197)		(0.133)		(0.052)	
Frequency	-0.002		-0.001		-0.005*	
	(0.579)		(0.641)		(0.097)	
Debut	-0.049		-0.045		-0.021	
	(0.199)		(0.235)		(0.554)	
NObs	474		474		474	
R^2 / Pseudo R^2	0.1005	0.2928	0.1021		0.1375	0.554
Wald chi2		222.75***		241.19***		342.45***
		(0.000)		(0.000)		(0.000)
F-statistic	1.88***		1.93***		2.81***	
	(0.008)		(0.006)		(0.000)	
Panel B. Post-financial crisis						
	Selection	**Outcome**	**Selection**	**Outcome**	**Selection**	**Outcome**
Fitted BR char		1.893*		2.020**		1.830***
		(0.069)		(0.023)		(0.007)
Instrumental variables						
Southern Europe	0.077***		0.112***		0.178***	
	(0.004)		(0.000)		(0.000)	
Frequency	-0.007***		-0.008***		-0.007**	
	(0.008)		(0.007)		(0.027)	
Debut	-0.093***		-0.081**		-0.069**	
	(0.010)		(0.029)		(0.033)	
NObs	543		543		543	
R^2 / Pseudo R^2	0.218	0.331	0.24	0.328	0.166	0.333
Wald chi2		316.19***		328.90***		323.13***
		(0.000)		(0.000)		(0.000)
F-statistic	61.24***		61.66***		6.07***	
	(0.000)		(0.000)		(0.000)	

Table 4.10: Pre- and Post-Financial crisis impact of bookrunner geography on quality of bookrunner services (continued)

Variable	Model 4 2SLS % Active non-domestic top 10 BR		Model 5 2SLS No Active domestic Top 10 BR, % Active Non-domestic top 10 BR	
Panel A. Pre-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		0.942		1.050
		(0.144)		(0.203)
Instrumental variables				
Southern Europe	0.067		0.081	
	(0.138)		(0.189)	
Frequency	-0.001		-0.003	
	(0.638)		(0.615)	
Debut	-0.069		-0.068	
	(0.101)		(0.314)	
NObs	474		250	
R^2 / Pseudo R^2	0.1236		0.2329	
Wald chi2		227.35***		83.60***
		(0.000)		(0.000)
F-statistic	1.98***		4.42***	
	(0.004)		(0.000)	
Panel B. Post-financial crisis				
	Selection	**Outcome**	**Selection**	**Outcome**
Fitted BR char		2.417***		7.020
		(0.009)		(0.158)
Instrumental variables				
Southern Europe	0.144***		0.073	
	(0.000)		(0.206)	
Frequency	-0.0028		0.004	
	(0.347)		(0.453)	
Debut	-0.054*		0.023	
	(0.096)		(0.751)	
NObs	543		258	
R^2 / Pseudo R^2	0.166	0.287	0.092	0.000
Wald chi2		317.43***		45.96***
		(0.000)		(0.001)
F-statistic	13.12***		1.70***	
	(0.000)		(0.031)	

Appendix 4.1: Durbin-Wu-Hausman test for endogeneity

Second-stage regression estimates from the Durbin-Wu-Hausman test predicting the endogeneity of the bookrunner syndicate parameters for a sample of 1,193 euro-denominated public bond tranches made by 304 Western European firms during 2001-2012. In an unreported first stage regression the bookrunner syndicate parameter is regressed against the instrumental variables and the exogenous variables contained in the main regression model predicting at-issue credit spread. In the second stage the residuals of this first stage regression are added to the main regression model.

All variables are defined in Table 4.1. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	**Model 1** **Total BRs**		**Model 2** **Total Active BR**		**Model 3** **% of BR in top 10**	
	coefficient	**p-value**	**coefficient**	**coefficient**	**coefficient**	**coefficient**
Residuals	0.525***	(0.000)	1.402***	(0.000)	-9.820***	(0.000)
Variable	**Model 4** **% of active BR in top 10**		**Model 5** **% non-domestic BR**		**Model 6** **% Active non-domestic BR**	
	coefficient	**coefficient**	**coefficient**	**p-value**	**coefficient**	**p-value**
Residuals	-14.558***	(0.000)	21.448***	(0.000)	27.451***	(0.000)

5 Allocation composition

5.1 Introduction

Bondholders are arguably amongst the most anonymous providers of capital that a firm faces. They are arms-length investors who unlike equity holders have no statutory duty to report their holdings (FCA, 2009) and are rarely consulted outside of the primary syndication process.[87] At the same time they are the largest funders of mid to large cap companies (Denis and Mihov, 2003).

Their anonymity has rendered detailed analysis of bond buyers challenging, with a large proportion of the foundational corporate debt literature considering them as homogeneous (Berlin and Loeys, 1988). More recent research has questioned this assumption and finds that various forms of bondholder heterogeneity, in particular geography and type, have a meaningful impact on a company's cost and reliability of funding (Massa et al., 2013; Massa and Zalkodas, 2014). Scant attention has however been given to the question of what determines a company's bond investor composition. This is the focus of this chapter, where I analyse the investor make-up at the point of primary syndication, when a firm still has flexibility over this distribution.[88] Understanding this is of significant importance to corporate treasurers, as marketing and allocating to the right type of investors is likely to reduce an issuer's current and future bond yields and enhance its ability to re-access the bond market.

[87] Outside of periods of financial distress.
[88] Assuming a bond is more than one times oversubscribed, which as I have found in Chapter 4 is nearly always the case.

Competing theoretical predictions can be made on the determinants of bond allocations, both with regards to the geography and the type of bond investors. The geographic make-up could be influenced by home selection bias, which implies that a European investors' nationality plays a crucial role in their selection of bonds, with investors preferring to purchase more bonds from familiar domestic companies (Chan et al., 2005: Kang and Stulz, 1997). Firms based in larger economies such as Germany, France and the UK should have ample domestic financial liquidity available and will arguably find it more beneficial to nurture these relationships with reliable domestic accounts rather than seeking to extensively market their securities internationally. Hence firms in larger economies would end up allocating more to domestic investors.

This is contrary to the implication of portfolio diversification theory (Markowitz, 1952; Pieterse-Bloem and Mahieu, 2013) which contends that investors prefer to diversify away from their domestic issuers in order to optimise the overall mean-variance characteristics of their bond portfolio. The diversification benefits which these investors obtain from international bond purchases renders them more price competitive than an issuer's domestic investor base (Massa and Zalkodas, 2014). Firms seeking to minimise their cost of funding should hence look to allocate more to non-domestic accounts.

With regards to the preferred type of investors, this could be influenced by the degree of discretion issuers have, as Denis and Mihov (2003) argue that a company's management often selects the bond market in order to avoid the greater scrutiny associated with a concentrated group of sizeable private debt investors. Bond issuers are therefore expected to allocate more to smaller, non-institutional

investors. This is consistent with Brennan and Franks' (1997) finding that equity IPO issuers avoid creating powerful new financial stakeholders by discriminating against larger share applicants. In practice in the primary corporate bond market smaller investors tend to be less price sensitive and are hence utilised by issuers and bookrunners in the price negotiation with larger accounts.

Previous corporate debt papers have also found that institutional investors, particularly insurers, have a longer investment horizon and are hence likely to be more reliable investors (Massa et al., 2013). They also typically have greater assets to invest than non-institutional investors such as private banks and retail (Johnson, 2014). Issuers could hence also be advised to maintain strong relationships with institutional investors and offer them preferential allocations.

In order to study these competing claims on bond allocations I consult a novel data set, based on Informa Global Markets Deal Navigator. This sample contains 309 euro-denominated investment grade bond tranches issued by 136 Western European corporates between 2001 and 2012. This data set has several attractive features. By studying the Western European euro-denominated bond market I can readily consider geographic influences arising from the combination of a range of bond issuing countries and a single pan-national group of investors. My focus on primary allocations allows me to study a bond's full ownership at a uniquely liquid point in its life cycle. Previous papers on investors' bond holdings typically rely on Thomson Reuter's eMAXX database, which only has access to reported bond holdings of a subset of institutional investors (Massa and Zalkodas, 2014). In addition the highly rated and well-established multinational firms I study

should have greater allocation discretion, which should add more heterogeneity in the allocation data.

Following the approach of Colla et al. (2013) the findings of this chapter are presented as a descriptive analysis without a preceding literature review and hypothesis section. My main analysis is conducted through Heckman two-stage regressions (Heckman, 1979), through which I control for the factors that determine the availability of allocation data.

My testing reconfirms several well-established and intuitive drivers of bond investor allocations amongst both tranche and firm variables. I find that the maturity of a bond is negatively related to private bank and retail demand and positively related to pension funds and insurance interest, reflecting the heterogeneous investment horizons of these investor types (Massa et al., 2013; Yoon, 2015). A bond's credit rating negatively influences pension fund and insurance demand, corroborating concerns these investors have around litigation risks arising from pursuing aggressive investment strategies (Chen et al., 2007).

I also obtain significant results for a number of less well-understood variables, being issuer geography, orderbook size and bookrunner syndicate structure. My results show a non-linear relation between the size of an issuer's home economy and the percentage it can allocate to domestic investors, with firms from top and lower tier economies relying more on local accounts than those from mid-tier economies. This is consistent with home selection bias (Chan et al., 2005; Kang and Stulz, 1997). Issuers from Germany, France and the UK benefit most from this bias as it gives them greater access to a large source of domestic bond liquidity to whom they can allocate a large share of their offering. On the other hand firms from

mid-tier economies such as Italy and Spain have outgrown their smaller domestic investor base and are required to actively seek non-domestic investor demand (Cheng, 2011). Finally firms from lower tier economies have more modest funding requirements to which their small domestic investor base can contribute a sizeable portion.

Regardless however of nationality all companies recognise the benefits of a geographically diversified investor base (Massa and Zalkodas, 2014). I find that any firms with more oversubscribed tranches tend to sell a larger share to non-domestic investors. This suggests that the costs entailed in actively pursuing international investors tends to withhold firms from small and large economies from diversifying their bondholders. They only engage in such diversification when the costs entailed are low, for instance during strong market conditions characterised by active interest in new bond offerings from a broad range of investors. Issuing during such periods will more easily allow the issuers to amass a large pan-European orderbook (Derrien, 2005; Foley, 2012).

As with investor geography, the investor type is partly influenced by an issuer's home country. While a full analysis of country-related variables is outside of the scope of this chapter[89] I do find noteworthy differences in the investor type composition of different issuer nationalities. Bond issuers from a mid or top tier economy typically allocate more to institutional investors. For German issuers an important investor type are the local public savings banks (Simpson, 2013) while French firms rely more on local pension funds and insurers (Borisova et al., 2015)

[89] Many of the country-specific variables utilised in public debt sourcing literature (Zhang, 2016), such as creditor rights, banking sector size, legal framework and GDP per capita, are arguably also proxies for a country's public debt investor base, both in terms of size and institutional structure.

and UK companies tend to benefit from a broad range of London-based institutional investors. Regardless of nationality however, when given greater allocation discretion issuers avoid becoming obligated to several large institutional investors. Those with higher oversubscription levels tend to allocate less to pension funds and insurers, which is consistent with Denis and Mihov's (2003) claim that bond issuers prefer a diffused group of holders.

The bookrunner syndicate supporting the issuer has significant influence over such allocation decisions. My findings show that having a larger proportion of Top 10 bookrunners leads to more bonds being placed with pension funds and insurers, likely reflecting long-standing relationships top tier bookrunners have with these regular investors (Chemmanur and Krishnan, 2012). I also find that appointing more non-domestic bookrunners has the opposite effect, i.e. a larger allocation to non-institutional accounts.

My study is most closely related to Brennan and Frank (1997), Massa et al. (2013) and Massa and Zalkodas (2014). I investigate Brennan and Franks' (1997) finding of equity IPO issuers discriminating against larger investors within the context of the bond markets, a substantially larger source of funding for firms (Denis and Mihov, 2003) and hence one where major investors arguably play an important role in shaping corporate decision making. Massa et al. (2013) study the impact of the make-up of a firm's institutional investor base in the secondary bond market on its ability to raise new debt funding, while Massa and Zalkodas' (2014) research how a firm's proportion of international investors impacts its decision to issue in the international bond markets. The investor type and geography percentages they utilise as explanatory variables are similar to several of my key investor type dependent

variables. Unlike these papers however I focus on primary market investor holdings, an increasingly relevant subject matter given the growing illiquidity of the secondary bond markets (International Capital Markets Association, 2014). Also through studying the largely unified European euro-denominated bond market I can more readily analyse the underlying theoretical considerations determining bond investor holdings, such as home selection bias and portfolio diversification concerns.

My results contribute to a number of strands of literature. They add to bond portfolio research (Pieterse-Bloem and Mahieu, 2013), highlighting that even amongst highly integrated bond markets such the Eurozone there are considerable geographic differences in investors' bond holdings favouring home companies and that these already occur at the point of primary distribution of a bond. Studies seeking to model bond investors' portfolio choice composition should hence seek to incorporate the marginal costs of investing in firms from less familiar countries.

They also contribute to the research on primary market oversubscription (Brennan and Franks, 1997; Cornelli and Goldreich, 2003; Derrien, 2005). Prior literature in this area has focused on the equity markets, which is a relatively smaller source of corporate funding (Denis and Mihov, 2003). My results for bond market oversubscription allow for more broad based conclusions on the impact of orderbook size on a firm's allocations and hence it's preferred combination of financial investors. In particular I find strong evidence of firms with more oversubscribed tranches looking to obtain both more diffused ownership and more geographic diversification amongst their investors.

In addition this chapter adds to the literature on corporate debt sourcing (Denis and Mihov, 2003; Johnson, 1997) and initial public bond offerings (Datta et

al. 1999). My findings show that the size of a firm's national economy as well as the size and nature of its domestic investor base play an important role in shaping the debt split between public and private instruments and should hence be incorporated in theoretical models on this composition. Companies from larger economies are expected to be able to have relatively less creditworthy threshold parameters than those from smaller economies when first accessing the bond markets as they benefit from stronger access to a large pool of domestic bond investor liquidity.

Furthermore my findings contribute to the literature on financial intermediaries (Chemmanur and Fulghieri, 1994; Chemmanur and Krishnan, 2012; Diamond, 1996), as I provide new evidence for the market power hypothesis of higher reputation bookrunners having stronger access to major institutional investors due to longer standing relationships (Chemmanur and Krishnan, 2012). I also find that in the euro-denominated bond market non-domestic bookrunners do not attract more international demand but are able to generate more interest from alternative investor classes. This suggests that an intermediary's relationship with different types of investors can make for a competitive advantage in winning bookrunner roles.

The remainder of the chapter is organised as follows. In Section 5.2 I set out the sample selection process and investigate for biases inherent in the subsample of tranches with available allocation statistics. I subsequently describe my allocation variables in Section 5.3. In Section 5.4 I set out the univariate research performed on investor type allocations, encompassing both cluster analysis and subsample analysis. The results of the multivariate analysis is discussed in Section 5.5, where I

present both a base model and consider the impact of country, oversubscription and bookrunner variables. Section 5.6 concludes.

5.2 Data

In this section I first explain the process by which I have constructed the allocation sample. I then set out my explanatory variables and use these to review inherent biases between my allocation sample and the overall euro-denominated bond market I am testing for.

5.2.1 Sample selection

My sample is based on an Informa Global Markets (IGM) Deal Navigator search of bond distribution statistics. IGM is a provider of financial data and news comparable in its offering to Dealogic and ThomsonReuters. It sources bond allocation data through a network of syndicate professionals, being the team within an investment bank responsible for distributing a primary bond offering. IGM's researchers are typically able to source final allocation splits by both country and investor type within a few hours after a bond is priced.[90] While competing financial news providers also extract and disseminate this data, IGM Deal Navigator is the only provider to systematically record allocation information in a database. This database has to my knowledge not been used in prior papers. My Deal Navigator

[90] Often such high level allocation statistics are discussed and agreed on by the involved bookrunners to avoid any discrepancy in external communication.

search for euro-denominated corporate bond offerings priced between 1st January 2001 and 31st December 2012 gives me an initial population of 685 tranches.

I match this initial list of tranches with my Dealogic Debt Capital Markets Analytics sample (see Section 2.4). This allows me to ensure my allocation sample meets my overall sample criteria, such as being made available for purchase by a broad group of European bond investors. This leaves me with a combined IGM and Dealogic sample of 442.

To ensure the data has been reliably recorded I subsequently filter out tranches where the sum of geographic or type allocations is less than 95% or greater than 105%. I allow 5 percentage points of rounding error as allocation data is typically reported by bookrunners in rounded percentages for up to 10 different groupings of investor countries and types. This results in the removal of 38 tranches or 8.6% of the sample. In separate empirical testing I apply a narrower permissible range of 1 percentage point, which leads to the removal of a further 20 tranches of the final sample and does not qualitatively impact the final results set out in this chapter.[91] As a final step I exclude tranches for which only the geographic or type allocation data is available. I end up with a final sample of 309 tranches.

Table 5.1 arranges these tranches by the issuers' home jurisdiction. Countries are split in three panels based on the IMF-reported size of their gross domestic product. The top tier economies are Germany, France and the UK, the mid-tier economies are Italy, Spain and the Netherlands and the lower tier economies are Austria, Belgium, Greece, Ireland, Luxembourg, Portugal and Switzerland. 199 tranches or nearly two-thirds of the total sample originate from issuers based in the

[91] Precedent allocation papers have not been required to consider this type of filter as they typically analyse the allocation breakdown for individual investors who placed an order. This micro-level data is often obtained from an investment bank for a relatively small sample size (Brennan and Franks, 1997; Cornelli and Goldreich, 2003).

top tier economies, which is unsurprising given that they are also expected to have the largest corporate sector. 76 tranches emerge from mid-tier economies and the remaining 34 tranches from lower-tier economies.

