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Syndicated project finance loans:

Spread determinants of institutional investor tranches

MSC IN ADVANCED ECONOMICS AND FINANCE
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Abstract

Project finance is focused on the financing, construction and operation of large-scale economic and social infrastructure assets by means of special purpose vehicles. The market, traditionally inhabited on the debt side by bank syndicates and on the equity side by industrial developers working in oil extraction and power, saw the entrance of institutional investors in the mid-2000's. The participation of institutional investors in loan syndicates – traditionally the domain of commercial banks and other financial intermediaries – raises questions on whether and how the inclusion of this new class of lender affects loan pricing practices. Studies have investigated this question – but they typically have not, however, distinguished between different types of institutional investors.

This thesis investigates whether institution type is a significant determinant in syndicated project finance loan spreads. The used sample consists of 5081 syndicated project finance loan tranches issued between 1987 and 2020. The hypotheses are tested with both Pooled OLS and Quantile regression models.

The contributions of this thesis can be summarized by four key findings. First, the results provide relatively strong support for institutional investor type being both a statistically and economically significant determinant in the pricing of syndicated project finance loans. Second, the effect on spread depends on whether the participating institution is a short or long-term investor, as the two groups appear to be driven by different factors. Third, these pricing effects of different institutional investors appear to be connected to lead bank experience and mean syndicate experience, but not to lead bank reputation measures. Fourth, the results indicate that the level of institutional investor experience has a connection to loan pricing. provided by long-term and short-term institutional investors

Keywords: project finance, syndicated lending, institutional investors, loan pricing

Contents

Table of figures

1 Introduction

This thesis investigates the idiosyncrasies of the project finance subset of the syndicated loan market, which is focused on the financing, construction and operation of large-scale economic and social infrastructure assets by means of special purpose vehicles. The market, traditionally inhabited on the debt side by bank syndicates and on the equity side by industrial developers working in oil extraction and power, saw the entrance of institutional investors in the mid-2000's (Gatti, 2013). McKinsey Global Institute (2016) estimates that an additional $3.7tn in infrastructure investment is required on average yearly through 2035 to keep pace with the projected global GDP growth. The increasing flow of private capital, currently in search of yield, is helping to bridge this gap.

The participation of institutional investors in loan syndicates – traditionally the domain of commercial banks and other financial intermediaries – raises questions on whether and how the inclusion of this new class of lender affects loan pricing practices. Studies have investigated this question (e.g., Jiang et al., 2010; Nandy & Shao, 2010) – but they typically have not, however, distinguished between different types of institutional investors. As insurance companies, pension funds, private equity funds, mutual funds and sovereign wealth funds are far from a homogenous group, this omission appears significant. Hence, the research question centers on whether institution type is a significant determinant in syndicated project finance loan spreads. And if type is a determinant, the logical follow-up question is what characteristic could be the driving factor behind the effect. Therefore, this thesis seeks to answer the research question and a set of subsequent hypotheses derived from relevant literature.

The structure of the text is as follows. In the next chapter, the thesis presents literature on project finance, institutional capital and syndicated lending in a comprehensive manner to create a framework through which the topic can be investigated. In the third chapter hypotheses are developed. The fourth chapter introduces the data, variables and chosen models which are used in the empirical testing of the hypotheses. The fifth chapter presents results and discussion on the hypotheses. The sixth chapter concludes.

2 Literature review

2.1 Project finance

Project finance is a distinct form of financing, separable from other financing methods by several key features. First, in a project finance deal, the company seeking the loan is a legally and financially separate entity created for the project it seeks to realize. Second, arranging a project finance transaction requires an extensive set of contracts, which allocate the various project risks to the parties involved best positioned to manage them.[1] Third, the loans used are characterized by their limited or non-recourse nature, restricting creditor actions in most cases solely to project company assets. Fourth, due to the lack of recourse, lending decisions are contingent on the project's projected future cash flows. Fifth, for additional security, project assets are provided as collateral. (Gatti, 2013). Sixth, project companies use extensive leverage – ranging between 70-95% of project cost (Esty, 2002; Yescombe, 2014). Finally, both debt and equity ownership are typically concentrated. (Esty, 2004a). In addition, infrastructure assets themselves are characterized by long duration, high fixed costs, low operating costs, high operating margins, inelastic demand and high barriers to entry (Inderst, 2010). Due to these characteristics, although project finance is a worthwhile topic of study in its own right, it provides an avenue to study and derive insights about debt finance, syndicated lending, information asymmetry and organizational dynamics in general (Arezki et al., 2016; Esty, 2004a; Sufi, 2007).

Project financing of infrastructure has gained attention in literature. In addition to the mentioned gap in global infrastructure investment, studies have gone as far as to name infrastructure efficiency as the most important determinant of economic growth differences (Hulten, 1996).[2] The topic is uniquely relevant to emerging economies, where the underdeveloped financial markets form a barrier for investment – a shortcoming which project finance can alleviate by decreasing lender risks and improving the availability of long-term financing (Kleimeier & Versteeg, 2010;

[1] Due to the contract-heavy nature of project finance, with the number of contracts even exceeding a thousand (Esty, 2002), it has been also called contract finance (Esty, 2004a). The arrangement itself has been characterized as a nexus of contracts (Esty & Megginson, 2003), borrowing Jensen & Meckling's (1976) characterization of the firm as merely a collection of contracts that connect the parties involved.

[2] However, only private investment in infrastructure has this effect (Kleimeier & Versteeg, 2010), emphasizing the relevance of increased institutional investment.

Sorge & Gadanecz, 2008). Problems such as delays and cost overruns are common in traditional public procurement, which strengthens the case of project finance as an alternative (Flyvbjerg et al., 2002, 2003).[3] Since the 1980's, private participation in infrastructure and the use of public-private partnership (PPP) schemes has become widespread in most developed nations (Inderst, 2016), which is attributed to the ability of project finance to alleviate agency problems (Aretzki et al., 2016; Brealey et al., 1996).[4] In these arrangements the role of the government shifts to that of a purchaser and regulator of services (Della Croce & Yermo, 2013). The efficiency gains have been attributed to the bundling of construction and operation – resulting in the internalization of positive externalities and construction risk (Hart, 2003).

2.1.1 Contractual network

The project company – i.e., nexus of contracts – connects a variety of parties with differing motives, objectives and constraints. This network of non-financial contracts alleviates the fundamental uncertainty facing firms by transforming firm-specific risks into managed and unmanaged risks (Bonetti et al., 2010; Gatti et al., 2013). The residual risk is then managed with insurance and hedging contracts where viable, enabling higher project leverage (Brealey et al., 1996).

Project finance reduces transaction costs that arise from information asymmetries and agency conflicts. The central functions of the contract network are to align incentives among participants and to transfer risks from lenders to project counterparties – in order to reduce project risk (Yescombe, 2014), cost of funding (Pinto & Santos, 2016) as well as increase debt capacity (Esty, 2002) and the present value of tax shields (John & John, 1991). From a creditor perspective, due to incentive misalignment (Harris & Raviv, 1991), contractual incompleteness (Williamson, 1979) and costly monitoring (Diamond, 1991), the cost of debt must reflect the possibility of debtor opportunism (Jensen & Meckling, 1976). Thus, agency costs in the end are paid by the equity holders (Brealey et al., 2020; Jiang et al., 2010).[5] Moreover, in project finance, incentive alignment is improved by the practice of project operators, management and other counterparties holding

[3] Flyvbjerg et al. (2002, p. 22) find that costs are systematically 20% over budget.
[4] For instance, Wagenvoort et al. (2010) report that in the EU, the proportion of private financing in infrastructure of new and old member states is 2:1 and 1:1, respectively.
[5] Agency costs are defined as the sum of monitoring costs by the principal, bonding costs by the agent, residual loss and the cost of contracting (Jensen & Meckling, 1976; Jensen & Smith, 1984).

equity stakes – i.e., making them residual claimants in the project company. Regardless, since the contractual network is necessarily imperfect (Hart & Moore, 1999), creditors can end up bearing residual risk (Dailami & Hauswald, 2007). In addition to problems with incompleteness, contract enforcement is not without problems as costs of litigation are high (Tirole, 1990 as cited in Sawant, 2010a).

Key objectives of a loan contract are to minimize value loss in states of distress and to disincentivize strategic default (Bolton & Scharfstein, 1996).[6] The incomplete contracting framework from debt literature is particularly relevant for analyzing the first objective (Shleifer & Vishny, 1997), as contract renegotiation is common – even inevitable (Beyhaghi et al., 2019) – in project finance. Moreover, Huberman and Kahn (1988b) find that loan contracts are at times constructed with terms impossible to fulfill so that renegotiations effectively become built in. Hence, the facilitation of low-cost re-contracting – a central task of so called debt governance (Dorobantu & Müllner, 2019) – is uniquely significant to project finance, providing a mechanism to complete contracts ex post and increase leverage levels (e.g., Beyhaghi et al., 2019; Hart & Moore, 1999). Moreover, the high value of renegotiability in project finance makes bank lending optimal – as opposed to public debt (Berlin & Mester, 1992) – and it arguably compensates for the increased transaction costs and slower issuance process (Eichengreen & Mody, 2000). Furthermore, loan contracts deter borrower ex post opportunism and mitigate contractual incompleteness via the transfer of control to lenders consequently preventing value loss of collateral (Aghion & Bolton, 1992).

The contractual structure of project finance supplies a financial and organizational risk management mechanism to minimize deadweight costs (Esty, 2002). According to Esty (2003), since incremental distress costs and investment size have been found to have a convex relationship, cumulative distress costs for project participants are lower the more capital providers there are – implying that risk sharing increases investment value by decreasing incremental distress costs. For the sponsoring firm, legal separation reduces the opportunity cost of underinvestment arising from leverage and incremental distress costs (Esty, 2003). However, there

[6] The second objective will be covered in section 2.3.2.3 Renegotiation.

is a tradeoff between contamination risk for the project sponsor and the loss of the co-insurance effect for the lenders. Although the project sponsor prefers to incorporate separately, this increases risk for the lender due to lost recourse to sponsor firm assets. (Gatti, 2013).

Complementing the distinctly agency theoretic nexus of contracts perspective, transaction cost economics (TCE) posits that asset characteristics themselves can cause agency conflicts.[7] Moreover, TCE states that the firm's choice of leverage is effectively a choice of governance and vitally connected to firm asset characteristics. According to Williamson (1988), debt is a rule-based form of governance and equity is a discretionary form of governance. Hence, equity is risk capital and suitable for growth firms where management discretion in decision-making is necessary, returns are positively skewed and upside potential is unlimited – whereas debt is ideal for firms with few growth options, stable cash flows, no need for management discretion and limited upside potential (Esty, 2002; Williamson, 1988). This perspective on the functions and roles of equity and debt provides a useful framework through which to examine project finance, syndicate structure and participant dynamics. TCE originates from Ronald Coase's (1937) writings on the nature and boundaries of the firm, which in essence state that the decision whether to produce or purchase is determined by transactions cost differences.[8] According to Esty (2003), large free cash flows and asset specificity make project assets particularly susceptible to agency problems.[9] The leveraged capital structure and debt service of project finance attenuates the first characteristic, but the second feature warrants discussion. Asset specificity can lead to agency conflicts both ex ante and ex post, causing hold-up problems ex post and underinvestment ex ante (Blanc-Brude et al., 2009; Subramaniam, 1996).[10][11] Accordingly, project finance has been observed to alleviate transaction costs arising from asset specificity by creating asset-specific governance systems (Esty, 2003; Habib

[7] Joskow (1985, p. 36) defines transaction costs as including the "costs of negotiating and writing contingent contracts; costs of monitoring contractual performance; costs of enforcing contractual promises; and costs associated with breaches of contractual promises."

[8] Williamson (1975) specifies that transaction costs are determined by frequency, asset specificity, uncertainty, limited rationality of agents and opportunistic behavior – and high transaction costs call for internalizing production when production costs are lower.

[9] For instance, while a gas-powered power plant can have operating margins in the 20-50% range, some projects can generate margins of up to 70-95% (Esty, 2002).

[10] Hold-up problems are considered one of the key sources of risk in infrastructure (Sawant, 2010a).

[11] When a firm decides to make an investment into an asset with high specificity, the ex ante large numbers competition transforms into a bilateral monopoly ex post – a phenomenon called the fundamental transformation (Williamson, 1996) – which then enables counterparty opportunism due to the sunk costs locking in the firm (Williamson, 1979).

& Johnsen, 1999).

Opportunistic behavior can be exhibited by any counterparty, be it a host-country government deciding not to renew concession agreements or a supplier increasing input prices (Esty, 2003). TCE literature offers three solutions: vertical integration (Klein et al., 1978), long-term contracts (Joskow, 1985) and leverage (Bronars & Deere, 1991; Subramaniam, 1996). The last two are central features of project finance, although elements of vertical integration are arguably also present due to counterparty equity stakes. Long-term contracts alleviate supplier and market risk and debt mitigates the hold-up problem by reducing cash flows susceptible to counterparty opportunism – and by increasing sponsor bargaining power vis-à-vis counterparties by inducing lenders to join renegotiations (Sawant, 2010b; Subramaniam, 1996). Cash flow predictability is central to project viability, which project finance structures mitigate by reducing supply and demand uncertainty with often inflation-linked long-term contracts (Bonetti et al., 2010).[12] In addition, governmental guarantees and credit enhancements as well as political risk guarantees from multilateral development banks reduce the cost of debt via improved credit ratings (Aretzki et al., 2016; Hainz & Kleimeier, 2012; Takashima et al., 2010). However, project companies in high political risk countries tend to forgo government agreements to avoid political influence (Byoun & Xu, 2014). It should be noted that contracts do not eliminate risk, but transform it into counterparty risk – e.g., with a public counterparty it could be sovereign risk due to expropriation (Bonetti et al., 2010). A way counterparty risk can be quantified is through creditworthiness, measurable via counterparty credit spread (Dailami & Hauswald, 2007).

From a lender perspective, although project assets display high specificity vis-à-vis location and counterparties – i.e., suppliers and buyers can have significant ex post bargaining power – they are typically not specific in terms of sponsor. The project is often redeployable to alternative operators (Habib & Johnsen, 1999; Sawant, 2010b; Yescombe, 2014), which decreases debtor bargaining power (Vaaler et al., 2008; Williamson, 1979). This is supported by findings that indicate project finance loans, regardless of high asset specificity, exhibit higher recovery rates and lower default

[12] Regardless of inflation-linked contracts, project companies are not immune to inflation risk as debt service is not commonly inflation-linked (Yescombe, 2014).

probabilities than corporate loans (Moody's, 2013 as cited in Yescombe, 2014). In summation, project finance can be considered an efficient risk management mechanism and mitigator of agency conflicts, which is reflected in the observed low spreads of project finance loan tranches (Jensen & Meckling 1976; Kleimeier & Megginson, 2000).

2.1.2 Leverage and incorporation

The key financing decisions include the mode of incorporation, type of debt and the level of leverage. The choice between joint and separate incorporation is determined by factors such as the nature of the company assets and cash flows, operating environment, firm scope considerations and the relationship between the project and sponsor company primary activities. Transaction costs are high in project finance due to the need for extensive planning, which then on the other hand results in a lower cost of debt and higher feasible leverage levels. Moreover, high leverage enables sponsors to invest in more projects, diversify idiosyncratic project risk and improve returns (Machlin & Rummel, 2020).

When equity financing is not sufficient and control benefits differ between projects, optimally the lower control benefit investment is project financed with higher leverage (Byoun et al., 2013; Chemmanur & John, 1996).[13] Berkovitch and Kim (1990) find that under symmetric information between lender and borrower, project finance is optimal and simultaneously mitigates over- and underinvestment. Although actual symmetry is unrealistic, the findings emphasize the importance of minimizing information asymmetry, which project finance achieves via an extensive due diligence process and debtor-creditor cooperation. Subramanian and Tung (2016) posit that the choice between project and corporate finance is affected by a tradeoff between the managerial discretion and cash flow verifiability – both of which in turn are influenced by borrower country investor protection laws. Moreover, Leland (2007) provides a theoretic rationale for project finance with an equilibrium model of activities with non-synergistic operational cash flows. The model asserts that the case for separate incorporation strengthens with the magnitude of default costs, differences in cash flow volatilities and the lack of correlation. Separate incorporation is also

[13] Control benefits are defined as the level and value of management discretion regarding free cash flows and firm strategy choices (Chemmanur & John, 1996).

beneficial in the absence of operational synergies – i.e., when assets are independent (Hart, 1995).

The choice of separate incorporation is vitally connected to the non- or limited-recourse nature of project finance debt. Use of separation in project finance mitigates leverage-induced underinvestment (John & John, 1991). Concentrated equity ownership and high levels of project risk increase the preference for leverage – an undiversified project sponsor benefits from the diminished equity contribution, increased value of the real option to walk away (Byoun et al., 2013) and the credibility of the threat to walk away in case of supplier hold-up (Subramaniam, 1996). Moreover, based on an observed willingness to accept riskier borrowers, longer maturities and lower spreads, lenders appear to tolerate higher leverage for project versus corporate financed firms (Kleimeier & Megginson, 2000). Institutional term loan lenders exhibit similar high tolerance for risk (Nini, 2008) – a characteristic which could also apply in the project finance context. Furthermore, the predictability of cash flows, asset values and high tangibility increases debt value – as creditors are effectively short volatility (Sawant, 2010a, p. 84) – enabling higher leverage levels. This attribute is observed on a macroeconomic level as well, as low collateral value volatility increases leverage in the economy (Geanakoplos, 2010). In addition, the equity ownership by insiders and counterparties (Leland & Pyle, 1977) and the high liquidation values of project assets (Harris & Raviv 1990; Williamson, 1988) can help to explain the observed high leverage ratios in project finance.[14]

Finally, the choice of leverage is influenced by risk management considerations. Byoun et al. (2013) find project risk and leverage are positively related, except when long-term risk-reducing contracts are present – implying that leverage substitutes more conventional forms of risk management in project finance. It could also explain why project finance loans have fewer covenants on average (Kleimeier & Megginson, 2000), as low free cash flows can effectively perform the same monitoring function. This relationship between risk and leverage goes contrary to conventional tradeoff theory, which states that risky firms should be equity financed (Byoun et al., 2013). However, since

[14] However, equity owners as counterparties is not unanimously seen as a positive. Corielli et al. (2010) find lenders do not appreciate involvement when determining leverage and spread when sponsors are key contractual counterparties. This can be partly attributed to sponsors gaining priority to cash flows when counterparties to project operations (Sawant, 2010a).

projects are typically characterized by asset tangibility, collateral value stability, high end-product substitutability, few growth opportunities as well as low information asymmetry because of due diligence and monitoring ease, high leverage can arguably also be justified by trade-off theory. This is also attributable to the contract network's efficiency in risk allocation and a transaction structure that mitigates bankruptcy costs. Direct bankruptcy costs are alleviated with a clear payment mechanism – the cash flow waterfall – and indirect costs by the lack of growth opportunities (Berkovitch & Kim, 1990; Byoun et al., 2013). In addition, the lack of growth opportunities enables longer maturity debt (Barclay & Smith, 1995). Moreover, the high level of regulation and the non-cyclicality of project company industries facilitates higher leverage (Jensen & Meckling, 1976; Shleifer & Vishny, 1992). Furthermore, the traditional agency problems of asset substitution and leverage induced underinvestment are alleviated due to the lack of assets in place in project companies (Byoun & Xu, 2014; Jensen & Meckling, 1976; Myers, 1977).

High leverage enforces contracts (Esty, 2003) – by minimizing free cash flow, the ability for opportunistic behavior without triggering a default is limited (Byoun & Xu, 2014; Esty, 2002; Jensen, 1986). Grossman and Hart (1982) provide similar thoughts on debt as a bonding and signaling mechanism for management to align incentives. In addition, capital structure theories based on information asymmetry – such as the signaling models of Ross (1977) and Leland and Pyle (1977) – prescribe a positive relation between profitability and leverage. Mitigation of political risk is another key factor in leverage determination and use of project finance in general (Hainz & Kleimeier, 2012; Kleimeier & Versteeg, 2010) – which is claimed to be significant only in emerging economies (Brealey et al., 1996). To conclude, since project finance transactions efficiently alleviate the traditional concerns of corporate finance, "project finance can be seen as an innovative risk-sharing mechanism that combines organizational structure with capital structure in order to maximize project value, while optimally allocating project risk." (Byoun et al., 2013, p. 550)

2.1.3 Syndicated project finance loans

Syndicated project finance loans have several distinct features that set them apart from other syndicated credits. Since project heterogeneity makes standardization challenging, transaction costs for these loans are high – estimated at around 5% of deal value (Esty, 2003). Moreover, fees of project finance syndications are significantly higher than other syndications (Kleimeier & Megginson, 2000). Traditional syndicated lending shares features of both traditional bilateral relationship lending and more diffuse transaction lending, i.e., publicly traded debt (Altunbaş et al., 2006). Their project finance counterparts, however, do not share the relationship element vis-à-vis the borrower and are thus more transaction-oriented (Contreras et al., 2018). Regardless of high transaction costs, for risky borrowers with high agency costs of debt, project finance is preferred for long-term financing (Pinto & Alves, 2016).

Loan syndicates in project finance are typically concentrated and the lead banks hold larger shares, which increases lead bank importance (Yescombe, 2014). Central tasks of lead arrangers are screening and due diligence of projects, organizing a suitable syndicate as well as to put in place covenants and rules to help monitor the borrower (Gatti et al., 2013). Due to the extensive collaboration with equity sponsors and the effort required in organizing a project finance loan, arranging banks become insiders in the project companies – "effectively" even owners (Blanc-Brude & Strange, 2007, p. 105) – further obscuring the line between debt and equity governance (Gatti et al., 2013). The high concentration in project finance loan syndicates has been attributed to level of free cash flows, differences in tax rates, level of political risk, lower information costs arising from legal separation and low bankruptcy costs due to asset tangibility (Brealey et al, 1996).

The remaining salient features of syndicated project finance loans are their long tenors, extensive security packages and number of third-party guarantees (Sorge & Gadanecz, 2008). In addition, strict covenant rules are typically present (Kleimeier & Megginson, 2000). Project finance loan maturities are longer, with the norm being between 12-15 years (Machlin & Rummel, 2020), and the relationship between spread and maturity is non-linear (Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008) - i.e., the term structure is hump-shaped. Moreover, the spread profile is typically staggered – relatively high pre-completion, low at the outset of operation and gradually higher as time passes (Yescombe, 2014). One explanation is that uncertainty is concentrated in the construction phase and the term structure could thus reflect the "sequential resolution of uncertainty that characterizes infrastructure projects" (Blanc-Brude et al., 2016, Reported financial metrics are inadequate, para. 2). Other explanations include the prevalence of political risk guarantees and the fact that the high leverage decreases over time (Sorge & Gadanecz, 2008). Regardless, the findings are consistent with Merton's (1974) debt pricing model – a hump-shaped spread pattern should be observed for high levels of leverage and when there is low uncertainty about firm asset values at maturity (Sorge & Gadanecz, 2008).[15]

2.2 Institutional capital

Institutional investors have since the 1980's grown in size and influence, and now hold a considerable proportion of global financial assets (Frichtner, 2020).[16] While pension funds and insurance companies are liability-driven investors with a long-term investment horizon in order to match future obligations, private equity funds and mutual funds are investors with asset-only management policies and shorter investment horizons (Basile & Ferrari, 2016). Liability-driven investors specifically are considered ideal long-term investors (Porter, 1992, as cited in Switzer & Wang, 2017). So far most institutional capital in project finance has been invested in equity, estimated at around 90%, but debt side participation is increasing (Inderst, 2013).

2.2.1 Institution types

When considering the effect of institutional investor participation, we must differentiate based on type due to significant investor heterogeneity (Yan & Zhang, 2009). Investment decisions are driven by a host of factors such as "…market trends, investment beliefs, regulation, risk appetite, liability considerations, cultural factors, governance structures, tax issues and ultimately domestically available assets" (Della Croce & Yermo, 2013, p. 9). These in turn are affected by institution type through diverging mandates, constraints and objectives. Typically, institutional investors are categorized into long and short-term investors based on investment horizon (Gaspar et al., 2005).

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[15] In Merton's model this non-linearity is driven by two components: firm leverage and uncertainty of firm asset values at maturity. Curiously, the second component in the model turns negative at very high maturity levels. – reflecting the realization that the longer the maturity, the lower the probability that firm assets will be below the model "strike price" (Sorge & Gadanecz, 2008).

[16] Total invested capital is estimated to be between USD 95-120 trillion (Arezki et al., 2016; G20 Sustainable Finance Study Group 2018). However, only approximately one percent is said to be allocated on average into infrastructure (Inderst, 2013, 2016).

Pension funds and insurance companies – particularly life insurance companies – are the central long-term institutional investors. For insurance companies, investment goals are two-fold – to meet future liabilities and to accumulate a sufficient surplus for shareholders and customers (Albrecher et al., 2018). Pension funds generally aim to maximize return subject to liquidity and liability needs while staying within pre-determined risk limits (OECD, 2006). Pension funds are further divided into defined benefit (DB) and defined contribution (DC) pensions. DB pensions provide a predefined benefit to all members, their risk attitude depends on their liability coverage levels and they have an asset-liability management (ALM) approach to investment strategy. DC funds cater to individual investors, maximize returns subject to an investor-defined risk level, they have an asset-only management approach to investing and allocation policies more akin to traditional investment funds. (Basile & Ferrari, 2016). Other than DC pension funds, long-term investors have low funding liquidity risk due to predictable cash flows, which enhances their ability for long-term investment (Beyhaghi et al., 2019; Insurance Europe and Oliver Wyman, 2013). Finally, sovereign wealth funds (SWFs), although similar to other long-term investors, are mainly unregulated, heterogenous and susceptible to political pressure. As a result, SWFs do not provide many of the benefits associated with other long-term investors (Knill et al., 2012).

The main short-term investors active in infrastructure are mutual funds and private equity funds.[17] The latter have been active as equity sponsors in infrastructure projects (Mugasha, 2007, as cited in Estevan de Quesada, 2018), while the former have traditionally focused on secondary market corporate loans in the syndicated lending space (Nini, 2017). The investment objectives and horizons of these investors are heterogenous and not liability-driven – their mandate is to maximize return subject to pre-determined risk levels or investment strategies. Moreover, investment strategy is heavily influenced by source of funding. While funding of private equity is through limited partnerships with lock-in periods, mutual funds, particularly open-ended ones, are subject to significant liquidity risk (Basile & Ferrari, 2016). Hence, private equity funds can arguably be defined as mid-term investors compared to mutual funds.[18] Notably, there is

[17] Notably, during this thesis mutual funds include all those investment funds which do not belong in the category of private equity funds, hedge funds, or any other of the mentioned investor types.
[18] For example, the life span of private equity funds active on the equity-side of infrastructure has ranged between 10-12 years (Inderst, 2010).

significant overlap between short and long-term investors due to the latter often providing the majority of the former's funds (Inderst, 2013).[19]

2.2.2 Investment principles

According to Basile and Ferrari (2016), the distinction between asset-only and asset-liability management policies differentiates institutional investors and their investment functions. While asset-liability constrained investors aim to meet predefined commitments, asset-only investors have no such performance commitments and can focus on optimal asset allocation. However, the lack of commitments is coupled with funding liquidity risk and as a result a short-term focus, as investors such as open-ended mutual funds are subject to sudden outflows (Edelen, 1999). In addition to liquidity considerations, investment is constrained by factors such as time horizon, tax treatment differences of different assets, available asset characteristics, regulation and legislation as well as investor-type specific characteristics (Basile & Ferrari, 2016; Insurance Europe & Oliver Wyman, 2013).

Investment horizon affects investment decisions, capacity to bear risk, investment monitoring and portfolio construction (Basile & Ferrari, 2016). Investment horizon differences have been attributed to differing age structures as well as liquidity needs among investors and institution beneficiaries (Gaspar et al., 2005). Moreover, liquidity is a key consideration that affects investment and a significant source of risk. According to Basile and Ferrari (2016), liquidity risk is further divided into funding and market liquidity risk. While the former has already been touched upon, the latter focuses on the liquidity of invested assets and their variation with market conditions (Basile & Ferrari, 2016). In a pension fund study, Broeders et al. (2021) find that average investment horizon and the share allocated to illiquid assets are affected by the pension fund's liquidity and capital requirements arising from regulation. Effectively, these requirements work through the fund's liability duration. For instance, a fund with a high liability duration, on average, has commitments in the long term. Subsequently, the resulting less severe liquidity requirements enable increased investment into illiquid assets. However, increased liability duration also increases interest rate

[19] In the project finance context, smaller institutional investors and those without the required expertise can invest, for example, through the project finance arms of large asset management firms, such as BlackRock, JPMorgan Asset Management and Allianz SE (Walter, 2016).

risk, for which regulators typically require capital to be available.[20] The interplay of these forces illustrates one of the many ways in which long-term investing can be constrained. Furthermore, the authors expect their findings to be stronger for insurance companies. This increased focus on liability duration increases the attractiveness of infrastructure investments due to the asset's duration hedging ability (Della Croce & Yermo, 2013).

According to Lim et al. (2014), required returns of long-term institutional investors and banks are largely similar. Instead of primarily seeking higher excess returns, pension funds and insurance companies focus on optimizing their portfolios to match liabilities in terms of duration and acceptable risk level. The expected returns of institutional investors are positively related to level of unfunded liabilities and CEO tenure, and they exhibit persistence, particularly in alternative assets (Andonov & Rauh, 2021). Long-term institutional investors tend to prefer safer firms on the equity side, but riskier firms when lending (Carey et al., 1998; Nandy & Shao, 2010) – except when simultaneously holding equity (Jiang et al., 2010). Required returns for private equity funds and mutual funds are considered to be significantly higher in order to justify higher fees (Lim et al. 2014). For example, according to Inderst (2010), private equity and bank-run infrastructure funds have an average reported target net IRR of 15.8%, median management fee of 1.75 percent and a typical private equity performance fee structure. However, there is significant variance in target returns based on industry and whether the project is greenfield or brownfield (Crédit Suisse Asset Management, 2010).

Institutional investors are often characterized as natural buyers of unlisted infrastructure assets (Della Croce & Yermo, 2013). Overall, there has been a trend of increasing investment into illiquid assets by institutional investors (Broeders et al., 2021) and infrastructure stands to benefit. For instance, a Willis Towers Watson 2019 study (as cited in Broeders et al., 2021) of the seven largest pension markets reports a 20 percentage point increase in illiquid allocation in the last two decades. Moreover, a recent OECD (2020) survey reports large pensions having an average allocation to unlisted infrastructure of 3.1 percent and a target allocation of 7.34 percent for

[20] Liquidity and capital requirements result in liability duration having a hump-shaped relationship with the ratio of illiquid to all assets and a convex relationship with overall risky asset allocation – the share of illiquid assets starts decreasing after a liquidity duration of 18 years due to offsetting increased capital requirements (Broeders et al., 2021).

respondents. The development is understandable, as particularly unlisted infrastructure has asset qualities that suit institutional investors. These include appealing returns; low correlation with other assets; cash flow stability and predictability; inflation hedging qualities and long maturity that fit the often inflation-linked liabilities; ESG-compatibility; and the ability to capture an illiquidity premium (Inderst, 2010, 2016). Institutional investors are reportedly averse to construction risk (Blanc-Brude & Ismail, 2013). Regardless, from a diversification perspective, an efficient portfolio should also include project finance debt from all project stages (Blanc-Brude & Ismail, 2013) – particularly in case of unlisted infrastructure (Blanc-Brude et al., 2017).

Other known factors that impede investment into project finance include the lack of credit ratings; borrower being private (Bosch & Steffen, 2011); short-term performance incentives of investors; asset class allocation limits (Della Croce et al., 2011; Group of Thirty, 2013); demand risk in greenfield projects (Dunning, 2013); less attractive yields in brownfield assets (Arezki et al., 2016); lack of a secondary market (Yescombe, 2014); lack of quality data and an agreed-upon return benchmark (Blanc-Brude et al., 2016). Moreover, investment is hindered by a lack of experience with the asset class; reputation risk in case of private infrastructure (Inderst, 2010); aversion to loan renegotiations (Beyhaghi et al., 2019) and a lack of skill to manage large project finance loan portfolios (Dwyer & Forrester, 2017). Furthermore, participation directly in lending syndicates requires specific capabilities, sufficient comfort and a level of specialization (Dwyer & Forrester, 2017). Conversely, institutional investment is facilitated by their longer investment holding periods, lower portfolio turnover, more diversified portfolios, long-term earnings preference (Bushee, 2001) and suitability for illiquid assets (Attig et al., 2012). Moreover, syndicated loans in general provide higher returns than bonds (Thomas & Wang, 2004).

Uncertainty grows with the time horizon and consequently ALM considerations are increasingly important in risk management and overall investment strategy (Della Croce & Yermo, 2013). Moreover, liability duration considerations are expected to strengthen further, for example, as longevity increases (Della Croce et al., 2011). The benefits of ALM strategies have become recognized in banks, insurance companies, pension funds and other institutions due to a change in how risk is assessed.[21] ALM has identified maturity mismatches as a central risk to long-term businesses (Albrecher et al., 2018; OECD, 2015). However, according to Albrecher et al. (2018), insurance companies and pension funds have liabilities of such high duration that they cannot be matched with existing financial instruments. As an example, an investor matching cash flows 50 years into the future is exposed to risk until sufficient maturity instruments become available – introducing a new dimension of unhedgeable risk (Albrecher et al. 2018). Moreover, there is an undersupply of high duration, low-risk assets such as government bonds (Della Croce & Yermo, 2013) – in fact, according to Albrecher et al. (2018), aggregate outstanding insurance liabilities outnumber available government bonds. Due to this deficiency, institutional investor suitability and demand for an asset should, ceteris paribus, increase with investment maturity (Albrecher et al, 2018).[22] Finally, high duration assets are often illiquid, but can be liquid as well (Albrecher et al., 2018). However, it should be noted that liquid assets are not immune to liquidity shocks – a risk for which they do not receive the same illiquidity premium as illiquid assets (Aretzki et al., 2016).

From a duration perspective there are still data-based questions, such as what is the effective duration of infrastructure debt once refinancings and covenants have been considered (Blanc-Brude et al., 2016). Consequently, increased infrastructure investment is impeded by the difficulty of integrating the asset into ALM strategies and allocation models without high quality data (Della Croce & Yermo, 2013; Inderst, 2010; Romanyuk, 2010). Moreover, persistent low interest rates create additional matching problems by increasing future liability values via a reduction in the discount rate (Insurance Europe & Oliver Wyman, 2013). ALM-driven investment strategies are influenced by the shift to a more risk-based capital framework in regulation, raising concerns that its liquidity focus disincentivizes and hinders long-term investment (OECD, 2015). This may preclude pension funds and insurance companies from investing in illiquid assets they would otherwise be uniquely able to hold to maturity (Insurance Europe & Oliver Wyman, 2013).

[21] These benefits include "an understanding of the company's overall position in terms of its obligations; comprehensive strategic management and investment in view of liabilities; the ability to quantify risks and risk preferences in the ALM process; better preparation for future uncertainties; and, ideally, gains in efficiency and performance from the integration of asset and liability management" (Romanyuk, 2010, p. 1)

[22] For instance on the equity side, infrastructure assets can alleviate these concerns with concessions and leases as long as 25 and 99 years, respectively (Inderst, 2010).

2.2.3 Institutional environment

Post-GFC (Global Financial Crisis) banking regulation emphasizes maturity mismatches, reflecting the risk of the modern banking model which arises from the mismatch between short-term funding and long-term lending (Albrecher et al., 2018). While the traditional deposit-taking source of funding is protected by deposit insurance, wholesale funding markets can dry up in an instant (Gatev & Strahan, 2009). This has led to regulation shifting to a more macroprudential approach, emphasizing the role of systemic risk (Hanson et al., 2011). The shift necessitated bank deleveraging, increased institutional capital importance, enhanced focus on ALM and restricted the ability of banks to provide long-term financing – weakening the traditional bank maturity transformation role of providing long-term financing with short-term deposits (Group of Thirty, 2013; Insurance Europe & Oliver Wyman, 2013). Moreover, the developments have coincided with the increasing prevalence of financial disintermediation and the expansion of capital markets (Della Croce & Yermo, 2013). Furthermore, in the project finance context market participants have considered withdrawing from holding loans altogether and focusing solely on origination and distribution (Dunning, 2013; Dwyer & Forrester, 2017). However, the trend could reverse if interest rates increase, as institutional investor search for yield subsides with an increased supply of suitable assets (Yescombe, 2014).

