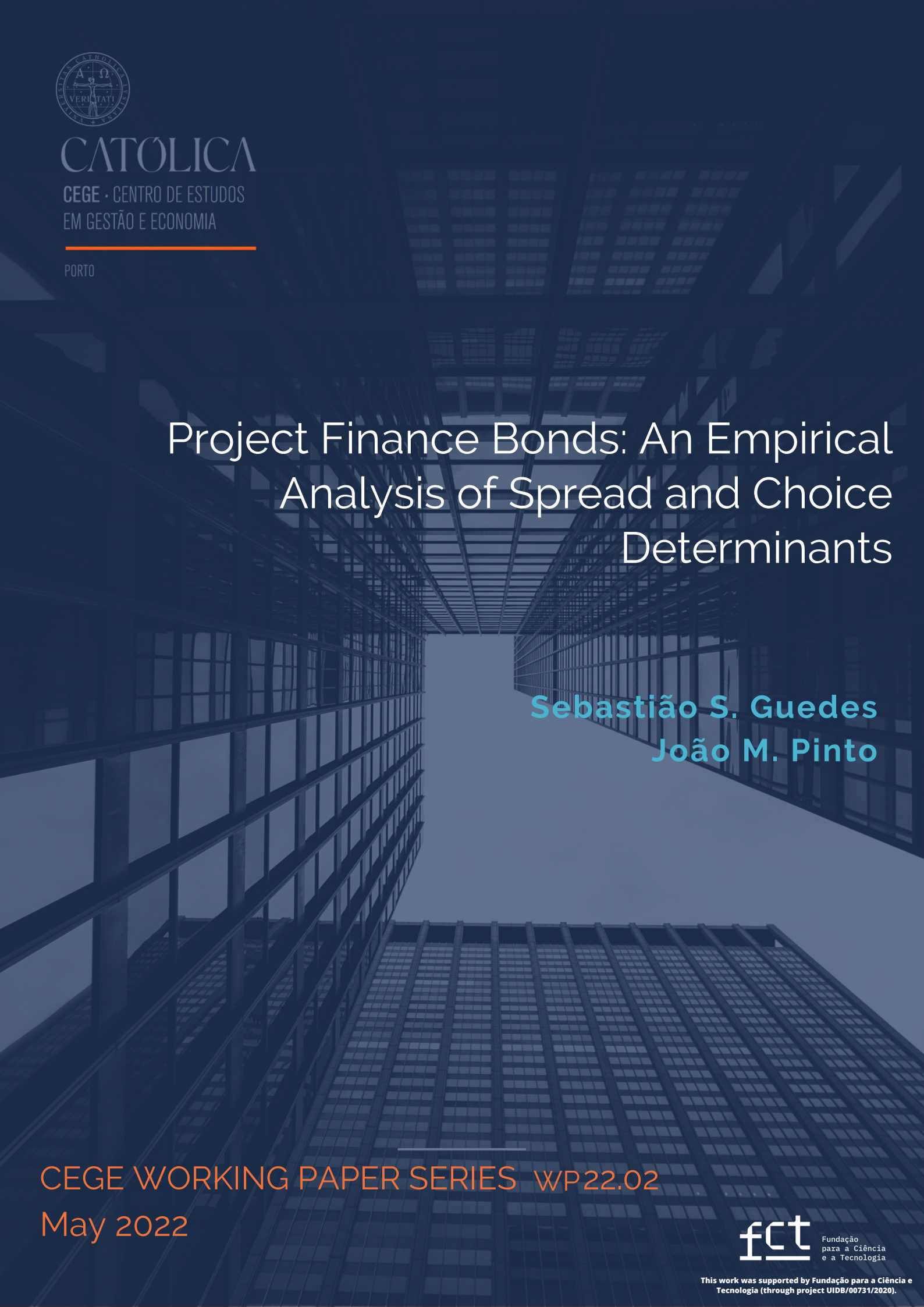

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Project Finance Bonds: An Empirical Analysis of Spread and Choice Determinants