5.2.2 Explanatory variables

As explanatory factors I source a range of tranche, firm, investor demand and bookrunner variables. These are obtained from a combination of Dealogic, Datastream, IFR, GlobalCapital, company reports and bond prospectuses. A complete list of variables and data sources is shown in Table 5.2.

The tranche variables are pricing date, credit rating, maturity, tranche size, credit spread, issue frequency as well as dummies for multi-tranche, frequency, debut, Floating Rate Note (FRN) and Euro Medium Term Note programme (EMTN) (see Chapter 3 for variable calculations). For firm variables I employ leverage, size, profitability, intangible assets, growth opportunities as well as dummies for whether the firm is publicly owned and whether it is headquartered in Germany, France or the United Kingdom (GFU). The public ownership variable accounts for potential government influence in both the investment and allocation decisions and GFU issuers are expected to have improved access to capital due to the size of their national economies. My investor demand variable is tranche oversubscription, which is a proxy for the degree of allocation discretion an issuer enjoys.

As bookrunner variables I employ the total number of bookrunners, the total number of active bookrunners, a passive bookrunner dummy, the proportion of active bookrunners that have a Top 10 league table ranking and the proportion of active bookrunners that is non-domestic (see Chapter 4).

5.2.3 Allocation selection bias

As my allocation sample of 309 tranches constitutes 25.2% of the original 1,224 tranches I extracted from Dealogic DCM Analytics (see Section 2.4) it is worth considering its representativeness. I therefore test for any selection bias in the reporting of allocation statistics through a univariate comparison between the allocation and non-allocation samples.

The results, shown in Table 5.3, confirm that the two samples differ in several respects. Tranches in the allocation sample are relatively younger with an average pricing date of 29th July 2010 in comparison to 18th December 2006 for the non-allocation sample. This suggests that the process of sourcing and sharing allocation statistics has become more common over time. Only 43 allocation sample tranches (13.9%) were priced before 2008. The bond market grew rapidly following this year (see Section 1.1.2), which has resulted in greater interest in these statistics.

The allocation sample also includes more high-demand tranches with an average oversubscription rate of 4.50x versus 3.40x for the residual sample. This could be due to the hot market for corporate bonds in the years following the financial crisis (Foley, 2012). Alternatively bookrunners of more successful tranches are expected to be more willing to share allocation statistics. Practitioners note that bookrunners tend to avoid sharing orderbook and allocation information on undersubscribed or weakly oversubscribed trades as this could negatively impact investor demand in the secondary market (Derrien, 2005).[92]

[92] Derrien (2005) finds that equity IPO oversubscription rates are positively associated with short-term performance.

Tranches in the allocation sample also tend to have a larger bookrunner syndicate. Their average syndicate size is 5.29 in comparison to 3.66 for the non-allocation sample. This differential continues to hold for active bookrunners, being 4.38 and 3.44 respectively. It arguably reflects the greater ease for researchers to source allocation statistics when there are more bookrunners to communicate with.

The allocation sample includes less debut trades, namely a proportion of 10.7% which compares to 28.7% for the tranches for which no allocation data was available. These initial public bond offerings may have been more unevenly distributed as prior literature suggests that major investors would avoid debut names due to the lack of a strong capital markets reputation and risk of adverse selection (Diamond, 1991). Their bookrunners may hence have been reluctant to share allocation statistics.[93]

Collectively these findings show that my allocation sample is skewed towards tranches that are more recently priced, attract larger orderbooks, are led by more sizeable bookrunner syndicates and are issued by repeat borrowers. I control for this selection bias when conducting my multivariate analysis in Section 5.5.[94]

[93] Tranches for which allocation data has been reported tend also to emanate from relatively larger firms. The average tranche in the allocation sample is issued by a firm with EUR 64.1bn in total assets compared to EUR 55.7bn for non-allocation sample. This skew is of limited theoretical interest as one would arguably classify both subsamples as representing the top tier of European corporates.

[94] My sample is nonetheless considerably larger and more diversified than that of prior capital markets allocation papers. Brennan and Franks' (1997) equity allocation study for instance has a sample of 69 initial public offerings made exclusively by British firms.

5.3 Description of allocation variables

In this section I discuss the allocation data I have gathered. Summary statistics are displayed in Table 5.4, with Panel A showing the data for geographic splits and Panel B for investor type splits. I discuss each in turn.

5.3.1 Allocation by geography

The IGM database typically records geographic allocations through combinations of countries, such as Benelux, reflecting a tendency of bookrunners to report their allocation percentages at this level. Regional combinations are generally based on geographic proximity and a common language and cultural heritage, with the main examples being Germany, Austria and Switzerland (GAS); Benelux and Scandinavia.

For comparison purposes I perform my analysis at the regional allocation level. For tranches where a region of interest is not directly reported I use manual calculations. For instance to determine Benelux region allocations I add up the individually reported percentages for the Netherlands, Belgium and Luxembourg. As nearly all tranches contain at least one region-based data point this approach allows for the highest degree of data integrity. An alternative country-level analysis would have required me to deconsolidate regional data, necessitating the use of highly contentious assumptions.

I end up with allocation statistics across seven distinct geographical areas, being the percentage allocated to GAS; UK and Ireland (UK&I), France, Benelux,

Scandinavia, Southern Europe and Other geographies.[95] The summary statistics of these variables show that the regions comprising Europe's largest three economies are the most prevalent with GAS, UK&I and France being allocated an average of 30.5%, 18.8% and 24.3% of allocations or a total of almost three quarters of the entire tranche. The size of the GDP of these countries should allow for substantial available financial resources. They are also expected to be home to the largest corporate sector and hence greatest supply of new bonds, as is clear from the sample geographic split shown in Table 5.1. GAS, UK&I and France account for 73.0% of issuance in my sample.

Yet their share of Western European GDP is smaller, at approximately 60% (Eurostat, 2014).[96] This suggests that debt investor demand is not evenly distributed across Europe, resulting in issuers from smaller economies being underrepresented in the bond market. I study this potential for home selection bias further in Section 5.5 (Kang and Stulz, 1997).

Not all smaller economies are necessarily underrepresented however. Southern Europe appears to have a relatively small bond domestic investor base in comparison to the number of tranches issued. 20.7% of sample tranches emerge from this region while its average allocations are less than half this number, at 9.1%.

It is also worth noting that Scandinavian investors are amongst the most selective investors, being involved in 43.0% of tranche issues in comparison to an average of 94.0% for the other regions. This likely reflects that none of the sample tranches come from this region and only one of its constituent countries (Finland) has adopted the Euro.

[95] Southern Europe contains Greece, Italy, Spain and Portugal, while the other categories combine the "Other" IGM variable with allocations to non-European geographies.
[96] Utilising the 15 European Union countries as of 2004 as well as Switzerland as representing the Western European economy.

I also calculate the proportion of domestic allocations for each tranche, being equivalent to the relevant country or region where the issuer's head office is based. The head office location is sourced from Dealogic and company filings. While the use of region-based proxies means this overestimates the proportion of interest from the same country, with the exception of French issuers, it does allow for indicative cross-tranche comparison of the relative magnitude of domestic interest.

On average 32.0% of the tranche is sold to domestic investors. This seems incompatible with the implications of portfolio diversification as no single Western Europe economy makes up a third of the GDP of this market (Pieterse-Bloem and Mahieu, 2013). Investors hence appear to place a disproportionate share of their portfolio with domestic companies, in line with the expectations from the home selection bias literature (Chan et al., 2005; Kang and Stulz; 1997).

5.3.2 Allocation by type

The investor type allocation percentages also tend to be grouped by bookrunners. The sets of investor types they report tend to be based on similarities in investors' organisational structure and investment strategies. For instance private bank and retail accounts (PB&R) are often jointly reported since both are generally smaller investors with shorter term investment horizons (Yoon, 2015). And pension funds and insurers (PF&I) are often combined as both are larger institutional investors with longer term investment strategies (Massa et al., 2013). For comparison purposes I base my dependent variables with these sets, leaving me with an allocation split across central banks, fund managers, PF&I, PB&R, corporate treasuries, hedge funds and other types.

As is apparent from the summary statistics in Table 5.4 the dominant type of investors buying corporate bonds are fund managers. They account for an average of 58.7% of allocations and are involved in all of the tranches in my sample. This is due to fund managers managing assets for a broad range of clients, including corporations, pension funds, charities and high net worth individuals (Union Invest, 2015). Since the last financial crisis they have been actively increasing the bond weightings in their portfolios (Oakley and Jopson, 2015).

The second and third largest type sets are PF&I and PB&R with average sample allocations of 18.3% and 16.5% respectively. Their actual level of purchases can differ significantly across tranches as both sets have a standard deviation of 11.4%. This high degree of selectivity amongst for PF&I likely reflects their more conservative and risk-averse investment strategy due to litigation risks should they make losses as a result of an aggressive investment strategy (Chen et al., 2007; City of London Economic Development, 2011). And private bank and retail accounts are arguably more discriminate due to the market sentiment driven nature of their investment behaviour (Derrien, 2005).

The smallest investors by type are corporate treasuries, hedge funds and central banks with average allocations of 0.2%, 0.5% and 0.6%. These figures are negatively skewed as these investor types participate relatively rarely in bond offerings, receiving allocations in 12.0% or less of the tranche sample. Where they do participate these three types are allocated an average of 2.9% (corporate treasuries), 3.9% (hedge funds) and 5.0% (central banks). While corporate treasuries typically sell bonds, practitioners note that some maintain substantial cash balances due to working capital requirements or strategic considerations which they at times invest in corporate bonds for yield enhancement (AFP, 2015). Central banks are also

irregular corporate bond buyers, typically investing their portfolio in sovereign bonds (Bernadell et al., 2004). Hedge funds are particularly discerning in their corporate bond investment decisions, focusing on tranches where they expect to be able to generate a short-term trading profit (Beales, 2005). Given the limited positive allocation data for these three investor types my empirical analysis focuses on fund managers, PB&R and PF&I.

5.4 Univariate analysis

In this section I consider likely relations between the explanatory variables and the allocation statistics through univariate analysis. This allows me to test predictions from a relatively broad literature that relate bond investor preferences to tranche parameters. For instance insurers are expected to prefer longer tenors while retail accounts are hypothesised to skew their holdings towards shorter dated debt (Massa et al., 2013; Yoon, 2015). The univariate analysis can corroborate these expectations and thereby provide a degree of comfort around data accuracy. This enables me to subject my relatively small and novel data set to the two-stage regression procedures set out in Section 5.5. This multivariate analysis focuses largely on issuer geography, investor demand and bookrunner variables, being less well explored areas in the bond investor literature. While these variables do appear in this section, they will hence be discussed in greater depth in Section 5.5.

The univariate analysis is developed as follows. I commence with a cluster analysis in Section 5.4.1, which assists in identifying relations between tranche, investor demand and bookrunner variables and investor type allocations present in my data set. Here I find particularly strong tranche parameter results for tranche

rating and tenor, which I explore further in Section 5.4.2 and Section 5.4.3 through subsample analysis. I finish with further subsample analysis on issuer geography in Section 5.4.4.

5.4.1 Exploratory analysis

The cluster analysis I utilise is a regression technique applied to attempt to locate natural groupings amongst the underlying data points. It is frequently employed in social science, for instance by politics researchers in studying political preferences of certain parts of a country or population (Akarca and Baslevent, 2011). My analysis considers similarities across the various investor type allocation percentages, being % central banks, % fund managers, % pension funds and insurers and so on. I expect to discover certain collections of tranches with comparable allocation skews, for instance a number of longer dated tranches with high PF&I allocations (Massa et al., 2013).

The method of cluster analysis I employ, k-means partition clustering, is applied by Colla et al. (2013) to study firm debt structure splits across instruments such commercial paper, senior bonds, term loans. This approach requires the preselection of the number of natural groupings I expect to find. The 309 tranches in my sample are then randomly divided across this number of groupings, i.e. 3 randomly generated groups of 103 tranches each.

The clustering algorithm then looks to move each tranche into a different group in order to reduce the intragroup allocation variance and increase the intergroup allocation variance. For instance assume the existence of 2 groups, where

Group 1 and 2 have a 55% and 75% average fund manager allocation respectively – ignoring for simplicity the other investor types. A tranche with an 80% fund manager allocation is initially assigned to Group 1. This tranche ought to be moved to Group 2 as this will reduce the intragroup variance both Group 1, through removing an outlier, as well as Group 2, by adding a tranche that is very close to the group mean. The intergroup variance would also increase with the average fund manager allocation of Group 1 decreasing and that of Group 2 increasing.

This re-categorisation continues until no more moves can be made. I end up with a set of natural groupings, or clusters, where the allocation statistics are relatively homogeneous, displaying minimal intragroup differences and maximum intergroup differences (Akarca and Baslevent, 2011).

In order to commence this process I am required to dictate at the outset the desired number of clusters. To determine this I follow Colla et al. (2013) in employing the Calinski-Harabasz index, which is one of the more robust predictive tools for this purpose (Cooper and Milligan, 1985). It takes a value for each possible number of clusters and is measured as follows:

$$\text{Calinski-Harabasz index}_{\text{x clusters}} = \frac{\text{Variance between clusters}_{\text{x clusters}}}{\text{Variance within clusters}_{\text{x clusters}}} \quad (1)$$

The goal is to select the lowest number of clusters that maximises this index, as this would be the number of clusters that has the largest intergroup variance and the lowest intragroup variance. The component calculations of the Calinski-Harabasz index illustrate this. The numerator is based on the difference between each cluster's mean allocation statistics, such as the mean % central banks, and the mean for this type set of the overall sample. This value will be large for tranches that are highly

heterogeneous as they will all be widely dispersed from the sample average. The denominator is calculated through the difference between the allocation split of the tranche with that of its corresponding cluster. The more homogeneous each cluster, the smaller this value (Calinski and Harabasz, 1974).

For my sample this index is maximised at three clusters, where I obtain an index value of 176.12 in comparison to 155.47 for two clusters and 166.37 for four clusters respectively. I therefore proceed with a k-means partitioning cluster analysis for three clusters.

The summary statistics of these clusters are shown in Table 5.5. Panel A contains the investor type allocation variables, Panel B tranche variables and Panel C investor demand and bookrunner variables.

As is apparent from Panel A the degree of involvement from fund managers, PF&I and PB&R differs considerably across the clusters. Cluster 1 is made up of 60 tranches with relatively high allocations to PB&R, namely an average of 35.2% in comparison to 18.3% for the entire sample. This cluster is also skewed towards shorter tenors with an average of 6.3 years to maturity, whereas the same figure for the full sample is 7.5 years. This likely reflects the shorter investment horizon of retail investors (Yoon, 2015). Cluster 1 is also dominated by more frequent borrowers; its mean issue frequency of 12.0 tranches is around one third higher than the overall sample. This is consistent with the notion that retail investors prefer familiar names with a strong capital markets reputation (Green and Jame, 2013). The tranches also have a below-average at-issue credit spread of 1.2%, which probably reflects their shorter tenors.

Cluster 2 contains 71 tranches with relatively high interest from PF&I, with average allocations to these accounts of 33.1% versus 18.3% for the entire sample. These tranches are also characterised by above-average credit ratings and tenors, with a mean S&P credit number of 6.7, being close to a A-, and a mean tenor of 9.5 years to maturity. The positive rating skew likely reflects the more conservative investment strategies of insurers in particular and is consistent with the litigation risk arguments made by Chen et al. (2007). The larger proportion of higher tenor transactions likely highlights the longer investment horizons of pension fund and insurance accounts which matches the longer term nature of their liabilities (Massa et al., 2013). Cluster 2 also has a higher share of high reputation intermediaries. 71.4% of active bookrunners are Top 10 in comparison to 65.0% for the overall sample. This could reflect such bookrunners attracting greater demand from major pension funds and insurers as a result of their long-standing relationships (Chemmanur and Krishnan, 2012). Tranches in this cluster also have more domestic bookrunners in their syndicate, with 58.8% of active bookrunners being non-domestic versus 65.6% for the entire sample. I posit that the major pension funds and insurers are known to most bookrunners and that non-domestic bookrunners are more likely to distinguish their capabilities by targeting smaller and alternative investor classes.

Cluster 3 contains over half the overall sample (178 tranches) and is characterised by a relatively large share of allocations to fund managers. The average fund manager allocation in this cluster is 67.5% in comparison to 58.7% for the overall sample. Cluster 3 tranches tend to have a weaker rating profile with an average S&P credit numeric rating of 7.8, or close to a BBB+ as well as an above-average credit spread of 1.7%. The relatively higher risk nature of these offerings may render them less attractive for pension funds and insurers due to their more

conservative investment strategy (Chen et al., 2007); issuers of such riskier tranches are also expected to have less well established business profiles, making them less appealing to retail accounts (Green and Jame, 2013). The typical tenor of these tranches is 7.1 years, residing close to the sample average and in between the other clusters. This suggests that the typical investment horizon for fund managers lies in between that of PB&R and PF&I. Tranches in Cluster 3 also receive the most investor demand, generating an average oversubscription level of 5.2x, which highlights that this does impact an issuer's allocation decision. In practice fund managers are relatively smaller than pension funds and insurers, and hence may be preferred out of managerial control considerations (Denis and Mihov, 2003).

Collectively my cluster analysis suggests a particularly important role for tranche rating and tenor in determining investor type allocations, while also bringing out potential investor demand and bookrunner syndicate drivers. As discussed previously I consider the influence of tranche rating and tenor in the following subsample analyses, while I reserve further study of investor demand and bookrunner syndicate for the multivariate analysis in Section 5.5.

5.4.2 Tranche rating comparison

I perform my rating subsample analysis through splitting my sample across alphabetic rating categories, namely unrated, BBB, A and AA. This is consistent with the categorisation employed by the market-leading iBoxx European bond indices (source: Markit), which include a iBoxx A EUR non-financial corporates index, iBoxx BBB EUR non-financial corporates index and so on. It also follows

typical institutional investor bond portfolio criteria, eg. a more conservative bond fund manager would only have a mandate to purchase A rating category or better quality securities (Langohr and Langohr, 2008).[97] The academic literature using this approach includes Massa et al. (2013), who use similar partitioning for their analysis of rating-specific bond investor turnover.