Thomas and Wang (2004) argue that informational, legal and institutional infrastructure developments have led to a reduction of information asymmetries and as a result the erosion of bank competitive advantage. This could arguably leave banks with only a liquidity function as the importance of information asymmetry decreases (Rajan, 1998). The competitive shift has been attributed to credit rating agencies improving information sharing (Millon & Thakor, 1985; Sufi, 2007); lowered monitoring costs (Preece & Mullineaux, 1994); increased capital requirements decreasing return on equity (Harjoto et al., 2006) and the growth of capital markets decreasing traditional financial intermediary importance (Della Croce & Yermo, 2013). Moreover, the basis of pricing has transformed from bank liquidity to a capital market-driven perspective, decreasing spreads by lowering liquidity premia (Thomas & Wang, 2004). In addition, changes in banking have been facilitated by the standardization of loan trading (Thomas & Wang, 2004); the repeal of the Glass-Steagall Act in 1999 (Jiang et al., 2010); the passing of Rule 144A allowing non-banks participation in secondary loan markets as well as globalization and deregulation increasing competitive pressure between banks (Boot & Thakor, 2000). Furthermore, information asymmetries are expected to further reduce globally with the consolidation of financial reporting standards such as a wide-spread adoption of IFRS (Yeh et al., 2019). Particularly credit ratings are important in institutional investor involvement as, for example, pension funds and insurance companies are often precluded from investing in unrated securities (Bosch & Steffen, 2011). While institutional investor involvement started on the secondary market, eventually the participation shifted to the primary market, leading to even institutional investor originated loans (Grupp, 2015).

The regulatory treatment of project finance loans has undergone changes in recent decades. Regulatory capital requirements are a key constraint for bank lenders, and the risk-weights which help determine them are calculated either with the standardized approach, foundation internal ratings-based (IRB) approach or advanced IRB approach (BIS, 2017). According to Dwyer and Forrester (2017), the Basel II (2004-2008) regulatory framework allowed banks to categorize these loans as specialized lending if using the foundation IRB approach, with risk-weights ranging from 70% to 250% based on credit rating and loan characteristics. The standardized approach treated project finance the same as corporate exposures, with risk-weights from 20% to 150% (ECB, 2004). For unrated loans, the risk-weight was 100%. The Basel III and IV, however, have had and are expected to have a detrimental effect on long-term lending prospects of banks active in project finance. Basel III (2011-2019) had an emphasis on leverage, liquidity and systemic risk. Its liquidity ratios – particularly the Net Stable Funding Ratio (NSFR) – led to increased capital quality requirements for long-term loans. Moreover, the higher capital requirements for globally systemically important banks (G-SIBs) affected project finance, as the active lenders are typically large. (Dwyer & Forrester, 2017). The standardized approach in Basel III gave an individualized treatment to project finance loans. While rated loans are treated the same as corporate exposures, unrated pre-operational phase loans have a weight of 130% and operational phase have a weight of 100%. Operational phase loans deemed of high quality get a lower 80% weight. (BIS, 2017). Finally, the range of possible IRB risk weights remained unchanged in Basel III regulation (BIS, 2019).

Pension fund and insurance company regulation has undergone changes as well.[23] As Broeders et al. (2021) describe, although the insurance industry has shifted toward risk-based regulation, the same is rare for pension funds as regulation is increasingly focused on qualitative factors.[24] Moreover, pension fund regulation depends on type – whereas DB pensions are regulated through restrictions on funding ratios, DC pensions often have quantitative restrictions related to pension plan age structure. Furthermore, there is significant heterogeneity in pension regulation globally, which is reflected in the selective adoption of the value-at-risk (VaR) measure (Boon et al., 2018). However, the existence of liquidity and capital requirements is common, and they are affected by whether the regulation has risk-based (e.g., Netherlands) or fixed capital requirements (e.g., Canada). (Broeders et al., 2021). Notably, institutions with risk-based regulation and DC pension funds are associated with significantly lower allocations to illiquid assets (Boon et al., 2018; Broeders et al. 2021). Moreover, pensions differ based on how the liability discount rate is determined – e.g., Netherlands uses market rates, Germany uses fixed rates (OECD, 2019) and in the US, public pension funds can use their expected return (Andonov et al., 2017). Infrastructure investment limits are rare, but investment could be indirectly affected through geographical restrictions or illiquid assets limits (OECD, 2015).

The adoption of risk-based regimes has various implications for institutional investors, particularly insurance companies. Risk-based regulation in the insurance industry has been in effect in the US since the 1990's and it became mandatory in the EU with the adoption of Solvency II in 2016.[25] However, the adoption of market-based valuation of assets and liabilities has raised concerns (Della Croce & Yermo, 2013; Inderst, 2013; OECD, 2015). For one, as mentioned when discussing ALM, mark-to-market accounting can hinder investment and lead to pro-cyclical behavior.[26] However, this issue is partly alleviated by the three counter-cyclical measures of Solvency II. While there has been a transition away from quantitative limits, they are often used in restricting

[23] The regulatory treatment of the mutual and private equity fund industries has also witnessed significant development and consolidation in recent decades, particularly in the EU (Basile & Ferrari, 2016). However, as there is significant heterogeneity in the regulation globally, the topic was determined to be left outside the scope of this thesis.

[24] These include general principles and guidelines regarding the conduct of investment and risk management processes, such as the prudent person principle and general fiduciary duties (OECD, 2105).

[25] Relevant to project finance, in 2016 the European Commission reduced the capital charges on qualifying rated infrastructure debt by 30% (Dwyer & Forrester, 2017).

[26] For example, a sudden deterioration of market conditions can lead to a drop in asset values but leaving liability values intact and thus creating the need to rebalance.

investment concentration, which could impede the participation of smaller investors in project finance lending. However, a benefit of risk-based regulation is its recognition of asset and liability interaction and consequently it promotes integration of suitable ALM practices. Finally, much like banks, insurance company risks are quantified via VaR models. (OECD, 2015).

2.3 Syndicated lending

2.3.1 Participants

The financial advisory and arranger functions have traditionally been the domain of financial intermediaries. Large deposit-taking financial institutions have had an advantage as arrangers due to low funding costs and have since the ease of regulation expanded their services to include advisory, becoming a single point of contact for prospective project finance borrowers. (Neuhann & Saidi, 2016). Moreover, investment banks and finance companies have been active in the market. Furthermore, multilateral and bilateral international financial institutions participate in project finance syndicates, particularly in emerging economies. Multilateral financial institutions (MFIs) promote private investment into infrastructure and are often necessary when exposed to political risk. Developmental finance institutions (DFIs), also known as development banks, and export credit agencies (ECAs) have a similar mandate but a narrower geographical scope. (Gatti, 2013)

2.3.2 Financial intermediation

The centrality of information asymmetries in syndicated lending necessitates the review of financial intermediation literature. For instance, within-syndicate information asymmetry is considerable and economically significant, accounting for approximately four percent of total cost of credit (Ivashina, 2009). A key function of financial intermediaries is to facilitate the efficient allocation of capital by minimizing the negative effects of asymmetric information. In addition, alleviating information asymmetry helps syndicate a larger part of the loan, leading to improved diversification and increased return on equity by decreasing capital requirements.

The syndicated loan market can be characterized as having two levels of information asymmetry. First, asymmetry between borrower and syndicate cause sub-optimal loan contracts compared to a symmetric information case. Due to borrower opacity and threat of moral hazard, arrangers must monitor and loan terms reflect the increased risk. Second, the information asymmetry between the syndicate lead and participants can cause ex ante adverse selection and ex post moral hazard regarding monitoring (Simons, 1993). Finally, a third level arguably exists – that between the arranger and institutional investors.

2.3.2.1 Information asymmetry

Lead banks mitigate information frictions through reputation, economies of scale, information production ability, relationships and actions (Gatti et al., 2013). Lead arrangers must screen potential borrowers, conduct due diligence, monitor borrowers and enforce contracts with the power to possess collateral and assume control (Djankov et al., 2007). Notably, project finance is considered particularly efficient at removing information asymmetries by decreasing screening costs and incentivizing arranger-borrower collaboration (Kleimeier & Versteeg, 2010; Shah & Thakor, 1987).

The syndicated loan market is characterized by high barriers to entry and repeated collaborations, both of which lead to banks capturing quasi-rents (Pichler & Wilhelm, 2001). The market structure creates a mechanism to punish free riders and opportunistic lead arrangers by barring future syndicate participation, transforming reputation and relationships into vital assets (Panyagometh & Roberts, 2010). Although quasi-rents are generally a sign of market and competition imperfections, the market structure may in fact be optimal due to information asymmetry and the expense of monitoring collaborators (Pichler & Wilhelm, 2001). Literature is mixed on whether moral hazard or adverse selection is the central agency problem in syndicated lending. The question hinges on where the key information asymmetry boundary lies (Sufi, 2007). In the adverse selection hypothesis, the lead has inside information on the borrower and participants are disadvantaged (e.g., Ivashina, 2005; Panyagometh & Roberts, 2010). In the moral hazard hypothesis, all syndicate members know little of the borrower and the arranger is delegated the monitoring role (e.g., Bosch & Steffen 2011; Sufi, 2007). The central mechanism lead banks employ to mitigate concerns is by retaining a larger share to signal commitment (Bosch, 2006; Leland & Pyle, 1977).

Mitigating syndicate moral hazard is vital to the supply of uninformed capital (Bosch & Steffen, 2011). For example, uninformed lenders prefer to participate in syndicates with strong arranger-borrower relationships (Bharath et al., 2011) and this effect is enhanced for private borrowers (Bosch & Steffen, 2011). Conversely, concerns over moral hazard increase with opacity and a lack of credit ratings due to increased monitoring effort and costs (Bosch, 2006), but decrease with the use of covenants and performance-pricing provisions (Drucker & Puri, 2009; Panyagometh & Roberts, 2002). *Syndicate moral hazard* (Holmström & Tirole, 1997) can be considered a particularly important concept in project finance, owing to high leverage and the lack of participant recourse against an opportunistic lead bank (Contreras et al., 2018; Jones et al., 2005). Moreover, the effect of the information asymmetry between lead banks and institutional investors has gained attention (Estevan de Quesada, 2018). Higher spreads in institutional investor tranches are considered compensation for an information disadvantage and they decrease with institutional investor experience (Nandy & Shao, 2010). Finally, in addition to the mentioned, syndicate formation is affected by information pooling motives regarding the borrower (Contreras et al., 2018). This has been considered more important than monitoring incentives in within-syndicate collaboration (Cai et al., 2017). Finally, from a lender perspective, information asymmetry is a non-diversifiable, systematic risk for which it requires an additional premium (Bosch, 2006). The effects of these asymmetries are mitigated by stronger ex post position of lenders via borrower country creditor rights or improving ex ante transparency with the prevalence of information-sharing institutions (Djankov et al., 2007).

2.3.2.2 Monitoring

Traditionally, financial intermediation literature has considered banks the most efficient providers of financing in the presence of information asymmetry due to their monitoring ability. As such, the efficacy of syndicated lending centers on lead arranger performance in a delegated monitoring role. (Diamond, 1984). If the borrower lacks collateral, a partial substitute is monitoring – with a lack of tangible assets, the borrower needs to rely on a more information-intensive form of funding (Holmström & Tirole, 1997). Moreover, borrowers with high information asymmetry and lack of reputation typically rely on loans due to banks being more effective monitors than public markets

(Diamond, 1984, 1991).[27] Due to diversification and regulatory concerns sizeable bilateral lending is impractical and thus outside capital participation is required.

According to Holmström and Tirole (1997), the monitoring mechanism is facilitated by a certification effect, where uninformed investors participate due to the intermediary's financial stake. The necessity for a sufficient stake has been the traditional view of financial intermediation, but this requirement has weakened with regulatory changes and the proliferation of universal banking – i.e. the monitoring incentive remains even as the lead bank financial stake decreases due to cross-selling (Neuhann & Saidi, 2016). However, this argument might not hold in project finance, where cross-selling and a past banking relationship is less important. Monitoring efficiency has been found to improve with lead bank share (Diamond, 1984; Holmström & Tirole, 1997; Sufi, 2007); proximity of lender (Nini, 2004); use of covenants (Rajan & Winton, 1995); use of performance-pricing provisions (Panyagometh & Roberts, 2002) and shorter maturities (Marchica, 2011). Moreover, monitoring is facilitated by smaller syndicates (Preece & Mullineaux, 1996); the importance of reputation (Champagne & Kryzanowski, 2007; Dennis & Mullineaux, 2000); the strength of creditor rights (Shleifer & Vishny, 1997); tangibility of borrower assets (Esty, 2002) and syndicate concentration (Esty & Megginson, 2003; Lee & Mullineaux, 2004).

The entrance of institutional investors into the syndicated lending market raises questions on how monitoring is affected. The facilitating and moral hazard reducing effect of universal banks as lead arrangers is particularly pronounced for institutional investors (Neuhann & Saidi, 2016). Considering more active lending roles, research in public equity markets has found that long-term investors have a stronger preference and ability for monitoring than short-term investors and that these strengthen with investment horizon and ownership concentration (Chen et al., 2007; Gaspar et al., 2005; Wahal & McConnell, 2000). In addition, institutional investors have a more significant impact on monitoring intensity (Marchica, 2011); a stronger governance role in presence of larger agency problems (Attig et al., 2013); receive stronger relative benefits to monitoring, particularly in the case of dual holders of equity and debt (Jiang et al., 2010) and they are not averse to active

[27] According to Diamond (1991), new firms acquire reputation by repaying these loans which require monitoring. As reputation accumulates, firms are eventually able to issue debt without monitoring, i.e. public debt (Diamond, 1991).

governance roles (McCahery et al., 2016). Moreover, their presence mitigates agency problems between stakeholders, decreases credit risk and these effects are increasing in investment horizon (Switzer & Wang, 2017). Almazan et al. (2005) provide contradicting evidence on monitoring efficiency, finding that active (i.e., short-term) investors have lower monitoring costs than passive investors. Although these findings are not explicitly lending related, they show how institutional investor characteristics could affect syndicated project finance lending.

2.3.2.3 Renegotiation

The availability of private debt is also driven by the ability of creditors to force repayment, possess collateral and assume control. The extent of these powers is relevant when loan agreements need renegotiating – a situation which is particularly common in syndicated lending. For instance, Roberts and Sufi (2009) find that more than 90 percent of long-term syndicated loans are renegotiated prior to maturity. Moreover, the average loan is renegotiated five times (Roberts, 2015). Renegotiation is considered a complement to monitoring (Preece & Mullineaux, 1996), as the opportunity to renegotiate and effectively reduce loan maturity provides additional monitoring incentives (Rajan & Winton, 1995). Moreover, renegotiation can substitute complex contracts (Huberman & Kahn, 1988a). From a debtor perspective, ease of renegotiation decreases financial distress costs (Hoshi et al., 1990). This is particularly relevant in project finance, where asset specificity reduces liquidation value (Shleifer & Vishny, 1992; Williamson, 1988). However, it should be noted that for opaque borrowers there is a threat of lender hold-up. Such borrowers can be locked into lending relationships where the lender gains monopoly power due to the acquired informational advantage in the lending relationship and the difficulty of finding alternative financing (Santos & Winton, 2008).

Syndicated lending benefits from an ease of renegotiation compared to public debt. This view is reinforced by unanimity requirements of changing key loan terms. Even more minor clauses like covenants require between a 1/2 or 2/3 majority (Sufi, 2007), emphasizing the importance of relationships in syndicate composition (Lee & Mullineaux, 2004). The ability to renegotiate is a source of value for firms (Gorton & Kahn, 1993) and the value increases with the quality of information, the severity of agency problems, monitoring ability (Berlin & Mester, 1992), contracting costs (Huberman & Kahn, 1988b) and decreases with borrower creditworthiness (Berlin & Mester, 1992). The costs of renegotiation are lower when asset tangibility is high, as costs of estimating asset values are reduced (Myers, 1977). Moreover, renegotiation has been noted to ease with a strong lead bank presence (Paligorova & Santos, 2018), stringent contract terms (Huberman & Kahn, 1988b) and borrower-lender information symmetry (Hart & Moore, 1998). Furthermore, geographic and cultural proximity and the resulting similarities in legal systems, lender loan portfolios and stakeholders decrease renegotiation costs (Dorobantu & Müllner, 2019).

As was alluded to earlier in section 2.1.1 Contractual network, the cost of renegotiation provides lead banks with an additional tool for dealing with information asymmetry vis-à-vis the borrower. Although ease of renegotiation is preferrable in general, it can incentivize strategic default and thus leads syndicates to face a tradeoff (Qian & Strahan, 2007). Strategic default can be deterred by altering the loan agreements to increase the inefficiency and costs of renegotiating (Bolton & Scharfstein, 1996). For example, this can be done by increasing syndicate size (Shleifer & Vishny, 1997). Although more diffuse debt ownership introduces free rider problems to monitoring, it also encumbers renegotiations (Brealey et al., 1996; Pichler & Wilhelm, 2001).[28] The reaction of increased diffusion emphasizes a distinct feature of credit that Shleifer & Vishny (1997) describe as the power of dispersed creditors – unlike equity, the toughness of debt increases when the number of creditors increases. Other ways lead banks can do this is by giving creditors the right to liquidate company assets (Bolton & Scharfstein, 1996); including distant lenders (Dorobantu & Müllner, 2019); threatening to impede future borrowing (Esty & Megginson, 2003) or by including more non-bank participants (Nandy & Shao, 2010). The aversion of institutional investors to renegotiation has been connected to lender funding liquidity risk – i.e., short-term investors are particularly averse (Beyhaghi et al., 2019). The aversion has led to the use of split control rights in multi-tranche loans post-GFC to mitigate bargaining frictions, as in such arrangements only the revolver tranche participants renegotiate (Berlin et al., 2020). Due to the organizational structure of project finance, creditor and equity holder incentives are more closely aligned and the threat of strategic default is lower. However, the risk of economic default is not and hindering renegotiation

[28] As an extreme example, the atomistic nature of bond ownership makes reaching an agreement prohibitively cumbersome (Esty & Megginson, 2003).

increases the costs of financial distress (Esty & Megginson, 2003).

2.3.3 Syndicate composition

Information and risk considerations are key drivers of syndicate structure. For instance, Ivashina (2009) finds that syndicate structure and loan terms are determined by the equilibrium of the information asymmetry premium required by participants and the diversification premium required by the lead arranger. Preece and Mullineaux (1996), on the other hand, view structure as an equilibrium between monitoring capability and renegotiation ease. Moreover, syndicate participation is driven by loan portfolio diversification (Thomas & Wang, 2004), relationship building and cross-selling incentives (Ivashina, 2005). However, from a diversification perspective, findings from the bond markets indicate that the benefits of geographic diversification, particularly to emerging markets, have diminished as the global co-movement of spreads has increased (Mauro et al., 2002).

Syndicate concentration and membership structure are two key attributes with which syndicates react to the borrower and lending environment. Larger syndicates are associated with longer maturities (Lee & Mullineaux, 2004); lower spreads (Champagne & Coggins, 2012); stronger lead-borrower relationships (Bosch & Steffen, 2011); credit risk and lead bank reputation (Lee & Mullineaux, 2004). Moreover, more diffuse syndicates are connected to higher financial distress costs (Godlewski, 2010; Hoshi et al., 1990); greater syndicate underwriter compensation (Esty, 2001); borrowers with more growth options (Panyagometh & Roberts, 2002); noncyclical industries and firms with complementary assets (Bolton & Scharfstein, 1996). Concentrated syndicates on the other hand are associated with improved screening; larger lead arrangers; price collusion (Cai et al., 2018); project finance borrowers (Esty & Megginson, 2003); emerging country borrowers (Champagne & Coggins, 2012); lack of credit ratings and borrower opacity (Bosch & Steffen 2011; Lee & Mullineaux, 2004). Moreover, syndicate concentration and the use of collateral have a connection – when concentration decreases, the probability of collateral use increases (Lee & Mullineaux, 2004; Qian & Strahan, 2007). Finally, concentrated syndicates are related to borrowers with higher default probabilities and lower credit quality in order to maximize liquidation values (Bolton & Scharfstein, 1996).

A substantial amount research is dedicated to the relationship between syndicate characteristics, and political and legal risk.[29] The findings on how syndicates respond to these risks are mixed – both increased diffusion and heterogeneity (Bosch & Steffen, 2011) as well as concentration (Esty, 2001) have been observed. The reaction to *political risk* of increased dispersion is attributed to the need for external leverage against sovereign expropriation.[30] Other ways to mitigate political risk include the use of non-recourse project finance as well as DFI (Hainz & Kleimeier, 2012) and ECA participation (Ahiabor & James, 2019). *Legal risk* measures the strength of host-country legal institutions – i.e., the level of creditor rights and the strength of legal enforcement. Legal origin is strongly related to country capital markets size and creditor rights strength, with common law countries – i.e., legal systems of UK origin – having the strongest rights. (Djankov et al. 2007; La Porta et al., 1997). Weak creditor rights and legal enforcement are associated with project finance (Kleimeier & Versteeg, 2010; Subramanian & Tung, 2016); less foreign lender participation (Houston et al., 2017; Qian & Strahan, 2007); higher spreads (Esty, 2004b; Qian & Strahan, 2007); shorter maturities; decreased likelihood of loan being secured (Qian & Strahan, 2007); concentrated syndicates (Bae & Goyal, 2009) as well as diffuse syndicates (Esty & Megginson, 2003). The reaction of syndicate dispersion to legal risk is also attributed to strategic default deterrence (Dorobantu & Müllner, 2019) – an effect which is non-linear, increasing when both creditor rights and legal enforcement are weak (Esty & Megginson, 2003).

The geographic and cultural distance is another dimension in which syndicate structure varies. For instance, in times of high systemic risk, banks form geographically close syndicates (Dorobantu & Müllner, 2019). The geographical distance between borrower and lender is associated with information asymmetry problems; higher spreads (Degryse & Ongena, 2005), particularly with longer maturities and in times of high volatility; higher monitoring costs and more covenants (Knyazeva & Knyazeva, 2012). As such, local bank involvement can improve information quality (Yeh et al., 2019). In addition, distance within the syndicate is related to increasing information gathering costs (Carey & Nini, 2007) and lead arrangers exhibit home bias in choosing participants

[29] Political risk can manifest in many forms, such as changes in law, controls on currency conversion and transfer, expropriation of the project and political violence (Yescombe, 2014).
[30] Effectively, a geographically dispersed syndicate provides an implicit threat of collective retaliation, restricted access to international credit markets and reputational damage (Dorobantu & Müllner, 2019).

(Champagne & Kryzanowski, 2007). The participation of foreign lenders on the other hand is associated with less-developed financial systems; less government participation in banking; higher fees; higher spreads (Esty, 2004b), particularly in larger financial markets (Haselmann & Wachtel, 2011); similarity of legal systems; smaller geographic distance and a local banking presence (Boyle & Stover, 2014). Moreover, foreign banks are particularly active in project finance syndicates – with Esty (2004b) finding foreign banks holding 74 percent of an average tranche. Furthermore, foreign lender involvement is positively related to larger borrowers, larger loans, higher leverage borrowers, asset tangibility, stronger banking restrictions, banking concentration and weak borrower country property rights (Houston et al., 2017). In addition, foreign banks are associated with diffuse syndicates and tranche structures; mining, oil, gas, power, utility and telecommunications sector borrowers (Ahiabor & James, 2019) as well as credit ratings (Bosch & Steffen, 2011). Finally, cultural distance is related to higher lead bank shares, syndicate concentration, spreads, smaller loans and additional borrower guarantee requirements (Giannetti & Yafeh, 2012).

2.3.3.1 Participant and lead arranger effects

In a market characterized by repeated collaborations (Panyagometh & Roberts, 2010), the information, relationship and reputation capital a lead arranger accumulates affect loan characteristics and syndicate composition. Their importance is emphasized by the fact that syndicate invites outnumber acceptances by 3:1 – demonstrating that in addition to banks competing for lead arranger status, they also compete for syndicate participants (Champagne & Kryzanowski, 2007).

Lead bank characteristics are significant particularly due to adverse selection considerations (Panyagometh & Roberts, 2010; Simons, 1993). Lead banks can mitigate agency problems by retaining a larger share – a method comparable to managerial ownership in the equity context (Ivashina, 2005). Moreover, lead bank significance is arguably particularly important in project finance due to limited recourse nature of the loans (Ahiabor & James, 2019). The incentive effect provided by a higher lead arranger share (Cai, 2010) is associated with lower spreads (Angbazo et al. 1998; Focarelli et al. 2008; Ivashina, 2005), borrower opacity (Dennis & Mullineaux, 2000; Jones et al. 2005; Sufi, 2007) and collateral (Panyagometh & Roberts, 2002). Moreover, a higher lead bank share is associated with a lead bank informational advantage, smaller lead bank size, smaller loan sizes, shorter maturities (Jones et al., 2005), weaker borrower country creditor rights (Esty & Megginson, 2003), weaker lead bank reputation, lack of a relationship with the borrower (Lee & Mullineaux, 2004) and riskier borrowers (Dennis & Mullineaux, 2000; Simons, 1993).

It is apparent that the market structure incentivizes lenders to foster relationships and reputation (Pichler & Wilhelm, 2001) – an assertion that has gained empirical support (Champagne & Coggins, 2012; Gopalan et al., 2011). Moreover, the significance of relationships and reputation is considered stronger in project finance (Yescombe, 2014). Through participation lenders acquire specialized skillsets in project evaluation, setting up contractual networks and monitoring (Gatti et al., 2013). Concurrently, lenders build and maintain portfolios of relationships, which arrangers then use to pool knowledge when reaching the limit of their informational capital (Contreras et al., 2018). Furthermore, prior interactions and reputation mitigate information asymmetry (Chaudhry & Kleimeier, 2015), predict future participation (Champagne & Kryzanowski, 2007), ease renegotiations (Bosch, 2006) and their lack is associated with opaque or emerging market borrowers (Champagne & Coggins, 2012). Furthermore, the interconnectedness of banks is time-varying, positively related to systemic risk and attributed to risk diversification motives (Cai et al. 2017). In addition, leads tend to choose strong participants to increase the likelihood of reciprocity (Cai, 2010) – a phenomenon particularly important in project finance (Contreras et al., 2018). This reciprocity effect is associated with lower lead shares, spreads and default probabilities (Cai, 2010).

Another key attribute is the level of lender skill and expertise. The repeated nature of syndicated lending results in lenders gaining transaction and industry-specific expertise, which then forms into competitive advantage (Champagne & Kryzanowski, 2007). When choosing particularly more senior participants, informationally disadvantaged arrangers tend to choose banks close to the borrower, banks with similar expertise or banks that are distant, provided they possess desired skillsets (Cai et al., 2018; Sufi, 2007). In addition, this perspective is particularly important to non-bank lead arrangers (Grupp, 2015). In choosing participants the lead faces a tradeoff vis-à-vis distance since both moral hazard and benefits from collaboration increase with it. Notably, in project finance, lead arrangers are more willing to collaborate with more distant banks (Contreras et al., 2018) – likely partly attributable to the benefits of collaborating with host-country banks (Yeh et al., 2019). The issue of moral hazard diminishes over time as collaborations accumulate, but so does the benefit (Champagne & Kryzanowski, 2007). Specialization is particularly common among finance companies and they tend to tolerate higher levels of default rates (Habib & Johnsen, 1999). In addition, lender specialization is positively related to expected payoffs for the financed project (Boot & Thakor, 2000), emphasizing the governance role of debt.

The effect of reputation is rooted in certification theory, which states that reputation is built by underwriting banks as a means of mitigating information asymmetry (Panyagometh & Roberts, 2010). Reputational capital enables lead arrangers to reduce information asymmetries and consequently decrease the share they retain (Dennis & Mullineaux, 2000; Lee & Mullineaux, 2004; Sufi, 2007). Strong bank reputation is related lower spreads; higher share of fees (Gatti et al., 2013); higher monitoring incentives (Billett et al., 1995); positive signaling of borrower quality (Yeh et al., 2019); larger syndicates (Panyagometh & Roberts, 2002) and stronger relationships particularly when of the same nationality (Champagne & Kryzanowski, 2007). Moreover, the effect of reputation is stronger when agency problems are more severe (Focarelli et al., 2008). The importance of reputation is emphasized by the observation that damage to it can have substantial repercussions in syndicated lending – bankruptcies of large borrowers force arrangers to retain larger shares, but this does not appear to occur to large lenders or during times of systemic stress (Gopalan et al., 2011).

2.3.4 Loan structure

Syndicated loan packages typically consist of multiple facilities or tranches of differing features and seniorities. The central part of a loan package is a term loan and there can be multiple such facilities in a loan package. In addition, syndicated loan packages include other discretionary and non-discretionary facilities. Revolvers or standby facilities allow flexible withdrawal at lower rates but require upfront and commitment fees to be paid for a portion of the undrawn facility (Lee & Mullineaux, 2004). From an investor and lender perspective, tranching divides loans into parts with different risk and return characteristics, enabling the participation of a wider variety of institutions and subsequently easing syndication (Maskara, 2010). Moreover, particularly for risky borrowers, tranching creates value by decreasing the total cost of credit (Maskara, 2010; Nadauld & Weisbach 2012).

Participants affect tranche features (Maskara, 2010). For instance, according to Gatev & Strahan (2009), commercial banks tend to dominate lines of credit and their advantage is connected to the liquidity hedge provided by government insured transaction deposits. Although institutional investors are willing to bear credit and market risk, they tend to shy from liquidity risk (Gatev & Strahan, 2009). Consequently, commercial banks still provide the vast majority – between 90-95% – of all project finance funding and can use their information monopolies in lending relationships to extract above-market interest rates (Ferreira & Matos, 2012; Walter, 2016). However, according to Rajan and Winton (1995), commercial banks should specialize in shorter maturity loans due to the structure of their liabilities, while institutional investors with long-term liabilities should focus on longer maturity loans. Harjoto et al. (2006) find that investment bank-arranged loans have lower spreads, which they attribute to investment banks requiring less compensation for bearing credit risk. However, they charge on average higher spreads for lines of credit, which the authors attribute to investment banks being transaction-oriented lenders.

Institutional investor tranches are characterized by longer tenors, riskier loan purposes, larger facility sizes, secondary market trading, credit ratings, more severe financial covenants, use of collateral (Nandy & Shao, 2010), dividend restrictions and a lack of collateral (Kim et al., 2018). The effect of institutional investors on spreads has been verified by numerous studies. However, the direction of the effect is in dispute. For instance, Ivashina and Sun (2011) find that institutional tranche spreads are lower and time-varying, which they hypothesize to be due to changes in institutional demand pressure or fluctuations in credit demand. The significance and time-varying nature of credit supply has gained support in other studies (Lim et al., 2014). Moreover, tranches likely to be securitized are also associated with lower spreads (Nadauld & Weisbach, 2012). The alternative conclusion is that institutional investor involvement leads to higher spreads (Jiang et al., 2010; Lim et al., 2014; Grupp, 2015). This has been attributed to non-bank investors exploiting a lender of last resort role (Biswas et al., 2020; Lim et al., 2014), lack of diversification in non-bank loan portfolios (Beyhaghi et al., 2019), lack of skill in monitoring private borrowers (Sufi, 2007) and the clientele effect – i.e., investors actively seek riskier loans (Nandy & Shao, 2010). Moreover, the spread differential is most pronounced when the institutional investor is a hedge fund, private equity fund (Lim et al. 2014) or an insurance company (Beyhaghi et al., 2019). Furthermore, the case of dual holder participation raises questions on pricing. For example, holding both debt and equity could lead to conflicts of interest. Jiang et al. (2010) find that dual holders are associated with longer investment horizons and lower spreads, which they contribute to incentive alignment effects. However, the presence of dual holders in the lending syndicate have also been associated with higher spreads (Lim et al., 2014).

2.3.5 Pricing

Most loan pricing models derive from the Black-Scholes-Merton option pricing model, which Merton (1974) later applied to pricing the default risk of corporate debt (Blanc-Brude & Strange, 2007). The model's estimate of the default risk premium is centrally driven by borrower leverage, variance of borrower asset values and debt maturity (Blanc-Brude & Strange, 2007). However, in practice the pricing of loans is driven by multitude of other factors. A debtors ability to repay is affected by risks related to operating conditions, macroeconomic events and country characteristics. In addition, the final spread charged is related to outside factors such as lender characteristics, syndicate dynamics and credit market conditions. The literature review will conclude with this section on pricing. Although there will be some repetition, it will assist with the transition to hypothesis development on project finance credit spreads.

Lending and pricing decisions are centered around the borrower. Unfortunately, due to the opacity and lack of data on project finance borrowers, many of these aspects cannot be considered in an empirical context. However, findings indicate that lower loan spreads are associated with project finance borrowers (Pinto & Alves, 2016); repeat borrowers, particularly when they are opaque (Bharath et al., 2011) and low counterparty risk in the case of project bonds (Bonetti et al., 2010). Although project viability is central, studies have considered pricing to be heavily affected by other factors. For instance, Altunbaş and Gadanecz (2004) find that lenders appear to focus more on country macroeconomic than borrower microeconomic characteristics when lending to emerging market borrowers. Loan spreads have been found to be positively related to debt-GNP ratio, the occurrence of sovereign debt reschedulings, debt service to export ratio (Eichengreen & Mody, 2000), weak legal and creditor rights (Esty, 2004b, Qian & Strahan, 2007); low sovereign risk scores (Ahiabor & James, 2019) and weak property rights (Bae & Goyal, 2009). Moreover, they are negatively related to banking market concentration and the extent banks participate in corporate governance (Hao et al., 2012); country credit risk ratings (Nini, 2004) and yield curve steepness (Pinto & Alves, 2016). In addition, European loans are associated with lower spreads compared to US loans (Carey & Nini, 2007), particularly for credit lines (Berg et al., 2016).[31] The role and ratio of fees to total borrowing cost differs between borrower countries. Gadanecz (2004) finds them higher for industrialized country borrowers, which he attributes to taxes or market disclosure incentives. Moreover, lenders evaluate borrower country balance of payments, exchange rate risk and foreign debt levels during debt decisions (Yescombe, 2014).

Syndicate structure has also been found to affect pricing. Spreads increase with syndicate size (Champagne & Coggins, 2012; Lim et al., 2014); relationship strength (Degryse & Ongena, 2005); within-syndicate cultural (Giannetti & Yafeh, 2012) and geographic distance (Knyazeva & Knyazeva, 2012); within-syndicate differences in lending experience (Cai et al., 2018); lower lead arranger share (Angbazo et al. 1998; Ivashina, 2005; Focarelli et al. 2008; Maskara, 2010); fewer lead arrangers (Bae et al., 2014) and the reciprocity effect (Cai, 2010). Moreover, lender characteristics are known to affect loan spreads. Higher spreads are connected to foreign lenders (Esty, 2004b, Yeh et al., 2019), but lower when borrower has foreign assets in lender's region (Houston et al., 2017) and investment bank revolver facilities – an effect, which is reversed for term loan spreads (Harjoto et al., 2006). A lower spread on the other hand is positively related to domestic syndicate participants (Ahiabor & James, 2019; Nini, 2004), borrower-lender distance (Degryse & Ongena, 2005), dominant banks (Ross, 2010) and high reputation lead banks (Gatti et al, 2013). Foreign lead arrangers and borrower country financial system size have been found to interact in loan pricing, with higher spreads charged from borrowers of larger systems (Haselmann & Wachtel, 2011). In addition, as was established in the previous section, institutional investors affect the spread, but

[31] However, the existence of a difference in total cost of borrowing for credit lines has been disputed. According to Berg et al. (2016), the higher spreads of US borrowers is offset by the higher fees of EU borrowers.

the results are mixed.