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February 24, 2022

Abstract

This paper provides a comparative analysis of project finance (PF) and traditional corporate finance (CF) bond pricing, along with an examination of the choice determinants of PF *vis-à-vis* CF transactions. Using a cross-section of 47,196 bonds issued worldwide in the 1993-2020 period, we show that PF and CF bonds are differently priced, PF bonds have higher spreads than comparable CF bonds, and although ratings are the most important pricing determinant for PF and CF bonds at issuance, investors rely on other contractual, macroeconomic, and firms' characteristics beyond these ratings. We find that economies of scale, risk management, and information asymmetry arguments affect sponsoring firms' choice between PF and CF transactions. Findings suggest that firms choose PF when they are relatively smaller, less profitable and creditworthy, and seek long-term financing. Our results also document that the host country's legal and institutional frameworks affect financing choices.

Key words: bond pricing; project finance; corporate bonds; debt choice.
JEL classification: G12; G15; G21; G32

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1. Introduction

Project finance (PF) is a form of financing based on a standalone entity created by the sponsors, with highly levered capital structures and concentrated equity and debt ownerships.[1] As a nexus of contracts between the players involved (Caselli and Gatti, 2005; Corielli *et al.*, 2010), it is used to segregate the credit risk of the project so that lenders, investors, and other parties will appraise the project strictly on its own economic merits. Typically used for funding public and private capital-intensive facilities and utilities, PF has become an economically significant growing financial market segment in recent decades, but is still largely understudied (Zingales, 2000; Dailami and Hauswald, 2007). Esty and Sesia (2007) report that a record $328 billion in PF funding was globally arranged in 2006, a 51.2% increase from the $217 billion reported for 2001. According to Refinitiv Deals Intelligence reviews, $328 billion was arranged worldwide in 2020, a drop of 11.2% from the $369 billion in 2019, the year the market hit a new global record.[2]

PF deals are typically funded with small amounts of private equity contributions and much larger amounts of nonrecourse syndicated loans (Esty and Megginson, 2003). However, the global financial crisis has resulted in stricter regulations on banks and their lending requirements: one of the most conspicuous impacts of the implementation of Basel II (and the ongoing Basel III) capital adequacy standards on banks' PF business is an increase in capital requirements (Esty and Sesia, 2003; Gatti, 2008; Sorge and Gadanecz, 2008).[3] Under this framework, PF bonds emerged as an innovative way to mitigate regulatory constraints at the bank level, allowing, simultaneously, to stimulate capital market financing, with longer maturities, for large-scale infrastructure projects. In developing countries, since the 1990s, a nascent PF bond market emerged as a funding alternative for the massive infrastructure needs in such countries (Dailami and Hauswald, 2003). In Europe, the European Commission and the European Investment Bank launched the 'Europe 2020 Project Bond Initiative' in 2012, designed to (*i*) mobilize the necessary funding for project

[1] For further discussion, see Brealey *et al.* (1996), Esty (2003, 2004a, 2004b), Caselli and Gatti (2005), Fabozzi *et al.* (2006), Blanc-Brude and Strange (2007), Dailami and Hauswald (2007), Gatti (2008) and Pinto (2017).
[2] Global Project Finance Review, full year 2020; Global Debt Capital Markets Review, full year 2020. Source: Refinitiv (https://www.refinitiv.com/dealsintelligence).
[3] According to Buscaino *et al.* (2012), unless a bank qualifies for the IRB approach, the capital reserve requirements for PF loans increase from January 1, 2008, especially for loan tranches that fall in the worst rating classes.

financing of infrastructure, which could exceed EUR 2 trillion between 2012 and 2020; and (*ii*) attract additional private finance from institutional investors such as insurance companies and pension funds.[4]

Considering the significant growth of PF bond issuance in the last decade, representing in 2020 15.3% of the Global PF market (PF bond issuance amounted to $50.2 billion in 2020; $58.6 billion in 2019),[5] as well as its importance in the financing of large infrastructure projects, our purpose is twofold. First, we compare spreads and pricing of PF *vis-à-vis* corporate finance (CF) bonds in a large sample of bonds (763 PF and 46,433 CF bonds, worth $282.7 billion and $16,935.3 billion, respectively) issued by nonfinancial firms worldwide between January 1, 1993 and December 31, 2020. Second, we examine, in a deal-level analysis (516 PF and 36,035 CF deals), the factors that drive sponsoring firms' choice between PF and internally organized investment projects funded via CF bonds.