In my analysis on these groupings I expect fund manager allocations to be highest amongst the A and BBB rating categories, offering both sufficient return, market availability while falling within their investment mandate (source: Dealogic). As discussed in Chapter 3 investors are expected to demand a higher share of weaker investment grade rated tranches in order to optimise the risk-return characteristics of their portfolio (Blume et al., 1991; Markowitz, 1952). Fund managers are a highly heterogeneous group, as a result of the multitude of clients they service, and I hence expect taken as a whole their investment preferences to follow this market-wide pattern. BBB and A tranches offer the necessary returns while also being relatively widely available, constituting 89.3% of my overall sample, and falling within their portfolio mandates. In practice many fund managers are excluded from purchasing BB bonds, being sub-investment grade, as well as unrated bonds as these tend to be less liquid and fall outside of the major iBoxx bond indices (source: Markit).

Pension funds and insurers are likely to display more conservative investment preferences, purchasing a larger share of AA and A bonds. This derives from Chen et al.'s (2007) notion of insurers in particular having a unique fiduciary duty, and risk facing substantial litigation costs should aggressive risk-taking result in losses. They

[97] Practitioners also point out that largely as a result of this credit spreads between rating categories tend to be larger than within categories, i.e. a firm's cost of funding goes up more when it is downgraded from A- to BBB+ than from BBB+ to BBB.

should therefore be less risk-tolerant and more focused on return of capital (Chen et al., 2007).

PB&R take-up is not envisaged to be related to credit rating. Being small and relatively unsophisticated investors they are not restricted by institutionalised portfolio criteria. They can therefore invest across the rating spectrum, focusing more on the tenor and their familiarity with the issuer (Green and Jame, 2013; Yoon, 2015).

Results for the credit rating subsample analysis are shown in Table 5.6. As expected only fund manager and PF&I take-up differ significantly across the rating categories. Fund managers' average allocations are indeed highest in the BBB and A categories where on average they are allocated 61.7% and 57.5%. In comparison they only purchase a mean of 50.5% and 52.6% of unrated and AA rated tranches. These differentials are consistent with the notion that fund managers seek a mean-variance efficient portfolio within the constraints of market availability and their portfolio mandates.

I also find that PF&I appear to be less risk tolerant, with allocations being positively related to creditworthiness. Average PF&I allocations increase from 15.5% and 15.2% for the unrated and BBB categories to 21.2% and 20.6% for A and AA. This is consistent with litigation concerns driving more stringent portfolio rating restrictions (Chen et al., 2007).

5.4.3 Tranche tenor comparison

For the tranche tenor subsample analysis I split my sample into four categories, namely 3-4.9 years, 5-6.9 years, 7-9.9 years and 10 years+. This follows the tenor ranges of the main Markit bond market indices (Markit, 2013). It also takes into account the findings of recent debt studies that find that corporate bond investors have heterogeneous investment horizons, not readily captured by a binary short-long term split as utilised in precedent empirical studies (Julio et al., 2008). Private bank and retail investors have been found to have a shorter term investment horizon, given more pressing liquidity needs and shorter term investment goals, while insurers tend to have a longer horizon as a result of the longer dated nature of their liabilities (Che-Yahya et al., 2014; Massa et al., 2013; Yoon, 2015). This leads me to expect that PB&R receive relatively larger allocations in the shorter tenors, fund managers in the medium tenors and PF&I in the longer tenors.

Table 5.7 presents the tenor subsample analysis results, which are consistent with my expectations. Pension funds and insurers have the longest investment horizon with their average allocations showing a clear upward pattern with the mean for 10 year+ range tranches being the highest. The averages for this investor type set are 13.4% for 3-4.9 years, 14.9% for 5-6.9 years, 17.0% for 7-9.9 years and 25.3% for 10 years+. This is in line with my cluster analysis in Section 5.4.1 as well as earlier findings from Massa et al. (2013) that insurers have a lower portfolio turnover than other institutional investors.

Private banks and retail accounts have an inverse preference, preferring shorter dated tranches. Their mean allocations fall with as the tenor increases, being 23.4% for 3-4.9 years, 19.1% for 5-6.9 years, 13.6% for 7-9.9 years and 13.9% for

10 years+. This result corroborates my expectation that PB&R have a shorter investment horizon (Yoon, 2015) and follows similar findings in the equity literature. Che-Yahya et al. (2014) for instance find that retail investors in Malaysian IPOs are more likely to sell part of their holdings in the first trading day.

Fund managers' allocations appear to be a non-linear function of tranche tenor, being largest in the 5-6.9 and 7-9.9 years categories. They purchase on average 60.6% and 62.6% of the issuance amount in these tenor ranges, in comparison to 54.3% and 54.9% for 3-4.9 years and 10 years+. This intermediate tenor preference can be readily interpreted. Fund managers tend to have less pressing liquidity concerns facing retail accounts and shorter dated liabilities than pension funds and insurers (Massa et al., 2013).

In conclusion I find that my allocation data set is reliable as it corroborates a range of well-established and intuitive relations between tranche parameters and allocation variables. In particular my results show that both tranche rating and tenor significantly influence the investor type compositions of bond allocations. Interest from PF&I and fund managers are both related to rating, with demand from the first being a positive function of the creditworthiness of the rating and that of the latter being strongest for BBB and A tranches; reflecting their greater credit spread and availability. Tranche tenor impacts all three major investor type sets. PB&R are relatively more prevalent in 3-4.9 years tranches, fund managers in 5-9.9 years tranches and PF&I in 10 years and longer tranches, reflecting divergent investment horizons.

5.4.4 Issuer country comparison

My univariate analysis has thus far ignored the impact of issuer geography, which is likely to influence my pan-national sample allocation statistics through home selection bias (Chan et al., 2005; Kang and Stulz, 1997).[98] This would imply larger domestic allocations amongst larger economies, as they can rely on a sizeable domestic investor base that prefers issuers from the same country. I consider this relation through splitting my sample based on the size of the issuer's home economy, separating the three top tier economies Germany, France, UK, and grouping the mid-tier and the lower tier economies due to limited data availability (see Section 5.2).

Summary statistics for these subsamples are shown in Table 5.8, with Panel A containing the investor type allocations and Panel B domestic investor allocations. Broadly in line with expectations I observe higher domestic allocations for the top-tier and lower-tier economies than for the mid-tier economies. The mean is 44.5% for German issuers, 35.9% for French issuers and 26.8% for UK issuers, 17.8% for mid-tier economies and 32.0% for lower tier economies respectively. These results are consistent with home selection bias. Investors skew their holdings towards domestic companies, entailing that firms strength of market access is positively related to the size of their home economy (Chan et al., 2005). While firms from lower tier economies therefore have weaker access, they also are amongst the least frequent issuers in my sample; their smaller domestic investor base can still support a sizeable share of their relatively small funding programme. Firms from mid-tier economies issue more frequently and will be required to source a larger proportion

[98] Given the range of issuer countries included in the sample and the lack of an obvious ordinal ranking of these, country variables were not included in the cluster summary statistics of the cluster analysis.

of bond investments from non-domestic investors. The relatively low domestic allocations for UK firms in comparison to other top tier economies is likely due to the lack of sterling-denominated tranches in my sample, being the home bond market for UK firms.

The home jurisdiction of an issuer also appears to impact its investor type allocation composition. German firms allocate a relatively large amount of their bond tranche to other types, namely 7.7% in comparison to a sample average of 5.1%. This is arguably due to the distinct nature of the German public savings bank structure, which does not get amalgamated in the alternative type categories (Simpson, 2013). Issuers from France rely more heavily on PF&I with an average allocation of 24.2% in comparison to a sample-wide mean of 18.3%. This is consistent with French government influence amongst this class of investors skewing holdings towards domestic issuers (Perotti and Schwienbacher, 2009). Corporates from mid-tier economies allocate a relatively high average of 63.6% of their tranche to fund managers. I posit that in their search for geographic diversification they find it most cost-efficient to market to the fund manager community than relatively smaller investor groups (Johnson, 2014). These preliminary observations are further analysed in the following section.

5.5 Multivariate analysis

The multivariate analysis further develops the impact of issuer geography, oversubscription and bookrunner parameters on the allocation statistics. It is developed as follows. Section 5.5.1 sets out the Heckman two-stage regression

procedure that I employ. Section 5.5.2 discusses the results of the first stage selection model and Section 5.5.3 presents findings of the main second-stage regression model. The following sections develop this second-stage model, with Section 5.5.4 incorporating country-specific variables, Section 5.5.5 orderbook oversubscription and Section 5.5.6 bookrunner syndicate variables.

5.5.1 Model specification

The Heckman two-stage procedure (see Chapter 4) allows me to control for selection bias inherent in the tranche availability of allocation statistics, discussed in Section 5.2.3.[99] As a first stage model I conduct a probit on the probability that reported allocation data is available. This is similar to my approach in Chapter 4 for dealing with the endogeneity inherent in appointing a passive bookrunner, with the main difference being that I am inserting a new explanatory variable to correct for selection bias rather than correcting an existing variable for matching bias.[100]

These second stage regressions incorporate an Inverse Mills ratio related to allocation availability to account for the known and unknown factors that influence the probability of allocation data being reported, such as for instance the number of bookrunners and the date the tranche was issued (see Section 5.2.3). They are

[99] In separate regressions reported in Appendix 5.1 I conduct Durbin-Wu-Hausman tests for the endogeneity of allocation availability. These tests confirm the endogenous nature of allocation availability, being significantly correlated to percentage domestic allocations, percentage institutional allocations, percentage PB&R allocations and percentage fund manager allocations.

[100] The other biases in Chapter 4 relate to divergent bookrunner group parameters, being the endogeneity in appointing more bookrunners, more active bookrunners, more reputable bookrunners and more non-domestic bookrunners respectively. Each of these requires a distinct first-stage selection model. By contrast in this chapter I deal with a single bias, namely the availability of allocation data, for which hence a single first stage model suffices.

structured as a tobit specification that is left and right-censored at 0 percent and 100 percent respectively (see Section 3.6.1), thereby taking into account limitations on possible observations of an allocation percentage that a standard ordinary least squares regression model would ignore.[101] It is clearly not possible for an allocation percentage to be lower than 0, which would imply that a group of investors were net sellers of a tranche in the primary market, or for an allocation percentage to be higher than 100, which would suggest that a group of investors purchased more of a tranche than an issuer has sold.[102]

As discussed in Section 4.4.3.1 the use of a two-stage regression specification entails additional diagnostic testing. In the case of a two-stage model employed to correct for selection bias I am required to test firstly for the existence of such a bias as well as for the existence of weak instruments. With regards to the first I confirm the existence of a selection bias in the reporting of allocation statistics on the basis of a univariate comparison between the allocation and non-allocation samples (see Section 5.2.3). Note that this is a different diagnostic test than was required in Chapter 4 for matching bias. I am not concerned about endogeneity because the allocations are determined after the transaction terms have been set (see Section 2.2). And the testing for the existence of weak instruments is discussed in the following section, where I test whether my instrument is related to the explanatory variable of interest, being the availability of allocation data, without being directly related to the dependent variable, namely the allocation statistics.

[101] The assumption of normality inherent in the tobit model is confirmed through a skewness-kurtosis test on the dependent allocation variables (Holden, 2004). The associated p-values are significant at the 1% level. In addition the assumption of homoscedasticity is confirmed through the rejection of the alternative Multiplicative Heteroscedasticity Tobit model; also with a 1% level of significance.
[102] Due to rounding errors this could of course occur when summing up each grouping of investors. However it would not occur for a single group.

5.5.2 Selection model

The regressand for my first stage probit regression is a categoric variable which takes the value of one if allocation data is available for a tranche and zero otherwise. As instrumental variable I take the number of active bookrunners (see Chapter 4). This variable is positively related to the allocation data being available, as I discuss in Section 5.5.3., [103] while in isolation having no significant direct impact on the individual allocation categories (at the 5% level), when accounting for issuer, tranche, bookrunner and investor demand factors. The latter is confirmed through separate ordinary least squares regressions. This composition is expected to be influenced by the identity of the involved bookrunners, as proxied for by their reputation or geographic background.

The other explanatory variables approximate for investor demand, tranche and firm factors. I proxy for investor demand through orderbook oversubscription (see Chapter 3) and expect bookrunners of more oversubscribed trades to be more willing to share allocation statistics with external parties (see Section 5.2.3). The included tranche parameters are pricing year, credit rating, maturity, tranche size, credit spread and dummies for debut, multi-tranche, floating rate tranches and tranches issued off an EMTN programme (see Chapter 3). I measure pricing year as a count of the year the tranche was priced, with 2001, the starting year of my sample, being number 1, 2002 number 2 and so on. I expect this variable to have a positive

[103] As discussed in Chapter 5 only active bookrunners are involved in the marketing and distribution of a tranche. Hence this is a more appropriate metric than taking all bookrunners, which would also include passive bookrunners not involved in distribution.

coefficient as the maturing of the Eurobond market has resulted in more regular reporting of allocation statistics. Tranche maturity is likely to have a positive relation as longer dated tranches can typically only be issued by firms whose prospects debt investors are generally comfortable with, allowing for a wider distribution and more ready dissemination of allocation statistics (Sarkar, 1999). Both the tranche size and multi-tranche variables are likely to be positively linked with allocation availability as larger trades are more prominent and hence receive more focus from financial data collectors. I envisage a negative relation for the debut dummy. Inaugural bond issuers have not yet built up a capital markets reputation (Diamond, 1991) and are hence expected to have a more concentrated investor base which bookrunners will be less willing to disclose publicly. The credit spread variable will likely have a negative coefficient. As bookrunners are tasked with obtaining the lowest possible pricing for their client (see Chapter 4), they will seek to lower the at-issue spread for tranches where they have obtained sufficient high quality investor demand; being also those whose statistics they are more willing to publish. I also envisage a negative relation for FRN instruments, given the more concentrated buyer base for these instruments, and a positive coefficient for EMTN, as these offerings tend to be made by firms with a more established presence in the capital markets.

My firm explanatory variables consist of leverage, firm size, profitability, intangible assets, growth opportunities and a public ownership dummy (see Chapter 4). These variables capture the notion that certain types of firms, such as higher levered issuers (see Chapter 3) may appeal to a more concentrated investor base and therefore tend to be associated with reduced allocation transparency. In addition firms that are less reliant on the public bond markets, such as highly profitable companies, are able to be less transparent in their placement process. Practitioners

also note that at times larger and publicly owned firms enforce specific constraints on bookrunner disclosure to the media out of public image concerns.

The results of the selection model are shown in Table 5.9. As expected the total number of active bookrunners is positive and highly significant (p value of 0.002), confirming that this is a highly appropriate instrumental variable. The relationship is arguably mechanical with more banks involved in the tranche distribution process allowing for more contact points for financial journalists.

The results for pricing year, maturity, tranche size, debut dummy and credit spread are also all in line with expectations, meaning allocation data is more likely to be available for more recently priced, longer tenor, larger, non-debut and lower credit spread tranches. Firm variables are of lesser importance as I only find weak evidence that allocation data is less frequently reported for tranches of more profitable firms (p value of 0.070).

5.5.3 Base model

My second-stage tobit regressions are run against a number of allocation statistics that are of theoretical interest, being percentage allocations to domestic investors, PB&R, institutional investors, fund managers and PF&I. Institutional investors are defined as the sum of fund managers and PF&I. My explanatory variables are tranche rating, tranche tenor and the Germany, France and UK (GFU) dummy while my additional tranche and issuer variables function as control factors.

In line with my univariate results in Section 5.4 I expect tranche tenor to be positively related to PF&I allocations, negatively related to PB&R allocations and not related to fund manager allocations, given the intermediate tenor preference of this investor category. As with the regressions in Chapter 4 I calculate this variable as the natural logarithm of the years to maturity. The tranche rating, as proxied by the S&P rating number (see Chapter 3), is likely to be negatively related to PF&I, noting that the rating number increases as the creditworthiness indicated by the rating decreases, while not impacting either PB&R and fund manager interest.

The inclusion of GFU allows me to further study the impact of the size of an issuer's national economy on tranche allocation statistics as the GFU countries are the largest three Western European economies and together constitute over half of the European Union's GDP (Eurostat, 2014). I expect this categoric variable to be positively related to the percentage of domestic allocations as a result of home selection bias. Given the diverse linguistic and cultural make-up of the European Union I posit that there is a degree of information immobility affecting the tranches in my sample resulting in such home selection bias amongst investors. GFU issuers should benefit most from this bias as it ensures they have relatively strong access to a sizeable domestic investor base, be that German, French or UK investors, and they are hence less incentivised to actively market their bonds internationally; resulting in larger average domestic allocations. The relation is arguably also partly investor driven as GFU investors can be seen to benefit less to overcome home selection bias as the size of their domestic economy allows them to accumulate a relatively diversified portfolio (Chan et al., 2005; Kang and Stulz, 1997). A German fund manager with a 50% weighting towards German securities is expected to have a

more mean-variance efficient portfolio than a Portuguese fund manager with the same Portuguese weighting.

This expectation runs against the implication of classical portfolio choice theory, which would predict that GFU issuers benefit from allocating more to foreign investors (Pieterse-Bloem and Mahieu, 2013). GFU companies, being some of the largest and most frequent issuers in Europe, are faced with marginally declining domestic demand as domestic investors reach portfolio concentration limits from prior purchases. Foreign investors will have started purchasing GFU bonds relatively later, meaning they have not yet reached such concentration limits and can hence demand more bonds at more competitive levels (Massa and Zalkodas, 2014). While compelling theoretically I assume that in practice regular GFU issuers find it more beneficial to sell to loyal and familiar domestic investors, giving rise to what some practitioners call a "home cooked" bond.