Non-price terms and other loan features also affect pricing. Higher loan spreads are connected to refinancing (Ahiabor & James, 2019); smaller loans (Ahiabor & James, 2019; Eichengreen & Mody, 2000); lack of credit ratings (Nini, 2004) and longer maturity (Gottesman & Roberts, 2004) – an effect which is decreasing for very long maturities in project finance (Sorge & Gadanecz, 2008). Also, higher spreads are associated with use of collateral (Dennis et al., 2000; Lim et al., 2014), particularly for commercial bank led loans (Harjoto et al., 2006). Notably, the observed effect of collateral can be explained by Stiglitz and Weiss (1981), who connect the use of collateral with screening – although collateral decreases risk, ceteris paribus, at high levels it can have adverse selection effects since only riskier borrowers seek funding. On the other hand, spread has been found to decrease with performance-pricing provision use (Lim et al., 2014) and with the presence of a currency mismatch (Gatti et al., 2013; Kleimeier & Megginson, 2000). The relationship between the loan base rate and the spread is positive in corporate loans and negative in project loans, meaning that a lower base rate (e.g., Libor) has resulted in higher spreads on average (Blanc-Brude et al., 2017).

3 Research question and hypotheses

This section develops and presents six hypotheses (H1-H6). To begin, the research question centers on finding out whether institutional investor type has an effect on syndicated loan pricing in project finance. As has been discussed in the literature review, institutional investor involvement can be expected to affect syndicated project finance lending and loan pricing (e.g., Beyhaghi et al., 2019; Grupp, 2015; Ivashina & Sun, 2011; Jiang et al., 2010; Lim et al., 2014; Neuhann & Saidi, 2016). In prior research (e.g., Nandy & Shao, 2010), the question of whether institutional investor involvement in general affects syndicated loan pricing has been investigated so far. Therefore as the first step, the earlier findings regarding institutional investor involvement are verified in the project finance context.

> **H1: Spreads in tranches with institutional investor participation differ from other tranches in project finance.**

Prior research has not, however, investigated whether institutional investor type affects pricing of institutional loan tranches in project finance. This thesis aims to contribute to existing literature by investigating the question.

> **H2: Institutional investor type is a determinant in project finance loan tranche spreads.**

Due to there being multiple types of institutional investors with vastly different motivations and constraints (Yan & Zhang, 2009), the expectation is that participant type does in fact matter. The empirical section will attempt to answer this question. If the hypothesis is confirmed, the subsequent empirical tests will seek to explain, through investigating the included hypotheses, what could be the reasoning behind the result. It should be noted that the method of classifying institutional investors according to type, however useful, has its caveats. Although there are distinct differences between types of institutional investors, there is also significant variation within the investor categories and results should thus be considered with caution (Bushee, 2004). Moreover, as detailed financial data at the investor-level was not available, the differences between investors cannot be controlled for. Nevertheless, the findings will be a useful start and possibly point towards a direction for future research.

H3: Maturity preferences of different investor types are a key determinant of spread differentials.

The hypothesis is rooted in the theory that although commercial banks are in general the most active lenders on the project finance market, they are in fact not well suited for project finance lending due to the maturity mismatch between their assets and liabilities (Gatti, 2013; Rajan & Winton, 1995). The mismatch arises from the discrepancy between the short-term funding commercial banks most often use and the nature of project finance loans being of particularly long maturity. As has been mentioned in the literature review (e.g., Della Croce & Yermo, 2013; Porter, 1992, as cited in Switzer & Wang, 2017), institutional investors such as pension funds and insurance companies might be uniquely suited for such lending through their long-term liability structure. The liability structure as well as the eroding competitive advantage of commercial banks lead to the expectation that long-term institutional investors have a competitive advantage in funding long-term loans (Thomas & Wang, 2004). As such, pension fund or insurance company tranches are expected to have lower spreads compared to the average loan tranche in the sample. However, other types of institutional investors, such as private equity funds have notably shorter investment horizons. The hypothesis implies that these differences in maturity preferences should be reflected in the pricing of loans. Therefore, the expectation is that if the hypothesized effect dominates, the spread should be highest for mutual fund tranches due to their high funding liquidity risk and subsequent short investment horizon, lower for private equity and the lowest for insurance companies and pension funds (Beyhaghi et al., 2019; Gaspar et al., 2005).

H4: Required rates of return of different investor types are a key determinant of spread differentials.

The spread differential could driven by short-term institutional investors requiring a higher rate of return to participate in loan syndicates compared to the one required by long-term institutional investors. Hence, observed pricing behavior could also be explained by the differences between the investment goals of different institutional investor types. The expectation is that if the hypothesized effect dominates, loan tranches with private equity participation have the highest spreads, followed by mutual funds and then by insurance companies and pension funds. Moreover, private equity fund and mutual fund tranches are expected to have higher spreads than non-institutional investor tranches due to having higher funding costs than commercial banks and lacking the liability structure of long-term institutional investors. Private equity funds have the highest required rate of return in order to satisfy their investors as well as to justify their high remuneration. For instance, the common compensation structure of a two percent management fee and 20 percent carried interest would be hard to justify with a low rate of return (Frichtner, 2020).

H5: The spread differential reflects the need to compensate for information asymmetry.

The characteristic of institutional investors being uninformed investors in the syndicated project finance lending market could lend an explanation to observed spread differentials (Bosch & Steffen, 2011; Neuhann & Saidi, 2016). Institutional investors are invited to participate in lending syndicates by syndicate lead arrangers, but they cannot verify the quality of the borrowers and might suspect that arrangers are attempting to unload low quality loans to uninformed investors. In this way adverse selection might require for the lead arrangers to offer institutional investors a higher spread to ensure their participation. Likewise, institutional investors cannot verify that syndicate lead arrangers are fulfilling their monitoring commitments. This way the possibility of syndicate moral hazard can also necessitate additional compensation.

Reputation can mitigate these concerns and its significance is observable in institutional investors behavior as they collaborate particularly with reputable leads. They hold higher shares of large universal bank-led loans, but the effect is found to weaken with investor experience (Neuhann & Saidi, 2016). As such, reputation as measured by market share has been found to mitigate agency problems (Panyagometh & Roberts, 2002, Gatti et al., 2013). In addition, due to experience being linked to competitive advantage (Champagne & Kryzanowski, 2007) and syndicate structure (Cai et al., 2018; Sufi, 2007) it stands to reason that it would affect participation choices and pricing as well. Moreover, the fact that agency problems appear to weaken as a participant gains experience supports the argument (Nandy & Shao, 2010).

These factors provide several implications for the thesis subject. First, since the syndicated lending market particularly for project finance is intensely specialized, stable in terms of participants and concentrated, institutional investors have a select group of highly reputable lead arrangers to collaborate with and gain experience (Neuhann & Saidi, 2016; Ross, 2010). Second, due to the stability of market participants, the importance of reputation is emphasized since the opportunity cost of lead arranger opportunism is high – i.e., the costs of a reputation loss through lost future revenue are significant. If information asymmetry concerns are a key driver in institutional investor participation, the expectation is that lead bank reputation and experience in the syndicate are determinants in institutional tranche pricing. In testing the hypothesis, reputation will be proxied by one, three and five year market shares and experience will be measured by constructed variables that measure accumulated transaction experience. In addition to reputation and experience, the use of performance pricing provisions have been associated with mitigating agency problems and thus the variable is also considered (Panyagometh & Roberts, 2002).

H6: The level of experience of different investor types are a key determinant of spread differentials.

Lending requires skills and expertise which take time, effort and resources to acquire. Banks have that capacity through their role as financial intermediaries. Institutional investors in general do not have the information gathering, screening and monitoring capabilities that lending necessitates. However, since the mid-2000's, institutional involvement in syndicated lending has become more common and it is conceivable that active participants in this particularly concentrated market have incrementally acquired the expertise required and that they have as a result become more informed investors (Nandy & Shao, 2010). Thus it stands to reason that the level of accumulated experience could explain differences in spread. In the empirical models, institutional investor experience will be measured by a constructed experience variable.

4 Empirical section

4.1 Data

4.1.1 Sample construction

The main dataset of syndicated loan tranches is from the Thomson/Refinitiv Dealscan database and was accessed via WRDS (Wharton Research Data Services). At the outset, the dataset consisted of 23,986 syndicated project finance loans. To have only syndicated loans in the sample, facilities Dealscan designated as *Bilateral, Sole Lender, Syndication (Bond)* and *Undisclosed (Bond)* by distribution method were removed from the sample. Moreover, the sample was further filtered to remove loans lacking the spread, maturity, lenders and other relevant information. The final dataset included 5081 unique loan traches. The sample has borrowers from 112 countries and the facilities are $1,382.45 billion combined. The first loan tranche is from 1987 and the most recent from 2020.

The main challenge in preparing the data was classifying lenders according to institution type. Due to gaps in the Dealscan database on lending company information, the research question necessitated the search for this information from elsewhere. In addition, as it later turned out, many lenders were originally misclassified in the Dealscan database. Manually checking lender types became impractical since the number of unique lenders in the final sample was 3,541. Although Dealscan had identification numbers for lenders, they could not be used to find information on the companies in other databases. Some notable linking tables do exist, namely those of Chava and Roberts (2008) and Schwert (2018), which connect Dealscan companies to Bank Focus and Compustat databases, respectively. However, these were useful for identifying only 390 large lenders and as a result most project finance lenders could not be linked to other databases for identification.

Since the mentioned papers used a method called fuzzy matching that could be implemented with statistical software, writing such a code for R became the next objective. The code functions by going through all names in a chosen field in a database and comparing the text strings to a list of names provided by the user. The fuzzyjoin package (Robinson, 2019) for R enabled the creation of such a code which could search a database for lender matches. It was run on the Orbis, Zephyr, Bank Focus and CapitalIQ databases. Through the process the identified firms could be classified using the institution, business and trade descriptions that the databases provided. The process resulted in a list of exact or close matches for the unidentified lenders. After removing false matches, the remaining matches were linked with the institution descriptions from their respective databases. Finally, the remaining unidentified lenders were manually checked and classified. In the end, the sample included 2,721 commercial banks, 69 DBs, 35 ECAs, 188 finance companies, 80 insurance companies, 225 investment banks, 81 mutual funds, 14 pension funds, 37 private equity funds, two SWFs and one hedge fund. The remaining lenders consist of institutions such as leasing companies and corporations.

4.1.2 Variables

In addition to the main variables of interest, the empirical testing required known variables from literature as controls. These included country-level, loan-level and syndicate-level variables. Firm-level data for borrowers and lenders would have been useful, but it was unavailable in sufficient numbers. During the lender identification phase also the project company names were run against Orbis database company names using the described fuzzy matching process. Although it found a match for around 1,400 of the 11,770 original sample project companies, for the majority the relevant data was missing. Including project company financial data in the empirical analysis would have been ideal, but useful firm-level data was available for less than 200 project companies so the idea had to be abandoned. Similar problem was present for lender-level financial data. However, the mentioned process led to the identification of companies listed in Orbis as equity holders in the sample project companies, which then led to finding some equity holders that were also participants in the syndicates. The majority of the variables used in the empirical part and their descriptive statistics are listed below in Table 1. Descriptive statistics of the remaining variables will be presented in Table 2. In Table 1, the studies in which they were used have been included in parentheses. Some notable variables that were omitted due to lack of access are country credit risk variables from *Institutional Investor* magazine (e.g., Esty, 2004b; Nini, 2004), loan issue credit ratings (e.g., Bosch & Steffen, 2011, Jiang et al., 2010) and project leverage (e.g., Byoun & Xu, 2014).

Table 1: Variable descriptions and descriptive statistics

Variable	Description	Obs.	Mean	SD	Min	Max
AISD	The dependent variable in the regressions is the all-in-drawn-spread (AISD). The AISD includes commitment fees and other yearly obligations, but does not include arranging or up-front fees. *Source: Dealscan.* **Unit:** *basis points (bps).*	5,081	202.86	158.71	10.00	3,728.00
FAC_AMT	Facility amount in million USD. Non-USD tranches have been converted with the exchange rates provided with the loan data on Dealscan. (e.g., Kleimeier & Megginson, 2000; Gatti et al., 2013). *Source: Dealscan.* **Unit:** *million, USD.*	5,081	272.08	582.44	1	13,204
MAT	Loan maturity (e.g., Sorge & Gadanecz, 2008; Kleimeier & Megginson, 2000). *Source: Dealscan.* **Unit:** *months.*	5,081	117.97	80.61	1	515
SHARE	Loan share retained by the lead arranger (e.g., Angbazo et al. 1998; Ivashina, 2005; Focarelli et al. 2008) Notably, although all single lender loans were excluded, one loan remains with a single lender holding all the debt. *Source: Dealscan.* **Unit:** *percentage points.*	5,081	10.12	17.39	0	100
LNCDAYS	Efficiency of borrower country legal enforcement. Measured by days to resolve payment dispute through the courts. *Source: Djankov et al. (2007).* **Unit:** *days.*	4,909	5.57	0.57	3.3	7.24
CRED	Borrower country creditor rights. Countries are assigned values based on the credit rights index by Djankov et al. (2007). Since creditor rights have historically shown little change, years after the index are assigned the final index year value (e.g., Esty & Megginson, 2003). *Source: La Porta et al. (1998) and Djankov et al. (2007).* **Unit:** *index value.*	4,911	1.93	1.09	0	4
CORR	Borrower country corruption. (Byoun & Xu, 2014). *Source: Transparency International.* **Unit:** *index value.*	5,025	6.09	2.00	1	9.9
GDPPC	Gross Domestic Product per capita to control for differences in borrower country economic development, as this has been found to affect the use of project finance (Kleimeier & Versteeg, 2010). *Source: World Development Indicators (WDI) from the World Bank.* **Unit:** *USD.*	5,067	28,257.1	19,725.1	276.8	116,597.3
GDPPC-%	GDP per capita growth (Kleimeier & Versteeg, 2010). *Source: World Development Indicators (WDI) from the World Bank.* **Unit:** *percentage points.*	5,053	1.99	3.52	-15.2	33
INFL	Inflation percentage (e.g., Djankov et al., 2007). *Source: World Development Indicators (WDI) from the World Bank.* **Unit:** *percentage points.*	5,014	4.3	7.64	-4.86	197.41
SENIOR	Seniority scale of loan tranche ranging from senior (1) to mezzanine (5). *Source: Dealscan.*	5,081	1.01	0.2	1	5

	Unit: *scale.*					
SEC	Dummy indicating loan is secured via collateral (e.g., Nini, 2004; Lim et al., 2014). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.57	0.50	0	1
SEC_MISSING	Dummy for loans lacking information on secured status as used in Chang et al. (2021). However, this produces the same results as if these loan were coded as unsecured via the *SEC* variable (Bosch & Steffen, 2011, p. 293). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.37	0.48	0	1
PPRICING	Dummy for the use performance pricing provisions (e.g., Lim et al., 2014; Panyagometh & Roberts, 2002). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.07	0.26	0	1
GUAR	Dummy indicating loan has a guarantor. (Santos & Winton, 2008). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.13	0.34	0	1
SPONS	Dummy indicating loan has a private equity sponsor according to Dealscan. (Santos & Winton, 2008). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.12	0.33	0	1
LIBOR	Dummy indicating which benchmark is used as the base rate in the loan (e.g., Blanc-Brude et al., 2017). *Source: Dealscan.* **Unit:** *dummy.*	5,078	0.65	0.48	0	1
EURIBOR		5,078	0.19	0.39	0	1
MULTI	Dummy indicating loan is a part of a multi-tranche package (e.g., Maskara, 2010). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.59	0.49	0	1
SPONS_DUAL	Dummy indicating loan has a lender which is also an equity holder (e.g., Lim et al., 2014; Jiang et al., 2010). *Source: Dealscan, Orbis.* **Unit:** *dummy.*	5,081	0.012	0.107	0	1
SYND_SIZE	Number of lenders in the syndicate (e.g., Champagne & Coggins, 2012; Lim et al., 2014). *Source: Dealscan.* **Unit:** *number of lenders.*	5,081	8.93	7.44	2	120
CURR_RISK	Dummy indicating loan facility currency differs from borrower country currency (e.g., Kleimeier & Megginson, 2000). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.51	0.5	0	1
US_DUMMY	Dummy indicating a borrower from the US. The variable has been included to (1) account for a known geographic pricing difference (e.g., Carey & Nini, 2007) and (2) because US borrower loans are particularly common in the sample. *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.23	0.42	0	1
EU_DUMMY	Dummy indicating a borrower is from a European OECD country. The reasoning for the variable mirrors those for the US dummy (e.g., Carey & Nini, 2007). *Source: Dealscan.* **Unit:** *dummy.*	5,081	0.31	0.46	0	1
1Y.MKT.SHR_$	A constructed variable measuring syndicate lead bank's market share of past loan deals, scaled by facility size.	4,748	7.9	7.95	0	55.29
3Y.MKT.SHR_$		4,721	6.6	6.97	0	36.35

5Y.MKT.SHR_$	(e.g., Gatti et al., 2013). *Source: Dealscan.* **Unit:** *percentage points.*	4,706	5.92	6.46	0	43.43
1Y.MKT.SHR	A constructed variable measuring syndicate lead bank's market share of past loan deals. (e.g., Gatti et al., 2013). *Source: Dealscan.* **Unit:** *percentage points.*	4,748	4.49	3.95	0.05	17.28
3Y.MKT.SHR		4,721	3.64	3.43	0.02	14.05
5Y.MKT.SHR		4,706	3.2	3.11	0.02	14.29
SYND_EXP	Syndicate mean experience. Measured by number of past syndicate participations. *Source: Dealscan.* **Unit:** *number of transactions.*	5,081	142.1	142.1	1	1,201.8
A_EXP	A variable of syndicate lead bank's experience, as measured by the number of syndicates participations accumulated by time of syndication. *Source: Dealscan.* **Unit:** *number of transactions.*	5,081	135.9	184	1	1,692.0
A.A_EXP	A variable of syndicate lead bank's arranging experience, as measured by the number of syndicates lead credits accumulated by time of syndication. *Source: Dealscan.* **Unit:** *number of transactions.*	5,081	48.3	66.9	1	515
INST_EXP	Mean experience of institutional investors in the syndicate. Measured by number of past syndicate participations. *Source: Dealscan.* **Unit:** *number of transactions.*	5,081	7.8	39.7	0	381

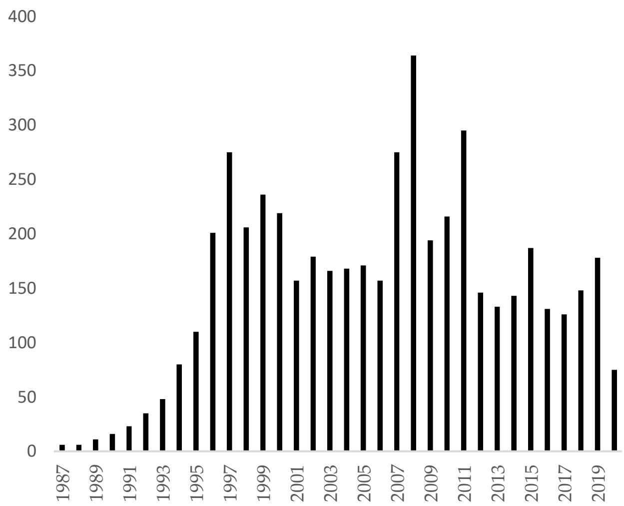
The main variables of interest are the dummies for institution type. These include mutual funds (*MUT*), pension funds (*PENS*), insurance companies (*INS*), private equity funds (*PE*), investment banks (*IB*), finance companies (*FIN*), sovereign wealth funds (*SWF*), developmental finance institutions (*DFI*) and export credit agencies (*ECA*). The default case is for commercial banks and other smaller categories of lender types without a dummy. In addition, a dummy for tranches with an institutional investor (*INST.TRANCE*) is created for testing the first hypothesis. Moreover, the sample includes dummies for loan types: Term A loans (*TERM.A*), Term B loans (*TERM.B*), Term C loans (*TERM.C*), Letters of Credit (*LC*) and other non-specified term loans (*TERM*). The omitted type is the revolver facility (*REV*). Furthermore, year dummies (Graph 1) were included to control for business cycle effects (Altunbaş et al., 2010), different interest rate regimes (Thia, 2019), credit cycles (Blanc-Brude & Strange, 2007) and common macroeconomic characteristics (Focarelli et al., 2008). Finally, year-US and year-EU interactions were included to account for trends and macroeconomic shocks in these regions which would not otherwise be captured.

Some control variables needed to be constructed at the syndicate-level and then condensed to a single figure for the loan. For example, a within-syndicate distance measure required the calculation of each lead-participant distance separately, which were then averaged to result in a loan-level syndicate distance measure (*S_DIST*). The distances were calculated using the ggmap package in R (Kahle & Wickham, 2013), which gets the latitude and longitude of a location from Google Geocoding API and then calculates the geodesic distance between them. A distance was also calculated between the lead arranger and the borrower. In cases of multiple arrangers (*B_DIST*), the lead status for the calculation was assigned to the one with also an agent credit. Where multiple remained, the one with the larger lending share was determined the lead arranger. Finally, if still multiple remained, the one closer to the borrower was chosen. A somewhat similar method was used to construct the cultural distance variables (Giannetti & Yafeh, 2012). First, using the Inglehart-Welzel cultural map values available from World Values Survey (Inglehart et al., 2014a, 2014b, 2014c, 2014d, 2014e, 2014f; Haerpfer et al., 2020) each lender and borrower was assigned coordinates. Second, lead-participant cultural distances were calculated and then averaged to get a mean value for the cultural distance measure (*S_C.DIST*). A similar measure was calculated for the lead-borrower distance to measure the cultural differences between lender and borrower, *B_C.DIST* (Giannetti & Yafeh, 2012). The descriptive statistics of these, loan and institution type variables are found in Table 2.

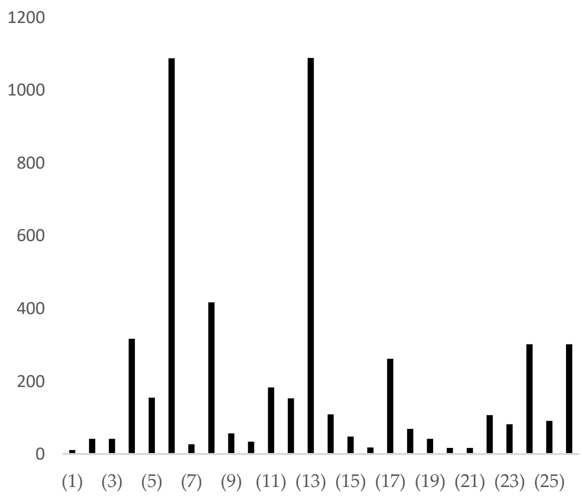
Table 2: Descriptive statistics

Variable	Obs.	Mean	SD	Min	Max
INST.TRANCHE	5,081	0.122	0.328	0	1
INS	5,081	0.031	0.173	0	1
PENS	5,081	0.045	0.208	0	1
PE	5,081	0.017	0.128	0	1
MUT	5,081	0.050	0.218	0	1
SWF	5,081	0.001	0.028	0	1
IB	5,081	0.357	0.479	0	1
FIN	5,081	0.186	0.389	0	1
DFI	5,081	0.088	0.284	0	1
ECA	5,081	0.061	0.239	0	1
LC	5,081	0.026	0.159	0	1
REV	5,081	0.151	0.358	0	1
TERM	5,081	0.637	0.481	0	1
TERM.A	5,081	0.019	0.135	0	1
TERM.B	5,081	0.023	0.15	0	1
TERM.C	5,081	0.003	0.051	0	1
S_C.DIST	4,685	0.733	0.53	0	3.29
B_C.DIST	4,685	0.584	0.861	0	4.07
S_DIST	5,081	3,263.16	2,689.10	0	13,095.16
B_DIST	5,081	2,858.40	4,127.77	0	19,640

The long maturity of project finance loans gives rise to additional risks. For instance, construction and project risks are substantial due to prevalence of forecasting errors (Flyvbjerg et al., 2002, 2003). Moreover, on the firm-level, projects face varying risks such as output and input-price risk and these then increase risk from the lender perspective. However, Dailami and Hauswald (2007) argue that these market risks have little explanatory power if the contractual network in project finance is efficient at allocating risk. If the contractual network is credible then this risk should not be priced in and hence should be secondary to, for instance, country or counterparty risk (Dailami & Hauswald, 2007). Altunbaş and Gadanecz (2004) report somewhat similar findings regarding lenders to emerging market borrowers prioritizing macroeconomic factors. Nevertheless, project risk will always be present to some extent and from an empirical perspective, these risks need to be proxied due to the lack of project-level data. Ideally loan issue credit ratings would have been used, but data was not accessible. However, it is reasonable to assume that for two project companies in the same industry these risks would be somewhat similar and therefore a natural proxy candidate is an industry dummy (Dorobantu & Müllner, 2019). Even though, for example, Corielli et al. (2010) find that borrower sector is not related to spread determination, arguably projects of similar type should face somewhat similar risks and thus help determine spreads.[32]



Graph 1: Year distribution



Graph 2: Industry distribution

Graph 1 shows how the loan issuance years are distributed in the sample. Graph 2 has the distribution of the dummies for the industries, which are Aircraft (1), Airports (2), Bridges and Tunnels (3), Electric cogeneration (4), Electric independent (5), Electric other (6), Electric transmission (7), Gas and Oil (8), Healthcare (9), Manufacturing (10), Transit (11), Mining (12), Other (13), Pipelines (14), Ports (15), Pulp (16), Commercial (17), Residential (18), Recycling (19), Ships (20), Arenas (21), Telecommunications (22), Casinos (23), Toll roads (24), Water (25) and Chemical (26), which is omitted.

[32] For instance, Hainz and Kleimeier (2012) find that industry leverage has a significant relation to the likelihood of project finance being used. Thus if industry-wide characteristics can affect use of project finance, they can arguably be expected to affect pricing.

4.2 Methodology

4.2.1 Univariate tests

As a first step, two univariate tests are run to see whether the spread means and medians differ between the different institutional tranches and the non-institutional tranches. The first test is the difference-in-means unpaired t-test, which has been used in multiple prior studies (e.g., Bae et al., 2014; Lim et al., 2014; Kleimeier & Megginson, 2000). In addition, the Wilcoxon rank sum test for difference-in-medians is also implemented (e.g., Bae et al., 2014; Bharath et al. 2011).

4.2.2 Primary model

For the multivariate stage, the structure of the data largely dictates model choice. Since the unit of observation is a loan tranche observed only at issuance, the data consists of independently pooled cross-sections. A pooled ordinary least square model (POLS) is chosen as traditional panel data methods are not applicable due to each loan being observed only once. After preliminary runs of all the models, visual inspection (Graph 10) and studentized Breusch-Pagan tests determined heteroscedasticity to be present. Consequently, all models are reported with clustered standard errors. Research with similar datasets have used clustering at the company (Bosch & Steffen, 2011), loan, SIC code (Giannetti & Yafeh, 2012), deal (Pinto & Alves, 2016), borrower country (Qian & Strahan, 2007) and project type level (Dorobantu & Müllner, 2019). Clustering at the project type, borrower country and deal-level were attempted, but final models are reported with deal-level clustered standard errors due to strong results of intra-cluster correlation from the Parente-Santos Silva test of the qreg2-module for Stata (Machado et al., 2011). Moreover, the use of both year and industry dummies should help control for heteroskedasticity, as the method effectively produces the same estimates as a year and industry fixed effects model (Wooldridge, 2013). The main regression equation (1) is as follows and is implemented in R.

$$\begin{aligned} log.AISD &= \boldsymbol{X\beta}^{POLS} + u \qquad (1) \\ &= \beta_0^{POLS} + \sum\nolimits_i \beta_{1i}^{POLS} \cdot (Type\ dummies)_i + \sum\nolimits_j \beta_{2j}^{POLS} \cdot (Loan\ variables)_j \\ &\quad + \sum\nolimits_k \beta_{3k}^{POLS} \cdot (Syndicate\ variables)_k + \sum\nolimits_l \beta_{4l}^{POLS} \cdot (Country\ variables)_l \\ &\quad + \sum\nolimits_m \beta_{5m}^{POLS} \cdot (Controls)_m + u \end{aligned}$$

where i represents institution type dummies, j are the loan variables, k are the syndicate variables, l are the country variables and m represents the remaining controls.

4.2.3 Econometric concerns

Endogeneity arising from simultaneity is a key concern that has been noted in prior studies. This is caused by the fact that some variables in the data may be co-determined, such as loan spread and non-price loan terms like the use of collateral (e.g., Fotak et al., 2019). Particularly the endogeneity of maturity has been considered in literature (e.g., Bharath et al., 2011; Gottesmann & Roberts, 2004). A common response to this is the use of instrumental variables (IVs). Two IV candidates for maturity were found – the term spread (Brick & Ravid, 1991) and a lagged moving average of the variable itself (Kleimeier & Versteeg, 2010). Both were found to fulfill the instrument relevance and exogeneity conditions (Wooldridge, 2013). However, as all post-estimation tests in Stata pointed towards instruments being weak, the use of a 2SLS model was abandoned. However, it should be noted that this suspected endogeneity of non-price terms has not received unanimous support, as some state that in practice these terms are fixed prior to pricing (Ivashina, 2009). This has been the case particularly in project finance (Sorge & Gadanecz, 2008), but opposing views do exist (Corielli et al., 2010). In any case, the endogeneity of maturity is a possibility, but it cannot be verified or denied without valid instruments.

Another caveat is that institutional investor participation itself could also be simultaneously determined. For example, much like the considerations Marchica (2011) faced on the connection of firm debt maturity and institutional ownership, institutional investor behavior in project finance lending could be determined by self-selection or the clientele effect. In the former, results could be biased due to certain types of institutional investors preferring to participate in loans with a certain level of spread. The latter, on the other hand, would bias results because of lead arrangers adjusting loan characteristics to attract specific institutional participation. Both of these would bias the inference regarding institutional investor effect on pricing by changing the direction of the causal relationship (Marchica, 2011; Wahal & McConnell, 2000). In addition to preferring certain spread levels, institutional investor participation could be driven by specific borrower characteristics that are omitted from the regression. Ideally this would be controlled for by including borrower company-level variables, but the lack of data precluded the option.

In addition to heteroskedasticity, the presence of other problems were tested. First, observing the fitted versus residuals plots from the POLS regressions (Graph 9, Appendix A), the zero conditional mean assumption appeared to hold. Second, a high level of multicollinearity was found. Although this was unobservable in a preliminary inspection of the correlation matrix (Table 12, Appendix A), calculation of variance inflation factors (VIFs) determined that particularly the year dummies, maturity terms and country-level variables suffer from multicollinearity. However, these instances turned out to be acceptable forms of multicollinearity, as they were caused by the inclusion of either power transformations or indicator dummies for categorical variables such as years. Moreover, regression inference is still valid for the key variables of interest as they were unaffected by multicollinearity. (Wooldridge, 2013, pp. 97-98).

4.2.4 Secondary model

A potential source of problems was the non-normality of residuals which was observed in all models, which was confirmed visually (Graphs 11 & 12, Appendix A) and with the Shapiro-Wilk test for normality ($W = 0.985$ and $p = 0.000$). Based on the use of clustered standard errors and the considerations above, it appeared that the POLS models satisfied the five Gauss-Markov assumptions – making it the best linear unbiased estimator (BLUE) – but not the normality of errors assumption (Wooldridge, 2013, p. 105). Koenker and Bassett (1978, p. 34) argue that although OLS is the unbiased estimator with the smallest variance when residuals are normally distributed, even a small number of outliers and hence a deviation from the normal distribution can make it a poor estimator, particularly in case of fat-tailed distributions. Because the residual distribution has fatter tails (Graph 11, Appendix A), quantile regression (QR) is expected to outperform OLS in terms of efficiency, i.e., have a smaller asymptotic variance (Koenker & Bassett, 1978, p. 34). Whereas traditional regression focuses on the expected mean of a dependent variable conditional on the explanatory variables $\boldsymbol{X}$, $E(Y|\boldsymbol{X})$, QR allows the study of this conditional distribution at different locations, $Q_\theta(Y|\boldsymbol{X})$, where θ signifies the quantile in question. According to Davino et al. (2014), QR is particularly useful in case of heteroskedasticity. When the variance of the dependent variable changes as a function of the explanatory variables, the coefficient estimates also change. Hence, in the presence of heteroskedasticity, QR can better explain the relationships between variables than OLS, due to the latter focusing solely on the conditional mean. (Davino et al., 2014).

$$F_n(\boldsymbol{\beta}_\theta|y,\boldsymbol{X}) = \sum_{i:y_i \geq x_i'\boldsymbol{\beta}_\theta}^{n} \theta|y_i - x_i'\boldsymbol{\beta}_\theta| + \sum_{i:y_i < x_i'\boldsymbol{\beta}_\theta}^{n} (1-\theta)|y_i - x_i'\boldsymbol{\beta}_\theta| \quad (2)$$

A key difference – as seen in the objective function (2) from Greene (2013) – is that QR is estimated by minimizing the *sum of weighted absolute residuals* rather than squared residuals as in OLS. This is illustrated by the above function which is minimized to compute the QR estimate of $\boldsymbol{\beta}_\theta$. The method decreases the effect of outliers, which is a particularly useful feature considering the nature of the thesis sample. (Greene, 2013). In addition, it is reasonable to expect that the explanatory variables may have different effects in different segments of the dependent variable population (Wooldridge, 2010). For these reasons and its use in finance literature (Switzer & Wang, 2017; Adrian & Brunnermeier, 2016), quantile regression was chosen as a second model. Therefore, the QR model run with the qreg2-module (Machado et al., 2011) in Stata, for a given conditional quantile θ, is as follows.

$$\begin{aligned} Q_\theta(log.AISD|\boldsymbol{X}) &= \boldsymbol{X}\boldsymbol{\beta}_\theta^{QR} + u \quad (3)\\ &= \beta_{0\theta}^{QR} + \sum\nolimits_i \beta_{1i\theta}^{QR} \cdot (Type\ dummies)_i + \sum\nolimits_j \beta_{2j\theta}^{QR} \cdot (Loan\ variables)_j \\ &+ \sum\nolimits_k \beta_{3k\theta}^{QR} \cdot (Syndicate\ variables)_k + \sum\nolimits_l \beta_{4l\theta}^{QR} \cdot (Country\ variables)_l \\ &+ \sum\nolimits_m \beta_{5m\theta}^{QR} \cdot (Controls)_m + u \end{aligned}$$

where θ represents the conditional quantile, i are the institution type dummies, j are the loan variables, k are the syndicate variables, l are the country variables and m represents the remaining controls.

A piecewise strategy is employed for the multivariate stage (Carey & Nini, 2007). The base models with the institutional tranche or institutional investor type variables are incrementally supplemented with different control variables to see whether observed effects persist after known determinants of loan pricing are considered. To complement the analysis, quantile regressions are run for the full model. For the later hypotheses, reputation and experience proxies are added to the full model. Moreover, additional regressions are run with interactions between reputation and different experience proxies and the lender type variables to investigate whether institutional investors differ in the sensitivity to these proxies.

5 Results and discussion

The results will be presented and discussed in the order of the hypotheses. The structure of the section follows the hypotheses, but due to significant overlap between the discussed topics, the subsections are not completely exclusive and several hypotheses can be discussed in any given point in the text. In addition, the full extended versions of all regressions are found in Appendix B.