This paper contributes to extant literature on the determinants of bond spreads. Despite the significant attention devoted by both academics and practitioners to the analysis of traditional on-balance-sheet corporate bond spreads (e.g., Collin-Dufresne *et al.*, 2001; Elton *et al.*, 2001; Campbell and Taksler, 2003; Hull *et al.*, 2004; Titman *et al.*, 2004; Longstaff *et al.*, 2005; Chen *et al.*, 2007; Bao *et al.*, 2011; Flannery *et al.*, 2012; Marques and Pinto, 2020), research on PF bond spreads is scant. A few exceptions are: Dailami and Hauswald (2003), who examine the pricing of 105 emerging market PF bonds issued between January 1993 and March 2002 and show that maturity and credit rating are the most significant determinants of bond spreads. Authors also find that legal and institutional frameworks of the host country have a relevant impact on spreads. Furthermore, two clinical studies provide an in-depth analysis of credit-spread determinants of two large-scale projects. Dailami and Hauswald (2007) focus on the Ras Gas project and study the impact of three interlocking contracts (two 25-year output sales and purchase agreements, bond covenants, and a debt-service guarantee) on

[4] In his 'State of the Union' speech in 2010, European Commission President José Manuel Barroso proposed the 'Europe 2020 Project Bond Initiative' to mobilise the necessary funding for project financing of infrastructure: 'A European Union initiative to support project bonds, together with the European Investment Bank, would help address the needs for investment in large European Union infrastructure projects.' See Scannella (2012) for further analysis.
[5] According to Esty *et al*. (2014), from 2009 to 2013 the use of PF bonds increased from 8% to 13% of the total PF market. The 2020 global PF bonds industry composition is as follows: oil and gas - $18.5 billion; power - $16.5 billion; transportation - $8.7 billion; leisure and property - $2.5 billion; petrochemicals - $2.2 billion; and other – $1.8 billion.

bond spreads by means of a time-series analysis. They show that credibly managed - through the SPE's contractual structure - risk factors do not affect Ras Gas' spreads, and the most important explanatory variable is the off-taker's credit spread. Bonetti *et al.,* (2010) use the case of the Quezon Power Ltd Co. to examine the effect of higher counterparty risk on Quezon's bond spread: authors find that deterioration in the off-taker's credit rating causes an increase in the spread paid by Quezon Power. We believe our study is the first to examine how spreads and pricing compare between PF and CF bonds. In addition, and to the best of our knowledge, we are the first to analyze the impact of sponsoring (in PF deals) or issuing (in CF deals) firms' characteristics on the pricing, taking into consideration the potential self-selection by firms between choosing on- *versus* off-balance-sheet funding for a specific investment project.[6] This is of particular relevance as extant literature shows that the choice of debt instruments influences the cost of borrowing in both private and public debt markets (Pinto and Santos, 2019; Marques and Pinto, 2020). This raises the following question: *to what extent are PF and CF bonds priced by the same contractual, macroeconomic and firms' characteristics?*