The GFU dummy is also expected to be positively related to the proportion of institutional allocations. Being major funders I posit that GFU firms seek to establish long term relationships with institutional investors to improve their access to larger levels of longer term bond funding. Both fund managers and PF&I tend to place larger orders than PB&R (Johnson, 2014), have medium to longer term investment strategies and have identifiable credit analysts and portfolio managers with whom a relationship can be developed (Green and Jame, 2013). While I do not expect major differences between fund managers and PF&I, I do also run separate regressions on both categories given that their differences in investment strategy (Massa et al., 2013) as well as differences in each country's institutional investor composition could result in different model coefficients.

The tranche and firm variables I employ as control variables have been found to be of relevance in studying the depth of investor demand (see Chapter 3) and hence are expected to influence the range of investor demand and consequently the investor allocation make-up. I hypothesise that credit spread, FRN, EMTN and public ownership are related to the level of domestic allocations. Credit spread is likely to have a negative coefficient as higher credit spread trades are likely to have been more difficult to sell to the most supportive domestic investors (see Section 5.5.2), necessitating a higher level of credit risk compensation to attract non-domestic investors. I expect the FRN dummy to also be negatively related as the floating rate note investor base is considerably smaller, requiring issuers of these types of tranches to sell into a wider range of countries (Dealogic, 2014). The EMTN dummy is expected to have a negative coefficient. Issuers typically set up an EMTN programme when they have a sizeable funding programme (see Chapter 3), which would also typically require them to market to a broader and more internationally diversified investor base. The publicly owned dummy should be positive as such firms are arguably subject to more political pressures to reward domestic investors with greater allocations. Alternatively major domestic institutional investors could face political pressure to support these government-owned corporations.

I also hypothesise that credit spread and the publicly owned dummy affect the composition of investor type allocations. The credit spread should be positively related to institutional investor allocations as this investor base is relatively more price-sensitive (Neupane and Poshakwale, 2012) and hence less likely to participate in lower-spread tranches. The public ownership dummy is expected to be positively related to PF&I allocations and negatively related to fund manager allocations. Perotti and Schwienbacher (2009) discuss how in many major European countries,

including France and Germany, the evolution of pension funding largely occurred through state-run programmes and remains under substantial government influence. Pension funds are hence expected to experience greater political pressures to support domestic government-backed firms, thereby partially crowding out fund managers.

The results for my main multivariate models are shown in Table 5.10. Models 1 and 2 contain the regressions on domestic allocations, Model 3 PB&R, Model 4 institutional investors, Models 5 fund managers and Model 6 PF&I. In Model 2 I limit my sample to the six largest Western European economies, Germany, France, UK, Italy, Spain and the Netherlands, thereby ensuring that the proportion domestic allocations taken from the geographic region is a relatively reliable indicator. As discussed in Section 5.3.1 the Germany, Austria and Swiss regional allocation percentage is more likely to be an effective proxy for a German firm than for an Austrian firm.

I find that the Mills ratio for allocation availability is positive for the domestic and PB&R allocations and negative for the institutional and fund manager allocations. The factors associated with a higher likelihood of the allocation data being reported also tend to result in increased domestic and private bank interest and reduced fund manager demand. This probably reflects the greater weighting in the allocation sample towards more recent years particularly the 2009 to 2012 period, with these immediate post-financial crisis years being characterised by high, albeit falling, bond yields (source: Markit), resulting in greater private bank involvement (Merriman, 2009). Market conditions were also more volatile (source: Bloomberg), which would have led to greater adverse selection concerns amongst investors

(Blackwell and Kidwell, 1988) and hence increased reliance on the domestic investor base, being the most familiar with their prospects and true quality.

In line with my expectations the GFU dummy has a positive and highly significant coefficient in both Models 1 and 2 (p values of 0.000 for both). This is consistent with the notion that there is persistently strong home selection bias in the placement of new European bond tranches with the three major economies benefiting from a large and loyal investor base (Chan et al., 2005).

Interestingly domestic allocations are also negatively related to tranche tenor in Model 2. This likely reflects the more concentrated buyer base for long dated debt issues, mostly consisting of selected pension funds and insurers, requiring issuers to market to a wider range of countries. I also find that higher credit spread, FRN and EMTN tranches are associated with lower domestic allocations, in line with expectations of these control factors. The same holds for non-publicly owned firms.

My results also provide partial confirmation of my expectation that GFU issuers attract more institutional investor demand with the GFU dummy coefficient in Model 6 on PF&I being positive and weakly significant (p=0.087). It is however not related to fund managers or institutional investors taken as a whole. This likely reflects greater domestic bias amongst pension funds and insurers with pension funds in particular generally having stronger government ties and hence expected to purchase more domestic offerings (Perotti and Schwienbacher, 2009). In this regression they can hence be partially regarded as a proxy for domestic interest.

The composition of investor type allocations is strongly driven by tranche rating and tenor, with my findings for these variables corroborating my earlier

univariate analysis. The credit rating number is negatively related to both PF&I and institutional investors and tranche maturity is negatively related to PB&R and positively to both PF&I and institutional investors. This is consistent with the notion that insurers adopt risk-averse investment strategies out of litigation risk concerns (Chen et al., 2007) and purchase longer dated instruments for asset-liability matching reasons (Massa et al., 2013). PB&R skew their holdings towards shorter tenors which match their investment horizon and liquidity requirements (Che-Yahya et al., 2014).

I also find that investor type allocations are impacted by the credit spread and tranche size as well as a firm's public ownership, leverage and size. Credit spread is positively related to institutional investor allocations albeit it does not influence either fund managers or PF&I independently. This likely reflects that issuers with a more concentrated orderbook of either fund managers or PF&I will have less pricing power as a result of these investors' greater price sensitivity (Neupane and Poshakwale, 2012). Tranche size on the other hand is negatively related to PF&I. As pension funds and insurers are more conservative investors they are less likely to scale their order for larger tranches (International Capital Markets Association, 2012) resulting in their allocations of these issues dropping. In practice major fund managers on the other hand will place an order that is proportional to the tranche size. The publicly owned dummy is negatively related to fund manager allocations and positively related to PF&I allocations, corroborating the notion of political pressures resulting in government-related pension funds crowding out other institutional investors. Leverage is positively related to institutional allocations, albeit does not have a significant coefficient for either of the independent fund managers and PF&I regressions. This likely reflects that highly levered issuers have

made more frequent use of the bond markets and have exploited most available interest from smaller non-institutional investors (Ødegaard, 2009). Company size is negatively related to fund manager interest suggesting that the greater name recognition of large firms allows them to draw in a broader investor base, away from the most dominant type.

5.5.4 Impact of country

As a first extension of my main model I substitute the GFU dummy with independent country categoric variables. These are applied for the six largest economies in my sample, being Germany, France, United Kingdom, Netherlands, Italy and Spain, while a lower tier dummy captures the residual countries. In additional testing I apply region-based categoric variables to match the geographic allocations, for instance a dummy if the issuer resides in Germany, Austria or Switzerland. [104] This approach has several practical and empirical benefits. The GFU dummy fails to account for the distinct economic, legal, political and cultural make-up of each of the component countries. Cross-national differences in such factors as creditor rights, banking sector size, legal framework and GDP per capita (Zhang, 2016) can be seen to influence the size of the public debt investor base, and hence the strength of the domestic bias, as well as the dominant types of domestic bond investors. For instance issuers from countries with a higher GDP per capita are expected to have access to a larger domestic PB&R investor base. In addition through the use of the GFU variable the main model groups an arguably even more

[104] With the major difference being that no Scandinavian issuers are included in my sample as Dealogic does not classify these countries as Western European.

heterogeneous range of non-GFU economies as the omitted reference group, consisting of Austria, Belgium, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain and Switzerland.

I expect these models to yield several new findings on the relation between country variables and allocations in the European debt capital markets. They will likely show that amongst the top tier economies only French and German firms have a higher proportion of domestic allocations than other European countries. The UK dummy is expected to have a negative coefficient as my sample excludes sterling-denominated tranches. Even though London is Europe's dominant financial centre (Chan et al., 2005) I posit that UK-based investors will have already amassed a sizeable exposure to their domestic companies through their sterling bond issuance (Bluebay, 2015), making them more selective in their purchase of euro-denominated bonds from the same issuers for portfolio diversification reasons.

I also envisage that firms from mid-tier economies will be associated with lower domestic allocations, while those from lower tier economies will have a positive relation with this variable. Firms from these mid-tier economies, being Italy, Spain and the Netherlands, are likely to be able to raise a relatively smaller proportion of their funding through domestic investors as they have outgrown the available domestic bond market liquidity. They are hence required to make more of a concerted effort at targeting international investors. Similar geographic diversification is required for Australian firms who in recent years have been issuing a larger share of non-australian dollar denominated bonds (Cheng, 2011). These concerns are expected not to apply to the lower tier economies, namely Austria, Belgium, Greece, Ireland, Luxembourg, Portugal and Switzerland. They are

relatively less frequent issuers in my sample and can hence continue to rely to a larger extent on their domestic bond market.

The investor type results are expected to also differ across issuer country. German issuers will allocate a relatively large share of their offering to non-institutional accounts as a result of the country's distinct system of regional public banks. These are an investor type unique to Germany, being municipality-backed credit institutions that provide both loan and bond investments, predominantly to German companies (Simpson, 2013). Their investments are expected to partially crowd out allocations to traditional institutional investors, as they also provide sizeable long-term investments (Massa et al., 2013).[105]

My expectation is also that companies from mid-tier economies tend to have higher institutional allocations while the opposite applies for those from lower-tier economies. I posit that firms from mid-tier economies will focus their investor diversification efforts on institutional investors given the greater return on effort from marketing to these major accounts (Johnson, 2014). Firms from lower-tier economies are less likely to engage in such active international marketing as discussed earlier.[106]

The results for my second stage tobit models on issuer geography can be found in Table 5.11, the structure of which mirrors the main model in Table 5.10. The table is split into three panels, with Panel A including only categorical variables for the three largest economies, Panel B for the six largest economies and Panel C

[105] These public savings banks are typically categorised as "Other investors" in allocation statistics.
[106] This applies especially to the Swiss firms in this group, who are likely to benefit from stronger access to a sizeable domestic private banking industry (Koh and Tan, 2014)

for all the geographic regions. France is excluded from Panel B and C as it constitutes the omitted reference group, being both the country and region with the largest number of observations in my data set. I do not report the control variables for the sake of brevity.[107]

In Models 1 and 2 I find strong evidence for a non-linear relation between economy size and the percentage domestic allocations with the proportion of domestic allocations generally being higher for top and lower-tier than for mid-tier economies. Amongst the top tier economies both France and Germany attract a relatively high share of domestic demand for their bond offerings, as highlighted in Panel A and B, with that of Germany being highest as a result of its relative economic size (source: Eurostat). As anticipated the UK domestic allocations are relatively low, being smaller than those French issuers enjoy, reflecting the exclusion of sterling-denominated tranches. In line with expectations issuers from mid-tier economies have become less reliant on their domestic investor base, with the coefficients for Italy, Spain and the Netherlands all being negative in Panel B. This is consistent with the notion that these bond issuers have outgrown their home market and have made a concerted effort to attract non-domestic investors; a trend previously described for Australian firms (Cheng, 2011). Firms from lower tier economies have not yet had to engage in such marketing given the low frequency with which they issue (source: Dealogic). I find that their typical domestic allocations are comparable to French firms and hence higher than those of mid-tier economies.

[107] There are no major differences between these and the main model shown in Table 6.8.

My results in Models 3 to 6 show that an issuer's home country influences the investor type composition of its allocations. Firms from top tier economies tend to rely on institutional or quasi-institutional investors, while those from mid-tier economies also seek to market to this investor class. Companies from lower tier economies can rely more on PB&R to fulfil their modest funding requirements. In line with expectations I find in Model 4 of Panel A and B that German firms allocate less to institutional investors, particularly PF&I. This is consistent with the notion that traditional institutional investor demand is cannibalised by interest from public savings banks, being quasi-institutional investors (Simpson, 2013). The results of Model 3 of Panel A and B also show that German issuers allocate more to PB&R than most other top and mid-tier economies. This probably reflects strong support from the predominantly German-speaking Swiss private bank community (Koh and Tan, 2014), for whom investing in German firms represents lower information asymmetry risks. UK bond issuers tend to attract a larger number of traditional institutional investors, either fund manager or PF&I. This likely reflects their proximity to London's financial centre, being home to one of the largest communities of institutional investors (Chan et al., 2005). French firms are associated with higher PF&I allocations, as is apparent from Model 6. I posit that this partly reflects political influence in the decision making of major French pension funds and insurers, with a relatively large number of major French bond issuers having (partial) government ownership (Borisova et al., 2015).

As anticipated companies from mid-tier economies typically also allocate a relatively large share of their securities to institutional investors, with Model 4 from Panel B highlighting that typical institutional allocations of Italian and Spanish firms are similar to those of French firms. This corroborates my assumption that they

engage in active marketing towards the largest pan-European institutional investors so as to obtain sufficient additional bond investor demand beyond their domestic investor base (Cheng, 2011). Dutch firms are a slight aberration in this regard, allocating relatively more to PB&R. This probably reflects that like German firms they are expected to have strong access to the sizeable Swiss private banking investor base (Koh and Tan, 2014), given the substantial institutional similarities between the Netherlands and Germany (CPB, 1997). Firms from lower tier economies allocate more to PB&R and less to institutional accounts, as is apparent from Models 3 and 4 of Panel B. This is consistent with the notion that they are less frequent bond issuers and hence do not need to actively market to large, non-domestic fund managers and PF&I.

5.5.5 Impact of oversubscription

My next extension test considers the impact of orderbook oversubscription on allocation parameters, a variable I employ to proxy for the degree of allocation flexibility a company has. My testing thus far has focused on typical allocation patterns as opposed to preferred allocation patterns.[108] Given the sizeable observed differentials in orderbook oversubscription in the European primary markets (see Chapter 3) there are expected to be significant differences in the level of flexibility an issuer has in distributing its bonds; the higher the oversubscription rate, the larger the range of possible allocation permutations.

[108] For instance issuers from top tier economies may generally end up allocating more to domestic accounts but would they not prefer to have a more geographically diversified investor base?

I expect issuers with higher oversubscribed tranches to allocate less to domestic investors. While I have established that only issuers from mid-tier economies are required to diversify geographically I also envisage that other issuers will seek such diversification if given the optionality. Massa and Zalkodas (2014) find that internationally recognised US issuers obtain more cost-effective pricing through accessing the international bond markets, benefiting from investors' diversification preferences in these non-domestic markets. Similarly one can argue that well-known European issuers will be able to price their euro-denominated tranches at more attractive levels by obtaining access to a greater number of non-domestic European accounts. Such broader market access requires management time and resources, meaning firms with a sufficiently sizeable domestic investor base will only engage in diversification if low-cost opportunities present themselves, for instance through issuing in hot bond market conditions (Derrien, 2005).

This expectation is not consistent with the notion that domestic bond investors could be considered inside investors, implying they are better monitors as well as more informed counterparties in a renegotiation discussion (Fama, 1985). However this consideration is expected to play an insignificant role in my sample of generally well-established investment grade companies. One could also argue that issuers feel a sense of loyalty towards their domestic investor base, which would lead them to reward such accounts with more sizeable allocations in highly oversubscribed tranches. This loyalty argument would be somewhat akin to Pinheiro's (2008) findings that employees overinvest in their own company stock, thereby missing out on the mean-variance returns benefits of a more diversified share portfolio. I do not expect this sentiment to prevail amongst my sample, given that it is made up of sizeable and mostly international corporations.

I also envisage that oversubscription is negatively related to the percentage of institutional allocations. Institutional investors tend to be more price sensitive and hence in practice issuers with a larger orderbook will seek to allocate more to smaller non-institutional investors, known as the tail-end of the orderbook, so as to optimise the at-issue pricing. This enhanced price sensitivity results from institutional accounts making large long term investments, exposing them to higher interest rate and default risk (Allen et al., 2008). The issuer pricing benefits of greater non-institutional demand has been established in literature on primary equity offerings. Neupane and Poshakwale (2012) find that in the Indian IPO market the level of retail investor participation has a positive impact on the final IPO price.

Issuers of higher oversubscribed tranches could also be expected to diversify away from institutional investors out of managerial control considerations. As argued by Denis and Mihov (2003), firms with low managerial equity stakes will want to avoid the greater scrutiny associated with creating powerful new external debt stakeholders. This is expected to apply to my sample given that they consist of sizeable firms with presumably low managerial holdings. They will hence prefer less major institutional investors holding their bonds when given the flexibility. Note that the preferred non-institutional investors could be both PB&R and other types, such as central banks, hedge funds and corporate treasuries, and hence I do not envisage a significant relation with PB&R. Evidence of this type of discrimination has been found in the equity offering literature. Brennan and Franks (1997) conclude that UK equity IPO issuers seek to build up a larger orderbook so they can allocate away from large applicants and avoid creating several highly influential new shareholders.

I envisage that these pricing and control considerations outweigh any relational benefits from providing preferential allocations to institutional investors. It could be argued that institutional investors should be assigned a greater share of a popular and highly oversubscribed tranche, as has recently been done by capital markets industry bodies (International Capital Markets Association, 2015), as they operate a long term, buy and hold strategy (International Capital Markets Association, 2014) which is supportive of the future performance of a company's bond tranche (Che-Yahya et al., 2014). Also individually they have more financial liquidity than any of the other investor types, so are more likely to be able to also participate in future tranches of the company, reducing associated search costs (Blackwell and Kidwell, 1988). However in practice such investors are used to receiving relatively low allocations as a result of a high oversubscription rate given they are amongst the most frequent investors; not offering a preferential allocation will hence not necessarily be seen as relationship-destructive and impacting an issuer's future access to these accounts.