5.1 Hypothesis 1

Univariate tests are conducted to determine whether the *AISD* statistically differs based on participant types and the results are reported in Table 3. In terms of H1, the preliminary results are significant as mean spreads are 13.12 bps higher in institutional loan tranches; however, only at a 10% significance level. H2 on the other hand produces mixed results. Mean or median spreads of *MUT* and *SWF* tranches are not statistically different from the rest of the sample. *INS* tranches have 5 bps higher median spreads, but only at the 10% level. Strongly significant results are found for the mean and median spread differences of *PENS*, *PE*, *IB* and *FIN* tranches. Pension fund tranches have a mean spread lower by 35.51 bps, while the private equity tranche mean is 153.36 bps higher. Finally, *FIN* and *IB* tranches have modestly higher spreads with 1% significance for the t-test and at least 5% significance for the Wilcoxon test. The univariate test results lend support to

Table 3: Univariate tests

	N(0)	N(1)	Mean(0) [Median(0)]	Mean(1) [Median(1)]	Difference	t-stat [z-stat]	p-value
INST.TRANCHE	4459	622	201.25	214.37	13.12	-1.816*	0.07
			[170]	[175]	[5]	[1331563]	[0.107]
INS	4925	156	202.90	201.35	-1.56	0.195	0.846
			[170]	[175]	[5]	[351421*]	[0.0695]
PENS	4850	231	204.47	168.96	-35.51	4.86***	0.000
			[175]	[150]	[-25]	[638007***]	[0.000]
PE	4996	85	200.29	353.65	153.36	-4.42***	0.000
			[170]	[250]	[80]	[137405.5***]	[0.00]
MUT	4828	253	202.99	200.28	-2.71	0.328	0.743
			[170]	[155]	[-15]	[598877.5]	[0.602]
SWF	5077	4	202.80	276.25	73.45	-1.077	0.36
			[170]	[212.5]	[42.5]	[5921.5]	[0.149]
IB	3268	1813	197.91	211.77	13.86	-2.952***	0.003
			[162.5]	[175]	[12.5]	[2848597**]	[0.023]
FIN	4138	943	199.60	217.14	17.53	-3.145***	0.002
			[165]	[175]	[10]	[1792736***]	[0.000]

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

institutional tranches having higher spreads (Jiang et al., 2010; Lim et al., 2014; Grupp, 2015), but do not support investment bank tranches having lower spreads (Harjoto et al., 2006), which are found to be higher (Maskara, 2010). Moreover, the preliminary results support the assertion that pension funds are particularly well suited for long-term lending (e.g., Della Croce & Yermo, 2013). Therefore, institutional investor type and involvement in general do appear to be connected to loan spread and further testing in a multivariate setting is warranted.

H1 is tested by running regressions on an institutional tranche dummy and a list of control variables. Results of these POLS models are presented in Table 4. Due to the log-level relationship between the dependent variable and *INST.TRANCHE,* a coefficient on the independent variable is inferred as a percentage change from the mean spread and not as a percentage point change in spread (Wooldridge, 2013). The same applies to all the main variables of interest that will be presented in later models. Inspecting Table 4, we see that institutional investor participation in loan syndicates is associated between 5.34 (7) and 9.97 (8) percent higher spreads ($100[\exp(\beta) - 1]$). Moreover, the signs and significance of the maturity coefficients confirm the hump-shaped term structure observed in literature (Kleimeier & Megginson, 2000; Sorge & Gadanecz, 2008). However, the significance of the squared term disappears in the full model. A larger and faster growing borrower country economy is associated with lower spreads. The effect is significant but modest, as spread decreases by 0.085 (7) and 0.018 (7) percent for a one percent increase in GDP and GDP per capita growth, respectively. The effect of corruption is statistically and economically significant in models (3), (5) and (6), but the direction is mixed.

Moreover, the coefficients on *SEC* confirm findings on the relationship of collateral and spread (Dennis et al., 2000; Lim et al., 2014), with secured loans having between 13.31 (8) and 27 (6) percent higher spreads. The lack of information on collateral indicate a similar effect. The significant but modest results on *log.FAC_AMT* and *MULTI* can be considered to illustrate a similar effect – larger and more complex loans tend to have lower spreads (e.g., Gatti et al., 2013), possibly due to only larger and more creditworthy borrowers having access to them (Altunbaş et al., 2010). Moreover, it could reflect the use of split control rights and the resulting ease of renegotiation decreasing financial distress costs and implying a more trustworthy borrower (Berlin

Table 4: POLS with institutional tranche

log(AISD)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**
log.FAC_AMT	-0.031***	-0.024***	-0.032***	-0.025***	-0.023***	-0.018***	-0.020***	-0.012*
	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
log.MAT	0.314***	0.295***	0.273***	0.273***	0.279***	0.266***	0.186**	0.149*
	(0.083)	(0.083)	(0.081)	(0.082)	(0.084)	(0.084)	(0.082)	(0.081)
log.MAT^2	-0.037***	-0.035***	-0.032***	-0.032***	-0.031***	-0.030***	-0.017*	-0.013
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
INST.TRANCHE	0.043	0.081***	0.058*	0.094***	0.025	0.068**	0.052*	0.095***
	(0.030)	(0.031)	(0.030)	(0.030)	(0.031)	(0.032)	(0.030)	(0.030)
log.GDPPC	-0.076***	-0.076***	-0.081***	-0.080***	-0.037*	-0.040*	-0.085***	-0.075***
	(0.021)	(0.020)	(0.021)	(0.021)	(0.023)	(0.022)	(0.024)	(0.024)
GDPPC-%	-0.009***	-0.008**	-0.006	-0.006	-0.014***	-0.012***	-0.018***	-0.016***
	(0.004)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
INFL	0.002	0.002	0.003*	0.003*	0.003	0.003	0.003	0.004
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
log.CORR	-0.015	-0.051	0.144**	0.073	-0.121*	-0.151**	-0.018	-0.003
	(0.061)	(0.059)	(0.069)	(0.067)	(0.068)	(0.065)	(0.078)	(0.077)
CURR_RISK		-0.075***		-0.072**		-0.044		0.071
		(0.026)		(0.028)		(0.029)		(0.046)
SEC		0.201***		0.184***		0.214***		0.222***
		(0.043)		(0.043)		(0.044)		(0.045)
SEC_MIS		0.234***		0.207***		0.239***		0.125**
		(0.045)		(0.045)		(0.046)		(0.049)
SENIOR		0.251***		0.266***		0.263***		0.258***
		(0.045)		(0.046)		(0.051)		(0.048)
MULTI		-0.042*		-0.039*		-0.040*		0.002
		(0.021)		(0.022)		(0.022)		(0.022)
SHARE		-0.002***		-0.002***		-0.002***		-0.002***
		(0.001)		(0.001)		(0.001)		(0.001)
SYND_SIZE		-0.013***		-0.013***		-0.013***		-0.012***
		(0.002)		(0.002)		(0.002)		(0.002)
GUAR		-0.127***		-0.108***		-0.128***		-0.144***
		(0.034)		(0.035)		(0.036)		(0.036)
SPONS		0.120***		0.125***		0.096***		0.044
		(0.031)		(0.031)		(0.032)		(0.030)
SPONS_DUAL		-0.273***		-0.253***		-0.285***		-0.287***
		(0.086)		(0.083)		(0.089)		(0.085)
LIBOR							-0.059	-0.075**
							(0.039)	(0.038)
EURIBOR							-0.125**	-0.127**
							(0.057)	(0.056)
US_DUMMY							0.326***	0.169
							(0.049)	(0.145)
EU_DUMMY							-0.025	-0.017
							(0.044)	(0.145)
CRED			-0.040***	-0.019*			0.018	0.011
			(0.010)	(0.011)			(0.014)	(0.014)
LNCDAYS			0.136***	0.114***			0.108***	0.102***
			(0.022)	(0.022)			(0.025)	(0.025)
B_C.DIST					-0.035	-0.047**	-0.031	-0.029
					(0.021)	(0.021)	(0.022)	(0.022)
Year x US, Year x EU								Yes
Other distances					Yes	Yes	Yes	Yes
DFI/ECA/IB/FIN	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry, Year, Loan type	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	4.607***	4.478***	3.758***	3.745***	4.473***	4.304***	4.065***	3.918***
	(0.288)	(0.305)	(0.319)	(0.336)	(0.295)	(0.310)	(0.335)	(0.385)
Observations	4,973	4,973	4,850	4,850	4,628	4,628	4,578	4,578
Adjusted R^2	0.353	0.391	0.36	0.393	0.353	0.387	0.389	0.444

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

et al., 2020). The significant and decreasing effect of *CURR_RISK* in models (2) and (4) appears to follow the same logic, as only less risky borrowers have access to currency mismatched loans. The significant coefficient on *SHARE* verifies earlier findings on larger lead shares mitigating information asymmetry concerns (e.g., Angbazo et al. 1998; Ivashina, 2005), however the effect is modest with a five percentage point increase in share retained associated with a one percentage decrease in spread. In contrast to earlier findings, the effect of syndicate size is significant, negative and larger, with the addition of a lender decreasing the spread by 1.29 percent on average (e.g., Champagne & Coggins, 2012; Lim et al., 2014).

The effects of a guarantor and private equity sponsor are of similar magnitude but opposing sign. The former decreases spread by up to 13.42 percent and the latter increases by up to 13.31, which however is not significant in the (8) model. This supports the findings of Lim et al. (2014) regarding PE owners, with the effect possibly reflecting PE borrowers being perceived as more risky. The coefficient of *SPONS_DUAL* reinforces the findings of Jiang et al. (2010), as the participation of an equity sponsor in the syndicate is associated with 24.95 percent lower spreads. Looking at *LIBOR* and *EURIBOR*, it is possible that the coefficients could be capturing a geographic pricing difference which the region dummies were expected to capture (Carey & Nini, 2007). The creditor rights variable is significant and negative, but only until model (4). On the other hand, the legal risk variable *LNCDAYS* is significant and consistent, with an additional day to translating to between 14.57 and 10.74 percent higher spreads. These results are largely in line with earlier findings (Esty, 2004b; Qian & Strahan, 2007). These findings together indicate that project finance lenders could value the efficiency of legal enforcement over creditor rights. With the exception of *B_C.DIST* (6), geographic and cultural distance variables do not appear significant in explaining observed spreads. This appears to contradict the expectation of local lenders improving monitoring and thus a lower cost to borrowers (Nini, 2004). Moreover, *B_C.DIST* at its mean is associated with only 2.68 percent lower spreads, lending weak support to the findings of Giannetti and Yafeh (2012). The two geographic distance variables and *S_C.DIST* are unreported in the summarized model.

The Year-US interaction terms are significant and higher for 1999, 2000, 2001, 2003, 2005 and 2007 – with spreads between 99.37 (2005) and 35.66 (2000) percent higher. The EU equivalents are significant for 2012, 2014 and 2015 and the spreads were between 37.03 (2015) and 54.19 (2012) higher. The interaction terms seem to capture at least some of the variation related to the Dot-com bubble and GFC for the US and the European debt crisis for the EU market. They help capture region specific macroeconomic shocks in loan spreads not explained by the year dummies, which were significant and positive for 2002 and all years after 2008. Moreover, they improve the fit of the model – the adjusted R^2 increases by 0.055. Finally, as can be verified from the extended Table 4 (Table 15, Appendix B), tranches with investment banks have spreads higher by as much as 6.61 percent (6), while for finance companies the increase is 17 percent (6). Based on past findings on the relationship between political risk and DFI participation, a connection between pricing and their involvement was expected (Hainz & Kleimeier, 2012). However, in Table 15 neither DFI nor ECA has a significant effect on pricing and this repeats in practically all later models.

Table 5: Institutional tranche quantile regression of model (8)

log(AISD)	(0.1)	(0.3)	(0.5)	(0.7)	(0.9)
log.FAC_AMT	-0.0266***	-0.00919	0.000729	0	-0.00568
	(0.00983)	(0.00810)	(0.00794)	(0.00726)	(0.00880)
INST.TRANCE	0.113**	0.0792**	0.0765*	0.0394	0.0849**
	(0.0501)	(0.0361)	(0.0408)	(0.0360)	(0.0336)
CURR_RISK	0.0243	0.0508	0.0941	0.109*	0.123**
	(0.0732)	(0.0609)	(0.0641)	(0.0577)	(0.0527)
SEC	0.218***	0.270***	0.251***	0.162***	0.123**
	(0.0830)	(0.0615)	(0.0638)	(0.0448)	(0.0554)
SEC_MIS	0.144*	0.156**	0.109*	0.0447	0.0372
	(0.0854)	(0.0675)	(0.0657)	(0.0550)	(0.0649)
SENIOR	0.154	0.274***	0.256***	0.338***	0.348***
	(0.0937)	(0.0282)	(0.0290)	(0.0594)	(0.0511)
GUAR	-0.134**	-0.142***	-0.151***	-0.0978**	-0.0716*
	(0.0564)	(0.0482)	(0.0490)	(0.0460)	(0.0370)
SPONS_DUAL	-0.0664	-0.236**	-0.353***	-0.463***	-0.255
	(0.204)	(0.0974)	(0.0982)	(0.124)	(0.247)
LNCDAYS	0.150***	0.136***	0.0832***	0.0712**	0.113***
	(0.0485)	(0.0331)	(0.0278)	(0.0279)	(0.0321)
LIBOR	0.0196	-0.0416	-0.0598	-0.0715*	-0.130***
	(0.0692)	(0.0487)	(0.0532)	(0.0433)	(0.0491)
EURIBOR	0.00526	0.0115	-0.0469	-0.0561	-0.192***
	(0.100)	(0.0693)	(0.0672)	(0.0781)	(0.0672)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.448***	3.460***	4.200***	4.773***	4.920***
	(0.729)	(0.513)	(0.464)	(0.521)	(0.613)

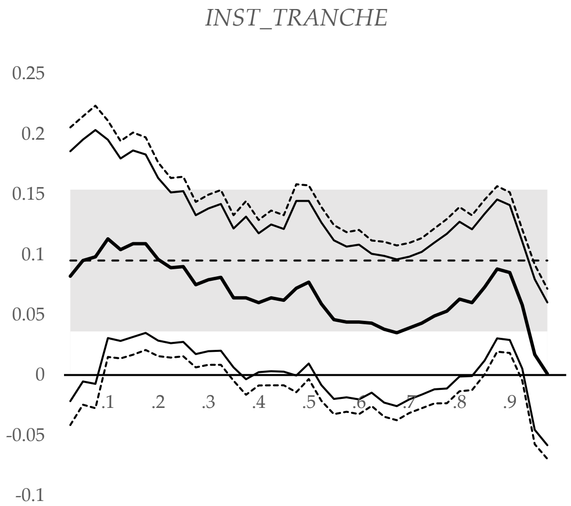
*** Significant at 1%; ** Significant at 5%; * Significant at 10%

The condensed output of a model (8) quantile regression in Table 5 illustrates how some of the key variables differ based on the conditional distribution of the dependent variable.[33] The behavior of *INST.TRANCHE* has been illustrated in Graph 3. Similar graphs (4-8) are made for the later model with institution type variables. The graphs visualize the QR results on the key variables of interest run at every 2.5th quantile, coupled with 5% and 10% confidence intervals and the POLS estimates

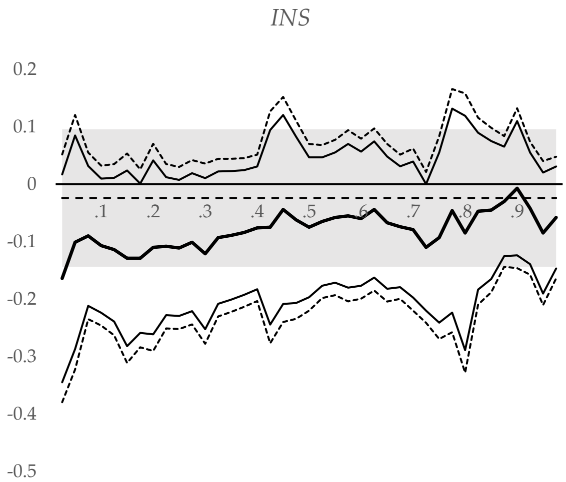
[33] Notably, the R^2 goodness-of-fit measure is not included in any of the quantile regressions as it is not applicable. An alternative measure sometimes used in quantile regressions is the $pseudoR^2$ (Davino et al., 2014).

for comparison. In Table 5, *INST.TRANCHE* is positive and significant in all but the 7th decile and appears to exhibit a somewhat quadratic pattern – institutional involvement is associated with 11.69 (1st), 7.95 (5th) and 8.86 (9th) percent higher spreads. However, a slightly decreasing trend is observable in Graph 3. The QR does not differ statistically from the POLS estimate until the 92.5th quintile, after which the spread increasing effect of *INST.TRANCHE* subsides. At the highest decile the pricing of institutional tranches does not appear to differ from an average tranche.

Contrary to past findings (e.g., Kleimeier & Megginson, 2000), currency risk in Table 5 has an increasing effect on spread, with a non-domestic borrowing currency associated with between 11.52 (7th) and 13.09 (9th) percent higher spreads. The effect of *SEC* increases until the 3rd decile and decreases after. The strongest positive effect is 31 percent (3rd) and the lowest is 13.09 percent (9th). *SEC_MIS* is smaller in magnitude and only significant until the median. The patterns appear quadratic for *GUAR* and increasing for *SPONS_DUAL*. The latter is only significant between the 3rd and 7th decile, strengthening from a 21.02 to a 37.06 percent negative effect. The strongest effect of *GUAR* is 14.02 percent at median and its weakest effect of 6.91 at the 9th decile. The effect of legal enforcement strength is also quadratic, with its strongest effects at the extremes – 16.18 (1st) and 11.96 (9th) percent. To conclude, the POLS and QR results provide support for H1 – institutional involvement in syndicates appears to have an effect on loan pricing.



Graph 3: Quantile regressions of model (8) from Table 4



Graph 4: Quantile regressions of model (8) from Table 6

5.2 Hypothesis 2

Table 6 presents the regression results of POLS models with institution type variables included. In addition to the models (1)-(8) from before, Table 6 includes the experience (9) and reputation (10) variables used in testing H5 and institution experience (11) that is used to test H6. Moreover, the model (8) of Table 6 is tested with QR methods, with results found in Table 7 as well as illustrative graphs. Finally, although not variables of interest, similar graphs (Graphs 13 & 14) have been included for *IB* and *FIN* in Appendix A.

Looking at Table 6, the first three rows of loan specific variables have largely similar coefficients compared to the earlier regressions, but with some notable differences. First, the *log.FAC_AMT* coefficients are significant and largely similar, supporting earlier findings on loan size (e.g., Ahiabor & James, 2019; Eichengreen & Mody, 2000). However, the effect disappears after model (8), indicating that the macro shocks from the region and year interactions could be capturing some this variation. The other loan-level variables – *SEC*, *SEC_MIS* and *SENIOR* – are practically identical to the Table 4 regressions. The inclusion of experience proxies in model (9) does not appear to have much affect on other coefficients, but the reputation proxies increase *SEC_MIS* and *SENIOR* magnitude in model (10).

While in earlier models *GUAR* and *SPONS* are of similar magnitude but opposing signs, this effect dissipates for *SPONS* in later models. The presence of a guarantor is associated with up to 13.41 percent lower spreads in the later models, but the spread increasing effect of *SPONS* weakens. For instance, in model (10), *SPONS* coincides with only 5.34 percent higher spreads and only significant at the 10% level. In the QR models, the significance of *SPONS* disappears in all but the 1st decile (Table 18, Appendix B). On the contrary, for *GUAR* and *SPONS_DUAL,* QR shows a quadratic pattern, with the largest negative effects on spreads found at the median – 15.04 percent for *GUAR* and 32.23 percent for *SPONS_DUAL*. In comparison, the spread decreasing *SPONS_DUAL* effect is between 24.95 and 25.77 percent in the full POLS models. Based on the output, it appears that the positive effect of a loan guarantee is seen as less beneficial compared to an equity holder in the loan syndicate. The *CRED* and *LNCDAYS* variables are largely similar compared to the *INST.TRANCHE* regressions in Table 4. In the quantile regressions of Table 7, the

LNCDAYS coefficient varies mildly, while *CRED* significance disappears (Table 18, Appendix B).

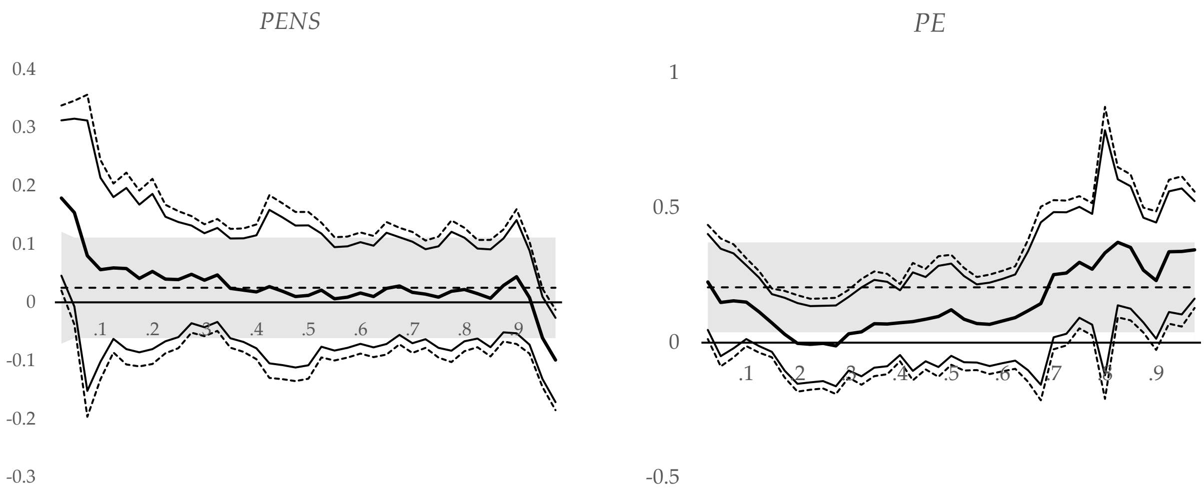
In the interest of conciseness, multiple control variables have been summarized in the Controls, Rates rows and other categories of Table 6. The full output has been moved to Table 17 in Appendix B. Controls include *IB, FIN, DB, ECA,* the loan type dummies, *log.CORR, log.GDP, GDPPC-%, INFL,* year dummies and industry dummies. Much of the output is as expected and similar to the *INST.TRANCHE* regressions, but some exceptions do exist. For example, the Year-US interaction term results are similar to *INST.TRANCHE*, except for 2000 losing significance and magnitudes decreasing slightly. The EU equivalents are significant for 1995, 2012 and 2014 and spreads are between 37.99 (2014) and 75.42 (1995) percent higher on average. Finally, the results of the cultural and geographic distances are largely similar to before, with only *B_C.DIST* significant in models (5) and (6). The QR results in Table 7 show that the effect is significant only at the median. Contrary to expectation, a one unit increase in the World Values Survey cultural distance is associated with 4.69 percent lower spreads. It is possible that due to missing some relevant controls, the *B_C.DIST* is actually capturing the known pattern of risky country project finance borrowers generally borrowing from syndicates led by large international banks. Hence, the variable would then be capturing the moral hazard and political risk reducing effect of these financial institutions and not the effect of cultural distance (Neuhann & Saidi, 2016; Dorobantu & Müllner; 2019).

Moving on to the key variables, the results are mixed, but appear to provide rather strong support for H2. Institutional investor type appears to have a connection to loan pricing in syndicated project finance loans. Looking at the *INS* coefficients, the presence of insurance companies in syndicates appears to have a mostly negative but insignificant effect. The results are largely consistent across specifications, but some patterns emerge. For instance, in models (2), (6) and to a lesser extent (4) in Table 6, the magnitude is particularly limited. This muted effect coincides with the inclusion of syndicate-level variables (*SEC-SPONS_DUAL*) and exclusion of country variables (*CRED* and *LNCDAYS*). In the final, full specification models the coefficients stabilize and indicate that *INS* tranches have 6.57 percent lower spreads, but the coefficients are insignificant. Observing the QR results of Table 7, since the confidence intervals in Graph 4 include zero for the most part,

Table 6: POLS with institution types

log(AISD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
log.FAC_AMT	-0.028***	-0.022***	-0.030***	-0.023***	-0.019***	-0.015**	-0.019***	-0.011	-0.006	-0.004	-0.011
	(0.006)	(0.007)	(0.006)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
log.MAT	0.307***	0.290***	0.268***	0.269***	0.274***	0.263***	0.187**	0.151*	0.144*	0.140*	0.155*
	(0.083)	(0.083)	(0.082)	(0.082)	(0.083)	(0.084)	(0.082)	(0.082)	(0.080)	(0.082)	(0.082)
log.MAT^2	-0.037***	-0.034***	-0.031***	-0.032***	-0.031***	-0.030***	-0.018*	-0.014	-0.012	-0.012	-0.014
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)	(0.01)
INS	-0.024	-0.0001	-0.043	-0.011	-0.027	0.0002	-0.068	-0.068	-0.092	-0.07	-0.088
	(0.061)	(0.062)	(0.058)	(0.060)	(0.060)	(0.061)	(0.055)	(0.056)	(0.058)	(0.056)	(0.06)
PENS	-0.141***	-0.090*	-0.103**	-0.061	-0.166***	-0.105**	-0.06	0.025	0.019	0.057	-0.04
	(0.049)	(0.050)	(0.048)	(0.050)	(0.050)	(0.051)	(0.049)	(0.049)	(0.052)	(0.051)	(0.084)
PE	0.202**	0.237***	0.201**	0.235***	0.232***	0.258***	0.197**	0.205**	0.192**	0.204**	0.193**
	(0.087)	(0.091)	(0.086)	(0.091)	(0.086)	(0.092)	(0.081)	(0.085)	(0.092)	(0.089)	(0.085)
MUT	0.090**	0.109**	0.104**	0.120***	0.07	0.091**	0.095**	0.105**	0.065	0.084*	0.082
	(0.044)	(0.043)	(0.044)	(0.043)	(0.046)	(0.045)	(0.045)	(0.044)	(0.044)	(0.044)	(0.051)
SWF	0.073	0.121	0.109	0.134	0.105	0.121	0.014	-0.069	-0.125	-0.177	0.006
	(0.127)	(0.108)	(0.128)	(0.111)	(0.109)	(0.105)	(0.115)	(0.109)	(0.130)	(0.158)	(0.135)
SEC		0.191***		0.176***		0.204***		0.220***	0.215***	0.216***	0.221***
		(0.043)		(0.044)		(0.044)		(0.045)	(0.045)	(0.046)	(0.045)
SEC_MIS		0.223***		0.199***		0.230***		0.126***	0.127***	0.132***	0.127***
		(0.045)		(0.046)		(0.046)		(0.049)	(0.049)	(0.050)	(0.049)
SENIOR		0.247***		0.262***		0.258***		0.256***	0.249***	0.280***	0.256***
		(0.046)		(0.047)		(0.051)		(0.048)	(0.046)	(0.048)	(0.049)
SHARE		-0.002***		-0.002***		-0.002***		-0.001**	-0.002***	-0.002***	-0.001**
		(0.001)		(0.001)		(0.001)		(0.001)	(0.001)	(0.001)	(0.001)
SYND_SIZE		-0.012***		-0.012***		-0.012***		-0.011***	-0.010***	-0.010***	-0.011***
		(0.002)		(0.002)		(0.002)		(0.002)	(0.002)	(0.002)	(0.002)
GUAR		-0.127***		-0.108***		-0.126***		-0.144***	-0.141***	-0.143***	-0.143***
		(0.034)		(0.034)		(0.036)		(0.036)	(0.035)	(0.036)	(0.036)
SPONS		0.117***		0.121***		0.092***		0.042	0.058*	0.052*	0.042
		(0.031)		(0.031)		(0.031)		(0.030)	(0.030)	(0.031)	(0.03)
SPONS_DUAL		-0.270***		-0.251***		-0.281***		-0.288***	-0.293***	-0.298***	-0.287***
		(0.088)		(0.085)		(0.091)		(0.086)	(0.091)	(0.087)	(0.086)
CRED			-0.041***	-0.019*			0.017	0.01	0.013	0.012	0.01
			(0.010)	(0.011)			(0.014)	(0.014)	(0.014)	(0.015)	(0.014)
LNCDAYS			0.127***	0.106***			0.103***	0.099***	0.086***	0.092***	0.100***
			(0.023)	(0.023)			(0.025)	(0.025)	(0.025)	(0.026)	(0.025)
log.SYND_EXP									-0.090***		
									(0.014)		
log.A.A_EXP									0.009		
									(0.017)		
log.A_EXP									-0.018		
									(0.017)		
3Y.MKT.SHR.$										-0.017***	
										(0.006)	
1Y.MKT.SHR.$										-0.002	
										(0.004)	
5Y.MKT.SHR.$										0.011**	
										(0.005)	
log.INST_EXP											0.016
											(0.016)
B_C.DIST					-0.037*	-0.048**	-0.033	-0.029	-0.004	-0.037	-0.029
					(0.021)	(0.021)	(0.022)	(0.022)	(0.022)	(0.023)	(0.022)
Year x US, Year x EU								Yes	Yes	Yes	Yes
Rates, EU, US							Yes	Yes	Yes	Yes	Yes
Other distances					Yes	Yes	Yes	Yes	Yes	Yes	Yes
Multi, Curr		Yes		Yes		Yes		Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Constant	4.622***	4.525***	3.830***	3.842***	4.490***	4.348***	4.106***	3.928***	3.968***	3.980***	3.914***
	(0.288)	(0.306)	(0.322)	(0.339)	(0.296)	(0.310)	(0.336)	(0.390)	(0.385)	(0.400)	(0.39)
Observations	4,973	4,973	4,850	4,850	4,628	4,628	4,578	4,578	4,578	4,254	4,578
Adjusted R^2	0.356	0.393	0.362	0.394	0.357	0.39	0.39	0.445	0.458	0.467	0.445

there seems to be little proof of insurance company involvement having an effect on loan spreads. This is in line with insurance companies reportedly having similar required returns as commercial banks (Lim et al., 2014). However, the 2.5th quantile in Graph 4 is an exception, as the QR coefficient becomes significant and shows a decreasing effect of 5.64 percent. Hence, these results indicate that insurance company participation in loan syndicates is associated with lower spreads. This is in line with expectations regarding long-term institutional investors (e.g., Della Croce & Yermo, 2013), but contrary to the findings of Beyhaghi et al. (2019). However, the increasing effect found in the z-statistic of Table 3 contradicts this assessment.



Graph 5 and 6: Quantile regressions of model (8)

Pension fund results are consistent, more significant, but mixed. In accordance with expectation, Table 6 *PENS* coefficients are negative and similar in magnitude, but significant only up to model (6) with the exception of (4). Loan tranches with pension fund involvement have between 8.61 (2) and 15.3 (5) percent lower spreads. However, in the later models the significance disappears, which could be caused the rates and US/EU dummies capturing some of the variance previously attributed to *PENS*. The QR results in Table 7 show that all the coefficients are insignificant. However, observing Graph 4, the coefficient becomes significant at the 2.5th and 97.5th quintiles and exhibits a decreasing trend. Pension fund involvement is associated with 19.6 percent higher spreads at the 2.5th and 9.43 percent lower at the 97.5th quantile. Moreover, the POLS and QR estimates significantly differ only at those quintiles, as the QR estimate tends to stay stable and within the POLS confidence interval. While the lack of significance in the full models of Table 6 and the positive QR results at the 2.5th quantile run contrary to expectations of pension funds being ideal long-term investors, the rest of the evidence support it. Although the liability matching ability of pension funds could enable them to provide lower cost financing – and thus explain part of the results – it appears other motives are present in their participation decisions.

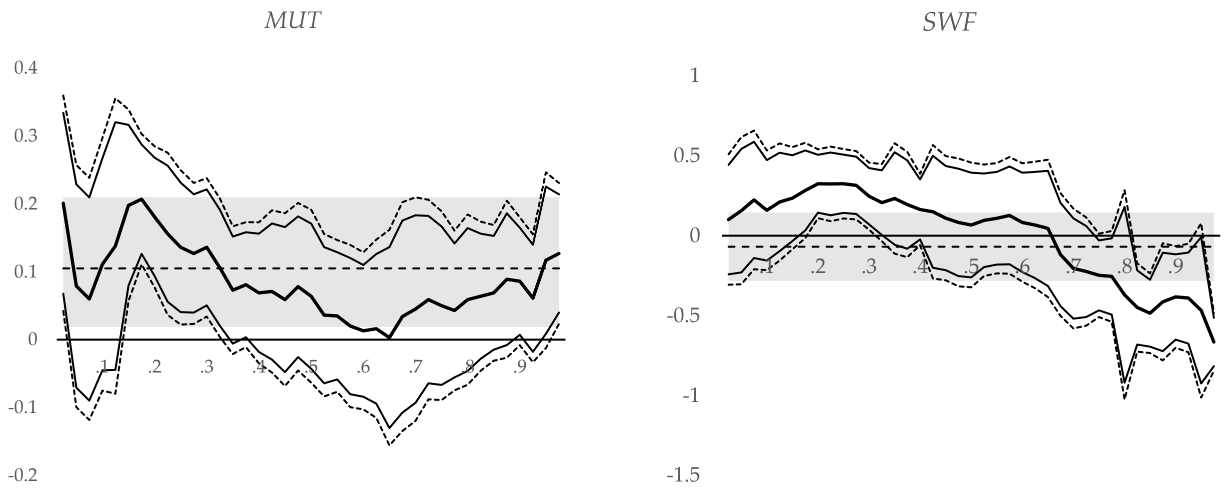
Table 7: Institution type quantile regression (8)

log(AISD)	(0.1)	(0.3)	(0.5)	(0.7)	(0.9)
log.FAC_AMT	-0.023**	-0.009	0.003	-0.000	-0.005
	(0.010)	(0.007)	(0.008)	(0.007)	(0.010)
INS	-0.107	-0.121	-0.075	-0.079	-0.007
	(0.071)	(0.080)	(0.074)	(0.073)	(0.071)
PENS	0.056	0.038	0.012	0.017	0.044
	(0.096)	(0.049)	(0.073)	(0.053)	(0.059)
PE	0.150*	0.033	0.122	0.252*	0.230*
	(0.083)	(0.083)	(0.104)	(0.141)	(0.131)
MUT	0.111	0.136***	0.064	0.045	0.086*
	(0.095)	(0.052)	(0.065)	(0.084)	(0.048)
SWF	0.159	0.247**	0.067	-0.205	-0.383**
	(0.191)	(0.107)	(0.199)	(0.191)	(0.162)
LNCDAYS	0.117**	0.126***	0.080***	0.079***	0.112***
	(0.054)	(0.032)	(0.029)	(0.025)	(0.036)
SEC	0.239***	0.254***	0.243***	0.172***	0.076
	(0.089)	(0.067)	(0.060)	(0.052)	(0.070)
SEC_MIS	0.184*	0.152**	0.112*	0.057	-0.002
	(0.096)	(0.070)	(0.063)	(0.055)	(0.078)
SENIOR	0.172	0.267***	0.252***	0.334***	0.366***
	(0.106)	(0.040)	(0.029)	(0.063)	(0.058)
GUAR	-0.129**	-0.150***	-0.163***	-0.106**	-0.066*
	(0.060)	(0.045)	(0.047)	(0.050)	(0.040)
SPONS_DUAL	-0.062	-0.253**	-0.389***	-0.451***	-0.244
	(0.204)	(0.112)	(0.103)	(0.125)	(0.249)
B_C.SYND	-0.003	-0.043	-0.048*	0.019	0.011
	(0.034)	(0.030)	(0.025)	(0.028)	(0.028)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.675***	3.761***	4.511***	4.859***	5.418***
	(0.634)	(0.484)	(0.420)	(0.417)	(0.591)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

The results from the *PE* coefficients are the strongest and in line with expectation (Lim et al., 2014). In Table 6, the coefficients are significant in all model specifications, have the same sign and are of similar magnitude. PE participation in loan syndicates is associated with spreads that are between 21.17 (9) and 29.43 (6) percent higher. The effect remains stable across models, which can be seen in even when various controls are added to the base model. The coefficients decrease slightly from model (7) onwards, which could be attributed to the combination of the rates and US/EU dummies, but the difference is negligible. Looking at the QR results in Table 7, a somewhat quadratic pattern appears, with the stronger *PE* effects being near the extremes. PE participation is associated with 16.18 (1st), 28.66 (7th) and 25.86 (9th) percent higher spreads. Observing Graph 5, the

QR estimate stays within the POLS confidence interval for the most part, except between the 2nd and 3rd deciles while also being insignificant. All in all the results of the private equity coefficients are largely as expected and consistent across models. We can safely state that private equity participation is associated with considerably higher spreads, particularly at the extremes. Considering that dual holder effects have been controlled for and that the positive effects are particularly strong at the extremes, it is plausible that private equity funds are being more opportunistic with their participations and exploiting a lender of last resort type role (Biswas et al., 2020; Lim et al., 2014).