The paper also contributes to the literature that studies firms' debt choices, namely the choice to borrow off-balance-sheet through the creation of a special purpose entity or vehicle (SPE/SPV). Prior research on firms' debt financing choice primarily highlights the coexistence of bank and bond financing (Diamond, 1984, 1991; Boyd and Prescott, 1986; Berlin and Loeys, 1988; Chemmanur and Fulghieri, 1994; Yosha, 1995; Bolton and Freixas, 2000; Fiore and Uhlig, 2011), with the main determinants of this decision related to information asymmetries and monitoring costs, economies of scale and transaction costs, and renegotiation and liquidation of debt (Houston and James, 1996; Krishnaswami *et al.*, 1999; Cantillo and Wright, 2000; Denis and Mihov, 2003; Fiore and Uhlig, 2011). More recently, structured finance transactions, such as PF, asset securitization, and structured leases, have seen strong growth (Leland 2007). Extant literature presents the following determinants of off-balance-sheet debt arrangements: funding costs, financial flexibility, risk management, agency costs, information asymmetries, interest tax shields, and financial synergies (Fabozzi *et al.*, 2006; Leland,

[6] Our analysis uses a dataset of worldwide PF and CF bonds, developed based on a hand-matching procedure between bonds extracted from DCM Analytics and firms' characteristics drawn from Datastream. Additionally, we use endogenous switching regression models to mitigate potential self-selection problems.

2007; Pinto and Santos, 2019). Empirically, few papers investigate this financial-economic issue. Mills and Newberry (2005) find that U.S. nonfinancial firms with lower debt ratings and higher leverage are more likely to use R&D limited partnerships, structured leases, and asset securitization. They also provide evidence suggesting that firms with more free cash-flow to total asset ratios use more structured financing arrangements. Lemmon *et al.* (2014) show that U.S. securitization users are larger and more concentrated in the middle of the credit quality distribution, and that securitization minimizes firms' financing costs. Similarly, Pinto and Santos (2019) show that informational frictions and issuance costs affect European nonfinancial firms' choice of structured finance transactions, namely asset securitization, and PF. Hainz and Kleimeier (2012) find that political risk and creditor rights correlate positively with the use of PF. They also find a negative relationship between the industry's leverage ratio and the use of PF. Subramanian and Tung (2016) point out that PF is more likely in countries with weaker laws and weaker creditor rights and that changes in investor protection have greater effects in industries with higher agency costs of free cash flow *vis-à-vis* tangible-asset-intensive industries. However, all these works that focus on the choice of PF deals have the syndicated loan market, not the corporate bond market, as their underlying focus. In addition, none of these analyzed how sponsoring firms' characteristics impact the choice of PF; i.e., implemented a firm-level analysis. This is of particular interest since, in our sample, 3,599 deals are issued by switchers, firms that choose both PF and CF bonds in the sampling period. Thus, it is still necessary to address two research questions within this literature: *(i) does firms' choice between PF and CF bonds affect the pricing of such securities? and (ii) if PF debt is more expensive than comparable CF debt (Klein et al., 1996; Pollio, 1998; Pinto and Santos, 2019), what are the sponsoring firms' characteristics that determine the choice between PF and CF bond issuance?*

We begin our analysis by examining the determinants of PF and CF bond spreads. Our findings document that PF and CF bonds are differently priced, PF bonds have higher spreads than CF bonds and, despite credit ratings being a major pricing determinant at issuance, investors rely on other pricing factors. We find that factors important for CF pricing, such as time to maturity, transaction size, currency risk, if the bond is collateralized, number of banks involved and their reputation, country risk, market volatility, and yield curve slope, are also important for determining spreads on PF bonds. Regarding the sponsoring/issuing firms'

characteristics, we show that the pricing of PF bonds depends on a single characteristic of the sponsoring firm, the debt to total assets ratio. Finally, when using endogenous switching regression models, we find evidence of sponsoring firms' choice between PF and CF bonds affecting the pricing of such securities.

Next, we analyze the sponsoring firms' characteristics that determine the firms' choice between PF and CF bond deals. We find strong evidence that PF mitigates the deadweight costs of asymmetric information frictions. Borrowers that choose off-balance-sheet financing, via project financing, over on-balance-sheet financing, via corporate financing, are relatively smaller and seek long-term financing. We also find that less profitable firms are more likely to use PF and that this funding method is mostly used for larger debt issuances because of the potential economies of scale in relation to issuance costs. Results show that PF sponsoring firms have higher credit risk, which supports the risk management motivation of using PF. In line with both PF and law and finance literature (La Porta *et al.*, 2000; Beck and Levine, 2002; Esty and Megginson, 2003), we show that PF transactions are chosen to implement projects in riskier than average countries and with lower contract enforcement. We check the robustness of our results for a matched sample of CF deals and a subsample of switchers and the results are qualitatively similar.