Results of my oversubscription regressions are set out in Table 5.12. As with the regressions for issuer geography for brevity I only report the constant, the Mills ratio and the coefficients for the explanatory variables.[109] I observe a negative relation between the level of oversubscription and the percentage domestic allocations in both Models 1 and 2.[110] This is consistent with the concept derived from portfolio choice theory that issuers should seek to obtain a geographically well-diversified range of bondholders so as to optimise their bond market cost of funding.

[109] Also for these regressions there are no major differences between the control variables in these regressions and those shown in the main model in Table 5.10.
[110] This also applies when only regressing for the top tier economies, i.e. Germany, France and the UK. In other words even those firms that I have found typically rely most on domestic demand will diversify internationally if given the optionality.

This type of well-spread investor base also offers an issuer stronger market access, making it less beholden to the economic or financial cycle of their home economy.

These results are also consistent with my expectation that issuers with sufficient domestic bond market liquidity may not typically find it cost-efficient to invest time and resources into diversifying their bond investor base, for instance through organising a three-day roadshow where treasury personnel and senior management meet with debt investors across various countries. However should external opportunities present themselves that offer greater allocation flexibility at a reduced cost they do take advantage of these. An example of this would be the ability to issue in particularly strong bond market conditions and thereby build up a larger and more geographically diversified orderbook (Derrien, 2005).[111]

My results also show that issuers with highly oversubscribed trades allocate less to institutional accounts, in particular PF&I, as highlighted in Models 4 and 6. This suggests that pension funds and insurers are typically amongst the most price sensitive and largest investors in an orderbook, therefore being least attractive for the management of an issuer that seeks to optimise its cost of funding and reduce threats to its control (Johnson, 2014). Such enhanced price sensitivity could result from their longer investment horizon (see Section 5.4.3). These results are consistent with the managerial control considerations formulated by Denis and Mihov (2003) as well as the results of Brennan and Franks (1997) equity IPO study. They suggest that corporates avoid creating the same type of controlling creditors in the bond market

[111] Alternatively an issuer could take advantage of what practitioners refer to as reverse enquiries, being interest expressed by an investor to purchase a privately placed bond from the issuer. Such reverse enquiries from non-domestic investors could also help widen the issuer's investor base.

as they already have, or could end up getting, in the bank loan market and non-bank private placement market (Denis and Mihov, 2003).

5.5.6 Impact of bookrunner syndicate parameters

My final extension test considers the impact of bookrunner syndicate parameters. These are expected to impact the allocation statistics indirectly, through the make-up of the orderbook, as well as directly through the allocation decision process. Adjustments to the make-up of a bookrunner syndicate is expected to influence the orderbook composition as each bookrunner maintains a distinct combination of investor relationships (Chemmanur and Krishnan, 2012) to whom he will market the tranche. Bookrunners also co-ordinate the allocation process (see Chapter 2.2) and can hence be expected to influence the outcome of this process. In practice following the closing of the orderbook the syndication professionals at the bookrunners will prepare a recommended allocation of a tranche, seeking to avoid allocating to lower quality investors who would immediately sell the bond, known as the flippers, while rewarding those accounts who have been transparent and given constructive feedback in the bookbuilding process.[112] They will also take into account any allocation preferences provided by the issuer before the start of this process, i.e. towards particularly investors, investor types or countries. The company subsequently reviews and signs off on the proposed allocation statistics.

[112] For instance, did the investor give useful feedback early in the process and clear indication of interest? Or did they enter the orderbook at the last minute, when it was clear the trade would be successful?

For this analysis I employ variables for bookrunner reputation and bookrunner geography (see Chapter 4). As mentioned in Section 5.5.2 bookrunner size is excluded as it has no theoretical or direct empirical bearing on allocation statistics.[113] I proxy for bookrunner reputation through the percentage of active bookrunners that are in the Top 10 of my overall sample. This is a more suitable variable than the percentage of total bookrunners in the Top 10 as the latter includes passive bookrunners that are not involved in the bookbuilding or allocation processes. It is also preferable to average ranking as a categoric variable more accurately represents the binary nature of reputation postulated in precedent literature (Chemmanur and Krishnan 2012).[114]

I expect this variable to be negatively related to PB&R allocations and positively related to institutional investor allocations.[115] Chemmanur and Krishnan (2012) argue that high-reputation financial intermediaries are able to attract a larger amount of institutional investor demand as a result of embedded long-term relationships. I expect them to nurture these relationships through seeking to offer preferential allocations. Reputable bookrunners are arguably less invested in their relationships with private bank and retail investors given the smaller typical orders of this investor class (Johnson, 2014). Practitioners argue that long-standing bookrunner-institutional investor relationships can benefit the smooth execution of a tranche as it allows high-reputation bookrunners to source useful feedback ex ante on

[113] While the number of active bookrunners is significantly negatively related to percentage domestic this results from a positive correlation with the number of non-domestic bookrunners. In other words the more bookrunners one appoints the more likely this includes non-domestic bookrunners. Taken together with the latter variable this relationship loses its statistical significance. The number of active bookrunners is also not significantly related to any of the investor type allocations of interest.
[114] In several unreported regressions I have run my models of interest utilising the average ranking of active bookrunners. Results are qualitatively similar.
[115] I do not envisage a relation with geographic allocations but will nonetheless re-run these models for consistency.

tranche parameters, such as tenor, credit spread and size (International Capital Markets Association, 2015).

I proxy for bookrunner geography through the proportion of active non-domestic bookrunners. This is preferable to the proportion of non-domestic bookrunners as it excludes passive bookrunners. I expect this variable to not be related to domestic allocations. While theoretically non-domestic bookrunners should be associated with reduced search costs in accessing non-domestic investors (Blackwell and Kidwell, 1988) I expect these marginal cost reductions to be negligible for most of my tranches in practice. European investors are characterised by strong home selection bias (see Section 5.5.4), which cannot solely be overcome through adjusting a bookrunner syndicate. French investors favour French issuers because they are more familiar with their business profile, not because these firms are marketed by BNP Paribas. This is partly corroborated by results in Chapter 4 that the costs of appointing non-domestic bookrunners, in particular through weaker issuer-bookrunner relationships, tend to outweigh the search benefits.

I also expect the proportion of non-domestic bookrunners to negatively impact the institutional investors allocation percentage. Issuers arguably tend to have longer relationships with their domestic banks, which enhances their chances of being appointed a bond bookrunner role (Yasuda, 2005). Non-domestic banks are therefore required to offer non-relational competitive advantages, which I expect to be reflected in the provision of a broader investor distribution platform. While they may not be able to offer this through additional geographic diversification they can specialise in marketing to alternative investor types, away from the large institutional accounts that are known to the majority of bookrunners. Such niches could be found

in private banking networks, central banks, hedge funds or even smaller fund managers.

My bookrunner regression results are shown in Table 5.13. Panel A contains the model estimates for bookrunner reputation while Panel B covers bookrunner geography. I find in Models 3, 4 and 6 of Panel A that tranches with high-reputation bookrunners are associated with lower allocations to PB&R and higher allocations to PF&I and consequently institutional accounts. This is consistent with Chemmanur and Krishnan's (2012) notion of high reputation bookrunners having long-standing relationships with major institutional investors; I find that in the bond markets this results in preferential allocations. Reputable bookrunners are arguably more invested in these relationships than lower tier bookrunners given their more frequent interactions. If a major insurer is dissatisfied with the execution or secondary performance of one Top 10 bookrunner-led tranche this could impact their ability to participate in the numerous other tranches this bookrunner will market in the following days. Lower tier bookrunners engage less frequently in such negotiations and will hence less often face these tit for tat risks.

My results in Models 4 and 6 of Panel B show that appointing more non-domestic bookrunners leads to a reduction in allocations to PF&I and institutional investors. This is consistent with my notion that non-domestic bookrunners seek to offer complementary distribution capabilities as a competitive advantage through targeting alternative types of bond investors which end up partly substituting for the more well-established PF&I demand. The marginal benefits of these distribution

niches are however arguably limited given they do not outweigh the relational benefits of appointing domestic bookrunners (see Chapter 4).[116]

5.6 Conclusion

In this chapter I conduct an exploratory analysis into the factors that determine the investor type and geography allocation splits of a bond tranche. My sample comprises 309 euro-denominated investment grade bond tranches issued by 136 Western European corporates between 2001 and 2012. It is sourced from IGM Deal Navigator, a unique database which to my knowledge has not been consulted in prior corporate bond market studies. My main analysis is conducted through a Heckman two-stage regression, allowing me to control for allocation availability bias.

My results provide a new source of empirical evidence for several well-established and intuitive relations between tranche variables and the nature of bond investor demand. I find that private banks and retail accounts prefer shorter tenors, fund managers medium tenors and pension funds and insurers longer tenors respectively. This confirms the divergent investment horizons of these investor bases, driven by such factors as liquidity needs, portfolio turnover and the nature of their liabilities (Massa et al., 2013; Yoon, 2015). My findings also show that pension funds and insurers are relatively risk-averse, being more prevalent in higher rated

[116] In unreported regressions I also test the impact of the proportion of non-domestic Top 10 bookruners, a variable I introduce in Chapter 4. Its coefficients are insignificant in all models.

tranches. This is in line with Chen's notion of litigation concerns driving a conservative investment strategy (Chen et al., 2007).

I also find that investor geography impacts the allocation composition, with my results suggesting a non-linear relation between the economy size and the percentage allocated to domestic investors. The proportion of domestic allocations is higher for firms from top and lower-tier economies than for mid-tier economies. Firms from top tier economies such as Germany, France and the UK benefit from stronger access to a sizeable domestic investor base, thereby reducing the need to diversify geographically (Chan et al., 2005; Kang and Stulz, 1997). Companies from mid-tier economies such as Italy, Spain and the Netherlands have outgrown their relatively smaller bond investor base and are hence forced to actively target foreign investors (Cheng, 2011). Issuers from lower tier economies tend to have limited funding needs of which their small domestic investor base can still provide a sizeable portion. These results provides a new source of support for the home selection bias theory (Chan et al., 2005; Kang and Stulz, 1997). Even when investors purchase low risk investment grade bonds they exhibit a preference towards the more familiar domestically headquartered corporates.

My findings also show that corporate treasurers seek to overcome this bias when given greater allocation flexibility through allocating more to foreign investors. While many corporate treasurers may not need to engage in such active diversification they do recognise its benefits. They select low-cost opportunities to broaden their investor base, for instance through issuing in strong bond market conditions (Derrien, 2005; Foley, 2012). This result provides weak evidence of the

price and market access benefits of having a more geographically diversified investor base (Massa and Zalkodas 2014).

I also find that an issuer's home country has an important influence on the investor type composition of its bond allocations. Firms from mid and top tier economies generally rely more on different types of institutional and quasi-institutional investors for their more sizeable funding programmes, with the dominant type driven by politics, local legislation and marketing strategies. German companies allocate more to local public savings banks (Simpson, 2013), French firms target domestic pension funds and insurers (Borisova et al., 2015) and Italian and Spanish firms market to pan-European pension funds and insurers. Companies from lower tier economies can rely more on private bank and retail accounts to meet their more modest debt financing requirements.

The investor type composition is also related to the bookrunner syndicate with high quality intermediaries generally attracting more institutional investor interest. This reflects their longer standing relationship with these accounts (Chemmanur and Krishnan, 2012). This investor base however tends to be more price sensitive and can pose a threat to managerial control, which is why I also find that issuers of higher-oversubscribed trades tend to allocate less to institutional accounts (Denis and Mihov, 2003). Appointing non-domestic bookrunners can help contribute to this purpose as my results show that they tend to be better able at finding specific niches of bond investor demand away from the major institutional accounts.

Table 5.1: Sample geographic split

Breakdown of allocation sample by issuer's country of incorporation. GDP statistics are obtained from the IMF World Economic Outlook 2015 and quoted in USD billion based on current prices.

	# tranches	GDP 2001	GDP 2012
Panel A: Top tier economies			
Germany	70	1,949.6	3,535.2
France	94	1,383.4	2,688.2
United Kingdom	35	1,529.6	2,624.3
Panel B: Mid-tier economies			
Italy	38	1,163.8	2,076.4
Spain	19	626.5	1,356.5
Netherlands	19	426.5	823.6
Panel C: Lower tier economies			
Switzerland	6	278.7	665.9
Belgium	7	237.6	499.1
Austria	8	197.1	407.8
Greece	2	136.1	249.7
Ireland	3	108.5	222.1
Portugal	5	121.7	216.5
Luxembourg	3	21.0	56.3

Table 5.2: Calculations and sources for bookrunner characteristics and other model variables

The table presents variable definitions for allocation, tranche, firm, demand and bookrunner characteristics for a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012.

Variable	Calculation	Source
Panel A: Allocation characteristics		
Geographic split	Allocation percentages to i) Germany, Austria and Switzerland, ii) UK & Ireland, iii) France, iv) Benelux, v) Scandinavia, vi) Southern Europe and vii) Other geographies.	IGM Deal Navigator
Type split	Allocation percentages to i) Central banks, ii) Fund managers, iii) Pension funds and insurers, iv) Private banks and retail, v) Corporate treasuries, vi) Hedge funds and vii) Other types.	IGM Deal Navigator
# Types	Count of the number of different investor types the tranche is allocated to.	IGM Deal Navigator
% Domestic	Allocation percentage to geographic region encompassing issuer's country of incorporation.	IGM Deal Navigator, IGM
Top tier economies	Indicator variable equal to one if the issuer's home jurisdiction is Germany, France or the United Kingdom, zero otherwise.	Dealogic, company reports
Mid-tier economies	Indicator variable equal to one if the issuer's home jurisdiction is Italy, Spain or the Netherlands, zero otherwise.	Dealogic, company reports
Lower tier economies	Indicator variable equal to one if the issuer's home jurisdiction is Austria, Belgium, Greece, Ireland, Luxembourg, Portugal or Switzerland, zero otherwise.	Dealogic, company reports
Institutional allocations	Sum of allocation percentages to i) Fund managers and ii) Pension funds and insurers.	Deal Navigator
Panel B: Tranche characteristics		
Pricing date	Date in which the bond was issued.	Dealogic
Pricing year	Year in which the bond was issued.	Dealogic
Credit rating	The numeric value for the S&P rating assigned to the bond tranche on the issue date, ascending from 1 for AAA to 10 for BBB- and 11 for unrated tranches.	S&P
Maturity	The natural logarithm of the tenor of the tranche in years.	Dealogic
Tranche size	The natural logarithm of the amount issued in EUR billions.	Dealogic
Multi-tranche	An indicator variable equal to one if the issuer sells 2 or more tranches in the same currency on the same day, and zero otherwise.	Dealogic
Frequency	Total number of tranches issued by the borrowing firm during the sample period.	Dealogic
Debut	An indicator variable set equal to one if the bond represents the firm's first syndicated public bond in the euro-denominated market, and zero otherwise.	Dealogic
Credit spread	At-issue yield to maturity minus the benchmark euro midswap rate for the equivalent tenor.	Dealogic, Bond prospectus
FRN	Indicator variable equal to 1 if the bond has a floating rate coupon.	Dealogic, Bond prospectus
EMTN	Indicator variable equal to 1 if the bond is issued off an EMTN programme.	Dealogic
Panel C: Firm characteristics		
Leverage	Book value of total debt divided by total assets.	Datastream
Publicly owned	An indicator variable equal to one if 50% or more of the firm's shares are owned by the national government, and zero otherwise.	Company reports
Firm size	The natural logarithm of the issuer's book value of total assets in EUR billions.	Datastream
Profitability	Earnings before interest, taxes, depreciation and amortization (EBITDA) divided by book value of total assets.	Datastream
Intangible assets	One minus the ratio of net property, plant, and equipment divided by the book value of total assets.	Datastream
Growth opportunities	Book value of total assets plus market value of equity minus book value of equity, divided by the book value of total assets.	Datastream
GFU	An indicator variable equal to one if the issuer is headquartered in Germany, France or the UK.	Dealogic, company reports
Panel D: Demand characteristics		
Oversubscription	Orderbook size divided by issue size.	GlobalCapital, IFR
Panel E: Bookrunner characteristics		
Total BR	A count of the total number of bookrunners on a tranche.	Dealogic, Bond prospectus
Total Active BR	A count of the total number of active bookrunners on a tranche.	Dealogic, Bond prospectus, financial press
Passive BR	An indicator variable taking the value of one if a tranche includes a passive bookrunner, and zero otherwise.	Dealogic, Bond prospectus, Financial press
% of Active Top 10 BRs	The percentage of active bookrunners on a tranche that are a Top 10 bank by deal value during the sample period.	Dealogic, Bond prospectus
% of Active Non-domestic BRs	The percentage of active bookrunners headquartered in a different country to the issuer.	Dealogic, Bond prospectus

Table 5.3: Comparison between allocation and non-allocation sample

Univariate comparison of a subsample of euro-denominated public bond tranches for which reliable allocation data is available, the allocation sample, with tranches for which this is not the case, the non-allocation sample, totalling 309 and 915 tranches respectively. All variables are defined in Table 5.2.