Graph 7 and 8: Quantile regressions of model (8)

In the POLS regression results in Table 6, the *MUT* coefficient is positive, significant at nearly all specifications and quite stable. A loan tranche with mutual fund involvement is associated with higher spreads by 8.76 (10) to 12.75 (4) percent. The coefficient is not significant in models (5), (9) and (11), with the latter two possibly caused by the inclusion of the different experience variables. In addition, the coefficient's significance varies with it being highest in model (4) and the weakest in model (10). Observing the QR output from Table 7, mutual fund presence is associated with 14.57 (3rd) and 8.98 (9th) percent higher spreads, with the former strongly significant. Graph 6 shows that the *MUT* coefficient varies depending on the quantile and has its peaks at the 2.5th and 17.5th quantiles and its trough at approximately the 65th quantile. However, notably the QR coefficient rarely differs statistically from the POLS estimate and when it does, is insignificant. Based on the presented results, it is likely that mutual fund involvement has a positive effect on spreads.

The *SWF* coefficients are insignificant in all the model specifications of Table 6, but the quantile regressions provide some evidence of a *SWF* effect on loan pricing. Table 7 shows that loan tranches with SWF involvement are associated with 28.02 (3rd) percent higher and 31.82 (9th) percent lower loan spreads depending on the decile. Graph 7 illustrates that *SWF* follows a trend in the sample – while on the lower end of *AISD* the *SWF* effect is positive, the effect reverses when moving to the higher end. The observed pattern is hard fit into existing literature, but it could reflect varying political pressure at the different extremes (Knill et al., 2012). Although speculation, it could be that at the high end of the spread distribution the projects are risky, but politically important and hence the SWF role could be one of facilitating investment. At the other end, a lack of political pressure could enable them to attempt to extract higher than average spreads. The QR estimates significantly differ from POLS estimates below approximately the 45th quantile and slightly above the 75th quantile. However, a large caveat is in order. These results can reflect the fact that there are few observations of *SWF* and hence the coefficients could be driven by few extreme observations. To conclude, although the presented results have been mixed and of varying significance, it appears that investor type does indeed have a connection to project finance loan pricing. Therefore, the second hypothesis appears to be confirmed.

5.3 Hypotheses 3 & 4

Having now presented the main regression results, hypotheses 3 and 4 can be discussed. The evidence for maturity preferences being a determinant in loan pricing is mixed. In Table 6 the *PENS* coefficients are negative and significant in models (1), (2), (3), (5) and (6) but insignificant in the full models. Hence, the POLS results show some support for H3, in that the loan spreads do appear to be lower in *PENS* tranches than the average bank tranche, which are typically dominated by commercial banks. Hence, except for the positive *PENS* effect at the lowest quantiles, the results indicate that pension funds could indeed possess a financing advantage vis-à-vis commercial banks that originates from their liability matching ability or some other factor. However, the QR results do not provide any evidence on the effect of pension funds. Moreover, the insignificance of the *INS* coefficients provides support for rejecting the hypothesis. Finally, the fact that *MUT* is smaller in magnitude than *PE* across all model specifications shows that the higher liquidity risk – for which mutual funds need to compensated – does not appear to dominate the effect of private equity funds requiring higher returns. Nevertheless, H3 cannot be completely rejected due to the difference between long-term and shorter term institutional investor spreads being in line with the hypothesis.

These same findings, however, appear to fit H4 particularly well. It seems that return considerations are the more significant determinant in institutional loan spreads, at least for *MUT* and *PE*. However, it could also be that no single hypothesis is able to explain the observed pricing behavior. On one hand, it is possible that the maturity perspective of H3 is more important to long-term investors on average and that this fit enables them to participate in, on average, lower spread tranches. On the other hand, shorter term investor participation could be primarily driven by return considerations, which is reflected in the stronger effect of *PE* compared to *MUT*. Finally, the QR results on SWFs do not seem to fit with either hypothesis. But as mentioned, the *SWF* results suffer from a lack of observations as well as the possibility of political pressure and as such strong assumptions cannot be made based upon the output.

5.4 Hypothesis 5

Next the focus is shifted to H5. Results of multiple models are presented in Tables 8-10 after which the hypothesis will be discussed. First, the effect of experience will be investigated and the results are presented in model (9) of Table 6. Second, the effect of reputation is tested – one, three and five year market share are used as proxies for reputation and the results are presented in model (10) of Table 6. Looking at the output, the coefficients on the experience variables in (9) show that only the mean syndicate experience (*log.SYND_EXP*) has a significant effect on the loan spread. This implies that if the lenders in the syndicate have participated in, say, on average 10 percent more project finance transactions, the loan spread of said tranche is on average 0.9 percent lower. The result is economically modest, but statistically significant. However, this does not provide evidence for or against H5. For this, an alternative specification of model (9) with interactions between experience and institution type variables is attempted – both as a regular POLS model (Table 8) as well as quantile regressions at different deciles (Table 9).

As discussed in section 3, using reputation and performance pricing covenants to test H5 rests on them being able to mitigate information asymmetry concerns (e.g., Panyagometh & Roberts, 2002, Gatti et al., 2013). Table 6 shows *3Y.MKT.SHR.$* and *5Y.MKT.SHR.$* are significant, but the one year market share is not. An additional percentage point of market share in the three year horizon translates to a 1.69 percent lower loan spread. An equivalent increase on the five year horizon, however, is associated with 1.11 percent higher loan spreads. These results provide mixed and contradicting evidence. On one hand, the lower interest rate indicated by *3Y.MKT.SHR.$* could reflect that high reputation lead arrangers can attract syndicate participants without compensating them with higher spreads (Gatti et al, 2013) or that dominant banks are more efficient in distribution, thus allowing them to offer loans at lower total cost (Ross, 2010). It could also reflect higher bargaining power of the borrower and more intense competition for lead arranger status, with lenders needing to lower spreads to win market share. On the other, looking at *5Y.MKT.SHR.$*, the higher spread could indicate greater pricing power by high reputation lead arrangers (Blanc-Brude & Strange, 2007; Harjoto et al., 2006; see also Kanatas & Qi, 2003).

Table 8: POLS with interaction terms (8)

log(AISD)	**(8)**	**(9.1)**		**(10.1)**		**(11.1)**
log.SYND_EXP		-0.092*** (0.014)	*3Y.MKT.SHR.$*	-0.017*** (0.007)	*log.INST_EXP*	-0.012 (0.024)
× *INS*		-0.015 (0.057)	× *INS*	0.015 (0.040)	× *INS*	-0.027 (0.049)
× *PENS*		0.178** (0.073)	× *PENS*	-0.019 (0.034)	× *PENS*	0.120*** (0.042)
× *PE*		-0.127** (0.057)	× *PE*	-0.038 (0.067)	× *PE*	-0.127** (0.061)
× *MUT*		-0.006 (0.037)	× *MUT*	0.008 (0.023)	× *MUT*	-0.015 (0.04)
log.A.A_EXP		0.009 (0.018)	*1Y.MKT.SHR.$*	-0.002 (0.004)		
× *INS*		-0.115 (0.089)	× *INS*	-0.027 (0.017)		
× *PENS*		-0.200** (0.094)	× *PENS*	-0.008 (0.016)		
× *PE*		-0.065 (0.128)	× *PE*	0.007 (0.036)		
× *MUT*		0.112* (0.065)	× *MUT*	0.015 (0.011)		
log.A_EXP		-0.023 (0.018)	*5Y.MKT.SHR.$*	0.009* (0.005)		
× *INS*		0.167* (0.09)	× *INS*	0.002 (0.039)		
× *PENS*		0.256** (0.11)	× *PENS*	0.049* (0.029)		
× *PE*		0.014 (0.121)	× *PE*	0.031 (0.054)		
× *MUT*		-0.106 (0.065)	× *MUT*	-0.009 (0.027)		
INS	-0.068 (0.056)	-0.339 (0.293)		0.028 (0.080)		0.012 (0.118)
PENS	0.025 (0.049)	-1.286*** (0.31)		-0.1 (0.090)		-0.438*** (0.148)
PE	0.205** (0.085)	0.963*** (0.291)		0.205* (0.118)		0.508*** (0.145)
MUT	0.105** (0.044)	0.197 (0.153)		0.002 (0.055)		0.163* (0.089)
SWF	-0.069 (0.109)	-0.16 (0.139)		-0.259 (0.242)		0.008 (0.133)
Controls from (8)	Yes	Yes		Yes		Yes
Observations	4,578	4,578		4,254		4,578
Adjusted R^2	0.445	0.462		0.469		0.447

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 8 includes the models (9) and (10) from Table 6 augmented with interaction terms between the institution type and the hypothesis variables. In addition, the H6 model (11) from Table 6 is included with interactions between type and INST_EXP. Estimates for the institution type variables from model (8) in Table 6 have been included for comparison.

The regression results do not provide strong proof on the direction of the effect of reputation, but they do indicate reputation being a factor in pricing. A way in which these results could be rationalized simultaneously is if the five year market share is measuring long-term reputation and prestige, while the three year market share coefficient reflects changing mid-term competitive pressure. As for the experience variables, the procedure from the previous hypothesis is run and the resulting POLS model is presented in Table 8 and the QR results in Table 10. It is necessary to note that the *SWF* interaction variables are dropped due to a lack of observations making the regressions impossible to compute. Moreover, the performance pricing covenants are used as an alternative way to test the hypothesis.

Observing model (9.1) results in Table 8, some notable changes are apparent. Interestingly, although the coefficient on *log.SYND_EXP* remains significant and the magnitude has increased slightly, the interaction coefficients for *PENS* and *PE* are now statistically and economically significant. For a loan tranche with pension fund participation, the effect of prior loan participation becomes stronger – syndicates with 10 percent more project finance experience have 1.78 percent higher loan spreads. The same effect for syndicates with private equity participation is slightly weaker in magnitude and of opposing sign – *PE* tranche loan spreads are 1.27 lower on average. Moving on to lead bank *arranging experience* (*log.A.A_EXP*), we find that the coefficient is still insignificant, but its interaction with *PENS* and *MUT* is significant. Now for a syndicate with pension fund participation, the 10 percent increase in lead bank arranging experience is associated with 2 percent lower spreads. The equivalent figure for mutual fund participated loans is 1.12 percent positive. Finally, *log.A_EXP* remains insignificant, but again the interaction with *PENS* is significant. In a *PENS* tranche, 10 percent increase in lead arranger *project finance experience* is associated with 2.56 percent higher spreads on average. Moreover, the same figure for *INS* tranches is 1.67 percent positive. Some changes occur for the original institution type variables as well. In (9.1) *MUT* is no longer significant, while *PENS* is significant. In addition, the coefficients of *PENS* and *PE* are significant and notably larger in magnitude. Another interesting observation is that *PENS* always has an opposing sign and larger magnitude compared to the variable it is interacted with, while *PE* does the same but with the same sign.

Table 9: Quantile regression of model (9.1)

log(AISD)	(0.1)	(0.3)	(0.5)	(0.7)	(0.9)
log.SYND_EXP	-0.087*** (0.026)	-0.085*** (0.017)	-0.102*** (0.020)	-0.109*** (0.017)	-0.077*** (0.018)
× *INS*	0.010 (0.070)	-0.096* (0.057)	-0.064 (0.075)	0.054 (0.060)	
× *PENS*	0.146 (0.237)	0.235* (0.126)	0.181** (0.075)	0.198*** (0.071)	0.006 (0.063)
× *PE*	-0.220** (0.101)	-0.116 (0.089)	-0.056 (0.064)	-0.102 (0.121)	-0.123 (0.128)
× *MUT*	0.100* (0.057)	0.022 (0.043)	0.044 (0.065)	0.020 (0.099)	
× *SWF*					
log.A.A_EXP	0.041 (0.030)	0.033 (0.024)	0.021 (0.022)	0.018 (0.022)	0.009 (0.017)
× *INS*	-0.203* (0.120)	-0.093 (0.072)	-0.098 (0.112)	-0.092 (0.115)	
× *PENS*	-0.119 (0.381)	-0.196 (0.204)	-0.260** (0.102)	-0.175 (0.143)	-0.016 (0.077)
× *PE*	-0.087 (0.135)	-0.247** (0.109)	-0.038 (0.157)	0.115 (0.321)	-0.097 (0.196)
× *MUT*	-0.036 (0.132)	0.085 (0.069)	0.097 (0.096)	0.113 (0.122)	
× *SWF*					
log.A_EXP	-0.063** (0.027)	-0.045* (0.024)	-0.028 (0.022)	-0.018 (0.022)	-0.024 (0.019)
× *INS*	0.193* (0.112)	0.187** (0.089)	0.200* (0.118)	0.105 (0.110)	
× *PENS*	0.134 (0.353)	0.252 (0.275)	0.307** (0.123)	0.209 (0.182)	0.066 (0.091)
× *PE*	0.149 (0.144)	0.109 (0.115)	-0.050 (0.135)	-0.183 (0.260)	0.089 (0.200)
× *MUT*	-0.027 (0.110)	-0.078 (0.075)	-0.090 (0.118)	-0.093 (0.107)	
× *SWF*					
INS	-0.334* (0.175)	-0.092 (0.295)	-0.316 (0.238)	-0.440 (0.318)	-0.070 (0.069)
PENS	-0.791 (0.708)	-1.609** (0.701)	-1.310*** (0.250)	-1.257*** (0.409)	-0.266 (0.297)
PE	0.874* (0.459)	1.071** (0.520)	0.770** (0.358)	1.035 (0.656)	0.757 (0.660)
MUT	-0.126 (0.235)	0.075 (0.183)	-0.075 (0.206)	-0.014 (0.211)	0.051 (0.068)
SWF	0.228 (0.289)	0.165 (0.230)	-0.180 (0.292)	-0.210 (0.360)	-0.388 (0.269)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.497*** (0.583)	3.766*** (0.480)	4.268*** (0.551)	4.819*** (0.375)	5.432*** (0.585)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Table 9 presents the results from the quantile regressions of model (9.1) at deciles 1, 3, 5, 7 and 9. All of the *SWF* interaction variables as well as *MUT* and *INS* interaction variables at the 9th decile were dropped to enable computation. The first observable difference is that the effect of experience in the syndicate (*log.SYND_EXP*) becomes stronger in the middle deciles and exhibits a quadratic pattern. Its interaction with *PENS* strengthens, behaves quadratically, has the smallest magnitude at the median and is significant between the 3rd and 7th deciles. A 10 percent higher level of syndicate experience translates to between 2.35 and 1.81 higher spreads in pension fund participated syndicates. The effect of the *PE* interaction strengthens, but is significant only at the 1st decile. Surprisingly, *INS* has the same sign as *PE,* while *MUT* shares sign with *PENS*. A 10 percent increase in syndicate mean experience is associated with 0.96 (3rd) percent lower spreads for insurance company tranches and one (1st) percent higher when mutual funds are present. The strongest results are for the *PENS* interactions, while the other estimates are significant in singular deciles. After the *PENS* coefficient, the experience variables and all their interactions have been controlled for, it appears that loan syndicates at the mid deciles with pension fund involvement and higher average experience are associated with higher spreads.

In Table 9 the results for the *log.A.A_EXP* interactions also change. Now the interactions are significant for *INS, PENS* and *PE*, while the significance of the *MUT* interaction becomes insignificant. Curiously, in contrast to *log.SYND_EXP*, all the remaining significant coefficients have the same sign and are of similar magnitude. A 10 percent increase in arranging experience is associated with 2.03 (1st), 2.6 (5th) and 2.47 (3rd) percent lower spreads for insurance company, pension fund and PE fund tranches, respectively. The results provide evidence in favor of lead arranger experience mitigating participant concerns and leading to lower spreads on average (Gatti et al., 2013). Moving to the next variable, we find that *log.A_EXP* is now significant and negative at 1st and 3rd deciles – a 10 percent increase in lead bank *project finance experience* is associated with between 0.45 and 0.63 percent lower spreads. Moreover, the interactions of *INS* and *PENS* are stronger in magnitude compared to the POLS results. The *INS* estimates are particularly strong, with a 10 percent increase in lead arranger project finance experience associated with between 1.87 (3rd) and two (5th) percent higher spreads. The magnitude of *PENS* is stronger, but only significant at the median – a 10 percent increase in lead experience is associated with 3.07 percent higher spreads. In general it appears that all significant interactions of the last two experience variables co-move. Finally, type coefficients themselves show some changes as well. *PENS* strengthens, exhibits a decreasing trend and is significant between the 3rd and 7th deciles. *PE* is significant between the 1st decile and the median, having its highest value at the 3rd decile. The *INS* coefficient is similar in magnitude, but is now significant (1st) at the 10% level.

Shifting focus to the market share variables, we see notably different results. The market share variables, although providing stronger results in the early (10) POLS model of Table 6 compared to model (9), show little interaction effects with institution type variables. The coefficient on *3Y.MKT.SHR.$* remains the same, while the coefficient on *5Y.MKT.SHR.$* decreases slightly in magnitude. Of the interaction terms, only the *PENS* interaction with *5Y.MKT.SHR.$* is found significant in (10.1) and only at the 10 percent level. For a syndicate with pension fund participation, a one percentage point increase of lead arranger five year market share is associated with 5.02 higher loan spreads compared to the average tranche. One change between (8) and (10.1) models is that the mutual fund coefficient becomes insignificant. Moreover, the significance for *MUT* disappears and for *PE* it weakens slightly. In addition, a regression was run with *PPRICING* and institution type variable interactions, but the results are not reported as no significance was observed.

Table 10: Quantile regression of model (10.1)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
1Y.MKT.SHR.$	0.005 (0.005)	0.000 (0.006)	0.000 (0.005)	-0.007* (0.003)	0.001 (0.004)
× *INS*	0.035 (0.022)	-0.032 (0.036)	-0.027 (0.016)		
× *PENS*	-0.047** (0.021)	-0.014 (0.018)	-0.004 (0.027)	0.012 (0.012)	0.005 (0.010)
× *PE*	0.055 (0.047)	-0.039 (0.033)	-0.027 (0.044)	0.000 (0.032)	-0.016 (0.066)
× *MUT*	-0.008 (0.034)	-0.004 (0.014)	0.020 (0.013)	0.037 (0.030)	
× *SWF*					
3Y.MKT.SHR.$	-0.018 (0.012)	-0.015 (0.010)	-0.022** (0.011)	-0.012* (0.007)	-0.030*** (0.005)
× *INS*	-0.047 (0.037)	0.053 (0.101)	0.028 (0.055)		
× *PENS*	0.071 (0.091)	-0.022 (0.040)	-0.049 (0.063)	-0.035 (0.039)	-0.003 (0.023)
× *PE*	-0.065 (0.090)	0.050 (0.048)	-0.003 (0.061)	-0.054 (0.041)	-0.060 (0.061)
× *MUT*	0.033 (0.040)	-0.011 (0.027)	0.022 (0.040)	0.016 (0.035)	
× *SWF*					
5Y.MKT.SHR.$	0.008 (0.011)	0.006 (0.008)	0.012 (0.008)	0.007 (0.007)	0.020*** (0.006)
× *INS*	-0.001 (0.050)	-0.032 (0.083)	-0.013 (0.046)		
× *PENS*	0.004 (0.091)	0.063 (0.039)	0.078 (0.056)	0.046 (0.036)	-0.001 (0.020)
× *PE*	-0.026 (0.064)	-0.005 (0.054)	0.038 (0.082)	0.057 (0.061)	0.091 (0.062)
× *MUT*	-0.007 (0.061)	0.040 (0.031)	-0.021 (0.049)	-0.031 (0.066)	
× *SWF*					
INS	-0.054 (0.111)	0.091 (0.105)	0.041 (0.096)	-0.086 (0.060)	-0.128** (0.052)
PENS	-0.167 (0.193)	-0.154 (0.152)	-0.066 (0.144)	-0.179* (0.093)	0.008 (0.129)
PE	0.244 (0.165)	0.010 (0.179)	0.111 (0.199)	0.192 (0.230)	0.179* (0.101)
MUT	0.101 (0.165)	0.045 (0.061)	-0.073 (0.077)	-0.159** (0.081)	0.029 (0.054)
SWF	0.285 (0.319)	-0.187 (0.330)	-0.301 (0.339)	-0.005 (0.302)	-0.269 (0.270)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.718*** (0.643)	4.027*** (0.672)	4.491*** (0.450)	4.978*** (0.333)	5.138*** (0.494)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

Looking at the QR results of model (10.1) in Table 10, some new details emerge. Except for the 7th decile, the coefficients on the *1Y.MKT.SHR.$* are all insignificant and only the *PENS* interaction (1st) is significant. A percentage point increase in market share is associated with a 0.7 percent decrease in spread, which becomes a 4.7 percent decrease when a pension fund is also present. *3Y.MKT.SHR.$* is stronger in magnitude compared to the one year market share and significant between the median and 9th decile. A percentage point increase in market share is associated with between 1.2 (5th) and three (9th) percent lower spreads. Notably, the interaction terms bring no changes as all the coefficients are insignificant, reinforcing earlier results. The magnitude of *5Y.MKT.SHR.$* increases, but is only significant at the 9th decile – a percentage point in market share coincides with two percent higher spreads. In addition, the interaction with *PENS* is no longer significant. Finally, several of the type variables now become significant compared to POLS, but only at higher deciles. *INS* (9th), *PENS* (7th) and *MUT* (7th) are associated with 12.8, 17.9 and 15.9

percent lower spreads. Private equity participation on the other hand is related to 17.9 (9th) percent higher spreads. However, in general the institution type variables are largely insignificant in the QR results. Finally, the Pooled OLS and QR were run with the market share variables that were not scaled by deal size – i.e., market share of transactions. The results were largely similar and thus the results found in Tables 12 and 13 were moved to Appendix A.#10.1b

The preceding regressions with the interactions provide some clarifications and details regarding H5. Although the market share variables have a significant relation to syndicated project finance loan spreads, most of the evidence presented does not find it having a significant relation to institutional investor type. Except for *1Y.MKT.SHR.$* × *PENS* at the 1th decile in Table 10 and *1Y.MKT.SHR.$* × *PENS* in Table 8, all of the interactions are insignificant. If the market share variables act as a reasonable proxy for reputation we can conclude based on the evidence that – contrary to earlier findings (Gatti et al., 2013) – lead bank reputation does not seem to be a significant determinant in pricing institutional loan tranches in project finance. The results from *1Y.MKT.SHR.$* (Table 6), *3Y.MKT.SHR.$* (Table 6) and *1Y.MKT.SHR.$* × *PENS* (Table 10) seem to fit with the findings that higher reputation lead banks are able to syndicate loans at a lower spread also in the project finance lending market – and that this result is connected to informationally disadvantaged institutional investors. Notably, *1Y.MKT.SHR.$* × *PENS* in Table 8 provides contradicting evidence. Nevertheless, although some significance is found, the presented evidence does not meaningfully support H5.

Moving on to the experience variables, the support for H5 is stronger – particularly for pension funds and insurance companies – but still mixed. In the POLS results of Table 8, the relation is especially strong for *PENS* as all its interactions with the experience proxies are significant. Pension funds appear to participate in loans of higher average spread when the syndicate has on average more experience and when the lead arranger has on average higher project finance experience. In addition, pension fund participated tranches are associated with lower average spreads when the lead arranger is on average more experienced in arranging project finance loans. Observing the QR results, Table 9 shows that these effects are stronger for the deciles where the effect is significant. Although statistically significant relationships have been observed, the signs of the coefficients are not in line with expectations. On one hand, *log.A.A_EXP* × *PENS* in Table 8 indicates that lead bank arranging experience significantly lowers spreads in tranches with pension funds, lending proof to the effect of information asymmetry and the ability of experience to mitigate it – i.e., when agency problem concerns are reduced, pension funds are willing to accept on average lower spreads. The negative coefficients for *log.SYND_EXP* × *INS* and *log.A.A_EXP* × *INS* in Table 9 is also consistent with that expectation. On the other hand, *PENS* interactions with *log.SYND_EXP* and *log.A_EXP* as well the significant *log.A_EXP* × *INS* interactions have a positive sign, which is harder to rationalize. In addition, the reasoning for the opposing signs of *PE* and *MUT* interactions with *log.SYND_EXP* is unclear. However, the fact that the *INS* and *PENS* interactions have the same sign for the most part is more in line with expectation – investors more similar in type (i.e., short vs. long-term) should exhibit similar effects.

As was seen in model (9.1) of Table 8, a statistically and economically significant interaction for *PE* exists with syndicate mean experience (*log.SYND_EXP*). Based on the regression results, private equity funds seem to participate in loans with lower spreads on average when the syndicate average level of experience is higher. The results for *PE* become more pronounced when looking at the QR results, as its magnitude increases. In addition to being statistically significant, these coefficients are economically meaningful. The level of lead bank arranging experience in private equity fund participated syndicates – like mean syndicate experience – is associated with lower spreads. Finally, looking at mutual funds, significant relationships exist for some of the interactions in Tables 8 and 9. The positive relationship observed in Table 9 for the 1st decile *log.SYND_ EXP* interaction coefficient and in Table 8 for the *log.A.A_EXP* interaction run contrary to expectation, particularly since they have an opposing sign compared to the *PE* interactions. This indicates that mutual funds may have less in common with private equity funds than was expected based on similarities of assumed investment horizons. However, it could also indicate that although the similarities are meaningful, they could be dominated by a lack of experience and the negative effects of information asymmetry. To conclude discussion on H5, it is apparent that although the results are quite mixed, the evidence provided show that considerations regarding information asymmetry are meaningful and that there indeed seems to be a relationship between the experience, loan pricing and institutional investor type.

5.5 Hypothesis 6

Finally, the evidence regarding H6 is examined. Starting with Table 8, we see that although the *log.INST_EXP* is still insignificant as in Table 6, now two of its interactions are significant. Their signs and magnitudes are similar to the *log.SYND_EXP* interactions in the same table, particularly the *PE* interaction which is identical. The sign of the *PE* interaction is in line with the expectation of experience decreasing spreads, but the positive and strongly significant coefficient on the *PENS* interaction is not. In Table 8, a 10 percent increase in institutional investor experience in syndicates is related to 1.2 higher spreads when pension funds are present and 1.27 lower when PE funds are present. Looking at Table 11, the *PE* interaction significance disappears, but the *PENS* interaction becomes even stronger in magnitude and significant at multiple deciles. A 10 percent increase in institutional investor experience in syndicates with pension funds is associated with between 1.37 (5th) and 1.45 (3rd) percent increase in spreads. Moreover, the fact that the *PENS* coefficients are largely significant and negative at the same time as the interactions, strengthen the significance of the interaction result.

One way the *PENS* result could be justified is if the positive sign reflects an increased comfort due to experience leading to lending to riskier borrowers. This conjecture is supported by the fact that although there are few pension funds in the sample (14), compared to for example insurance companies (80), pension fund participated tranches are relatively more common (4.5% vs. 3.1%, Table 2). This implies that the pension funds involved in project finance lending are particularly active. Therefore, pension funds appear to be on average more experienced compared to other institutional investors – and this experience seems to have an increasing effect on spreads. However, this assertion is not consistent with the *PE* interaction coefficient in Table 8, as in expectation it should have the same positive sign. It is possible that the *log.INST_EXP* is capturing some other effect and not the accumulation of experience, but the other effect does not seem to be experience or reputation as their patterns of significant coefficients differ from *log.INST_EXP*. With the presented evidence it appears difficult to strongly support H6 – however, if we are to assume that the *log.INST_EXP* variable is a valid proxy for institutional investor experience, then there indeed seems to be some weak evidence for a relationship between institutional investor experience and loan pricing in project finance.

Table 11: Quantile regression of model (11.1)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
log.INST_EXP	0.017 (0.028)	-0.011 (0.021)	-0.008 (0.030)	0.005 (0.093)	-0.050 (0.065)
× *INS*	-0.071 (0.059)	-0.062 (0.062)	-0.025 (0.058)	-0.052 (0.093)	-0.002 (0.100)
× *PENS*	0.100 (0.062)	0.145*** (0.055)	0.137** (0.053)	0.083 (0.106)	0.112 (0.071)
× *PE*	-0.062 (0.060)	-0.109 (0.078)	-0.073 (0.070)	-0.090 (0.159)	-0.105 (0.120)
× *MUT*	0.064 (0.053)	0.002 (0.050)	-0.006 (0.052)	-0.013 (0.122)	0.024 (0.065)
INS	0.041 (0.125)	0.061 (0.197)	0.008 (0.129)	0.022 (0.141)	0.081 (0.140)
PENS	-0.423** (0.213)	-0.513*** (0.196)	-0.556*** (0.187)	-0.385 (0.388)	-0.261** (0.116)
PE	0.301** (0.152)	0.347* (0.204)	0.275* (0.148)	0.363* (0.219)	0.671*** (0.258)
MUT	-0.029 (0.134)	0.178 (0.117)	0.096 (0.112)	0.094 (0.163)	0.106 (0.097)
SWF	0.502*** (0.125)	0.333 (0.258)	0.356 (0.226)	-0.006 (0.732)	-0.595*** (0.158)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.654*** (0.619)	3.761*** (0.469)	4.426*** (0.544)	4.894*** (0.403)	5.350*** (0.475)

*** Significant at 1%; ** Significant at 5%; * Significant at 10%

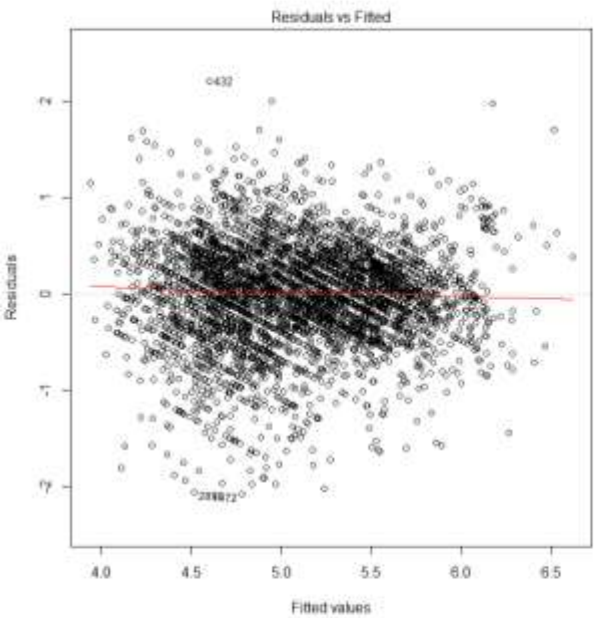
6 Conclusion

The widely recognized increase of institutional investor participation in the syndicated loan market for project financing raises questions on how the entrance of this new class of lender affects the practices, structure and conditions on the market (e.g., Ivashina & Sun, 2011; Jiang et al., 2010; Lim et al., 2014). Finance literature has sought to answer whether and how tranches with institutional investor participation differ from other syndicated credits. The literature review herein presented relevant findings on the topic, but it became clear that although the phenomenon has received attention on a general level, their effect specifically in the project finance market has been less studied. Moreover, common feature of studies on institutional investor behavior and effects treat the group as homogenous (e.g., Nandy & Shao, 2010). However, as theory and findings indicate, institutional investors are in effect vastly different from one another (Yan & Zhang, 2009) in terms of investment behavior (Lim et al. 2014), maturity preferences (Gaspar et al., 2005), funding liquidity (Beyhaghi et al., 2019; Basile & Ferrari, 2016), to name a few. Hence, ignoring institution type is a notable omission in present literature on syndicated lending – particularly in the project finance context – and the objective of this thesis has been to remedy this shortcoming. The author has attempted to answer whether institutional investor type is a significant determinant in syndicated project finance loan pricing – and if so, what factors, characteristics and conditions might contribute to the effect.

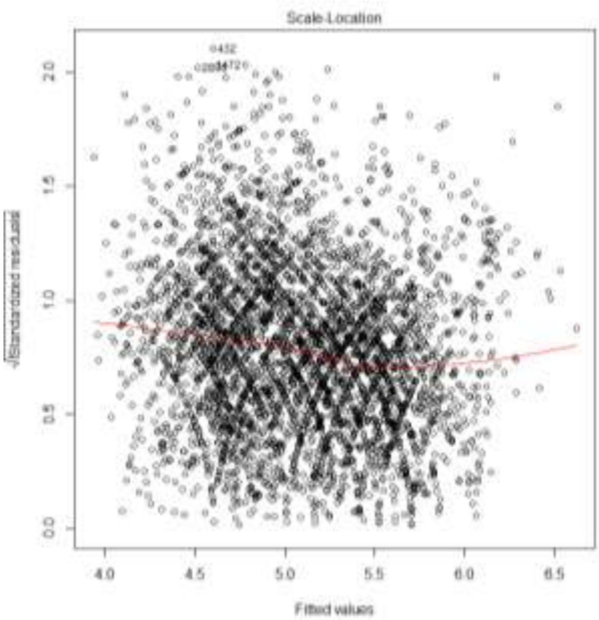
The contributions of this thesis can be summarized by four key findings. First, the presented evidence provide relatively strong support for institutional investor type being both a statistically and economically significant determinant in the pricing of syndicated project finance loans. Particularly the difference between private equity, pension and mutual fund effects is distinct. Loan tranches with private equity and mutual fund participation have on average higher spreads, with the former's effect stronger in magnitude. Loans with pension fund participation, however, are associated with lower than average spreads. Hence, the main research question has been answered. Second, on one hand, the lower pricing of a pension fund tranche compared to a commercial bank tranche supports the hypothesis that long-term institutional investors could be uniquely suitable to providing long-term financing and could have a competitive advantage arising from their characteristic long-term liability structure. On the other hand, short-term institutional investor tranches do not have a similar effect and their spreads appear to be driven by required return considerations. Third, these pricing effects of different institutional investors appear to be connected to lead arranger and mean syndicate experience, but not to lead bank reputation measures. Lead bank arranging experience has a similar, spread diminishing interaction effect on all investor types except mutual funds. Moreover, the level of project finance experience an arranger has is associated with above average spreads in tranches with insurance companies and pension funds. Furthermore, the average level of experience in a syndicate has a significant effect on investor types, but the results are more mixed. Fourth, the results imply that institutional investor experience could have a connection to pricing, as more experienced pension funds participate in tranches with higher spreads.

The results are interesting, but preliminary. The empirical testing suffered from a lack of data in general – and a lack of lender and borrower firm-level data in particular. Multiple known controls from literature were employed in testing, but due to data restrictions firm-level characteristics could not be controlled for. One direction for future research could be to test again the hypotheses with more robust data. Particularly the fact that this thesis was unable to control for institutional investor characteristics is a deficiency which future studies could remedy. For example, Broeders et al. (2020) find that a pension fund, which is ten times larger in terms of assets under management, has on average an allocation to illiquid assets which is 7.4 percentage points higher. The finding demonstrates how important it is to control investor characteristics in the future. A second deficiency relates to loan-level data. The Dealscan database had little information on loan covenants and their critical values. For instance, covenants can be connected to maintaining various debt cover ratios (e.g., Annual Debt Service Cover ratio, ADSCR; Loan-Life Cover Ratio, LLCR), which facilitate monitoring (Yescombe, 2014, p. 322). The determined ratios can provide information on project company characteristics and riskiness. A researcher with access to the mentioned data will be able to provide a more complete picture of the effects studied in this thesis.