This paper is organized as follows. Section 2 reviews the literature. Section 3 describes the data and variables we use in our tests. Section 4 examines the determinants of credit spreads for PF and CF bonds. It also analyzes if the choice process affects the pricing of PF and CF bonds. Section 5 examines sponsoring firms' characteristics that determine the choice between PF and CF and section 6 concludes the paper.

2. Literature review

2.1. The financial economics of project finance bonds

In our sample, the first PF bond was issued by Petronas Capital Ltd, an SPV of the Malaysian state-owned oil and gas company Petronas, in 1993, with a tranche size of $500 million and a 10-year maturity. The largest transaction, with a deal size of $4.0 billion in two tranches of $1 and $3 billion, with maturities of 10.6 and 29.9 years, respectively, was closed in 2017 by Mexico City Airport Trust (NAFIN), to finance a new international airport in Mexico City. Over the last 25 years, the bond market has financed a broad range of project

types, tranche sizes, seniorities, and maturities. But what are the main characteristics of these bonds that make them different from traditional CF bonds?

PF transactions are financing structures based on the use of contracting tools helping to efficiently finance a specified asset beyond the scope of on-balance sheet financing (Fabozzi *et al.*, 2006; Leland, 2007; Corielli *et al.*, 2010). Transactions are designed in terms of tranching, credit enhancement mechanisms, covenants, warrantees, corporate structures, and contracts to achieve segregation of cash flows generating assets from the sponsor(s), which protects investors from dilution (Pinto and Santos, 2019). This 'bankruptcy remoteness' feature provided by the instrumental SPE is not available in on-balance-sheet funding such as CF bonds (Caselli and Gatti, 2005; Gorton and Souleles, 2005; Ayotte and Gaon, 2011).[7]

Credit risk segregation of the project from that of its sponsors leads lenders, investors, and other stakeholders to appraise the project strictly on its own economic merits (Shah and Thakor, 1987; John and John, 1991; Esty, 2004a,b; Gatti, 2008). Therefore, PF bonds' credit risk largely depends on the assets and cash flows generated by the project and not on the reliability and creditworthiness of the sponsors (Esty, 2003; Fabozzi *et al.*, 2006; Leland, 2007). On the contrary, 'corporate financing is based on being able to count on a much broader asset base than assets relating specifically to the individual initiative (if the latter fails, the financer can always count on the company's other assets)' (Caselli and Gatti, 2005). Likewise, Dailami and Hauswald (2003) point out that the main difference between PF and CF bonds is related to the guarantees provided to bondholders in case of default.[8] This explains why PF bond investors are cash-flow oriented and demand a much more careful analysis of the factors that determine the underlying economics of the project, the covenants and guarantees that support the transaction, and the financing deal's economic and legal structures (Yescombe, 2007; Gatti, 2008).

[7] Among the most important distinctive characteristics of PF transactions are (Esty, 2004; Pinto, 2017): (*i*) the debtor, a project company (an SPV or SPE) that is financially and legally independent from the sponsors; (*ii*) lenders that have only limited or no recourse to the sponsors; (*iii*) project risks that are allocated to those parties that are best able to manage them; (*iv*) that the project's cash flows must be sufficient to service the debt in terms of interest and debt repayment; and (*v*) collateral that is given by sponsors to lenders as security for cash inflows and assets tied up in managing the project.

[8] According to Dailami and Hauswald (2003), in developing countries 'issuers take particular care in designing their projects' organizational, legal, and financial structure when they wish to fund them in public debt markets.'