Variable	Allocation sample			Non-allocation sample					
	#	Mean	Median	#	Mean	Median	ANOVA	kruskal-wallis	Wilcoxon Rank Sum
Panel A: Tranche characteristics									
Pricing date	309	29Jul10	08Sep11	915	18Dec06	18May07	0.000	0.000	
Credit rating	309	7.44	7.00	915	7.17	7.00	0.086	0.271	
Maturity	309	7.46	7.00	915	7.25	7.00	0.517	0.000	
Tranche size	309	0.83	0.75	915	0.81	0.70	0.557	0.001	
Multi-tranche	309	0.29	0.00	915	0.30	0.00	0.956	0.965	0.956
Frequency	309	9.09	7.00	915	8.73	7.00	0.430	0.056	
Debut	309	0.11	0.00	915	0.29	0.00	0.000	0.000	0.000
Credit spread	309	1.50	1.15	884	1.33	0.90	0.027	0.000	
FRN	309	0.02	0.00	915	0.10	0.00	0.000	0.020	0.000
EMTN	309	0.84	1.00	915	0.73	1.00	0.000	0.006	0.000
Panel B: Firm characteristics									
Leverage	287	0.34	0.34	808	0.34	0.35	0.532	0.410	
Publicly owned	309	0.11	0.00	915	0.15	0.00	0.065	0.271	0.065
Firm size	287	64.12	36.50	808	55.67	36.25	0.029	0.056	
Profitability	287	0.12	0.11	808	0.16	0.11	0.570	0.406	
Intangible assets	287	0.64	0.66	808	0.65	0.68	0.426	0.296	
Growth opportunities	278	1.3	1.18	765	1.34	1.20	0.087	0.110	
GFU	309	0.64	1.00	915	0.69	1.00	0.120	0.209	0.120
Panel C: Demand characteristics									
Oversub-scription	303	4.50	3.83	799	3.40	2.67	0.000	0.000	
Panel D: Bookrunner characteristics									
Total BR	309	5.29	4.00	915	3.66	3.00	0.000	0.000	
Total Active BR	309	4.38	4.00	915	3.44	3.00	0.000	0.000	
Passive BR dummy	309	0.18	0.00	915	0.05	0.00	0.000	0.001	0.000
% of Active Top 10 BRs	309	0.65	0.67	915	0.62	0.67	0.120	0.148	
% of Active non-domestic BR	309	0.66	0.67	915	0.66	0.67	0.846	0.911	

Table 5.4: Summary allocation statistics

Summary statistics of a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. All variables are defined in Table 5.2.

Variable	#	Mean	St dev	Low	P25	Median	P75	High	# positive instances	% positive instances
Panel A: Allocation by investor geography										
% Domestic	309	31.96	16.84	0.00	18.00	29.00	43.00	79.00	305	99%
% Germany, Austria and Switzerland	309	30.45	14.02	0.00	21.00	28.00	38.00	79.00	305	99%
% UK & Ireland	309	18.76	10.63	0.00	11.00	17.00	25.00	50.00	301	97%
% France	309	24.29	14.36	0.00	15.00	21.00	30.00	75.00	303	98%
% Benelux	309	7.73	5.35	0.00	4.00	7.00	10.00	41.00	271	88%
% Scandinavia	309	1.88	2.92	0.00	0.00	0.00	3.00	24.00	133	43%
% Southern Europe	309	9.07	9.03	0.00	3.00	7.00	12.00	53.00	252	82%
% Other geographies	309	7.78	7.53	0.00	3.00	5.00	11.00	46.00	296	96%
Panel B: Allocation by investor type										
# Types	309	4.09	0.67	2.00	4.00	4.00	4.00	6.00	309	100%
% Central banks	309	0.57	2.74	0.00	0.00	0.00	0.00	39.00	35	11%
% Fund managers	309	58.73	13.04	20.00	50.00	61.00	68.40	85.00	309	100%
% Pension funds and insurers	309	18.31	11.42	0.00	11.00	16.00	23.00	70.00	302	98%
% Private banks and retail	309	16.51	11.42	0.00	10.00	14.00	20.00	75.00	291	94%
% Corporate treasuries	309	0.22	0.87	0.00	0.00	0.00	0.00	6.00	23	7%
% Hedge funds	309	0.47	1.61	0.00	0.00	0.00	0.00	11.00	37	12%
% Other types	309	0.51	6.53	0.00	1.00	3.00	6.00	43.00	267	86%

Table 5.5: Cluster analysis on tranche allocation statistics

Clustered tranche summary statistics of a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. For cluster analysis I use the Stata command cluster kmeans and define clusters over all seven investor type sets simultaneously. I obtain three clusters using the stopping rule based on the Calinski/Harabasz index. Mean and median are reported for each cluster and for the overall sample. # Obs counts the number of tranches in a particular cluster. All variables are defined in Table 5.2.

Panel A: Investor type clusters

	% Central banks		% Fund managers		% Pension funds and insurers		% Private banks and retail		% Corporate treasuries		% Hedge funds		% Other types		# Obs.
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
1	0.41	0.00	44.76	46.30	12.89	11.50	35.20	33.50	0.27	0.00	0.69	0.00	5.57	4.00	60
2	1.01	0.00	48.51	50.00	33.27	29.00	10.82	11.00	0.10	0.00	0.22	0.00	5.95	3.00	71
3	0.45	0.00	67.51	67.00	14.18	14.00	12.47	13.00	0.25	0.00	0.49	0.00	4.65	3.00	178
All	0.57	0.00	58.73	61.00	18.31	16.00	16.51	14.00	0.22	0.00	0.47	0.00	5.13	3.00	309

Panel B: Tranche characteristics of investor type clusters

	Credit rating		Maturity		Tranche size		Multi-tranche		Frequency		# Obs.
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
1	7.18	7.00	6.28	5.00	0.90	0.75	0.33	0.00	11.95	10.50	60
2	6.73	7.00	9.46	10.00	0.83	0.70	0.30	0.00	8.62	7.00	71
3	7.80	8.00	7.06	7.00	0.81	0.75	0.28	0.00	8.31	7.00	178
All	7.44	7.00	7.46	7.00	0.83	0.75	0.29	0.00	9.09	7.00	309

	Debut		Credit spread		FRN		EMTN		# Obs.
	Mean	Median	Mean	Median	Mean	Median	Mean	Median	
1	0.12	0.00	1.13	0.68	0.07	0.00	0.78	1.00	60
2	0.11	0.00	1.31	1.15	0.01	0.00	0.79	1.00	71
3	0.10	0.00	1.70	1.35	0.00	0.00	0.88	1.00	178
All	0.11	0.00	1.50	1.15	0.02	0.00	0.84	1.00	309

Panel C: Investor demand and bookrunner characteristics of investor type clusters

	Oversubscription		# Obs.	# Active bookrunners		% Active BR in Top 10		% Active non-domestic BR		# Obs.
	Mean	Median		Mean	Median	Mean	Median	Mean	Median	
1	3.38	2.60	56	3.55	3.00	63.36	66.67	68.33	66.67	60
2	3.54	3.00	69	4.00	4.00	71.36	75.00	58.79	60.00	71
3	5.24	4.67	178	4.80	5.00	63.02	60.00	67.36	66.67	178
All	4.50	3.83	303	4.38	4.00	65.00	66.67	65.58	66.67	309

Table 5.6: Tranche type allocations by rating subsamples

Univariate analysis of a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. The sample is split in four subsamples based on the tranche rating category: unrated, BBB-rated, A-rated and AA-rated. Reported statistics are the number of observations, mean and median. All variables are defined in Table 5.2.

Variable	Unrated			BBB			A			AA			
	#	Mean	Median	#	Mean	Median	#	Mean	Median	#	Mean	Median	kruskal-wallis
# Types	10	4.20	4.00	135	4.08	4.00	141	4.08	4.00	23	4.17	4.00	0.891
% Central banks	10	0.80	0.00	135	0.45	0.00	141	0.45	0.00	23	1.91	0.00	0.324
% Fund managers	10	50.50	49.50	135	61.72	64.00	141	57.45	61.00	23	52.56	52.00	0.000
% Pension funds and insurers	10	15.50	11.50	135	15.16	14.00	141	21.17	18.70	23	20.59	18.00	0.000
% Private banks and retail	10	18.70	16.50	135	17.03	13.00	141	15.72	14.00	23	17.26	19.00	0.750
% Corporate treasuries	10	0.30	0.00	135	0.10	0.00	141	0.26	0.00	23	0.61	0.00	0.696
% Hedge funds	10	1.00	0.00	135	0.58	0.00	141	0.40	0.00	23	0.00	0.00	0.731
% Other types	10	13.20	3.50	135	4.95	4.00	141	4.43	3.00	23	6.96	3.00	0.373

Table 5.7: Tranche type allocations by tenor subsamples

Univariate analysis of a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. The sample is split in four subsamples based on tenor of the tranche: 3-4.9 years to maturity, 5-6.9 years to maturity, 7-9.9 years to maturity and 10 years+ to maturity. Reported statistics are the number of observations, mean and median. Reported statistics are the number of observations, mean and median. All variables are defined in Table 5.2.

Variable	3-4.9 years			5-6.9 years			7 - 9.9 years			10 years+			
	#	Mean	Median	#	Mean	Median	#	Mean	Median	#	Mean	Median	kruskal-wallis
# Types	41	4.00	4.00	87	4.15	4.00	92	4.17	4.00	89	4.00	4.00	0.310
% Central banks	41	1.56	0.00	87	0.43	0.00	92	0.46	0.00	89	0.37	0.00	0.939
% Fund managers	41	54.34	56.00	87	60.61	63.00	92	62.61	65.50	89	54.89	58.00	0.000
% Pension funds and insurers	41	13.39	13.00	87	14.86	14.00	92	17.04	15.00	89	25.28	24.00	0.000
% Private banks and retail	41	23.40	19.00	87	19.05	16.00	92	13.56	12.00	89	13.89	13.00	0.000
% Corporate treasuries	41	0.44	0.00	87	0.29	0.00	92	0.13	0.00	89	0.13	0.00	0.879
% Hedge funds	41	0.15	0.00	87	0.55	0.00	92	0.74	0.00	89	0.26	0.00	0.475
% Other types	41	6.70	4.00	87	4.11	3.00	92	5.39	4.00	89	5.12	3.00	0.196

Table 5.8: Tranche type and geography allocations by issuer country

Univariate analysis of a sample of 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. The sample is split in five subsamples based on the issuer's country of incorporation: Germany, France, UK, mid-tier economies and lower-tier economies. Mid-tier economies include Italy, Spain and the Netherlands and lower-tier economies include Austria, Belgium, Greece, Ireland, Luxembourg, Portugal and Switzerland. Reported statistics are the number of observations, mean and median. # Types stands for the number of different investor types the tranche is allocated to. All variables are defined in Table 5.2.

Variable	Germany			France			UK			Mid-tier economies			Lower tier economies			
	#	Mean	Median	#	Mean	Median	#	Mean	Median	#	Mean	Median	#	Mean	Median	kruskal-wallis
Panel A: Allocation by investor type																
# Types	70	4.07	4.00	94	4.07	4.00	35	4.00	4.00	76	4.18	4.00	34	4.06	4.00	0.586
% Central banks	70	0.64	0.00	94	0.38	0.00	35	1.91	0.00	76	0.18	0.00	34	0.41	0.00	0.740
% Fund managers	70	53.73	54.50	94	57.50	60.00	35	61.91	65.00	76	63.55	64.00	34	58.31	61.55	0.000
% Pension funds and insurers	70	12.84	11.50	94	24.17	22.00	35	18.06	18.00	76	15.87	15.00	34	19.13	16.50	0.000
% Private banks and retail	70	24.24	22.00	94	13.32	11.00	35	13.60	11.00	76	14.85	14.00	34	16.09	15.00	0.000
% Corporate treasuries	70	0.51	0.00	94	0.15	0.00	35	0.06	0.00	76	0.04	0.00	34	0.35	0.00	0.456
% Hedge funds	70	0.27	0.00	94	0.53	0.00	35	0.09	0.00	76	0.95	0.00	34	0.03	0.00	0.418
% Other types	70	7.69	4.00	94	3.81	3.00	35	4.34	3.00	76	4.55	4.00	34	5.59	3.00	0.529
Panel B: Allocation by geography																
% Domestic	70	44.50	42.50	94	35.94	32.00	35	26.80	28.00	76	17.81	16.00	34	32.04	34.00	0.000

Table 5.9: Probit estimation results for the availability of allocation data

Estimates from probit regression analysis predicting the probability of reported allocation data being available for 1,224 euro-denominated public bond tranches made by 324 Western European firms during 2001-2012. All variables are defined in Table 5.2. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	coefficient	p-value
Constant	-10.098***	(0.001)
Instrumental variable		
Total Active BR	0.132***	(0.002)
Explanatory variable		
Oversubscription	0.031	(0.179)
Pricing year	0.221***	(0.000)
Credit rating	-0.012	(0.771)
Maturity	0.288***	(0.007)
Tranche size	0.340**	(0.024)
Multi-tranche	-0.110	(0.410)
Debut	-0.405**	(0.017)
Credit spread	-0.177***	(0.003)
FRN	-0.057	(0.844)
EMTN	-0.035	(0.835)
Leverage	-0.080	(0.856)
Publicly owned	-0.192	(0.442)
Firm size	-0.022	(0.784)
Profitability	-0.062*	(0.070)
Intangible Assets	-0.135	(0.683)
Growth Opportunities	0.066	(0.688)
Ind controls	yes	
Nobs	945	
Pseudo R^2	0.244	
Wald chi2	145.23***	(0.000)
Log pseudolikelihood	-430.22	

Table 5.10: Second stage tobit on impact of economy size on allocation statistics

Estimates from tobit regression analysis predicting the allocation statistics 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012. All variables are defined in Table 5.2. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 % domestic		Model 2 % domestic - major econ		Model 3 % PB&R	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	9.577	(0.879)	3.843	(0.950)	-22.917	(0.598)
Explanatory variables						
GFU	11.255***	(0.000)	16.970***	(0.000)	-1.748	(0.147)
Credit rating	-0.249	(0.727)	-0.694	(0.313)	-0.129	(0.779)
Maturity	-1.426	(0.614)	-4.490*	(0.073)	-5.272***	(0.002)
Mills alloc. available	23.963***	(0.002)	17.019**	(0.022)	9.172**	(0.024)
Control factors						
Tranche size	0.743	(0.806)	1.264	(0.662)	2.211	(0.305)
Multi-tranche	-3.918*	(0.075)	-2.739	(0.168)	-1.633	(0.229)
Debut	2.605	(0.597)	2.987	(0.562)	1.629	(0.602)
Credit spread	-4.724***	(0.000)	-2.983**	(0.020)	-0.551	(0.476)
FRN	-9.160	(0.207)	-13.135*	(0.080)	7.792	(0.358)
EMTN	-4.730	(0.118)	-6.640**	(0.024)	0.352	(0.851)
Leverage	-4.807	(0.572)	-2.314	(0.786)	1.511	(0.734)
Publicly owned	11.355**	(0.034)	11.712**	(0.025)	-3.910	(0.128)
Firm size	-0.022	(0.986)	-0.333	(0.782)	0.467	(0.527)
Profitability	31.867	(0.265)	42.878	(0.127)	-3.312	(0.815)
Intangible Assets	0.250	(0.964)	6.281	(0.254)	-0.539	(0.847)
Growth Opportunities	-0.956	(0.761)	-2.873	(0.327)	-2.875	(0.134)
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.060		0.075		0.092	
F-statistic	6.72***	(0.000)	7.87***	(0.000)	9.66***	(0.000)
Log pseudolikelihood	-1083.21		-961.80		-929.54	

Table 5.10: Second stage tobit on impact of economy size on allocation statistics (continued)

Variable	Model 4 % institutional		Model 5 % fund managers		Model 6 % PF&I	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	108.46***	(0.002)	12.215	(0.783)	98.382**	(0.032)
Explanatory variables						
GFU	1.853	(0.109)	-0.463	(0.752)	2.307*	(0.087)
Credit rating	-0.809**	(0.046)	0.287	(0.590)	-1.173***	(0.009)
Maturity	8.506***	(0.000)	-2.053	(0.255)	10.929***	(0.000)
Mills alloc. available	-10.951***	(0.004)	-13.980***	(0.003)	2.540	(0.614)
Control factors						
Tranche size	-1.481	(0.378)	3.194	(0.133)	-4.786**	(0.020)
Multi-tranche	0.909	(0.466)	0.287	(0.842)	0.653	(0.643)
Debut	1.328	(0.640)	3.095	(0.350)	-1.514	(0.623)
Credit spread	1.628**	(0.021)	0.857	(0.306)	0.885	(0.199)
FRN	-4.551	(0.216)	-2.020	(0.605)	-6.454	(0.115)
EMTN	-1.038	(0.518)	1.807	(0.405)	-2.869	(0.208)
Leverage	10.680***	(0.007)	7.202	(0.154)	3.676	(0.421)
Publicly owned	3.783	(0.147)	-9.244**	(0.020)	13.048***	(0.000)
Firm size	-0.912	(0.189)	-2.189**	(0.012)	1.216	(0.110)
Profitability	-3.506	(0.756)	-6.140	(0.669)	2.199	(0.883)
Intangible Assets	-0.471	(0.869)	4.511	(0.240)	-4.689	(0.245)
Growth Opportunities	-1.073	(0.555)	-0.209	(0.928)	-0.798	(0.718)
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.133		0.082		0.075	
F-statistic	28.10***	(0.000)	12.00***	(0.000)	6.64***	(0.000)
Log pseudolikelihood	-929.86		-994.27		-965.48	

Table 5.11: Second stage tobit on impact of issuer economy on allocation statistics

Estimates from tobit regression analysis predicting the allocation statistics 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012 using a range of issuer country indicator variables. All variables are defined in Table 5.2. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Panel A: Top tier economies						
Variable	**Model 1 % domestic**		**Model 2 % domestic - major econ**		**Model 3 % PB&R**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	71.128	(0.254)	81.830	(0.156)	10.516	(0.808)
Germany	21.825***	(0.000)	27.212***	(0.000)	3.090	(0.112)
France	9.604***	(0.000)	14.568***	(0.000)	-3.187***	(0.010)
UK	1.735	(0.596)	8.521***	(0.003)	-3.730*	(0.057)
Credit rating	-0.244	(0.708)	-0.723	(0.243)	-0.113	(0.820)
Maturity	0.148	(0.956)	-3.119	(0.152)	-4.865***	(0.004)
Mills alloc. available	15.097**	(0.040)	7.018	(0.306)	4.611	(0.249)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.079		0.097		0.101	
F-statistic	9.78***	(0.000)	11.62***	(0.000)	9.40***	(0.000)
Log pseudolikelihood	-1061.99		-938.96		-919.93	
Variable	**Model 4 % institutional**		**Model 5 % fund managers**		**Model 6 % PF&I**	
	coefficient	**p-value**	**coefficient**	**p-value**	**Coefficient**	**p-value**
Constant	57.176*	(0.086)	17.555	(0.707)	38.8229	(0.397)
Germany	-5.207***	(0.001)	-0.746	(0.725)	-4.799***	(0.005)
France	4.185***	(0.000)	-1.231	(0.453)	5.512***	(0.000)
UK	4.079***	(0.005)	2.523	(0.201)	1.641	(0.397)
Credit rating	-0.804**	(0.021)	0.284	(0.588)	-1.168***	(0.008)
Maturity	7.971***	(0.000)	-2.433	(0.174)	10.831***	(0.000)
Mills alloc. available	-4.017	(0.249)	-14.435***	(0.002)	10.232**	(0.032)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.157		0.084		0.093	
F-statistic	31.24***	(0.000)	12.00***	(0.000)	7.11***	(0.000)
Log pseudolikelihood	-904.22		-992.77		-947.13	