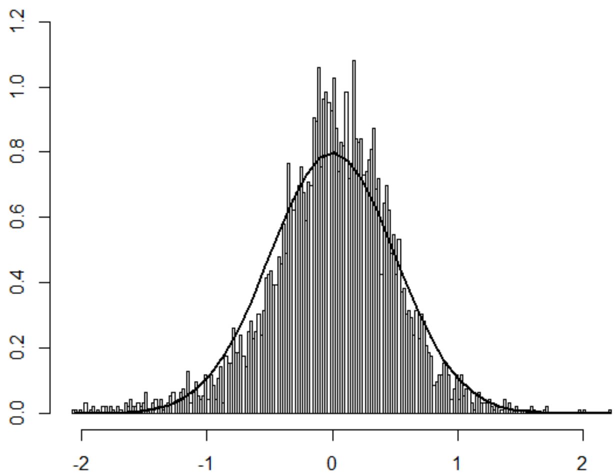
Appendix A



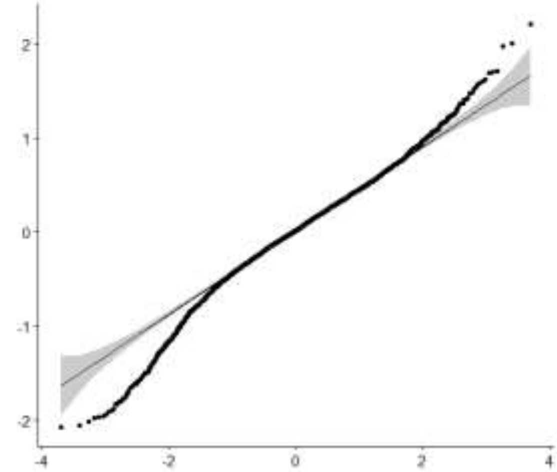
Graph 9: Residual versus fitted plot of model (8)



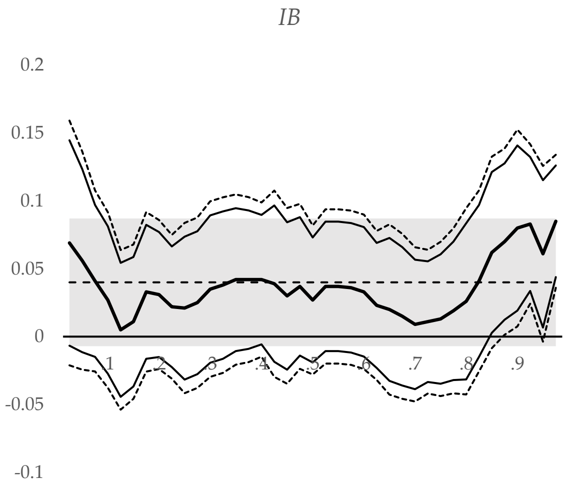
Graph 10: Scale-location plot of model (8)



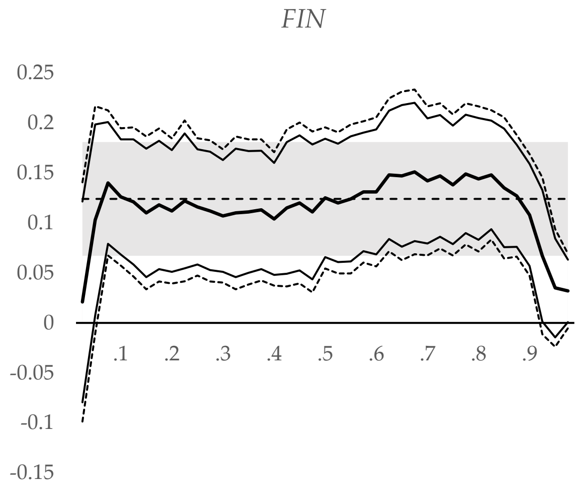
Graph 11: Histogram of model (8) residuals



Graph 12: QQ-plot of model (8) residuals



Graph 13: *IB* from quantile regressions of model (8)



Graph 14: *FIN* from quantile regressions of model (8)

Table 12: POLS with interaction terms (8) with alternative market share variables

log(AISD)	**(9.1)**			**(10.1a)**		**(10.1b)**			**(11.1)**	
log.SYND_EXP	-0.092***	(0.014)	*3Y.MKT.SHR.$*	-0.017***	(0.007)	-0.026**	(0.013)	*log.INST_EXP*	-0.012	(0.024)
× *INS*	-0.015	(0.057)	× *INS*	0.015	(0.040)	0.043	(0.066)	× *INS*	-0.027	(0.049)
× *PENS*	0.178**	(0.073)	× *PENS*	-0.019	(0.034)	0.045	(0.055)	× *PENS*	0.120***	(0.042)
× *PE*	-0.127**	(0.057)	× *PE*	-0.038	(0.067)	0.079***	(0.094)	× *PE*	-0.127**	(0.061)
× *MUT*	-0.006	(0.037)	× *MUT*	0.008	(0.023)	-0.035	(0.057)	× *MUT*	-0.015	(0.04)
log.A.A_EXP	0.009	(0.018)	*1Y.MKT.SHR.$*	-0.002	(0.004)	-0.0003	(0.008)			
× *INS*	-0.115	(0.089)	× *INS*	-0.027	(0.017)	-0.023	(0.027)			
× *PENS*	-0.200**	(0.094)	× *PENS*	-0.008	(0.016)	-0.05	(0.024)			
× *PE*	-0.065	(0.128)	× *PE*	0.007	(0.036)	-0.095	(0.065)			
× *MUT*	0.112*	(0.065)	× *MUT*	0.015	(0.011)	0.018	(0.019)			
log.A_EXP	-0.023	(0.018)	*5Y.MKT.SHR.$*	0.009*	(0.005)	0.003	(0.011)			
× *INS*	0.167*	(0.09)	× *INS*	0.002	(0.039)	-0.029	(0.054)			
× *PENS*	0.256**	(0.11)	× *PENS*	0.049*	(0.029)	0.044	(0.048)			
× *PE*	0.014	(0.121)	× *PE*	0.031	(0.054)	0.013	(0.092)			
× *MUT*	-0.106	(0.065)	× *MUT*	-0.009	(0.027)	0.042	(0.059)			
INS	-0.339	(0.293)		0.028	(0.080)	-0.013	(0.088)		0.012	(0.118)
PENS	-1.286***	(0.31)		-0.1	(0.090)	-0.094	(0.103)		-0.438***	(0.148)
PE	0.963***	(0.291)		0.205*	(0.118)	0.327*	(0.182)		0.508***	(0.145)
MUT	0.197	(0.153)		0.002	(0.055)	0.026	(0.059)		0.163*	(0.089)
SWF	-0.16	(0.139)		-0.259	(0.242)	-0.13	(0.181)		0.008	(0.133)
Controls from (8)	Yes			Yes		Yes			Yes	
Observations	4,578			4,254		4,254			4,578	
Adjusted R^2	0.462			0.469		0.47			0.447	

Table 13: Quantile regression of model (10.1b)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
1Y.MKT.SHR	0.013 (0.009)	0.001 (0.011)	-0.002 (0.009)	-0.006 (0.009)	0.001 (0.012)
× *INS*	0.045 (0.051)	0.001 (0.047)	-0.022 (0.033)	0.019 (0.022)	
× *PENS*	-0.092** (0.039)	-0.082*** (0.022)	-0.062** (0.026)	-0.010 (0.047)	-0.019 (0.025)
× *PE*	-0.128* (0.070)	-0.121 (0.094)	-0.127 (0.166)	-0.076 (0.048)	-0.111 (0.172)
× *MUT*	0.072** (0.029)	0.034 (0.024)	0.033 (0.021)	0.043 (0.066)	
× *SWF*					
3Y.MKT.SHR	-0.012 (0.020)	-0.028 (0.019)	-0.030* (0.016)	-0.025 (0.016)	-0.030* (0.018)
× *INS*	-0.088 (0.135)	0.058 (0.062)	0.034 (0.075)	-0.034 (0.082)	
× *PENS*	0.160 (0.098)	0.094** (0.045)	0.020 (0.052)	-0.009 (0.118)	0.012 (0.051)
× *PE*	0.173 (0.140)	0.117 (0.106)	0.091 (0.126)	0.088 (0.126)	-0.033 (0.613)
× *MUT*	-0.150 (0.131)	-0.089 (0.064)	-0.072 (0.067)	-0.050 (0.122)	
× *SWF*					
5Y.MKT.SHR	-0.011 (0.019)	0.010 (0.013)	0.009 (0.013)	0.006 (0.011)	0.008 (0.017)
× *INS*	0.016 (0.139)	-0.073 (0.064)	-0.031 (0.051)	-0.006 (0.066)	
× *PENS*	-0.035 (0.099)	0.030 (0.038)	0.073 (0.045)	0.060 (0.083)	0.013 (0.039)
× *PE*	-0.057 (0.083)	0.020 (0.080)	0.037 (0.196)	-0.036 (0.083)	0.154 (0.787)
× *MUT*	0.094 (0.110)	0.078 (0.056)	0.087 (0.073)	0.051 (0.103)	
× *SWF*					
INS	-0.037 (0.116)	-0.023 (0.136)	0.034 (0.089)	-0.020 (0.094)	-0.150* (0.087)
PENS	-0.077 (0.259)	-0.109 (0.183)	-0.038 (0.155)	-0.153 (0.121)	0.035 (0.110)
PE	0.211 (0.258)	0.093 (0.291)	0.240 (0.292)	0.306* (0.168)	0.340 (0.944)
MUT	0.108 (0.119)	0.051 (0.062)	-0.095 (0.065)	-0.159 (0.120)	0.043 (0.058)
SWF	0.235 (0.221)	0.352 (0.220)	-0.042 (0.363)	-0.006 (0.306)	-0.199 (0.292)
Controls from (8)	Yes	Yes	Yes	Yes	Yes
Constant	2.628*** (0.595)	4.156*** (0.477)	4.557*** (0.448)	5.162*** (0.357)	5.142*** (0.658)

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	(24)
(1)	*PENS*	1																							
(2)	*CORR*	0.05	1																						
(3)	*log.GDP*	0.09	0.85	1																					
(4)	*GDPPC-%*	-0.13	-0.33	-0.47	1																				
(5)	*CRED*	0.02	0.09	-0.07	0.05	1																			
(6)	*LNCDAYS*	-0.13	-0.5	-0.35	0.02	-0.06	1																		
(7)	*log.SYND_EXP*	0.08	0.22	0.39	-0.33	-0.07	-0.07	1																	
(8)	*log.A.A_EXP*	0.13	0.2	0.29	-0.26	-0.04	-0.1	0.64	1																
(9)	*log.A_EXP*	0.11	0.24	0.32	-0.27	-0.04	-0.13	0.66	0.92	1															
(10)	*3Y.MKT.SHR.$*	0.17	0.14	0.28	-0.23	-0.01	-0.08	0.61	0.39	0.37	1														
(11)	*1Y.MKT.SHR.$*	0.16	0.13	0.28	-0.23	-0.02	-0.06	0.61	0.39	0.37	0.91	1													
(12)	*5Y.MKT.SHR.$*	0.15	0.14	0.28	-0.23	-0.01	-0.09	0.61	0.39	0.37	0.96	0.86	1												
(13)	*log.INST_EXP*	0.79	0.02	0.07	-0.11	0	-0.1	0.11	0.16	0.13	0.17	0.15	0.16	1											
(14)	*LIBOR*	-0.21	-0.02	-0.05	0.08	-0.18	0.19	0	-0.08	-0.05	-0.04	-0.01	-0.03	-0.19	1										
(15)	*EURIBOR*	0.33	0.05	0.2	-0.23	-0.07	-0.14	0.22	0.17	0.17	0.23	0.23	0.21	0.24	-0.64	1									
(16)	*US_DUMMY*	-0.13	0.36	0.42	-0.11	-0.53	-0.01	0.01	0.01	0.01	-0.06	-0.06	-0.06	-0.1	0.46	-0.32	1								
(17)	*EU_DUMMY*	0.29	0.18	0.28	-0.29	0.2	-0.08	0.29	0.22	0.23	0.3	0.31	0.28	0.2	-0.35	0.7	-0.42	1							
(18)	*S_C.SYND*	-0.17	-0.07	-0.15	0.12	0.06	0.09	0.01	-0.19	-0.17	0.1	0.11	0.09	-0.15	0.28	-0.28	0.01	-0.21	1						
(19)	*B_C.SYND*	-0.13	-0.39	-0.42	0.19	-0.07	0.23	-0.12	-0.15	-0.08	-0.15	-0.14	-0.15	-0.14	0.27	-0.21	-0.06	-0.23	0.28	1					
(20)	*S_DIST*	-0.19	0.1	-0.02	0.08	0.06	-0.02	0.04	-0.08	-0.09	0.06	0.06	0.08	-0.14	0.29	-0.41	0.16	-0.4	0.69	0.18	1				
(21)	*B_DIST*	-0.12	-0.19	-0.24	0.12	-0.06	0.13	-0.09	-0.12	-0.07	-0.12	-0.11	-0.11	-0.12	0.27	-0.26	0.06	-0.31	0.31	0.74	0.3	1			
(22)	*CURR_RISK*	-0.17	-0.5	-0.63	0.36	0.28	0.16	-0.25	-0.23	-0.23	-0.19	-0.21	-0.18	-0.12	-0.04	-0.33	-0.54	-0.37	0.22	0.31	0.2	0.22	1		
(23)	*SEC_MIS*	-0.16	0.08	0.1	0.02	-0.32	0.06	0.07	0.07	0.05	-0.02	-0.01	-0.01	-0.11	0.33	-0.37	0.48	-0.47	0.1	0.08	0.22	0.13	-0.02	1	
(24)	*SEC*	0.14	0	0.01	-0.1	0.25	-0.02	0.05	0.03	0.05	0.08	0.08	0.08	0.11	-0.32	0.4	-0.4	0.5	-0.11	-0.11	-0.22	-0.16	-0.07	-0.86	1

Appendix B

Table 15: Pooled OLS with institutional tranche (extended)

log(AISD)	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
log.FAC_AMT	-0.031***	-0.024***	-0.032***	-0.025***	-0.023***	-0.018***	-0.020***	-0.012*	-0.007	-0.005
log.MAT	0.314***	0.295***	0.273***	0.273***	0.279***	0.266***	0.186**	0.149*	0.142*	0.136*
log.MAT^2	-0.037***	-0.035***	-0.032***	-0.032***	-0.031***	-0.030***	-0.017*	-0.013	-0.012	-0.012
INST_TRANCHE	0.043	0.081***	0.058*	0.094***	0.025	0.068**	0.052*	0.095***	0.075**	0.097***
IB	0.014	0.064***	0.013	0.062***	0.019	0.064**	0.017	0.046*	0.052**	0.056**
FIN	0.110***	0.137***	0.109***	0.140***	0.138***	0.157***	0.084***	0.127***	0.109***	0.112***
DFI	-0.048	0.009	-0.033	0.019	-0.068*	-0.016	-0.04	-0.003	-0.02	-0.021
ECA	-0.054	0.021	-0.055	0.019	-0.057	0.001	-0.05	-0.004	-0.016	-0.035
TERM	0.026	0.047**	0.049**	0.060***	0.017	0.034	0.049**	0.058***	0.053**	0.055**
TERM.A	0.210***	0.182***	0.187***	0.171***	0.173***	0.162***	0.095	0.120**	0.113**	0.103*
TERM.B	0.487***	0.429***	0.468***	0.423***	0.442***	0.400***	0.375***	0.297***	0.286***	0.280***
TERM.C	0.551***	0.453***	0.539***	0.459***	0.542***	0.455***	0.485***	0.360***	0.334***	0.353***
LC	-0.204***	-0.133**	-0.183***	-0.121*	-0.223***	-0.147**	-0.179***	-0.053	-0.053	-0.073
CORR	-0.015	-0.051	0.144**	0.073	-0.121*	-0.151**	-0.018	-0.003	-0.017	-0.018
log.GDPPC	-0.076***	-0.076***	-0.081***	-0.080***	-0.037*	-0.040*	-0.085***	-0.075***	-0.062***	-0.078***
GDPPC-%	-0.009***	-0.008**	-0.006	-0.006	-0.014***	-0.012***	-0.018***	-0.016***	-0.018***	-0.017***
INFL	0.002	0.002	0.003*	0.003*	0.003	0.003	0.003	0.004	0.004	0.003
CURR_RISK		-0.075***		-0.072**		-0.044		0.071	0.057	0.097**
MULTI		-0.042*		-0.039*		-0.040*		0.002	0.012	0.006
SEC		0.201***		0.184***		0.214***		0.222***	0.216***	0.217***
SEC_MIS		0.234***		0.207***		0.239***		0.125**	0.126**	0.129**
SENIOR		0.251***		0.266***		0.263***		0.258***	0.250***	0.280***
SHARE		-0.002***		-0.002***		-0.002***		-0.002***	-0.002***	-0.002***
SYND_SIZE		-0.013***		-0.013***		-0.013***		-0.012***	-0.010***	-0.011***
GUAR		-0.127***		-0.108***		-0.128***		-0.144***	-0.140***	-0.142***
SPONS		0.120***		0.125***		0.096***		0.044	0.060*	0.054*
SPONS_DUAL		-0.273***		-0.253***		-0.285***		-0.287***	-0.293***	-0.298***
CRED			-0.040***	-0.019*			0.018	0.011	0.014	0.014
LNCDAYS			0.136***	0.114***			0.108***	0.102***	0.088***	0.094***
LIBOR							-0.059	-0.075**	-0.051	-0.064*
EURIBOR							-0.125**	-0.127**	-0.109**	-0.127**
log.SYND_EXP									-0.090***	
log.A.A_EXP									0.008	
log.A_EXP									-0.018	
3Y.MKT.SHR.$										-0.017***
1Y.MKT.SHR.$										-0.002
5Y.MKT.SHR.$										0.010**
S_C.SYND					-0.015	0.0001	0.005	0.014	0.024	0.035
B_C.SYND					-0.035	-0.047**	-0.031	-0.029	-0.004	-0.037
S_SYND					0	0	-1E-05	0	0	0
B_SYND					0.00001***	0.00001***	0.00001*	0	0	0
US_DUMMY							0.326***	0.169	0.137	0.158
× *y_1990*								-0.389	-0.281	-0.291
× *y_1991*								-0.009	0.08	0.058
× *y_1992*								-0.067	0.04	0.032
× *y_1993*								-0.025	0.081	0.116
× *y_1994*								-0.227	-0.148	-0.202
× *y_1995*								-0.057	0.065	-0.013
× *y_1996*								-0.166	-0.144	-0.12
× *y_1997*								0.086	0.134	0.139
× *y_1998*								0.277	0.302	0.451**
× *y_1999*								0.572***	0.598***	0.567***
× *y_2000*								0.305*	0.325*	0.422**
× *y_2001*								0.418**	0.426**	0.450**
× *y_2002*								0.287	0.266	0.311*
× *y_2003*								0.555***	0.504***	0.580***
× *y_2004*								0.202	0.203	0.249
× *y_2005*								0.690***	0.643***	0.714***
× *y_2006*								0.355	0.324	0.333
× *y_2007*								0.506***	0.496**	0.487**
× *y_2008*								0.2	0.207	0.239
× *y_2009*								0.088	0.131	0.163
× *y_2010*								-0.093	-0.114	-0.05
× *y_2011*								-0.222	-0.214	-0.146
× *y_2012*								0.287	0.241	0.341*

× y_2013								-3E-05	-0.01	0.002
× y_2014								0.22	0.224	0.238
× y_2015								0.262	0.296*	0.251
× y_2016								-0.049	-0.015	0.006
× y_2017								0.195	0.164	0.189
× y_2018								-0.009	-0.038	0.016
× y_2019								-0.226	-0.234	-0.219
EU_DUMMY							-0.025	-0.017	-0.034	0.011
× y_1991								-0.042	-0.05	-0.135
× y_1992								0.036	0.166	0.246
× y_1993								-0.275	-0.208	-0.309
× y_1994								0.089	0.163	0.01
× y_1995								0.595**	0.658**	0.582**
× y_1996								-0.083	0.012	-0.056
× y_1997								-0.041	0.049	0.063
× y_1998								-0.227	-0.147	-0.368
× y_1999								0.01	0.071	0.158
× y_2000								-0.02	0.029	-0.38
× y_2001								-0.117	-0.102	-0.11
× y_2002								-0.093	-0.104	-0.073
× y_2003								-0.109	-0.137	-0.09
× y_2004								-0.104	-0.104	-0.131
× y_2005								0.032	0.069	0.075
× y_2006								-0.331	-0.301	-0.323
× y_2007								-0.247	-0.209	-0.144
× y_2008								-0.058	-0.013	-0.005
× y_2009								-0.087	-0.017	-0.037
× y_2010								-0.096	-0.054	-0.042
× y_2011								-0.058	0.005	0.011
× y_2012								0.433**	0.464***	0.456**
× y_2013								0.156	0.214	0.175
× y_2014								0.364*	0.382**	0.306
× y_2015								0.315*	0.366**	0.269
× y_2016								-0.078	-0.001	-0.019
× y_2017								0.088	0.107	0.047
× y_2018								0.044	0.052	0.047
× y_2019								-0.329	-0.338	-0.324
ind_Aircraft	-0.03	-0.103	-0.056	-0.114	-0.152	-0.187	-0.226**	-0.147	-0.117	-0.138
ind_Airports	0.286***	0.207*	0.256**	0.199*	0.255**	0.184*	0.263***	0.245**	0.221**	0.235**
ind_Bridges_Tunnels	0.059	0.055	0.034	0.039	0.023	0.026	0.023	0.059	0.076	0.083
ind_Electric_Cogeneration	0.193***	0.135**	0.135**	0.106**	0.143**	0.098*	0.061	0.095*	0.113**	0.091*
ind_Electric_Independent	0.112*	0.059	0.052	0.026	0.087	0.031	-0.013	0.022	0.041	0.06
ind_Electric_Other	0.064	-0.01	0.013	-0.036	0.003	-0.054	-0.04	-0.02	-0.009	-0.022
ind_Electricity_transmission	0.241*	0.154	0.125	0.081	0.158	0.079	0.067	0.128	0.144	0.113
ind_Gas_Oil	0.113**	0.089*	0.083	0.078	0.092	0.075	0.059	0.093*	0.103*	0.078
ind_Healthcare	0.266***	0.223**	0.181*	0.159	0.198**	0.168*	0.177*	0.145**	0.141**	0.162**
ind_Manufacturing	0.202	0.202*	0.155	0.162	0.172	0.17	0.06	0.054	-0.013	0.081
ind_Transit	-0.108	-0.128*	-0.136**	-0.145**	-0.142**	-0.154**	-0.118*	-0.098	-0.098	-0.107
ind_Mining	0.456***	0.392***	0.410***	0.367***	0.419***	0.354***	0.419***	0.400***	0.412***	0.442***
ind_Other	0.271***	0.155***	0.201***	0.118**	0.235***	0.131***	0.125**	0.091*	0.093**	0.094*
ind_Pipelines	0.096	0.089	0.064	0.081	0.077	0.075	0.013	0.08	0.109	0.088
ind_Ports	0.141	0.119	0.098	0.097	0.096	0.079	0.05	0.057	0.076	0.035
ind_Pulp	-0.011	-0.159	-0.063	-0.212**	-0.047	-0.163	-0.028	-0.058	-0.074	-0.022
ind_Commercial	0.222***	0.170***	0.177***	0.145**	0.180***	0.139**	0.127**	0.093*	0.082*	0.091*
ind_Residental	0.417***	0.446***	0.391***	0.423***	0.379***	0.417***	0.270***	0.250***	0.196**	0.248***
ind_Recycling	0.146*	0.099	0.1	0.06	0.102	0.073	0.08	0.065	0.041	0.037
ind_Ships	0.113	0.058	0.229	0.21	-0.021	-0.038	0.075	0.099	0.028	0.011
ind_Arenas	0.370***	0.274***	0.335***	0.261***	0.345***	0.261***	0.338***	0.295***	0.285***	0.257***
ind_Telecommunications	0.319***	0.250***	0.251***	0.211**	0.298***	0.232***	0.258***	0.243***	0.246***	0.241***
ind_Casinos	0.776***	0.774***	0.656***	0.643***	0.726***	0.727***	0.520***	0.442***	0.448***	0.451***
ind_Toll	0.062	0.015	0.014	-0.006	0.018	-0.019	0.048	0.076	0.069	0.063
ind_Water	0.212*	0.188	0.213	0.199	0.272	0.251	0.282*	0.256**	0.265**	0.251**
y_1988	0.481	0.357	0.45	0.33	0.456	0.365	0.482*	0.423	0.437	0.47
y_1989	0.213	0.108	0.179	0.079	0.193	0.111	0.173	0.125	0.195	0.171
y_1990	-0.092	-0.049	-0.07	-0.03	-0.124	-0.066	0.02	0.23	0.235	0.189
y_1991	0.169	0.107	0.175	0.093	0.127	0.077	0.25	0.172	0.227	0.116
y_1992	0.128	0.162	0.173	0.168	0.12	0.163	0.271	0.194	0.262	0.144
y_1993	0.107	0.145	0.164	0.153	0.085	0.132	0.267	0.211	0.318	0.201
y_1994	0.225	0.261	0.283	0.277	0.211	0.256	0.410**	0.367	0.506**	0.351
y_1995	0.236	0.286	0.289	0.296	0.204	0.267	0.390**	0.298	0.414*	0.263
y_1996	0.27	0.283	0.329*	0.294	0.244	0.268	0.442**	0.297	0.443*	0.259

y_1997	0.213	0.208	0.265	0.217	0.215	0.216	0.406**	0.222	0.412*	0.181
y_1998	0.213	0.192	0.254	0.195	0.211	0.2	0.397**	0.195	0.403	0.153
y_1999	0.399**	0.360*	0.429**	0.358*	0.412**	0.376*	0.608***	0.241	0.487**	0.253
y_2000	0.370*	0.319	0.393**	0.314	0.367*	0.322	0.555***	0.267	0.550**	0.157
y_2001	0.334*	0.3	0.365*	0.302	0.330*	0.306	0.504***	0.209	0.493*	0.175
y_2002	0.483**	0.426**	0.508***	0.423**	0.506***	0.450**	0.704***	0.435*	0.735***	0.42
y_2003	0.357*	0.307	0.392**	0.303	0.375*	0.334*	0.614***	0.332	0.628**	0.311
y_2004	0.319*	0.233	0.367*	0.24	0.338*	0.263	0.599***	0.374	0.677***	0.377
y_2005	0.212	0.138	0.219	0.112	0.204	0.135	0.453**	0.054	0.356	0.055
y_2006	0.175	0.086	0.215	0.088	0.155	0.071	0.409**	0.195	0.495*	0.225
y_2007	0.195	0.1	0.252	0.118	0.221	0.117	0.484**	0.175	0.489*	0.134
y_2008	0.329*	0.24	0.366*	0.24	0.286	0.207	0.558***	0.263	0.606**	0.292
y_2009	1.113***	1.032***	1.149***	1.026***	1.052***	0.989***	1.270***	1.047***	1.365***	1.057***
y_2010	1.170***	1.080***	1.196***	1.075***	1.158***	1.075***	1.374***	1.189***	1.562***	1.203***
y_2011	1.135***	1.053***	1.198***	1.077***	1.139***	1.058***	1.394***	1.203***	1.578***	1.225***
y_2012	1.169***	1.082***	1.231***	1.100***	1.139***	1.053***	1.398***	0.870***	1.230***	0.891***
y_2013	1.112***	1.032***	1.154***	1.037***	1.136***	1.070***	1.375***	1.080***	1.435***	1.120***
y_2014	1.039***	0.939***	1.062***	0.935***	1.024***	0.929***	1.264***	0.783***	1.174***	0.865***
y_2015	0.989***	0.900***	1.023***	0.907***	0.961***	0.879***	1.189***	0.738***	1.075***	0.839***
y_2016	0.919***	0.816***	0.950***	0.816***	0.890***	0.790***	1.098***	0.907***	1.253***	0.942***
y_2017	0.933***	0.854***	0.985***	0.866***	0.880***	0.803***	1.147***	0.787***	1.205***	0.871***
y_2018	0.905***	0.823***	0.946***	0.833***	0.858***	0.769***	1.068***	0.832***	1.243***	0.856***
y_2019	0.974***	0.880***	0.991***	0.869***	0.918***	0.831***	1.106***	1.084***	1.499***	1.103***
y_2020	0.601***	0.573***	0.652***	0.581***	0.576***	0.550***	0.749***	0.531**	0.966***	0.582***
Constant	4.607***	4.478***	3.758***	3.745***	4.473***	4.304***	4.065***	3.918***	3.965***	3.994***
Observations	4,973	4,973	4,850	4,850	4,628	4,628	4,578	4,578	4,578	4,254
Adjusted R^2	0.353	0.391	0.36	0.393	0.353	0.387	0.389	0.444	0.457	0.466

Table 16: Institutional tranche quantile regression of model (8) (extended)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
log.FAC_AMT	-0.0266***	-0.00919	0.000729	0	-0.00568
log.MAT	-0.0367	0.158	0.157	0.107	0.217*
log.MAT^2	0.0120	-0.0117	-0.0153	-0.0106	-0.0271*
INST.TRANCE	0.113**	0.0792**	0.0765*	0.0394	0.0849**
IB	0.0172	0.0274	0.0318	0.0128	0.0932***
FIN	0.123***	0.0986***	0.122***	0.140***	0.113***
DFI	0.0185	-0.0398	-0.0205	-0.0175	-0.0130
ECA	-0.0164	-0.0216	-0.0227	-0.0113	-0.00826
TERM	0.127***	0.0444*	0.0212	0.00275	0.0148
TERM.A	0.118	0.115	0.112	0.102	0.0797*
TERM.B	0.308***	0.252***	0.155***	0.214**	0.269***
TERM.C	0.528***	0.249	0.318	0.237	0.223
LC	-0.0450	-0.00262	-0.0287	-0.0443	0.0216
CORR	0.180	0.00506	-0.0157	-0.0401	0.153
log.GDPPC	-0.0171	-0.0836***	-0.106***	-0.0965***	-0.159***
GDPPC-%	-0.0109	-0.0129**	-0.0241***	-0.0298***	-0.0206**
INFL	0.00155	0.000506	0.00453**	0.00407***	0.00717
CURR_RISK	0.0243	0.0508	0.0941	0.109*	0.123**
MULTI	0.0178	-0.00161	0.0283	-0.00620	-0.0101
SEC	0.218***	0.270***	0.251***	0.162***	0.123**
SEC_MIS	0.144*	0.156**	0.109*	0.0447	0.0372
SENIOR	0.154	0.274***	0.256***	0.338***	0.348***
SHARE	-0.000672	-0.00144*	-0.000745	-0.000978	-0.00113
SYND_SIZE	-0.00811***	-0.0109***	-0.0126***	-0.00948***	-0.01000***
GUAR	-0.134**	-0.142***	-0.151***	-0.0978**	-0.0716*
SPONS	0.0914**	0.0389	0.0127	0.00588	-0.0467
SPONS_DUAL	-0.0664	-0.236**	-0.353***	-0.463***	-0.255
CRED	-0.00347	0.0228	0.0203	0.0268	0.00889
LNCDAYS	0.150***	0.136***	0.0832***	0.0712**	0.113***
LIBOR	0.0196	-0.0416	-0.0598	-0.0715*	-0.130***
EURIBOR	0.00526	0.0115	-0.0469	-0.0561	-0.192***
S_C.SYND	0.0668	0.0480	0.0475	0.0227	-0.00787
B_C.SYND	-0.00575	-0.0459	-0.0497**	0.0128	0.00811
S_SYND	-1.83e-06	-9.22e-08	-5.16e-06	-1.51e-05*	-1.59e-05*
B_SYND	1.94e-06	4.87e-06	7.63e-06*	-1.16e-06	2.10e-06
US_DUMMY	0.0349	0.228	0.185	0.123	0.330*
× *y_1992*	-0.310	-0.171	-0.294	0.134	0.762***
× *y_1993*	-0.142	-0.0114	-0.0770	-0.147	-0.498**
× *y_1994*	-0.435	-0.125	-0.0609	0.198	-0.123
× *y_1995*	-0.228	-0.336	-0.124	-0.107	-0.273

× *y_1996*	0.190	-0.115	-0.205	0.0136	-0.00829
× *y_1997*	-0.315	-0.282	-0.165	-0.0434	0.00127
× *y_1998*	0.295	0.193	0.104	0.165	-0.130
× *y_1999*	0.338	0.372	0.407**	0.410	0.131
× *y_2000*	0.667*	0.535**	0.510**	0.574*	0.342
× *y_2001*	0.439	0.386*	0.293*	0.395	0.0873
× *y_2002*	0.934***	0.682***	0.539***	0.396	-0.273
× *y_2003*	0.790*	0.497	0.186	0.109	-0.0696
× *y_2004*	0.812**	0.686***	0.629***	0.649**	0.202
× *y_2005*	0.895	0.506**	0.0590	0.0779	-0.250
× *y_2006*	0.939***	0.673**	0.661***	0.770*	0.598**
× *y_2007*	0.434	0.414	0.243	0.331	0.0104
× *y_2008*	0.856**	0.540**	0.594***	0.372	0.190
× *y_2009*	0.244	0.193	0.266	0.261	-0.0314
× *y_2010*	0.447	0.0956	0.0221	0.0847	-0.388
× *y_2011*	0.0985	0.201	0.0424	-0.0991	-0.690***
× *y_2012*	0.0503	-0.198	-0.221	-0.139	-0.640**
× *y_2013*	0.286	0.312	0.181	0.134	0.0914
× *y_2014*	0.0970	0.104	-0.0128	0.130	-0.0842
× *y_2015*	0.325	0.129	0.305*	0.323	-0.0860
× *y_2016*	0.359	0.231	0.276	0.405	0.158
× *y_2017*	0.108	-0.137	-0.00668	0.165	-0.0296
× *y_2018*	0.146	0.176	0.346**	0.420	0.0882
× *y_2019*	-0.0501	-0.0543	0.146	0.385	-0.313
× *y_2020*	0.0333	-0.199	-0.117	-0.546	-0.589**
EU_DUMMY	-0.257	-0.182	0.0645	0.0467	-0.155
× *y_1991*	0.696	0.199	0.121	-0.131	1.333***
× *y_1992*	0.379	0.408	-0.607**	-0.514**	0.0282
× *y_1993*	0.555	0.579***	-0.235	-0.501**	-0.557**
× *y_1994*	-0.474	-0.0341	-0.435	-0.184	-0.473*
× *y_1995*	0.197	0.199	-0.0947	0.137	0.233
× *y_1996*	1.214***	0.627**	0.657**	0.379	0.554**
× *y_1997*	-0.200	0.186	-0.340	-0.332	0.636**
× *y_1998*	0.282	0.367	-0.0559	-0.216	0.200
× *y_1999*	-0.158	-0.0793	-0.0631	-0.122	0.179
× *y_2000*	0.0353	0.249	-0.0685	-0.248	0.229
× *y_2001*	0.329	0.204	-0.0592	-0.0575	0.170
× *y_2002*	0.379	0.165	-0.162	-0.236	-0.222
× *y_2003*	0.186	0.341	-0.295	-0.431	-0.161
× *y_2004*	-0.184	0.0791	-0.153	-0.0531	0.0185
× *y_2005*	0.461	0.282	-0.311	-0.454**	-0.00491
× *y_2006*	0.0968	0.222	-0.0785	-0.0623	0.319
× *y_2007*	0.0148	-0.0813	-0.636**	-0.649*	-0.207
× *y_2008*	-0.0592	-0.156	-0.190	-0.491**	-0.299
× *y_2009*	-0.0229	0.00708	-0.217	-0.206	0.0793
× *y_2010*	0.117	-0.0597	-0.241	-0.266	-0.0327
× *y_2011*	0.0322	0.261	-0.123	-0.251	-0.235
× *y_2012*	-0.0581	0.0396	-0.0482	-0.0612	-0.151
× *y_2013*	0.616*	0.563**	0.160	0.0736	0.433*
× *y_2014*	0.440	0.300	0.118	0.0130	0.417*
× *y_2015*	0.413	0.355*	0.224	0.173	0.556**
× *y_2016*	0.373	0.460**	0.187	0.292	0.506*
× *y_2017*	0.148	-0.0417	-0.113	0.0104	0.187
× *y_2018*	0.218	0.102	0.0760	0.188	0.375
× *y_2019*	0.127	0.195	0.0583	0.0150	0.0272
× *y_2020*	0.260	-0.0823	-0.403	-0.996**	-0.309
ind_Aircraft	-0.747***	-0.128	-0.220	-0.103	0.455***
ind_Airports	0.0948	0.0950	0.186	0.262	0.153
ind_Bridges_Tunnels	-0.337	0.0647	0.0708	0.191	-0.00429
ind_Electric_Cogeneration	0.0166	0.0659	0.162**	0.106*	0.0684
ind_Electric_Independent	0.00462	-0.0758	0.116	0.0765	-0.0339
ind_Electric_Other	-0.0199	-0.0307	-0.0157	-0.0154	-0.0565
ind_Electricity_transmission	0.0366	-0.00387	0.144	0.137	-0.0108
ind_Gas_Oil	-0.00410	-0.00349	0.145*	0.196***	0.165**
ind_Healthcare	0.230*	0.142	0.0902	0.0628	0.00127
ind_Manufacturing	-0.227*	-0.170	0.166	0.185	0.303**
ind_Transit	-0.111	-0.146	-0.0953	-0.0434	-0.0858
ind_Mining	0.478***	0.483***	0.396***	0.352***	0.208**
ind_Other	-0.00263	0.0740	0.133**	0.0872	0.0771
ind_Pipelines	0.0329	-0.0528	0.130	0.0831	0.151
ind_Ports	0.0830	-0.00587	-0.0749	0.152	-0.00275

ind_Pulp	0.245	-0.157	-0.0245	-0.00541	-0.100
ind_Commercial	0.0317	0.0580	0.0869	0.0374	0.0295
ind_Residental	0.245**	0.224**	0.227**	0.154	0.0384
ind_Recycling	0.197	0.114	0.0743	0.0347	-0.182***
ind_Ships	0.386**	0.183	0.0994	-0.118	-0.296**
ind_Arenas	0.438**	0.492***	0.362***	0.197	-0.0221
ind_Telecommunications	0.341***	0.168	0.181	0.232*	0.250***
ind_Casinos	0.366**	0.337**	0.499***	0.489***	0.460***
ind_Toll	0.148*	0.0284	0.0773	0.0745	-0.0907*
ind_Water	0.0933	0.274**	0.244**	0.183*	-0.0295
y_1988	0.496**	0.304	0.346	0.364	0.697***
y_1989	-0.410	0.154	0.151	0.292	0.564***
y_1990	-0.216	-0.163	-0.0646	-0.196	-0.293*
y_1991	0.576	0.0308	0.511**	0.0952	-0.271
y_1992	0.490	-0.00422	0.265	0.201	0.535**
y_1993	0.577	0.303	0.283	-0.00581	0.256
y_1994	0.533	0.392	0.387*	0.214	0.278
y_1995	0.212	0.317	0.455**	0.236	0.183
y_1996	0.311	0.263	0.411**	0.233	0.192
y_1997	0.0714	0.0905	0.265	0.209	0.374
y_1998	0.0576	0.0669	0.246	0.105	0.277
y_1999	0.298	0.128	0.372*	0.299	0.370
y_2000	0.379	0.0789	0.342	0.273	0.385
y_2001	0.133	-0.0313	0.165	0.170	0.607**
y_2002	0.259	0.269	0.648***	0.554	0.624***
y_2003	0.541	0.204	0.379*	0.157	0.438*
y_2004	0.0540	0.130	0.601***	0.542	0.561**
y_2005	0.0810	-0.0320	0.213	0.0291	0.0993
y_2006	0.0647	0.0375	0.464**	0.315	0.535
y_2007	-0.0147	0.0632	0.139	0.256	0.583**
y_2008	0.351	0.186	0.302	0.259	0.500*
y_2009	1.155*	1.115***	1.130***	0.898**	1.210*
y_2010	1.373***	0.990***	1.169***	1.085***	1.469***
y_2011	1.383***	1.158***	1.168***	0.985**	1.447***
y_2012	1.023**	0.807**	1.058***	0.880**	1.096***
y_2013	1.279***	1.069***	1.097***	0.924**	1.024***
y_2014	0.961**	0.815***	0.864***	0.685	0.933***
y_2015	0.886**	0.674**	0.798***	0.623	0.790***
y_2016	1.021**	0.898***	0.936***	0.705*	0.811***
y_2017	1.080***	0.846***	0.780***	0.607	0.706***
y_2018	1.130***	0.776***	0.728***	0.548	1.006***
y_2019	0.989**	0.921***	1.071***	1.451**	1.361***
y_2020	0.794**	0.514**	0.516***	0.240	0.608***
Constant	2.448***	3.460***	4.200***	4.773***	4.920***
Observations	4,578	4,578	4,578	4,578	4,578
R^2	0.388	0.439	0.444	0.420	0.369