Table 5.11: Second stage tobit on impact of issuer economy on allocation statistics (continued)

Panel B: Top tier and mid-tier economies						
Variable	**Model 1**		**Model 2**		**Model 3**	
	% domestic		**% domestic - major econ**		**% PB&R**	
	Coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	32.367	(0.608)	80.770	(0.169)	8.447	(0.848)
Germany	11.906***	(0.000)	12.134***	(0.000)	6.570***	(0.001)
UK	-7.009**	(0.017)	-6.628**	(0.014)	0.095	(0.956)
Italy	-12.613***	(0.000)	-12.878***	(0.000)	1.136	(0.393)
Spain	-11.736***	(0.001)	-11.705***	(0.001)	-0.559	(0.817)
Netherlands	-20.474***	(0.000)	-21.039***	(0.000)	6.578***	(0.000)
Lower tier	-0.521	(0.900)			5.868***	(0.004)
Credit rating	-0.155	(0.802)	-0.868	(0.160)	0.044	(0.930)
Maturity	0.177	(0.943)	-1.850	(0.390)	-5.870***	(0.001)
Mills alloc. available	15.182**	(0.045)	10.043	(0.151)	2.371	(0.566)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.089		0.100		0.106	
F-statistic	11.50***	(0.000)	12.37***	(0.000)	9.89***	(0.000)
Log pseudolikelihood	-1049.75		-936.41		-915.33	
Variable	**Model 4**		**Model 5**		**Model 6**	
	% institutional		**% fund managers**		**% PF&I**	
	coefficient	**p-value**	**coefficient**	**p-value**	**Coefficient**	**p-value**
Constant	54.872*	(0.098)	17.976	(0.706)	36.090	(0.428)
Germany	-9.791***	(0.000)	0.258	(0.902)	-10.495***	(0.000)
UK	-0.799	(0.568)	3.232	(0.111)	-4.045**	(0.048)
Italy	-1.844	(0.186)	3.515*	(0.070)	-5.434***	(0.002)
Spain	-0.442	(0.837)	2.000	(0.490)	-2.405	(0.348)
Netherlands	-9.399***	(0.000)	-0.248	(0.924)	-9.389***	(0.000)
Lower tier	-6.438***	(0.000)	-1.159	(0.668)	-5.408***	(0.008)
Credit rating	-0.970***	(0.005)	0.209	(0.692)	-1.267***	(0.005)
Maturity	9.159***	(0.000)	-1.842	(0.299)	11.464***	(0.000)
Mills alloc. available	-1.239	(0.722)	-12.561***	(0.010)	11.170**	(0.019)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.165		0.085		0.095	
F-statistic	23.68***	(0.000)	12.29***	(0.000)	7.13***	(0.000)
Log pseudolikelihood	-896.14		-991.08		-944.76	

Table 5.11: Second stage tobit on impact of issuer economy on allocation statistics (continued)

Panel C: All geographic regions						
Variable	**Model 1**		**Model 2**		**Model 3**	
	% domestic		**% domestic - major econ**		**% PB&R**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	35.720	(0.513)	79.588	(0.172)	11.319	(0.790)
Germany, Austria and Switzerland	11.966***	(0.000)	12.095***	(0.000)	6.629***	(0.000)
UK & Ireland	-6.604**	(0.014)	-6.658**	(0.014)	-0.135	(0.938)
Benelux	-22.167***	(0.000)	-21.067***	(0.000)	5.714***	(0.000)
Southern Europe	-11.954***	(0.000)	-12.549***	(0.000)	1.057	(0.451)
Credit rating	-0.560	(0.326)	-0.851	(0.170)	-0.069	(0.888)
Maturity	-0.775	(0.709)	-1.882	(0.380)	-5.767***	(0.001)
Mills alloc. available	11.654*	(0.073)	10.281	(0.144)	2.176	(0.602)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.106		0.100		0.105	
F-statistic	16.92***	(0.000)	12.74***	(0.000)	9.76***	(0.000)
Log pseudolikelihood	-1031.08		-936.47		-916.32	
Variable	**Model 4**		**Model 5**		**Model 6**	
	% institutional		**% fund managers**		**% PF&I**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	60.128*	(0.059)	9.843	(0.831)	50.184	(0.263)
Germany, Austria and Switzerland	-9.552***	(0.000)	-0.784	(0.694)	-9.144***	(0.000)
UK & Ireland	-0.855	(0.531)	3.925*	(0.052)	-4.819**	(0.019)
Benelux	-6.738***	(0.001)	2.245	(0.309)	-9.291***	(0.000)
Southern Europe	-1.574	(0.248)	2.538	(0.158)	-4.120**	(0.017)
Credit rating	-0.850**	(0.020)	0.357	(0.497)	-1.297***	(0.003)
Maturity	9.155***	(0.000)	-2.252	(0.204)	11.887***	(0.000)
Mills alloc. available	-1.161	(0.742)	-12.309***	(0.010)	11.002**	(0.022)
Tranche and firm variables	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.163		0.085		0.092	
F-statistic	28.28***	(0.000)	12.29***	(0.000)	7.23***	(0.000)
Log pseudolikelihood	-897.92		-990.96		-947.63	

Table 5.12: Second stage tobit on impact of oversubscription levels on allocation statistics

Estimates from tobit regression analysis predicting the allocation statistics 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012 using orderbook oversubscription as the main explanatory variable. All variables are defined in Table 5.2. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Variable	Model 1 % domestic		Model 2 % domestic - major econ		Model 3 % PB&R	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	80.154	(0.304)	133.132*	(0.078)	-25.647	(0.560)
Oversubscription	-1.242**	(0.022)	-1.651***	(0.004)	0.071	(0.811)
Credit rating	0.637	(0.390)	0.152	(0.845)	-0.254	(0.571)
Maturity	-3.523	(0.222)	-5.909**	(0.036)	-5.154***	(0.003)
Mills alloc. Available	17.973**	(0.034)	12.502	(0.122)	9.000*	(0.079)
Tranche and firm vars	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.051		0.056		0.091	
F-statistic	6.65***	(0.000)	6.64***	(0.000)	9.72***	(0.000)
Log pseudolikelihood	-1093.81		-981.61		-930.51	
Variable	**Model 4** **% institutional**		**Model 5** **% fund managers**		**Model 6** **% PF&I**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	136.113***	(0.001)	-20.768	(0.698)	166.064***	(0.002)
Oversubscription	-0.439*	(0.060)	0.494	(0.143)	-1.067***	(0.001)
Credit rating	-0.634	(0.117)	0.198	(0.703)	-0.888**	(0.034)
Maturity	7.772***	(0.000)	-1.229	(0.515)	9.305***	(0.000)
Mills alloc. Available	-14.070***	(0.003)	-9.730*	(0.072)	-6.014	(0.299)
Tranche and firm vars	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.134		0.083		0.080	
F-statistic	21.51***	(0.000)	11.75***	(0.000)	6.68***	(0.000)
Log pseudolikelihood	-929.63		-993.09		-960.83	

Table 5.13: Second stage tobit on impact of bookrunner syndicate parameters on allocation statistics

Estimates from tobit regression analysis predicting the allocation statistics 309 euro-denominated public bond tranches made by 136 Western European firms during 2001-2012 using a range of bookrunner parameters as the main explanatory variables. All variables are defined in Table 5.2. P-values are calculated from bond level-clustered standard errors. ***, **, and * denote significance at the 1%, 5%, and 10% levels respectively.

Panel A: Bookrunner Reputation						
Variable	**Model 1 % domestic**		**Model 2 % domestic - major econ**		**Model 3 % PB&R**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	-11.822	(0.853)	19.854	(0.763)	-29.549	(0.476)
% Active BR in Top 10	-5.209	(0.263)	-6.062	(0.197)	-5.991**	(0.017)
Credit rating	0.518	(0.474)	0.000	(1.000)	-0.214	(0.628)
Maturity	-0.776	(0.794)	-2.454	(0.408)	-4.492***	(0.008)
Mills alloc. Available	30.359***	(0.000)	28.009***	(0.001)	9.680**	(0.019)
Tranche and firm vars	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.049		0.052		0.094	
F-statistic	6.28***	(0.000)	5.79***	(0.000)	9.69***	(0.000)
Log pseudolikelihood	-1096.47		-986.19		-927.38	
Variable	**Model 4 % institutional**		**Model 5 % fund managers**		**Model 6 % PF&I**	
	coefficient	**p-value**	**coefficient**	**p-value**	**coefficient**	**p-value**
Constant	114.254***	(0.001)	13.321	(0.763)	102.885**	(0.029)
% Active BR in Top 10	5.438**	(0.024)	0.377	(0.899)	5.100**	(0.025)
Credit rating	-0.716*	(0.078)	0.254	(0.621)	-1.047**	(0.012)
Maturity	7.797***	(0.000)	-2.101	(0.247)	10.283***	(0.000)
Mills alloc. Available	-11.310***	(0.003)	-14.277***	(0.004)	-5.113**	(0.017)
Tranche and firm vars	yes		yes		yes	
Ind & year controls	yes		yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.135		0.082		0.076	
F-statistic	20.65***	(0.000)	11.83***	(0.000)	6.64***	(0.000)
Log pseudolikelihood	-928.10		-994.31		-965.04	

Table 5.13: Second stage tobit on impact of bookrunner syndicate parameters on allocation statistics (continued)

Panel B: Bookrunner geography						
Variable	**Model 1 % domestic**		**Model 2 % domestic - major econ**		**Model 3 % PB&R**	
	coefficient	**p-value**	**Coefficient**	**p-value**	**coefficient**	**p-value**
Constant	11.742	(0.857)	38.153	(0.567)	-24.577	(0.578)
% Active non-domestic BR	-6.570	(0.176)	-8.334	(0.106)	1.534	(0.582)
Credit rating	0.181	(0.814)	-0.321	(0.691)	-0.172	(0.720)
Maturity	-1.594	(0.578)	-3.686	(0.187)	-5.236***	(0.002)
Mills alloc. Available	28.880***	(0.000)	26.002***	(0.001)	8.433**	(0.040)
Tranche and firm vars	yes		Yes		yes	
Ind & year controls	yes		Yes		yes	
Nobs	274		248		274	
Pseudo R^2	0.049		0.052		0.091	
F-statistic	6.21***	(0.000)	5.63***	(0.000)	9.64***	(0.000)
Log pseudolikelihood	-1096.09		-985.63		-930.35	
Variable	**Model 4 % institutional**		**Model 5 % fund managers**		**Model 6 % PF&I**	
	coefficient	**p-value**	**Coefficient**	**p-value**	**coefficient**	**p-value**
Constant	120.950***	(0.000)	12.011	(0.786)	111.078**	(0.017)
% Active non-domestic BR	-6.040**	(0.012)	0.311	(0.918)	-6.390**	(0.030)
Credit rating	-0.970**	(0.021)	0.271	(0.622)	-1.318***	(0.004)
Maturity	8.372***	(0.000)	-2.046	(0.257)	10.782***	(0.000)
Mills alloc. Available	-10.390***	(0.006)	-14.178***	(0.003)	3.298	(0.510)
Tranche and firm vars	yes		Yes		yes	
Ind & year controls	yes		Yes		yes	
Nobs	274		274		274	
Pseudo R^2	0.136		0.082		0.076	
F-statistic	88.53***	(0.000)	12.18***	(0.000)	6.52***	(0.000)
Log pseudolikelihood	-927.60		-994.32		-964.17	

6 Conclusion

This thesis has empirically examined several crucial aspects of the primary corporate bond distribution process through studying a sample of 1,224 euro-denominated investment grade public bond tranches made by 324 Western European firms during 2001 to 2012. I have in turn analysed the level of investor demand, bookrunner performance and the allocation composition. Understanding these elements is essential in helping issuers optimise their bond market pricing and access.

I have selected this topic for multiple reasons, relating to the product, issuers, investors, bookrunners and the European context. The bond product is a relatively unsophisticated debt instrument about which a high degree of public information is available, allowing it to function as a useful proxy for other debt instruments. It is also of increasing importance to corporate treasurers, being one of the largest and fastest growing markets, particularly in the years following the recent financial crisis (Kaya and Meyer, 2013). Its investor base is highly heterogeneous and we only have a limited understanding of their preferences. The roles taken on by financial intermediaries in this market have also become more complex as a result of heightened competition amongst bookrunners and growing bookrunner syndicate sizes. And by studying this market from the European context allows me to study multiple different geographies combined in a common currency and capital markets.

In this chapter I summarise my empirical contributions. In Section 6.1 I set out the main results for each of my empirical chapters. Section 6.2 considers possible areas for future research emerging from each of these studies. Section 6.3 concludes.

6.1 Summary of empirical findings

6.1.1 Investor demand

In this chapter I study the determinants of primary corporate bond investor demand through the orderbook oversubscription levels of a sample of 1,103 euro-denominated public bond tranches. This is a subsample of my overall sample of 1,224 tranches for which reported orderbook data is available.

I consider three explanatory variables that are expected to impact investor demand, being risk of default, information costs and bond market presence. There is a range of literature on these variables and their hypothesised impact on debt investor demand, most of which is based on debt sourcing, agency costs and portfolio choice considerations. Classical debt sourcing literature claims that demand is negatively related to a company's risk of default given greater investor concerns around an inefficient liquidation occurring or shareholder-debtholder agency costs (Berlin and Loeys, 1988; Myers, 1977). From an investor's portfolio choice perspective however it can be mean-variance beneficial to purchase risky securities, resulting in greater demand for these instruments when they are relatively scarce – as is the case in the European debt markets (Blume et al., 1991; Markowitz, 1952).

Investor demand can also be argued to be a negative function of information costs as investors will be concerned around the risks of adverse selection and asset substitution (Harris and Raviv, 1991; Leland and Pyle, 1977). Classical portfolio choice literature on the other hand would argue that information costs should not be

a primary concern as adding higher-information cost firms to a portfolio could improve its overall risk-return characteristics (Heston and Rouwenhorst, 1994).

A firm's bond market presence can be seen to positively impact debt investor demand as a result of reduced adverse selection concerns (Cantillo and Wright, 2000). Yet companies with larger bond market presence can also pose portfolio concentration concerns which should result in lower demand (Pieterse-Bloem and Mahieu, 2013).

In this chapter I study which of these possible explanations is a more significant driver of investor demand. I research this by conducting a range of ordinary least squares regressions on the tranche orderbook oversubscription. While this dependent variable has been rarely used in bond market research, it is highly suitable for my research objective, being a direct proxy of investor demand which is based on a uniquely liquid point in a bond's life cycle. It also has proven utility in equity market studies (Cornelli and Goldreich, 2003; Derrien, 2005).

This approach has certain limitations. My focus on investment grade tranches (see Section 2.4) means my conclusions do not necessarily apply to sub-investment grade firms. They are also not necessarily indicative of investor demand in the secondary market, which is more unpredictable and increasingly less relevant given the growing illiquidity of the secondary corporate bond markets globally (ICMA Secondary Market Practices Committee, 2014). It also does not take into account the influence of changes in market sentiment, for which my time period of 12 years is insufficiently long.

My findings for risk of default show that demand is higher for lower rated and higher credit spread companies. This can be explained by the view derived from classical portfolio choice literature of higher-risk bonds being relatively scarce assets for European investors as well as being valuable for their optimisation of the risk-return parameters of their portfolio (Blume et al., 1991). I also find that investor demand is negatively related to firm leverage. This is in line with Myers' underinvestment theory, namely that the management of higher levered companies is less incentivised to pursue profitable projects (Myers, 1977). Debt investors are concerned about these agency costs that directly impact their probability of being fully repaid and will hence demand less bonds from higher levered firms. Considering these results in unison I suggest that corporate bond investors are discerning in the type of risk they take on. They are generally willing to add more business risk, i.e. through investing in more cyclical industries, while being reluctant to add more financial risk, i.e. investing in firms which have been highly levered by their management.

I also find that information costs impact investor demand with oversubscription levels being higher for firms domiciled outside of Germany, France and the United Kingdom (GFU), the largest three economies within my sample and home to most issuers in my sample. This can reflect both investors' interest in geographic diversification of their holdings as well as non-GFU issuers' greater international marketing efforts, with my results in Chapter 5 suggesting the latter explanation is more plausible (Pieterse-Bloem and Mahieu, 2013).

My findings for bond market presence show that investor demand is highest for established firms who issue with a moderate frequency. Both debut issuers and

highly frequent established issuers tend to attract lower oversubscription levels. This suggests that there is an asymmetric bond market entry-exit threshold, as proposed by Cantillo and Wright (2000), with established issuers typically enjoying more demand than debut issuers with similar business parameters. At the same time the results also corroborate the notion derived from portfolio choice literature of the importance for investors of diversifying holdings across a broad range of issuers, thereby avoiding taking on excessive concentration risk (Pieterse-Bloem and Mahieu, 2013).

Collectively my results on the drivers of bond investor demand are of considerable practical importance to issuers accessing the corporate bond market. In practice it is challenging for them to truly assess the preferences of their corporate debt investors, being a highly heterogeneous group that is at arms' length. The results also benefit bookrunners as it is not always apparent to them which transactions will gather larger oversubscriptions. Obtaining reliable investor feedback on an issuer or envisaged tranche is challenging as a result of complex wall-crossing arrangements,[117] the range of different stakeholders at a major typical institutional investor[118] as well as the reluctance of investors to give away too much information early on in the negotiation process. My findings are also of considerable interest to the financial regulators, who have recently increased their scrutiny on the bookbuilding process in both the equity and bond markets (Teasdale, 2015).

[117] Wall-crossing is the term used by practitioners to describe the process by which an investor can be provided with confidential information before the announcement of a transaction. It is used to source investor feedback on this transaction.

[118] In particular the large numbers of fund managers and credit analysts that institutional investors employ.

6.1.2 Bookrunner performance

My second empirical chapter analyses the impact of the bond bookrunner syndicate composition on the quality of bookrunner services. The sample I utilise for this purpose incorporates 1,193 euro-denominated investment grade public bond tranches issued by 304 companies between 2001 and 2012.

The literature on bookrunners sets out two distinct roles they are deemed to perform, namely placement and certification. The first function is largely commercial, involving the planning, marketing and distribution of securities (Kessel, 1971). The second is more legalistic, reviewing the issuer and the transaction documentation on behalf of investors (Chemmanur and Fulghieri, 1994).

I use prior research and practitioners' sources to extract various pertinent bookrunner syndicate parameters, being bookrunner syndicate size, allocation of responsibilities, bookrunner reputation and bookrunner geography. In terms of bookrunner syndicate size it can be argued that a larger group offers greater search benefits for the placement process (Kessel, 1971). Yet such a group could also offer lower quality services as a result of free rider problems (Diamond, 1996; Shivdasani and Song, 2006).

Practitioners note that issuers have started to differentiate between bookrunners' responsibilities, appointing a subset of trusted banks to active bookrunner status, responsible for certification as well as placement, while relegating the remainder to passive bookrunner, accountable for only the certification role. This could be argued to reduce the agency costs inherent in the placement process.

Bookrunner reputation is deemed to have a positive impact by Chemmanur and Fulghieri (1994), who argue that more reputable intermediaries are incentivised to perform higher quality services in order to maintain their strong reputation. Yet Chemmanur and Krishnan (2012) hypothesise that more reputable banks are likely to perform lower quality services as investors will be concerned that they abuse their more established position to sell higher risk tranches. Empirical results for this factor have been mixed (Andres et al., 2014; Fang, 2005).

Issuers could also differentiate according to a bank's geography. Domestic banks could be seen to offer higher quality services as a result of their better understanding of an issuer's business profile and financing preferences; a hypothesis for which Butler finds proof in the US single-bookrunner led underwritten municipal bond market (Butler, 2008). However it can also be argued that non-domestic bookrunners are better able to source international investor interest for an offering and hence perform the placement role more effectively. Prior papers have found that international investors tend to be more price-competitive as a result of diversification benefits (Massa and Zalkodas, 2014).

I test the relative impact of this range of bookrunner syndicate parameters through a two stage Heckman and least squares regressions on the at-issue credit spread, taking into account endogenous issuer-bookrunner matching. The credit spread is a suitable proxy for the quality of bookrunner services as it is one of the few in the investment grade market that is directly influenced by the effort of bookrunners, and is subject to homogeneous issuer preferences (Andres et al., 2014; Fang, 2005). My sample makes for a valuable testing ground in this regard. It consists of relatively homogeneous issuers, being both typically low risk and well-

known companies and therefore theoretically receiving limited benefits from the placement and certification roles offered by bookrunners. The sample also covers a period during which the market for bookrunners of euro-denominated bond issues has been subject to a high degree of change, in particular the growth in bookrunner syndicate sizes and the introduction of passive bookrunner roles (Chivukula et al., 2014; Cowie, 2009). In addition my sample is characterised by a relatively high degree of geographic dispersion, with bookrunner syndicate services offered from banks across each mid to large size European economy.

There are limitations to my approach. Most obviously the results do not necessarily apply to sub-investment grade rated offerings. Also they are not relevant for single bookrunner led offerings; I have intentionally excluded these as they tend to be non-public transactions, sold to one or a small handful of investors (see Section 2.4).

My strongest and most consistent results are obtained for bookrunner geography. I find that issuers obtain the highest quality of bookrunner services by hiring domestic banks, in line with earlier findings from Butler on the US municipal bond market (Butler, 2008). This outperformance remains valid when I compare domestic banks to foreign banks based solely in GFU countries, being those that should offer the greater placement benefits (Massa and Zalkodas, 2014), or foreign banks that have a Top 10 league table ranking, being those who should offer higher certification benefits (Chemmanur and Fulghieri, 1994).

This result appears to derive predominantly from the sizeable number of tranches that have been placed after the last financial crisis. This period is characterised by larger bookrunner syndicates as firms are required to award

bookrunner services to more of their relationship banks (Chivukula et al., 2014), including those non-domestic banks whom they enjoy a less strong relationship. Such bookrunners are less effective at performing their placement and certification roles. They have a less well-developed understanding of an issuer's financing objectives, reducing their effectiveness in the placement role, and also know less about an issuer's prospects, limiting their ability to conduct robust due diligence.

I also find that bookrunner syndicate size is negatively related to the quality of bookrunner services as a result of co-ordination and free rider problems (Diamond, 1996). This issue again arose largely after the financial crisis. Introducing a passive role can partly mitigate this. It offers issuers reduced co-ordination costs amongst the bookrunners performing the placement role while maintaining the benefits from having multiple banks conduct their own certification procedures.

My results also show that reputation is only of importance when selecting between different domestic bookrunners. This suggests that in a geographically diverse area such as the European Union the banks dominating the euro-denominated league table often excel at offering stronger services to their domestic market. The larger the volume of issuance by domestic clients, the better the league table position is expected to be.

These results are of considerable importance. It is becoming increasingly challenging for issuers to determine the optimal bookrunner group for their offerings. The breadth of candidates they have to choose from has increased (Abramowicz, 2014), as have typical bookrunner group sizes (source: Dealogic), resulting in more possible permutations. Deciding on decision criteria and role responsibilities is hence highly important. This increased competition also places growing pressure on fees

(Wilson, 2011) and therefore requires financial intermediaries to focus their debt capital market offering towards clients and tranches where they can add more value and have a greater chance of being mandated, i.e. where their quality of service is higher. Understanding the drivers of this quality of service is hence also relevant for bookrunners.

6.1.3 Allocation composition

My third empirical chapter studies the variables that drive the allocation of bonds by investor type and country. The subsample used for this study consists of 309 euro-denominated investment grade bond tranches issued by 136 firms between 2001 and 2012. Given the lack of well-developed theory on the make-up of bond allocations I explore different possible explanatory relations based on existing debt market research; these relate to bond tranche parameters, country variables, oversubscription levels and bookrunner variables.

The impact of tranche parameters on investor demand has been relatively widely studied. Insurers have for instance been found to have a longer investment horizon (Massa et al., 2013) and are hence expected to prefer longer tenor bond issues. Also Chen et al. (2007) argue that insurers could purchase more lower risk debt instruments as a result of litigation concerns.

Home selection bias implies that country variables are also pertinent regressors, with the size of an issuer's home economy expected to determine the proportion of domestic allocations for its bond offerings. All else equal a firm headquartered in a larger economy will benefit from a more sizeable domestic

investor base with a strong local bias than a company in a smaller economy, necessitating the latter to market its securities more actively internationally. Portfolio diversification theory however implies such biases should not exist meaning issuers from major economies, being amongst the larger and frequent bond issuers, will be faced with reduced interest from existing domestic investors and should seek to market to international investors (Pieterse-Bloem and Mahieu, 2013).

A higher oversubscription level improves an issuer's allocation flexibility. Prior debt sourcing papers such as Denis and Mihov (2003) claim that firms typically issue into the corporate bond market so as to obtain a more dispersed and hence less influential group of investors, suggesting that higher oversubscribed trades result in greater allocations to smaller non-institutional investors. However it can also be argued that institutional investors should be rewarded with preferential allocations in more oversubscribed offerings as they are valuable long term partners for a regular bond issuer (Massa et al., 2013).

Bookrunner parameters are also tested because bookrunners manage the bookbuilding and allocation processes and are hence expected to influence the ultimate allocation composition.

In order to determine the impact of these different variables I perform two-stage least squares regressions on investor geography and type allocation compositions, allowing me to account for the endogeneity inherent in the reporting of allocation statistics. The dependent variables are grouped to ensure they are aligned with the typical categorisations reported by bookrunners. I hence arrive at allocations to different geographic regions, such as Germany, Austria and

Switzerland (GAS), as well as different investor type sets, such as pension funds and insurers (PF&I).

This approach has certain limitations. As my sample only includes euro-denominated offerings I am not able to fully analyse the jurisdiction and type of investors that purchase UK and Swiss corporate bonds, given their additional reliance on the Sterling and Swiss Franc bond markets. I also rely on high level statistics that have been reported by the bookrunners involved on a tranche. These are less accurate than actual line-by-line orderbook information, albeit they are sufficient for my research purpose.

I find that tenor and rating are amongst the most influential bond tranche parameters that impact a bond's investor type allocation parameters. Private bank and retail accounts purchase shorter tenors, fund managers more medium tenors and pension funds and insurers longer tenors. This is consistent with the different investment horizons of these investor types (Massa et al., 2013; Yoon, 2015). I also find that pension funds and insurers purchase more highly rated corporate bond tranches, reflecting their more risk-averse investment strategy (Chen et al., 2007).

My results also show that the country of an issuer has an important bearing on the proportion of domestic allocations. Issuers in my sample from top tier and lower tier economies allocate a larger portion of their bond tranches to domestic investors than those from mid-tier economies. This is consistent with investors exhibiting a degree of home selection bias, purchasing a large share of bonds from domestic firms (Chan et al., 2005: Kang and Stulz, 1997). Issuers from smaller economies, such as Belgium, Switzerland and Austria, tend to be less frequent bond issuers and can hence afford to rely more on their small domestic investor base.

Firms from larger economies, such as Germany, France and the UK, can also source a significant share of their (larger) funding programmes through the domestic bond market. Firms from mid-tier economies, such as The Netherlands, Italy and Spain, are in a less fortunate position. Their funding needs have grown beyond the capacity of their domestic market and they are hence required to actively source non-domestic investor interest (Cheng, 2011).

The level of oversubscription does impact the strength of this relationship. When companies obtain larger orderbooks they allocate less to domestic accounts, regardless of whether they are from a lower, mid or top tier economy. This suggests that all firms recognise the market access and pricing benefits of having a geographically diverse bond investor base (Massa and Zalkodas 2014*)*, while being cognisant of the costs involved in targeting international investors. Firms with a sufficiently large and supportive domestic investor base may only seek geographic diversification when the associated costs of doing so are relatively low, for instance when bond market conditions are strong (Derrien, 2005; Foley, 2012).

I also find that a higher oversubscription rate results in a lower proportion of bonds being allocated to pension funds and insurers. In practice these are typically amongst the most price sensitive investors and can hence limit the extent a firm can optimise its at-issue pricing. They can also be deemed as undesirably influential external stakeholders by the management (Denis and Mihov, 2003).

In addition my results show that bookrunners harbour relations with different types of investors. I find that appointing higher reputation bookrunners tends to result in larger allocations to pension funds and insurers, with whom Top 10 bookrunners tend to enjoy a strong and longstanding relationship (Chemmanur and

Krishnan, 2012). And non-domestic bookrunners tend to be associated with higher non-institutional allocations, suggesting they can help an issuer target specific investor type niches.

These results are of importance to regular bond issuers. As European companies' reliance on public debt markets grows it becomes more valuable for them to understand the identity and preferences of their public debt investor base. Firms are increasingly adjusting their investor relations to cater to these external stakeholders, going beyond the traditional focus of shareholders and banks. My findings are also of interest to financial regulators given their growing focus on the bond allocation process. In the UK the Financial Conduct Authority FCA has recently commenced an in-depth scrutiny of this process to ensure it is both transparent towards issuers and unaffected by bookrunner conflicts of interest (Helgren, 2015).

6.2 Areas for future research

In this section I consider areas for future research arising from my three empirical chapters.

6.2.1 Investor demand

My study on investor demand could be extended by analysing the impact of macro-economic and financial market variables on orderbook oversubscription using a longer data series. This could help determine which periods tend to be associated

with stronger conditions for new primary bond issuance, for instance higher investor demand and stronger secondary market performance, also known as hot bond markets (Derrien, 2005). It would be worthwhile considering to what extent these factors also influence a firm's bond-equity mix.

Future research can also study the reverse causal effect of investor preferences determining bond parameters. How can issuers leverage greater bond investor demand to achieve marginally better pricing, a larger issue size and a more desirable tenor? In order to study this one should seek to create lagged investor demand variables across a longer time period, assessing how these influence the issuance decisions of companies.

Furthermore it would be worthwhile extending my study into related debt markets, such as the high yield and the convertible bond markets. Given the more equity like features of both products to what extent do their investor preferences differ from those I have identified? Also given that these tend to be smaller debt markets (source: Dealogic) is this investor base more concentrated?

I also recommend conducting further studies into the intraday bookbuilding development. How fast does an orderbook grow, and how do orderbook sizes typically react to price and size revisions? This would require sourcing intraday time series data directly from major bond bookrunners.

6.2.2 Bookrunner performance

My study into the quality of bond bookrunner services also merits extending into other debt markets. The high yield market for instance is characterised by somewhat different bookrunner syndicate compositions than the investment grade market, introducing different variables such as the type of bank that takes the lead-left bookrunner role (Harrison, 2013). The non-bank private market on the other hand employs agents, while the loan market distinguishes between mandated lead arrangers and arrangers.

It is also worth considering applying more granular distinctions in the research into M&A advisors, thereby mirroring the approach I have taken for corporate bond bookrunners. Variables such as the number of advisers, their geographic presence and their relationship strength could be employed to better understand dynamics in this crucial intermediation service.

I also recommend incorporating more effective proxies of a bookrunner's geographic presence. These could relate to their loan commitments, personnel or offices. Similarly additional variables could be construed for the strength of the issuer-bookrunner relationship. These could be based on the length of relationship, number of banking products offered or size of lending commitments.

In addition I see scope to further study to what extent a bookrunner's quality of service impacts its share of an issuer's bond business. Do better performing banks get rewarded with more bookrunner roles or more prestigious bookrunner roles – i.e. those on larger transactions? This would require sourcing a broad range of bond

transactions across different currencies for a select number of highly frequent bond issuers.

Further granular data on the bookrunner role splits would also be worthwhile to study. In practice the active bookrunners tend to delegate specific tasks to one bank, the most common being co-ordinating the documentation process, organising the roadshow and helping draft the investor presentation.

6.2.3 Allocation composition

Future research on the determinants of bond allocations could look to study micro-level orderbook and allocation information which is available from bookrunners. This consists of detailed breakdowns of each individual order, including the investor name, type and country, their sales person and which bank(s) submitted the order. Such data should allow for more detailed studies into the investment preferences of different investor types and geographies. Moreover it will enable further analysis into the allocation process, studying which investors receive relatively higher proportional allocations.

It would also be worthwhile to source a larger sample of tranche-level allocation statistics and use these to directly analyse the relative propensity of home selection bias of different types of investors, particularly institutional investors and private banks and retail. Which of these investors are more likely to support domestic firms?

Moreover it would be useful to incorporate sterling and swiss franc denominated tranches. This would allow for a more comprehensive understanding of the make-up of the Western European bond market investor base as it would incorporate the domestic funding markets of UK and Swiss firms.

It would also be worthwhile to source allocation information for more information-sensitive and higher risk debt products such as high yield and convertible debt. To what extent does the make-up of the investor base differ here to investment grade securities? Is there a higher proportion of more opportunistic investors, such as hedge funds, or more yield-focused investors such as retail accounts, in comparison to insurers?

I also see scope to study the relation between allocation decisions and secondary performance of a bond. Do bonds with greater hedge fund allocations underperform those with greater pension fund and insurer allocations? Similarly do bonds with more loyal domestic investors outperform those with more non-domestic allocations? Given the importance of a positive secondary performance of a bond for an issuer's future market access, particularly if it is an inaugural bond, this should be of considerable interest.

6.3 Conclusion

My thesis studies several key aspects of the primary corporate bond distribution process through an overall sample of 1,224 euro-denominated investment grade public bond tranches made by 324 Western European firms in the years 2001 to 2012. My first empirical chapter analyses the level of bond investor

demand through oversubscription rates. I find that investors purchase more bonds from firms with a higher business risk profile, lower financial risk profile as well as companies that issue less frequently. This reflects concerns around obtaining a mean-variance efficient portfolio as well as managerial agency costs from being highly levered. The second empirical chapter studies the quality of bookrunner performance through the at-issue credit spread. I conclude that domestic bookrunners are the best at performing bookrunner services, resulting from relationship and informational benefits, and that issuers can utilise passive bookrunners to reduce the agency costs associated with large bookrunner groups. The results are driven by the post-financial crisis rise in bookrunner group sizes and complexity. My third chapter focuses on the composition of bookrunner allocations by country and type. I find that investors exhibit a high degree of home selection bias, requiring larger firms with smaller domestic capital markets to seek to actively diversify their investor base. In addition firms with greater allocation flexibility allocate more to non-domestic and smaller investors, allowing for stronger market access and better price negotiation.

Collectively my results offer multiple worthwhile areas for further research. It would be interesting to study the macro-economic and financial market drivers of strong bond market conditions, given oversubscription rates change over time. In addition it would be useful to extend my research into the high yield and convertible debt markets, given their distinct investor make-up, risk characteristics and bookrunner group compositions. It would also be worthwhile to source micro-level and intraday time series orderbook data, allowing for a more granular analysis of investor preferences and allocation decisions.

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