Table 17: Pooled OLS with institution types (extended)

log(AISD)	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**	**(10)**	**(11)**
log.FAC_AMT	-0.028***	-0.022***	-0.030***	-0.023***	-0.019***	-0.015**	-0.019***	-0.011	-0.006	-0.004	-0.011
log.MAT	0.307***	0.290***	0.268***	0.269***	0.274***	0.263***	0.187**	0.151*	0.144*	0.140*	0.155*
log.MAT^2	-0.037***	-0.034***	-0.031***	-0.032***	-0.031***	-0.030***	-0.018*	-0.014	-0.012	-0.012	-0.014
INS	-0.024	-0.0001	-0.043	-0.011	-0.027	0.0002	-0.068	-0.068	-0.092	-0.07	-0.088
PENS	-0.141***	-0.090*	-0.103**	-0.061	-0.166***	-0.105**	-0.06	0.025	0.019	0.057	-0.04
PE	0.202**	0.237***	0.201**	0.235***	0.232***	0.258***	0.197**	0.205**	0.192**	0.204**	0.193**
MUT	0.090**	0.109**	0.104**	0.120***	0.07	0.091**	0.095**	0.105**	0.065	0.084*	0.082
SWF	0.073	0.121	0.109	0.134	0.105	0.121	0.014	-0.069	-0.125	-0.177	0.006
IB	0.004	0.056**	0.005	0.055**	0.01	0.056**	0.011	0.040*	0.046**	0.052**	0.040*
FIN	0.101***	0.129***	0.102***	0.133***	0.129***	0.148***	0.080***	0.124***	0.108***	0.110***	0.125***
DFI	-0.053	0.004	-0.039	0.014	-0.073*	-0.022	-0.042	-0.006	-0.023	-0.024	-0.008
ECA	-0.055	0.024	-0.055	0.023	-0.059	0.003	-0.046	0.002	-0.01	-0.027	0.001
TERM	0.025	0.048**	0.047**	0.060***	0.015	0.034	0.048**	0.058***	0.053**	0.055**	0.058***
TERM.A	0.215***	0.185***	0.190***	0.174***	0.175***	0.164***	0.095	0.119**	0.111**	0.101*	0.120**
TERM.B	0.481***	0.423***	0.463***	0.419***	0.431***	0.390***	0.371***	0.296***	0.287***	0.282***	0.297***
TERM.C	0.526***	0.427***	0.514***	0.435***	0.507***	0.422***	0.457***	0.337***	0.312***	0.332**	0.333***
LC	-0.208***	-0.138**	-0.189***	-0.127**	-0.228***	-0.153**	-0.185***	-0.058	-0.059	-0.077	-0.06
CORR	-0.015	-0.051	0.136**	0.067	-0.127*	-0.155**	-0.022	-0.004	-0.018	-0.019	-0.002
log.GDPPC	-0.076***	-0.079***	-0.081***	-0.083***	-0.036	-0.041*	-0.086***	-0.076***	-0.062***	-0.078***	-0.076***
GDPPC-%	-0.011***	-0.009**	-0.008*	-0.008**	-0.016***	-0.014***	-0.019***	-0.017***	-0.019***	-0.018***	-0.017***
INFL	0.002	0.002	0.003*	0.003*	0.002	0.003	0.003	0.004	0.003	0.003	0.004

CURR_RISK	-0.090***		-0.086***		-0.056*		0.061	0.047	0.086*	0.062
MULTI	-0.040*		-0.037*		-0.036		0.002	0.012	0.006	0.003
SEC	0.191***		0.176***		0.204***		0.220***	0.215***	0.216***	0.221***
SEC_MIS	0.223***		0.199***		0.230***		0.126***	0.127***	0.132***	0.127***
SENIOR	0.247***		0.262***		0.258***		0.256***	0.249***	0.280***	0.256***
SHARE	-0.002***		-0.002***		-0.002***		-0.001**	-0.002***	-0.002***	-0.001**
SYND_SIZE	-0.012***		-0.012***		-0.012***		-0.011***	-0.010***	-0.010***	-0.011***
GUAR	-0.127***		-0.108***		-0.126***		-0.144***	-0.141***	-0.143***	-0.143***
SPONS	0.117***		0.121***		0.092***		0.042	0.058*	0.052*	0.042
SPONS_DUAL	-0.270***		-0.251***		-0.281***		-0.288***	-0.293***	-0.298***	-0.287***
CRED		-0.041***	-0.019*			0.017	0.01	0.013	0.012	0.01
LNCDAYS		0.127***	0.106***			0.103***	0.099***	0.086***	0.092***	0.100***
LIBOR						-0.057	-0.076**	-0.051	-0.065*	-0.074*
EURIBOR						-0.113**	-0.123**	-0.106*	-0.127**	-0.122**
log.SYND_EXP								-0.090***		
log.A.A_EXP								0.009		
log.A_EXP								-0.018		
3Y.MKT.SHR.$									-0.017***	
1Y.MKT.SHR.$									-0.002	
5Y.MKT.SHR.$									0.011**	
log.INST_EXP										0.016
S_C.SYND				-0.022	-0.006	0.001	0.012	0.023	0.035	0.013
B_C.SYND				-0.037*	-0.048**	-0.033	-0.029	-0.004	-0.037	-0.029
B_SYND				0	0	-1E-05	0	0	0	0
S_SYND				0.00001***	0.00001***	0.00001*	0	0	0	0
US_DUMMY						0.330***	0.184	0.144	0.172	0.178
× *y_1990*							-0.327	-0.227	-0.235	-0.328
× *y_1991*							-0.015	0.079	0.045	-0.01
× *y_1992*							-0.097	0.017	-0.003	-0.093
× *y_1993*							-0.051	0.063	0.083	-0.046
× *y_1994*							-0.255	-0.167	-0.233	-0.25
× *y_1995*							-0.084	0.046	-0.041	-0.08
× *y_1996*							-0.185	-0.152	-0.14	-0.178
× *y_1997*							0.067	0.126	0.118	0.073
× *y_1998*							0.258	0.291	0.426**	0.263
× *y_1999*							0.547***	0.582***	0.537***	0.551***
× *y_2000*							0.283	0.312*	0.399**	0.29
× *y_2001*							0.422**	0.437**	0.451**	0.432**
× *y_2002*							0.27	0.259	0.295	0.275
× *y_2003*							0.533***	0.492***	0.558***	0.544***
× *y_2004*							0.186	0.199	0.235	0.192
× *y_2005*							0.661***	0.619***	0.680***	0.665***
× *y_2006*							0.35	0.332	0.32	0.35
× *y_2007*							0.491**	0.486**	0.471**	0.497**
× *y_2008*							0.176	0.188	0.21	0.183
× *y_2009*							0.062	0.112	0.139	0.069
× *y_2010*							-0.123	-0.136	-0.077	-0.112
× *y_2011*							-0.247	-0.229	-0.171	-0.238
× *y_2012*							0.26	0.22	0.313	0.269
× *y_2013*							-0.029	-0.032	-0.029	-0.023
× *y_2014*							0.204	0.217	0.222	0.21
× *y_2015*							0.245	0.286	0.233	0.248
× *y_2016*							-0.097	-0.054	-0.043	-0.093
× *y_2017*							0.187	0.157	0.177	0.189
× *y_2018*							0.001	-0.021	0.025	-0.0002
× *y_2019*							-0.233	-0.236	-0.23	-0.227
EU_DUMMY						-0.021	0.016	-0.015	0.041	0.015
× *y_1991*							-0.078	-0.079	-0.173	-0.078
× *y_1992*							0.004	0.147	0.204	0.002
× *y_1993*							-0.303	-0.222	-0.335	-0.304
× *y_1994*							0.051	0.137	-0.032	0.052
× *y_1995*							0.562**	0.638**	0.549**	0.564**
× *y_1996*							-0.112	-0.003	-0.085	-0.113
× *y_1997*							-0.07	0.035	0.038	-0.073
× *y_1998*							-0.258	-0.166	-0.400*	-0.259
× *y_1999*							-0.026	0.048	0.126	-0.027
× *y_2000*							-0.057	0.006	-0.419	-0.054
× *y_2001*							-0.138	-0.109	-0.13	-0.129
× *y_2002*							-0.131	-0.128	-0.11	-0.128
× *y_2003*							-0.147	-0.161	-0.125	-0.141
× *y_2004*							-0.128	-0.115	-0.154	-0.124

× *y_2005*								-0.001	0.046	0.039	0.003
× *y_2006*								-0.37	-0.328	-0.363	-0.372
× *y_2007*								-0.28	-0.231	-0.18	-0.278
× *y_2008*								-0.089	-0.033	-0.039	-0.089
× *y_2009*								-0.121	-0.038	-0.069	-0.125
× *y_2010*								-0.129	-0.074	-0.072	-0.127
× *y_2011*								-0.088	-0.012	-0.02	-0.091
× *y_2012*								0.396**	0.439**	0.420**	0.399**
× *y_2013*								0.108	0.18	0.129	0.109
× *y_2014*								0.322*	0.355*	0.269	0.323*
× *y_2015*								0.27	0.340*	0.23	0.27
× *y_2016*								-0.119	-0.029	-0.058	-0.122
× *y_2017*								0.059	0.085	0.019	0.056
× *y_2018*								0.026	0.047	0.03	0.026
× *y_2019*								-0.377	-0.366	-0.371	-0.365
ind_Aircraft	-0.026	-0.099	-0.043	-0.104	-0.158	-0.19	-0.204*	-0.121	-0.089	-0.112	-0.122
ind_Airports	0.288***	0.211**	0.262***	0.206*	0.254**	0.186*	0.269***	0.261**	0.237**	0.252***	0.259**
ind_Bridges_Tunnels	0.067	0.059	0.043	0.044	0.026	0.028	0.027	0.065	0.08	0.09	0.062
ind_Electric_Cogeneration	0.185***	0.125**	0.129**	0.098*	0.135**	0.088	0.056	0.091*	0.111**	0.088	0.091*
ind_Electric_Independent	0.105*	0.052	0.046	0.02	0.08	0.024	-0.017	0.017	0.036	0.055	0.017
ind_Electric_Other	0.067	-0.01	0.015	-0.036	0.003	-0.056	-0.042	-0.023	-0.013	-0.026	-0.024
ind_Electricity_transmission	0.219*	0.135	0.114	0.071	0.124	0.051	0.057	0.124	0.14	0.111	0.111
ind_Gas_Oil	0.107**	0.085	0.079	0.076	0.085	0.07	0.057	0.093	0.102*	0.079	0.092
ind_Healthcare	0.262***	0.216**	0.180*	0.155	0.189*	0.159*	0.168*	0.140**	0.137**	0.160**	0.140**
ind_Manufacturing	0.192	0.192	0.148	0.154	0.156	0.156	0.055	0.054	-0.013	0.082	0.054
ind_Transit	-0.106	-0.134*	-0.135*	-0.151**	-0.144**	-0.162**	-0.124*	-0.107	-0.105	-0.116*	-0.105
ind_Mining	0.445***	0.386***	0.399***	0.361***	0.407***	0.347***	0.412***	0.396***	0.412***	0.442***	0.394***
ind_Other	0.265***	0.149***	0.194***	0.112**	0.225***	0.122**	0.119**	0.084*	0.087*	0.089*	0.085*
ind_Pipelines	0.089	0.084	0.06	0.078	0.069	0.069	0.015	0.084	0.113	0.094	0.085
ind_Ports	0.141	0.118	0.097	0.095	0.095	0.077	0.047	0.052	0.07	0.03	0.052
ind_Pulp	-0.024	-0.172	-0.076	-0.224**	-0.064	-0.178	-0.045	-0.067	-0.081	-0.026	-0.069
ind_Commercial	0.218***	0.163***	0.173***	0.138**	0.173***	0.130**	0.122**	0.088*	0.077	0.087*	0.088*
ind_Residental	0.414***	0.442***	0.389***	0.419***	0.373***	0.411***	0.270***	0.247***	0.191**	0.244***	0.249***
ind_Recycling	0.164**	0.108	0.119	0.071	0.12	0.083	0.094	0.071	0.049	0.043	0.073
ind_Ships	0.095	0.048	0.21	0.197	-0.041	-0.05	0.062	0.092	0.023	0.007	0.092
ind_Arenas	0.352***	0.253***	0.318***	0.241***	0.323***	0.240***	0.322***	0.280***	0.273***	0.248***	0.283***
ind_Telecommunications	0.312***	0.241***	0.245***	0.203**	0.288***	0.222***	0.250***	0.237***	0.242***	0.238***	0.236***
ind_Casinos	0.761***	0.758***	0.637***	0.621***	0.709***	0.710***	0.504***	0.430***	0.439***	0.443***	0.432***
ind_Toll	0.07	0.016	0.018	-0.007	0.021	-0.02	0.042	0.068	0.063	0.056	0.068
ind_Water	0.214*	0.191	0.216	0.203	0.277	0.256	0.283*	0.256**	0.264**	0.252**	0.259**
y_1988	0.477	0.354	0.446	0.328	0.459	0.367	0.480*	0.422	0.437	0.473*	0.42
y_1989	0.196	0.096	0.163	0.069	0.177	0.101	0.158	0.12	0.196	0.176	0.121
y_1990	-0.119	-0.073	-0.098	-0.055	-0.153	-0.093	-0.005	0.163	0.177	0.134	0.164
y_1991	0.172	0.113	0.181	0.102	0.129	0.082	0.261	0.201	0.251	0.155	0.196
y_1992	0.123	0.162	0.168	0.169	0.119	0.165	0.267	0.222	0.284	0.182	0.217
y_1993	0.111	0.15	0.168	0.16	0.093	0.141	0.271	0.238	0.339	0.237	0.232
y_1994	0.231	0.269	0.288	0.285	0.222	0.267	0.414**	0.396	0.528**	0.388	0.39
y_1995	0.238	0.29	0.29	0.302	0.211	0.275	0.392**	0.325	0.436*	0.298	0.32
y_1996	0.269	0.288	0.329*	0.3	0.247	0.274	0.442**	0.322	0.462*	0.293	0.316
y_1997	0.211	0.211	0.264	0.222	0.214	0.22	0.406**	0.248	0.433*	0.216	0.242
y_1998	0.207	0.194	0.248	0.198	0.205	0.202	0.394**	0.219	0.423*	0.186	0.214
y_1999	0.401**	0.369*	0.431**	0.367*	0.417**	0.387*	0.611***	0.271	0.511**	0.292	0.265
y_2000	0.372*	0.328	0.396**	0.325	0.372*	0.332	0.558***	0.296	0.572**	0.193	0.287
y_2001	0.335*	0.308	0.366*	0.31	0.331*	0.312	0.505***	0.225	0.505*	0.201	0.216
y_2002	0.487**	0.436**	0.512***	0.434**	0.512***	0.461**	0.708***	0.464*	0.759***	0.456*	0.458*
y_2003	0.357*	0.313	0.392**	0.309	0.376*	0.340*	0.612***	0.358	0.649**	0.345	0.347
y_2004	0.340*	0.258	0.385**	0.264	0.363*	0.291	0.610***	0.4	0.696***	0.409	0.392
y_2005	0.229	0.16	0.238	0.136	0.227	0.16	0.465**	0.088	0.386	0.099	0.081
y_2006	0.183	0.101	0.222	0.103	0.165	0.088	0.417**	0.228	0.522*	0.267	0.223
y_2007	0.204	0.116	0.26	0.134	0.234	0.136	0.489**	0.201	0.511*	0.168	0.192
y_2008	0.346*	0.263	0.381**	0.262	0.303	0.229	0.566***	0.294	0.633**	0.332	0.284
y_2009	1.117***	1.040***	1.153***	1.034***	1.051***	0.993***	1.269***	1.074***	1.387***	1.090***	1.069***
y_2010	1.182***	1.097***	1.207***	1.092***	1.169***	1.091***	1.381***	1.224***	1.589***	1.241***	1.211***
y_2011	1.149***	1.072***	1.211***	1.096***	1.152***	1.075***	1.399***	1.232***	1.600***	1.260***	1.222***
y_2012	1.161***	1.081***	1.223***	1.099***	1.128***	1.048***	1.389***	0.892***	1.249***	0.922***	0.883***
y_2013	1.111***	1.037***	1.153***	1.043***	1.134***	1.073***	1.374***	1.113***	1.462***	1.160***	1.105***
y_2014	1.032***	0.939***	1.058***	0.937***	1.017***	0.927***	1.259***	0.808***	1.194***	0.895***	0.801***
y_2015	0.984***	0.899***	1.018***	0.906***	0.953***	0.876***	1.182***	0.761***	1.093***	0.869***	0.757***
y_2016	0.909***	0.814***	0.941***	0.816***	0.876***	0.785***	1.091***	0.947***	1.291***	0.992***	0.943***
y_2017	0.924***	0.852***	0.976***	0.865***	0.869***	0.797***	1.143***	0.808***	1.229***	0.902***	0.803***
y_2018	0.904***	0.829***	0.946***	0.841***	0.854***	0.772***	1.072***	0.847***	1.253***	0.876***	0.842***

y_2019	0.968***	0.878***	0.985***	0.867***	0.909***	0.825***	1.100***	1.105***	1.519***	1.133***	1.096***
y_2020	0.564***	0.539**	0.620***	0.550***	0.533***	0.510**	0.727***	0.528**	0.974***	0.591***	0.519**
Constant	4.622***	4.525***	3.830***	3.842***	4.490***	4.348***	4.106***	3.928***	3.968***	3.980***	3.914***
Observations	4,973	4,973	4,850	4,850	4,628	4,628	4,578	4,578	4,578	4,254	4,578
Adjusted R^2	0.356	0.393	0.362	0.394	0.357	0.39	0.39	0.445	0.458	0.467	0.445

Table 18: Institution type quantile regression (8) (extended)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
log.FAC_AMT	-0.023**	-0.009	0.003	-0.000	-0.005
log.MAT	-0.031	0.168	0.135	0.128	0.218
log.MAT^2	0.012	-0.013	-0.013	-0.013	-0.028
INS	-0.107	-0.121	-0.075	-0.079	-0.007
PENS	0.056	0.038	0.012	0.017	0.044
PE	0.150*	0.033	0.122	0.252*	0.230*
MUT	0.111	0.136***	0.064	0.045	0.086*
SWF	0.159	0.247**	0.067	-0.205	-0.383**
IB	0.027	0.035	0.027	0.009	0.080**
FIN	0.126***	0.107***	0.125***	0.142***	0.108***
DFI	0.029	-0.044	-0.015	-0.032	-0.010
ECA	-0.020	-0.010	-0.028	0.012	0.003
TERM	0.121***	0.050*	0.022	0.004	0.018
TERM.A	0.109	0.094	0.109	0.109*	0.082*
TERM.B	0.299***	0.261***	0.164***	0.266***	0.263***
TERM.C	0.527***	0.201**	0.203	0.243	0.212
LC	-0.055	-0.006	-0.022	-0.043	0.016
CORR	0.127	-0.013	-0.038	0.004	0.163
log.GDPPC	-0.011	-0.084***	-0.105***	-0.110***	-0.175***
GDPPC-%	-0.010	-0.015**	-0.024***	-0.030***	-0.021***
INFL	0.001	-0.000	0.004**	0.004***	0.004
CURR_RISK	-0.002	0.044	0.090	0.098*	0.115*
MULTI	0.017	0.003	0.030	-0.009	-0.014
SEC	0.239***	0.254***	0.243***	0.172***	0.076
SEC_MIS	0.184*	0.152**	0.112*	0.057	-0.002
SENIOR	0.172	0.267***	0.252***	0.334***	0.366***
SHARE	-0.001	-0.001*	-0.001	-0.001	-0.001
SYND_SIZE	-0.007**	-0.010***	-0.012***	-0.009***	-0.009***
GUAR	-0.129**	-0.150***	-0.163***	-0.106**	-0.066*
SPONS	0.091**	0.029	0.017	-0.007	-0.052
SPONS_DUAL	-0.062	-0.253**	-0.389***	-0.451***	-0.244
CRED	-0.003	0.027	0.023	0.026	0.010
LNCDAYS	0.117**	0.126***	0.080***	0.079***	0.112***
LIBOR	0.010	-0.059	-0.076	-0.087**	-0.138**
EURIBOR	-0.024	0.006	-0.058	-0.071	-0.193***
S_C.SYND	0.072	0.054	0.046	0.014	-0.006
B_C.SYND	-0.003	-0.043	-0.048*	0.019	0.011
B_SYND	-0.000	-0.000	-0.000	-0.000*	-0.000*
S_SYND	0.000	0.000	0.000*	-0.000	0.000
US_DUMMY	-0.268	0.036	-0.106	0.251	0.261
× *y_1991*	-0.268	0.036	-0.106	0.251	0.261
× *y_1992*	-0.129	0.218	0.127	-0.024	-0.166
× *y_1993*	-0.377	0.109	0.142	0.324**	0.256
× *y_1994*	-0.156	-0.104	0.081	0.043	0.031
× *y_1995*	0.225	0.134	0.007	0.122	0.326
× *y_1996*	-0.301*	-0.047	0.035	0.099	0.333***
× *y_1997*	0.299*	0.421***	0.336**	0.323*	0.145
× *y_1998*	0.332	0.627**	0.599***	0.501***	0.417**
× *y_1999*	0.758***	0.778***	0.689***	0.700***	0.733***
× *y_2000*	0.504***	0.641***	0.489***	0.495**	0.491***
× *y_2001*	0.936***	0.975***	0.770***	0.547***	0.087
× *y_2002*	0.832***	0.745**	0.402***	0.226	0.243**
× *y_2003*	0.781**	0.948***	0.821***	0.738***	0.549**
× *y_2004*	0.906	0.768***	0.266*	0.233	0.094
× *y_2005*	0.959***	0.909***	0.845***	0.868***	0.927***
× *y_2006*	0.468*	0.704*	0.419**	0.489*	0.385
× *y_2007*	0.837***	0.770***	0.796***	0.502***	0.530***
× *y_2008*	0.284*	0.414**	0.438*	0.361*	0.316*
× *y_2009*	0.454	0.316***	0.171	0.202	-0.074
× *y_2010*	0.207	0.447***	0.223*	0.037	-0.332*
× *y_2011*	0.013	-0.019	-0.028	-0.032	-0.277
× *y_2012*	0.282	0.549***	0.325*	0.232*	0.326

× *y_2013*	0.111	0.324**	0.189	0.232	0.229
× *y_2014*	0.342*	0.430***	0.512***	0.435***	0.273
× *y_2015*	0.339**	0.449***	0.444***	0.522***	0.547***
× *y_2016*	0.091	0.085	0.100	0.282*	0.316**
× *y_2017*	0.161	0.442	0.560***	0.579**	0.450***
× *y_2018*	-0.017	0.210*	0.379***	0.495**	0.018
× *y_2019*	0.044	0.065	0.130	-0.415**	-0.254*
× *y_2020*	0.061	0.209	0.217	0.203	0.497***
EU_DUMMY	0.367	-0.189	-0.046	-0.213	0.266
× *y_1991*	0.165	0.195	-0.517**	-0.479***	-0.044
× *y_1992*	0.241	0.402***	-0.125	-0.438**	-0.645***
× *y_1993*	-0.658**	-0.200	-0.344	-0.142	-0.550***
× *y_1994*	-0.036	0.007	-0.049	0.223	0.059
× *y_1995*	0.960***	0.491**	0.725***	0.423***	0.434*
× *y_1996*	-0.399*	0.009	-0.302**	-0.263	0.501***
× *y_1997*	-0.009	0.240*	0.047	-0.129	0.061
× *y_1998*	-0.388*	-0.220	-0.022	-0.064	-0.037
× *y_1999*	-0.207	0.094	-0.001	-0.199	0.091
× *y_2000*	0.104	0.051	0.009	-0.040	0.023
× *y_2001*	0.037	0.047	-0.089	-0.176	-0.353*
× *y_2002*	-0.075	0.165	-0.199	-0.377**	-0.299**
× *y_2003*	-0.346	-0.152	-0.079	-0.026	-0.106
× *y_2004*	0.277	0.120	-0.211	-0.369***	-0.153
× *y_2005*	-0.156	0.065	-0.004	-0.039	0.180
× *y_2006*	-0.208	-0.272	-0.551***	-0.579**	-0.300
× *y_2007*	-0.300	-0.313**	-0.115	-0.430**	-0.421***
× *y_2008*	-0.244	-0.148	-0.155	-0.176*	-0.070
× *y_2009*	-0.081	-0.245*	-0.191	-0.232	-0.222
× *y_2010*	-0.215	0.127	-0.025	-0.186	-0.335*
× *y_2011*	-0.346	-0.192	0.033	-0.015	-0.271
× *y_2012*	0.319	0.374**	0.178	0.115	0.275**
× *y_2013*	0.152	0.098	0.200	0.041	0.224*
× *y_2014*	0.169	0.163	0.310**	0.217*	0.412**
× *y_2015*	0.050	0.274	0.271*	0.333**	0.397**
× *y_2016*	-0.173	-0.191	-0.086	0.005	0.056
× *y_2017*	-0.161	-0.024	0.176	0.258	0.235**
× *y_2018*	-0.052	0.090	0.145	0.025	-0.121
× *y_2019*	-0.060	-0.256*	-0.330	-0.918***	-0.439***
× *y_2020*	-0.051	-0.187	0.117	0.108	-0.000
ind_Aircraft	-0.766***	-0.152	-0.062	-0.117	0.447***
ind_Airports	0.221	0.126	0.194	0.241	0.157
ind_Bridges_Tunnels	-0.283	0.125	0.127	0.170	0.018
ind_Electric_Cogeneration	-0.018	0.095	0.166**	0.087	0.054
ind_Electric_Independent	-0.056	-0.053	0.106	0.057	-0.030
ind_Electric_Other	-0.040	-0.018	-0.015	-0.015	-0.056
ind_Electricity_transmission	0.099	0.061	0.075	0.138	-0.010
ind_Gas_Oil	-0.022	-0.005	0.143**	0.196***	0.158**
ind_Healthcare	0.232**	0.155	0.101	0.063	0.008
ind_Manufacturing	-0.278**	-0.139	0.161	0.169	0.275**
ind_Transit	-0.157	-0.127	-0.112	-0.058	-0.093
ind_Mining	0.424***	0.481***	0.420***	0.358***	0.231**
ind_Other	-0.038	0.087	0.131**	0.076	0.084
ind_Pipelines	-0.008	-0.038	0.132	0.132	0.169
ind_Ports	0.071	-0.021	-0.040	0.163*	0.006
ind_Pulp	0.217	-0.136	-0.036	-0.008	-0.118
ind_Commercial	0.018	0.082	0.093	0.051	0.036
ind_Residental	0.230**	0.241**	0.223**	0.152	0.029
ind_Recycling	0.229*	0.147	0.094	0.024	-0.163**
ind_Ships	0.463***	0.175	0.105	-0.099	-0.289**
ind_Arenas	0.380**	0.509***	0.360***	0.194	-0.028
ind_Telecommunications	0.340***	0.158	0.164	0.211*	0.208***
ind_Casinos	0.349**	0.340***	0.492***	0.471***	0.496***
ind_Toll	0.102	0.033	0.076	0.067	-0.074
ind_Water	0.063	0.277**	0.238***	0.185***	-0.039
y_1988	0.496**	0.299	0.318*	0.370	0.712***
y_1989	-0.454	0.169	0.143	0.306	0.583***
y_1990	-0.259	-0.175	-0.081	-0.171	-0.286*
y_1991	0.530*	-0.188	0.298	0.005	-0.659***
y_1992	0.430	-0.242	0.040	0.095	0.170
y_1993	0.510*	0.073	0.069	-0.113	-0.126
y_1994	0.455*	0.148	0.179	0.087	-0.014

y_1995	0.134	0.075	0.242	0.143	-0.138
y_1996	0.256	0.031	0.207	0.107	-0.125
y_1997	0.065	-0.135	0.054	0.083	0.046
y_1998	0.041	-0.185	0.062	0.000	0.004
y_1999	0.240	-0.116	0.173	0.189	0.044
y_2000	0.291	-0.165	0.130	0.198	0.083
y_2001	0.136	-0.317	-0.041	0.054	0.280*
y_2002	0.217	0.055	0.423**	0.451*	0.316**
y_2003	0.429	-0.015	0.162	0.078	0.111
y_2004	-0.003	-0.119	0.387**	0.406	0.253
y_2005	0.040	-0.262	0.004	-0.054	-0.212
y_2006	0.001	-0.203	0.253	0.196	0.195
y_2007	-0.051	-0.179	-0.073	0.155	0.249
y_2008	0.304	-0.040	0.113	0.189	0.199
y_2009	1.081**	0.885***	0.961***	0.818***	0.919
y_2010	1.309***	0.748***	0.962***	0.971***	1.135***
y_2011	1.387***	0.974***	0.959***	0.895***	1.108***
y_2012	0.986***	0.581**	0.904***	0.797***	0.775***
y_2013	1.240***	0.855***	0.881***	0.856***	0.754***
y_2014	0.926***	0.603**	0.648***	0.583**	0.608***
y_2015	0.876***	0.461*	0.586***	0.528**	0.437**
y_2016	1.009***	0.680***	0.785***	0.616**	0.495***
y_2017	1.029***	0.586**	0.552***	0.473	0.396***
y_2018	1.072***	0.530**	0.505***	0.481	0.714***
y_2019	0.949***	0.676***	0.854***	1.359***	1.046***
y_2020	0.712***	0.296	0.275	0.079	0.136
Constant	2.675***	3.761***	4.511***	4.859***	5.418***
Observations	4,578	4,578	4,578	4,578	4,578
Adjusted R^2	0.391	0.437	0.443	0.423	0.369

Table 19: Quantile regression of model (9.1) (extended)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
log.FAC_AMT	-0.021**	-0.006	0.002	0.002	-0.001
log.MAT	-0.015	0.188	0.152	0.062	0.204**
log.MAT^2	0.010	-0.016	-0.015	-0.005	-0.025**
INS	-0.334*	-0.092	-0.316	-0.440	-0.070
PENS	-0.791	-1.609**	-1.310***	-1.257***	-0.266
PE	0.874*	1.071**	0.770**	1.035	0.757
MUT	-0.126	0.075	-0.075	-0.014	0.051
SWF	0.228	0.165	-0.180	-0.210	-0.388
IB	0.024	0.048	0.050*	0.038	0.065
FIN	0.109***	0.095***	0.104***	0.137***	0.088***
DFI	0.012	-0.037	-0.049	-0.061	-0.030
ECA	-0.006	0.020	-0.034	-0.022	-0.038
TERM	0.116***	0.056**	0.019	0.005	0.002
TERM.A	0.104	0.126*	0.107	0.080	0.052
TERM.B	0.314***	0.233***	0.206***	0.196***	0.190**
TERM.C	0.507***	0.228	0.253*	0.282	0.236
LC	-0.052	-0.007	-0.037	-0.048	0.004
CORR	0.213	-0.032	-0.059	-0.040	0.111
log.GDPPC	-0.005	-0.062*	-0.076**	-0.088***	-0.154***
GDPPC-%	-0.008	-0.017**	-0.022***	-0.027***	-0.025**
INFL	0.004	-0.000	0.004	0.004**	0.004
CURR_RISK	0.019	0.039	0.041	0.087**	0.075
MULTI	0.026	0.014	0.012	0.018	-0.027
SEC	0.284***	0.234***	0.245***	0.185***	0.065
SEC_MIS	0.232***	0.147**	0.128**	0.086	-0.039
SENIOR	0.178***	0.244***	0.235***	0.304***	0.344***
SHARE	-0.001	-0.001*	-0.001	-0.001	-0.002***
SYND_SIZE	-0.008***	-0.010***	-0.009***	-0.008***	-0.007***
GUAR	-0.106*	-0.133***	-0.147***	-0.100*	-0.082**
SPONS	0.108**	0.068*	0.042	0.033	-0.021
SPONS_DUAL	-0.192	-0.365***	-0.428***	-0.430***	-0.148
CRED	-0.009	0.026	0.037*	0.022	0.024
LNCDAYS	0.112**	0.090**	0.073**	0.071***	0.100**
LIBOR	0.070	-0.048	-0.032	-0.031	-0.165***
EURIBOR	0.032	-0.015	-0.019	-0.020	-0.229***
log.SYND_EXP	-0.087***	-0.085***	-0.102***	-0.109***	-0.077***
× *INS*	0.010	-0.096*	-0.064	0.054	
× *PENS*	0.146	0.235*	0.181**	0.198***	0.006
× *PE*	-0.220**	-0.116	-0.056	-0.102	-0.123

× *MUT*	0.100*	0.022	0.044	0.020	
log.A.A_EXP	0.041	0.033	0.021	0.018	0.009
× *INS*	-0.203*	-0.093	-0.098	-0.092	
× *PENS*	-0.119	-0.196	-0.260**	-0.175	-0.016
× *PE*	-0.087	-0.247**	-0.038	0.115	-0.097
× *MUT*	-0.036	0.085	0.097	0.113	
log.A_EXP	-0.063**	-0.045*	-0.028	-0.018	-0.024
× *INS*	0.193*	0.187**	0.200*	0.105	
× *PENS*	0.134	0.252	0.307**	0.209	0.066
× *PE*	0.149	0.109	-0.050	-0.183	0.089
× *MUT*	-0.027	-0.078	-0.090	-0.093	
S_C.SYND	0.069	0.058	0.077**	0.027	0.002
B_C.SYND	-0.002	-0.023	-0.013	0.033	0.044
S_SYND	-0.000	0.000	-0.000	-0.000	-0.000
B_SYND	0.000	0.000	0.000	-0.000	0.000
US_DUMMY	-0.152	-0.0296	0.1232	0.0816	0.1296
× *y_1991*	-0.301	0.150	-0.048	0.383	1.425***
× *y_1992*	-0.143	0.402*	0.403	0.226	0.124
× *y_1993*	-0.281	0.256	0.180	0.343**	0.524
× *y_1994*	-0.190	-0.037	0.154	0.102	0.162
× *y_1995*	0.286	0.177	0.054	0.225*	0.426***
× *y_1996*	-0.351	0.011	0.098	0.151	0.406
× *y_1997*	0.287	0.434***	0.404**	0.347**	0.254
× *y_1998*	0.363	0.647***	0.531**	0.327**	0.663*
× *y_1999*	0.697***	0.825***	0.684***	0.634***	0.763***
× *y_2000*	0.526***	0.630***	0.511**	0.355	0.427
× *y_2001*	0.898***	0.850***	0.673***	0.481**	0.135
× *y_2002*	0.658***	0.651**	0.311*	0.227	0.134
× *y_2003*	0.608**	0.932***	0.644***	0.584***	0.609***
× *y_2004*	0.652	0.736***	0.140	0.044	0.090
× *y_2005*	0.665***	0.817*	0.762***	0.777***	0.930***
× *y_2006*	0.448*	0.644***	0.547**	0.468	0.378*
× *y_2007*	0.752***	0.776***	0.651***	0.438**	0.619***
× *y_2008*	0.423***	0.455**	0.359*	0.344**	0.377
× *y_2009*	0.365*	0.350***	0.161	0.275**	0.170
× *y_2010*	0.185	0.294***	0.138	0.003	-0.370**
× *y_2011*	0.018	-0.086	-0.114	-0.032	-0.243
× *y_2012*	0.225	0.422***	0.239	0.163	0.334
× *y_2013*	0.068	0.213*	0.100	0.193	0.183
× *y_2014*	0.353	0.419***	0.415***	0.423***	0.255
× *y_2015*	0.424**	0.465**	0.320**	0.490***	0.622***
× *y_2016*	-0.017	0.181	0.075	0.172	0.207
× *y_2017*	0.045	0.435**	0.379	0.444**	0.411***
× *y_2018*	-0.114	0.233**	0.188	0.297	0.252
× *y_2019*	-0.010	0.109	-0.001	-0.383	-0.261
× *y_2020*	-0.117	0.116	0.091	0.204	0.302
EU_DUMMY	0.255	-0.109	-0.259	-0.278*	-0.238
× *y_1991*	0.129	0.137	-0.461**	-0.326**	-0.173
× *y_1992*	0.283	0.681***	0.228	-0.154	-0.408*
× *y_1993*	-0.669	-0.070	-0.300	-0.070	-0.385
× *y_1994*	0.016	-0.038	0.099	0.329*	0.112
× *y_1995*	1.065***	0.612***	0.794***	0.597***	0.472**
× *y_1996*	-0.179	0.076	-0.155	-0.114	0.643***
× *y_1997*	0.035	0.266*	0.190	-0.109	0.180
× *y_1998*	-0.353**	-0.017	0.045	-0.128	0.024
× *y_1999*	-0.143	0.121	0.077	-0.102	0.117
× *y_2000*	0.039	0.142	0.024	0.029	-0.081
× *y_2001*	-0.014	0.056	0.026	-0.209	-0.276
× *y_2002*	0.036	0.147	-0.199	-0.338	-0.380***
× *y_2003*	-0.408	-0.077	-0.233	-0.075	-0.041
× *y_2004*	0.243	0.196	-0.215	-0.304*	-0.174
× *y_2005*	-0.187	0.114	0.075	0.060	0.122
× *y_2006*	-0.339	-0.057	-0.358*	-0.490*	-0.413**
× *y_2007*	-0.248	-0.213	-0.125	-0.368**	-0.448***
× *y_2008*	-0.240**	-0.067	-0.054	-0.110	-0.004
× *y_2009*	-0.265	-0.152	-0.135	-0.065	0.026
× *y_2010*	-0.076	0.078	-0.067	-0.108	-0.319**
× *y_2011*	-0.281	-0.162	-0.039	0.007	-0.135
× *y_2012*	0.303*	0.377**	0.309**	0.125	0.247**
× *y_2013*	0.258	0.143	0.104	0.071	0.228
× *y_2014*	0.262	0.239*	0.288**	0.255***	0.420**

× *y_2015*	0.025	0.351	0.275*	0.284***	0.441***
× *y_2016*	-0.101	-0.044	-0.133	-0.035	0.003
× *y_2017*	-0.087	0.054	0.047	0.135	0.176
× *y_2018*	-0.224	0.103	0.037	-0.120	0.136
× *y_2019*	0.004	-0.123	-0.376	-0.794	-0.554***
× *y_2020*	-0.051	-0.145	-0.046	0.152	-0.191
ind_Aircraft	-0.808***	-0.085	-0.134	-0.118	0.459***
ind_Airports	0.161	0.201	0.183	0.216	0.179*
ind_Bridges_Tunnels	-0.176	0.076	0.252	0.138	0.054
ind_Electric_Cogeneration	0.043	0.165**	0.151*	0.094	0.101
ind_Electric_Independent	-0.037	0.020	0.079	0.055	0.059
ind_Electric_Other	-0.026	0.004	-0.014	-0.033	-0.057
ind_Electricity_transmission	0.109	0.105	0.153	0.199*	0.025
ind_Gas_Oil	-0.048	0.022	0.141	0.183**	0.167***
ind_Healthcare	0.207	0.202*	0.093	0.041	0.003
ind_Manufacturing	-0.356**	-0.088	0.094	0.089	0.160
ind_Transit	-0.129	-0.031	-0.074	-0.076	-0.101
ind_Mining	0.471***	0.429***	0.467***	0.367***	0.217**
ind_Other	-0.036	0.105	0.119*	0.072	0.091
ind_Pipelines	0.020	-0.004	0.124	0.085	0.291
ind_Ports	0.066	0.046	0.002	0.198**	-0.076
ind_Pulp	0.117	-0.170	-0.091	0.026	-0.145
ind_Commercial	0.051	0.100	0.049	-0.010	-0.027
ind_Residental	0.261**	0.131	0.150	0.131	-0.032
ind_Recycling	0.195	0.086	0.022	-0.016	-0.203***
ind_Ships	0.249*	0.107	-0.106	-0.354	-0.191
ind_Arenas	0.447**	0.495***	0.274***	0.219**	-0.073
ind_Telecommunications	0.269*	0.162	0.172	0.278**	0.240
ind_Casinos	0.345**	0.301***	0.524***	0.433***	0.530***
ind_Toll	0.108	0.067	0.068	0.002	-0.072
ind_Water	0.138	0.358***	0.232**	0.185	0.039
y_1988	0.541**	0.334	0.370	0.401**	0.764***
y_1989	-0.392	0.339	0.293	0.618*	0.789***
y_1990	-0.073	-0.068	0.098	0.055	-0.140
y_1991	0.658**	-0.009	0.359	0.057	-0.555***
y_1992	0.648**	-0.228	0.043	0.208	0.128
y_1993	0.671*	0.191	0.301	0.187	-0.048
y_1994	0.642**	0.373	0.386	0.409**	0.179
y_1995	0.336	0.264	0.475	0.382***	0.082
y_1996	0.461**	0.293	0.489	0.379**	0.037
y_1997	0.290	0.176	0.332	0.443***	0.244*
y_1998	0.356	0.083	0.350	0.463***	0.212
y_1999	0.605***	0.247	0.518	0.589***	0.367**
y_2000	0.602***	0.201	0.481	0.618***	0.505***
y_2001	0.489**	0.132	0.371	0.511**	0.566***
y_2002	0.593**	0.416	0.857**	0.849***	0.739***
y_2003	0.795***	0.319	0.624	0.569***	0.382*
y_2004	0.383	0.295	0.838**	0.907***	0.635***
y_2005	0.456*	0.196	0.369	0.388***	0.193
y_2006	0.433*	0.018	0.500	0.608**	0.673***
y_2007	0.334	0.203	0.402	0.643***	0.643***
y_2008	0.701***	0.329	0.522	0.639***	0.571*
y_2009	1.633***	1.262***	1.415***	1.250***	1.061***
y_2010	1.658***	1.260***	1.463***	1.461***	1.557***
y_2011	1.806***	1.452***	1.508***	1.426***	1.529***
y_2012	1.449***	1.092***	1.271***	1.336***	1.192***
y_2013	1.658***	1.331***	1.413***	1.377***	1.179***
y_2014	1.376***	1.052***	1.185***	1.122***	1.057***
y_2015	1.226***	0.820***	1.150***	1.054***	0.797***
y_2016	1.521***	1.050***	1.283***	1.185***	0.969***
y_2017	1.467***	1.007***	1.194***	1.118***	0.894***
y_2018	1.531***	0.936***	1.137***	1.167***	0.946***
y_2019	1.467***	1.132***	1.440**	1.797***	1.527***
y_2020	1.339***	0.815***	0.912**	0.720***	0.829
Constant	2.497***	3.766***	4.268***	4.819***	5.432***
Observations	4,578	4,578	4,578	4,578	4,578
R^2	0.409	0.458	0.463	0.444	0.380

Table 20: Quantile regression of model (10.1) (extended)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**

log.FAC_AMT	-0.024**	-0.004	0.007	0.010	-0.000
log.MAT	0.058	0.188*	0.150	0.061	0.198
log.MAT^2	0.001	-0.015	-0.013	-0.004	-0.023
INS	-0.054	0.091	0.041	-0.086	-0.128**
PENS	-0.167	-0.154	-0.066	-0.179*	0.008
PE	0.244	0.010	0.111	0.192	0.179*
MUT	0.101	0.045	-0.073	-0.159**	0.029
SWF	0.285	-0.187	-0.301	-0.005	-0.269
IB	0.022	0.055	0.069**	0.044	0.077**
FIN	0.096**	0.095***	0.121***	0.139***	0.077**
DFI	0.020	-0.055	-0.030	-0.015	-0.094*
ECA	-0.024	-0.027	-0.033	-0.049	-0.048
TERM	0.121***	0.059**	0.013	0.007	0.001
TERM.A	0.133	0.101	0.102	0.092	0.086
TERM.B	0.341***	0.277***	0.177***	0.235***	0.223***
TERM.C	0.528**	0.521**	0.349***	0.205	0.165
LC	-0.048	0.034	-0.045	-0.054	-0.034
CORR	0.149	-0.067	-0.046	-0.027	0.167*
log.GDPPC	-0.034	-0.079*	-0.100***	-0.101***	-0.175***
GDPPC-%	-0.013	-0.017**	-0.021***	-0.029***	-0.019***
INFL	0.001	0.001	0.003	0.006***	0.010**
CURR_RISK	0.055	0.092	0.128**	0.102**	0.098
MULTI	0.006	-0.006	0.017	0.024	-0.011
SEC	0.277***	0.238***	0.241***	0.167**	0.078
SEC_MIS	0.197**	0.154**	0.120	0.052	0.037
SENIOR	0.223***	0.286***	0.282***	0.300***	0.337***
SHARE	-0.001	-0.002**	-0.001	-0.001	-0.002**
SYND_SIZE	-0.009**	-0.012***	-0.014***	-0.010***	-0.007***
GUAR	-0.095	-0.143***	-0.165***	-0.116**	-0.057*
SPONS	0.129***	0.056	0.032	0.016	-0.007
SPONS_DUAL	-0.033	-0.322***	-0.413***	-0.469***	-0.175
CRED	-0.006	0.029	0.028*	0.016	0.025
LNCDAYS	0.097**	0.086***	0.073***	0.070**	0.115***
LIBOR	0.046	-0.056	-0.056	-0.081*	-0.097**
EURIBOR	-0.009	-0.049	-0.047	-0.056	-0.165**
1Y.MKT.SHR.$	0.005	0.000	0.000	-0.007*	0.001
× *INS*	0.035	-0.032	-0.027		
× *PENS*	-0.047**	-0.014	-0.004	0.012	0.005
× *PE*	0.055	-0.039	-0.027	0.000	-0.016
× *MUT*	-0.008	-0.004	0.020	0.037	
3Y.MKT.SHR.$	-0.018	-0.015	-0.022**	-0.012*	-0.030***
× *INS*	-0.047	0.053	0.028		
× *PENS*	0.071	-0.022	-0.049	-0.035	-0.003
× *PE*	-0.065	0.050	-0.003	-0.054	-0.060
× *MUT*	0.033	-0.011	0.022	0.016	
5Y.MKT.SHR.$	0.008	0.006	0.012	0.007	0.020***
× *INS*	-0.001	-0.032	-0.013		
× *PENS*	0.004	0.063	0.078	0.046	-0.001
× *PE*	-0.026	-0.005	0.038	0.057	0.091
× *MUT*	-0.007	0.040	-0.021	-0.031	
S_C.SYND	0.078	0.065*	0.066	0.014	-0.005
B_C.SYND	-0.023	-0.044	-0.052	-0.010	-0.004
S_SYND	-0.000	0.000	-0.000	-0.000	-0.000
B_SYND	-0.000	0.000	0.000	0.000	0.000
US_DUMMY	-0.0408	0.2424	0.1216	0.1712	-0.0496
× *y_1991*	-0.252	0.075	0.052	0.297	1.373***
× *y_1992*	-0.051	0.303	0.152	0.214	-0.062
× *y_1993*	0.115	0.204	0.322	0.329	0.325
× *y_1994*	-0.253	0.010	0.123	0.017	0.026
× *y_1995*	0.173	0.171	0.100	0.100	0.367***
× *y_1996*	-0.091	0.053	0.060	0.037	0.340***
× *y_1997*	0.353*	0.534***	0.347**	0.373**	0.205
× *y_1998*	0.601**	0.667***	0.567***	0.469***	1.043***
× *y_1999*	0.806***	0.710***	0.604***	0.527***	0.733***
× *y_2000*	0.483***	0.676***	0.619**	0.636***	0.613**
× *y_2001*	1.062***	1.038***	0.639***	0.524***	0.133
× *y_2002*	0.866**	0.775**	0.444**	0.215	0.217*
× *y_2003*	0.888**	1.011***	0.789***	0.707***	0.635***
× *y_2004*	1.095***	0.859***	0.268	0.183	0.089
× *y_2005*	1.100***	0.933***	0.850***	0.824***	0.871***
× *y_2006*	0.498*	0.633*	0.505**	0.358	0.395**

× *y_2007*	0.914***	0.808***	0.729***	0.466**	0.378**
× *y_2008*	0.407*	0.480***	0.497**	0.319***	0.500***
× *y_2009*	0.489*	0.495***	0.294**	0.194	0.025
× *y_2010*	0.342**	0.439***	0.271**	-0.107	-0.289**
× *y_2011*	0.140	0.049	0.035	-0.008	-0.257
× *y_2012*	0.580	0.591**	0.361**	0.194	0.404
× *y_2013*	0.112	0.277	0.172	0.190	0.100
× *y_2014*	0.347*	0.483***	0.447**	0.352***	0.212
× *y_2015*	0.502**	0.441	0.400**	0.416***	0.404***
× *y_2016*	0.113	0.146	0.210	0.232**	0.280**
× *y_2017*	0.131	0.456*	0.416**	0.515**	0.560**
× *y_2018*	-0.004	0.229*	0.354**	0.424**	0.187
× *y_2019*	0.079	0.093	0.113	-0.506***	-0.327**
× *y_2020*	0.066	0.154	0.217	0.108	0.472**
EU_DUMMY	0.273	-0.216	-0.164	-0.222	0.176
× *y_1991*	0.144	0.201	-0.443**	-0.446***	-0.215
× *y_1992*	0.455	0.692***	0.235	-0.126	-0.356**
× *y_1993*	-0.689**	-0.031	-0.255	-0.236	-0.616***
× *y_1994*	-0.109	-0.032	-0.022	0.177	-0.023
× *y_1995*	1.121***	0.442**	0.773***	0.435***	0.366**
× *y_1996*	-0.304	0.030	-0.293**	-0.286	0.536***
× *y_1997*	0.409	0.341**	0.104	-0.152	-0.013
× *y_1998*	-0.318	-0.636**	-0.134	-0.155	-0.261*
× *y_1999*	0.932***	0.397*	0.021	-0.361***	-0.685***
× *y_2000*	-1.417***	-0.082	-0.223	-0.161	-0.221
× *y_2001*	-0.043	0.239	-0.156	-0.105	-0.375*
× *y_2002*	0.055	0.254	-0.110	-0.352*	-0.271**
× *y_2003*	-0.166	0.033	-0.037	-0.007	-0.098
× *y_2004*	0.617**	0.232	-0.186	-0.244*	-0.251
× *y_2005*	0.005	0.229	0.072	0.015	0.172
× *y_2006*	-0.247	-0.104	-0.503***	-0.651*	-0.003
× *y_2007*	-0.201	-0.065	-0.046	-0.246	-0.299**
× *y_2008*	-0.138	-0.039	-0.052	-0.157	0.139
× *y_2009*	-0.176	-0.047	-0.155	-0.148	-0.145
× *y_2010*	-0.086	0.140	0.052	-0.211*	-0.227
× *y_2011*	-0.232	-0.001	-0.004	0.016	-0.040
× *y_2012*	0.539*	0.549***	0.262	0.097	0.239**
× *y_2013*	0.203	0.195	0.176	0.089	0.192
× *y_2014*	0.092	0.296*	0.257	0.144	0.302*
× *y_2015*	0.227	0.276	0.240*	0.174	0.288**
× *y_2016*	-0.035	-0.120	0.048	0.052	0.070
× *y_2017*	-0.095	0.063	0.093	0.183	0.173*
× *y_2018*	-0.055	0.138	0.172	-0.038	0.034
× *y_2019*	0.014	-0.116	-0.326	-0.941***	-0.580***
× *y_2020*	-0.023	-0.047	0.100	0.101	-0.021
ind_Aircraft	-0.676***	-0.005	-0.116	0.013	0.350**
ind_Airports	0.189	0.202*	0.192*	0.215	0.123
ind_Bridges_Tunnels	-0.306	0.162	0.172	0.171	0.052
ind_Electric_Cogeneration	0.027	0.113	0.151*	0.100	0.032
ind_Electric_Independent	-0.001	0.011	0.093	0.074	0.048
ind_Electric_Other	-0.011	-0.002	0.003	-0.040	-0.038
ind_Electricity_transmission	0.059	0.193	0.065	0.103	0.011
ind_Gas_Oil	-0.035	0.040	0.177**	0.173**	0.169***
ind_Healthcare	0.366**	0.208*	0.114	0.104	-0.000
ind_Manufacturing	-0.316**	0.086	0.257**	0.265*	0.121
ind_Transit	-0.114	-0.060	-0.136	-0.126	-0.072
ind_Mining	0.558***	0.541***	0.443***	0.375***	0.250***
ind_Other	0.015	0.110*	0.144**	0.110*	0.118**
ind_Pipelines	0.028	0.005	0.091	0.179	0.222**
ind_Ports	0.135	-0.023	-0.025	0.197**	-0.010
ind_Pulp	0.149	-0.073	0.063	-0.014	-0.132
ind_Commercial	0.026	0.069	0.084	0.064	0.058
ind_Residental	0.212	0.269***	0.228**	0.187**	0.107
ind_Recycling	0.262**	0.112	0.061	0.000	-0.166
ind_Ships	0.271	0.146	-0.024	-0.182	0.003
ind_Arenas	0.417	0.489***	0.287***	0.118	-0.113
ind_Telecommunications	0.172	0.262**	0.208**	0.237*	0.235**
ind_Casinos	0.397**	0.374***	0.490***	0.516***	0.546***
ind_Toll	0.121	0.034	0.073	0.041	-0.069
ind_Water	-0.003	0.329***	0.240***	0.155**	-0.090
y_1988	0.484**	0.205	0.438	0.467**	0.961***

y_1989	-0.381	0.126	0.180	0.411	0.837***
y_1990	-0.209	-0.252	-0.164	0.071	-0.071
y_1991	0.508	-0.355	0.088	-0.020	-0.495**
y_1992	0.411	-0.374	-0.057	0.082	0.340
y_1993	0.477*	-0.120	-0.084	-0.024	0.096
y_1994	0.545*	0.001	0.065	0.170	0.127
y_1995	0.161	-0.043	0.100	0.161	0.025
y_1996	0.203	-0.108	0.114	0.144	0.055
y_1997	0.000	-0.297	-0.069	0.114	0.222
y_1998	-0.088	-0.266	-0.057	0.074	0.204
y_1999	0.235	-0.085	0.129	0.332**	0.210
y_2000	0.310	-0.286	-0.088	0.010	0.064
y_2001	-0.040	-0.506	-0.036	0.090	0.463***
y_2002	0.149	-0.054	0.283	0.466**	0.515***
y_2003	0.317	-0.178	0.075	0.094	0.285
y_2004	-0.231	-0.275	0.282	0.441***	0.547*
y_2005	-0.041	-0.370	-0.103	0.027	0.062
y_2006	0.039	-0.336	0.134	0.302	0.302
y_2007	-0.127	-0.304	-0.141	0.099	0.444**
y_2008	0.282	-0.124	0.015	0.233*	0.341
y_2009	1.119***	0.724	0.861***	0.882***	1.158***
y_2010	1.206***	0.724	0.877***	1.171***	1.301***
y_2011	1.304***	0.879*	0.937***	0.972***	1.280***
y_2012	0.845**	0.490	0.792***	0.936***	1.064***
y_2013	1.239***	0.786*	0.872***	0.961***	1.095***
y_2014	1.037***	0.521	0.647***	0.738***	0.933***
y_2015	0.756***	0.465	0.637***	0.755***	0.783***
y_2016	1.048***	0.620	0.634***	0.672***	0.777***
y_2017	1.115***	0.514	0.609***	0.621***	0.741***
y_2018	1.074***	0.429	0.439**	0.563**	0.807***
y_2019	0.920***	0.609	0.787**	1.422***	1.356***
y_2020	0.706**	0.246	0.196	0.239	0.468**
Constant	2.718***	4.027***	4.491***	4.978***	5.138***
Observations	4,254	4,254	4,254	4,254	4,254
R^2	0.404	0.466	0.474	0.448	0.382

Table 21: Quantile regression of model (11.1) (extended)

log(AISD)	**(0.1)**	**(0.3)**	**(0.5)**	**(0.7)**	**(0.9)**
log.FAC_AMT	-0.026***	-0.010	0.003	0.000	-0.003
log.MAT	-0.065	0.125	0.186	0.113	0.211*
log.MAT^2	0.015	-0.008	-0.019	-0.011	-0.026*
INS	0.041	0.061	0.008	0.022	0.081
PENS	-0.423**	-0.513***	-0.556***	-0.385	-0.261**
PE	0.301**	0.347*	0.275*	0.363*	0.671***
MUT	-0.029	0.178	0.096	0.094	0.106
SWF	0.502***	0.333	0.356	-0.006	-0.595***
IB	0.019	0.031	0.028	0.010	0.097***
FIN	0.127***	0.120***	0.119***	0.136***	0.104***
DFI	0.007	-0.032	-0.019	-0.007	-0.025
ECA	-0.012	-0.029	-0.021	0.000	0.006
TERM	0.118***	0.055*	0.021	0.008	0.011
TERM.A	0.129**	0.100	0.116	0.115**	0.077*
TERM.B	0.293***	0.260***	0.156***	0.231**	0.260***
TERM.C	0.515***	0.235**	0.179	0.198	0.187
LC	-0.016	-0.005	-0.032	-0.042	0.009
CORR	0.261**	-0.005	-0.021	0.012	0.129
log.GDPPC	-0.043	-0.082**	-0.109***	-0.111***	-0.160***
GDPPC-%	-0.010	-0.013**	-0.023***	-0.029***	-0.022***
INFL	0.001	-0.000	0.004**	0.004***	0.006
CURR_RISK	-0.019	0.056	0.094	0.100*	0.131**
MULTI	0.008	0.007	0.031	-0.008	-0.005
SEC	0.192**	0.267***	0.257***	0.178***	0.119**
SEC_MIS	0.147*	0.172**	0.129*	0.048	0.025
SENIOR	0.174*	0.265***	0.247***	0.335***	0.361***
SHARE	-0.001	-0.001	-0.001	-0.001	-0.001
SYND_SIZE	-0.008***	-0.010***	-0.013***	-0.009***	-0.010***
GUAR	-0.107*	-0.147***	-0.153***	-0.101**	-0.060
SPONS	0.094**	0.035	0.021	0.003	-0.049
SPONS_DUAL	-0.047	-0.250**	-0.384***	-0.500***	-0.189*
CRED	-0.003	0.026	0.020	0.023	0.019

LNCDAYS	0.149***	0.135***	0.077***	0.081***	0.098***
LIBOR	0.007	-0.050	-0.075	-0.095**	-0.137***
EURIBOR	-0.039	-0.027	-0.072	-0.075	-0.177***
log.INST_EXP	0.017	-0.011	-0.008	0.005	-0.050
× *INS*	-0.071	-0.062	-0.025	-0.052	-0.002
× *PENS*	0.100	0.145***	0.137**	0.083	0.112
× *PE*	-0.062	-0.109	-0.073	-0.090	-0.105
× *MUT*	0.064	0.002	-0.006	-0.013	0.024
S_C.SYND	0.073	0.041	0.038	0.012	-0.001
B_C.SYND	-0.007	-0.051*	-0.051**	0.013	0.009
S_SYND	-0.000	0.000	-0.000	-0.000*	-0.000**
B_SYND	0.000	0.000	0.000*	-0.000	0.000
US_DUMMY	-0.236	0.083	-0.117	0.256	0.219
× *y_1992*	-0.125	0.208	0.114	0.012	-0.125
× *y_1993*	-0.432	0.132	0.133	0.328**	0.200
× *y_1994*	-0.181	-0.065	0.056	0.030	0.076
× *y_1995*	0.117	0.157	-0.008	0.127	0.354
× *y_1996*	-0.355*	-0.026	-0.001	0.108	0.365***
× *y_1997*	0.256	0.441***	0.314**	0.321	0.158
× *y_1998*	0.391	0.650***	0.556***	0.509***	0.492*
× *y_1999*	0.752***	0.800***	0.711***	0.656***	0.722***
× *y_2000*	0.451***	0.636***	0.511***	0.543**	0.493***
× *y_2001*	0.934***	0.978***	0.782***	0.531***	0.040
× *y_2002*	0.817***	0.741***	0.372***	0.201	0.263***
× *y_2003*	0.773	0.913***	0.755***	0.774***	0.596**
× *y_2004*	0.832***	0.702***	0.224	0.226	0.077
× *y_2005*	0.937***	0.955***	0.851***	0.937**	0.956***
× *y_2006*	0.486**	0.695	0.439**	0.498**	0.344
× *y_2007*	0.813***	0.770***	0.790***	0.508***	0.577***
× *y_2008*	0.264	0.408**	0.432*	0.373**	0.331
× *y_2009*	0.299	0.344***	0.194	0.196	0.012
× *y_2010*	0.164	0.358***	0.215*	0.053	-0.365***
× *y_2011*	0.044	-0.031	-0.031	-0.011	-0.331*
× *y_2012*	0.332	0.528***	0.343*	0.243	0.122
× *y_2013*	0.099	0.332**	0.204	0.254**	0.293
× *y_2014*	0.348	0.412***	0.507***	0.425***	0.271
× *y_2015*	0.405***	0.484***	0.459***	0.533***	0.579***
× *y_2016*	0.102	0.069	0.073	0.291*	0.308**
× *y_2017*	0.179	0.434	0.540***	0.567**	0.516***
× *y_2018*	0.033	0.207	0.343**	0.524***	0.029
× *y_2019*	0.050	0.082	0.091	-0.330	-0.182
× *y_2020*	-0.007	0.177	0.157	0.075	0.482***
EU_DUMMY	-0.1408	-0.176	-0.106	-0.231	0.220
× *y_1991*	0.196	0.224	-0.484**	-0.466***	-0.143
× *y_1992*	0.350	0.395**	-0.128	-0.407**	-0.720***
× *y_1993*	-0.631**	-0.172	-0.360	-0.141	-0.584***
× *y_1994*	-0.103	0.036	-0.053	0.189	0.037
× *y_1995*	0.902***	0.518**	0.733***	0.413***	0.443***
× *y_1996*	-0.487**	0.010	-0.305**	-0.267**	0.495***
× *y_1997*	0.018	0.216	0.009	-0.141	0.088
× *y_1998*	-0.338	-0.223	-0.026	-0.045	0.026
× *y_1999*	-0.135	0.109	0.046	-0.243*	0.124
× *y_2000*	0.084	0.058	0.027	0.006	-0.007
× *y_2001*	0.149	0.043	0.045	-0.207	-0.402***
× *y_2002*	-0.105	0.175	-0.200	-0.403**	-0.351***
× *y_2003*	-0.310	-0.110	-0.081	-0.003	-0.116
× *y_2004*	0.286	0.129	-0.188	-0.328**	-0.222
× *y_2005*	-0.147	0.121	0.033	-0.007	0.149
× *y_2006*	-0.162	-0.204	-0.523***	-0.569**	-0.356
× *y_2007*	-0.247	-0.276*	-0.095	-0.428**	-0.439***
× *y_2008*	-0.248	-0.167	-0.148	-0.196	-0.090
× *y_2009*	-0.225	-0.269**	-0.203	-0.262	-0.147
× *y_2010*	-0.188	0.024	-0.060	-0.183	-0.471***
× *y_2011*	-0.273	-0.219*	0.001	-0.084	-0.373**
× *y_2012*	0.390*	0.343*	0.204	0.093	0.276**
× *y_2013*	0.180	0.183	0.218*	0.056	0.240**
× *y_2014*	0.241	0.225*	0.320***	0.191	0.325
× *y_2015*	0.244	0.325**	0.275*	0.328**	0.357**
× *y_2016*	-0.161	-0.175	-0.099	0.003	0.025
× *y_2017*	-0.050	-0.006	0.162	0.209	0.240**
× *y_2018*	0.047	0.126	0.145	0.127	-0.160

× y_2019	0.133	-0.163	-0.336	-0.873*	-0.475***
× y_2020	-0.113	-0.071	0.065	0.013	-0.065
ind_Aircraft	-0.747***	-0.179	-0.085	-0.093	0.475***
ind_Airports	0.156	0.117	0.190	0.249*	0.162
ind_Bridges_Tunnels	-0.235	0.096	0.191	0.180	0.014
ind_Electric_Cogeneration	-0.013	0.089	0.177**	0.096	0.076
ind_Electric_Independent	-0.029	-0.068	0.097	0.055	0.006
ind_Electric_Other	-0.059	-0.034	-0.010	-0.020	-0.033
ind_Electricity_transmission	0.158	0.077	0.135	0.165	-0.005
ind_Gas_Oil	-0.053	-0.024	0.143**	0.195**	0.185***
ind_Healthcare	0.210*	0.152	0.119	0.047	0.015
ind_Manufacturing	-0.278***	-0.138	0.170	0.190	0.286**
ind_Transit	-0.159*	-0.117	-0.089	-0.050	-0.061
ind_Mining	0.495***	0.456***	0.424***	0.331***	0.271***
ind_Other	-0.034	0.070	0.134**	0.084	0.097**
ind_Pipelines	0.008	-0.084	0.139	0.136	0.192
ind_Ports	0.025	-0.024	-0.049	0.174*	0.030
ind_Pulp	0.271	-0.149	-0.042	-0.007	-0.104
ind_Commercial	0.032	0.066	0.094	0.050	0.043
ind_Residental	0.251*	0.243**	0.257**	0.158	0.039
ind_Recycling	0.210*	0.168*	0.139	0.049	-0.153**
ind_Ships	0.400**	0.197	0.086	-0.101	-0.248**
ind_Arenas	0.380**	0.490***	0.351***	0.187**	-0.026
ind_Telecommunications	0.304**	0.167	0.195*	0.208	0.226***
ind_Casinos	0.379***	0.331***	0.488***	0.458***	0.503***
ind_Toll	0.102	0.017	0.065	0.065	-0.067
ind_Water	0.060	0.273**	0.238**	0.191	-0.016
y_1988	0.496**	0.293	0.313	0.387	0.716***
y_1989	-0.385	0.180	0.148	0.291	0.625***
y_1990	-0.201	-0.176	-0.078	-0.178	-0.274*
y_1991	0.516*	-0.190	0.303	-0.006	-0.631***
y_1992	0.464	-0.235	0.056	0.061	0.169
y_1993	0.582**	0.053	0.080	-0.123	-0.122
y_1994	0.545**	0.112	0.184	0.100	-0.049
y_1995	0.252	0.039	0.253	0.134	-0.152
y_1996	0.338	0.020	0.224	0.099	-0.144
y_1997	0.084	-0.146	0.055	0.079	0.022
y_1998	0.009	-0.192	0.068	-0.020	-0.063
y_1999	0.279	-0.134	0.148	0.222	0.019
y_2000	0.380*	-0.166	0.126	0.134	0.083
y_2001	0.171	-0.313	-0.056	0.062	0.307*
y_2002	0.270	0.030	0.444	0.467*	0.308***
y_2003	0.468	-0.023	0.188	0.042	0.068
y_2004	0.116	-0.086	0.395	0.405	0.272
y_2005	0.098	-0.274	-0.022	-0.089	-0.219
y_2006	0.047	-0.245	0.242	0.184	0.202
y_2007	-0.013	-0.191	-0.067	0.143	0.207
y_2008	0.371	-0.048	0.122	0.173	0.158
y_2009	1.272***	0.913***	0.965***	0.836***	0.805***
y_2010	1.381***	0.766***	0.974***	0.957***	1.164***
y_2011	1.406***	0.976***	0.971***	0.887***	1.154***
y_2012	1.024***	0.613**	0.870**	0.795***	0.725***
y_2013	1.303***	0.830***	0.871**	0.828***	0.682***
y_2014	0.962***	0.578**	0.651*	0.597**	0.607**
y_2015	0.863***	0.416*	0.590	0.524**	0.406**
y_2016	1.084***	0.675***	0.806**	0.606**	0.477***
y_2017	1.091***	0.556**	0.568	0.484	0.355***
y_2018	1.083***	0.522**	0.512	0.460*	0.694***
y_2019	0.985***	0.648**	0.881*	1.299**	1.031***
y_2020	0.830***	0.314	0.343	0.185	0.137
Constant	2.654***	3.761***	4.426***	4.894***	5.350***
Observations	4,578	4,578	4,578	4,578	4,578
R^2	0.387	0.442	0.447	0.425	0.369

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