Cuchra (2005) and Brennan *et al.* (2009) stress that the rating process is different in structured *versus* corporate bonds. While in the latter, securities and issuers are evaluated according to certain conditions upon which a given rating is assigned, in structured finance the process is inverted: the issue is structured in order to achieve a specified credit rating and a corresponding cost of debt. PF arrangements are typically structured as extensive and detailed networks of contracts to transfer a variety of project risks to the parties that are best able to appraise and manage them (Brealey *et al.*, 1996, Corielli *et al.*, 2010). This contractual bundle is then presented to creditors to seek debt financing, serving as the basis for negotiating the quantity, credit quality, and the cost of external funding. In addition to the debtor likelihood of default and recovery in bankruptcy and the host country's institutional factors, in the context of PF, additional factors that affect idiosyncratic risk perceptions, like counter-party, price, and demand risk also affect the premium that bondholders demand in PF bonds.

Due to the specific characteristics of PF transactions, in particular the 'bankruptcy remoteness' feature, PF bond spreads depend essentially on the project creditworthiness and not on the sponsors' accounting and financial characteristics. Therefore, contrary to the traditional CF bonds, where the credit spread depends essentially on the issuing firms' characteristics, the credit spread of any PF tranche depends, instead, on the assets and cash flows pledged as collateral and on the credit enhancement mechanisms used (Liu *et al.*, 2018; Pinto and Santos, 2019). Under this framework, we expect that PF and CF bonds are priced differently by common pricing factors; i.e., the common determinants of CF bond spreads affect those of PF bonds differently.

2.2. The determinants of spreads for PF loans and bonds issued by nonfinancial firms

The academic literature contains numerous bond pricing studies, both theoretical and empirical. Virtually all of the empirical studies on corporate bond spreads find credit ratings to be one of its most important determinants. Some of the more recent papers include Collin-Dufresne *et al.* (2001), Elton *et al.* (2001), Hull *et al.* (2004), Titman *et al.* (2004), Gabbi and Sironi (2005), and Longstaff *et al.* (2005). In searching for determinants of corporate bond spreads, researchers also find other factors to be important, like liquidity (Longstaff *et al.*, 2005; Chen *et al.*, 2007; Bao *et al.*, 2011), systematic risk (Collin-Dufresne *et al.*, 2001; Elton *et al.*, 2001), incomplete accounting information (Flannery *et al.*, 2012), leverage (Cremers *et al.*, 2008; Flannery *et al.*, 2012), taxes (Elton *et al.*, 2001), and control/ownership structure and creditor rights protection (Boubakri

and Ghouma, 2010). Market variables, like the level of interest rates, the slope of the yield curve, and market volatility, also have a significant impact on corporate bond spreads (Campbell and Taksler, 2003; Krishnan *et al.*, 2005; Cremers *et al.*, 2008). An important stream of the literature analyzes the relationship between spread and maturity. Several authors (Jones *et al.*, 1984; Sarig and Warga, 1989; Gabi and Sironi, 2005; Sorge and Gadanecz, 2008) argue that, on average, the term structure of spreads for investment-grade bonds appears upward-sloping. However, the literature has been more controversial regarding the term structure of spreads for non-investment grade bonds (Fons, 1987; Sarig and Warga, 1989; Helwege and Turner, 1999). More recently, Marques and Pinto (2020) find a convex relationship for a European sample.

Compared with a large number of empirical studies on corporate bond spreads, research on structured finance bond spreads issued by nonfinancial firms, as well as on PF syndicated loan spreads has been scant. The few exceptions related to the pricing of asset securitization bonds are: Cuchra (2005), Buscaino *et al.*, (2012), Fabozzi and Vink (2012), and Marques and Pinto (2020), who find that credit rating is the most important pricing factor at issuance. However, this stream of research suggests that investors also rely on factors other than credit ratings when pricing asset-backed claims. Cuchra (2005) provides evidence of factors documented as important for pricing in the case of corporate bonds, such as market liquidity and creditor rights, and they are also important for determining spreads on structured bonds. Buscaino *et al.* (2012) use a sample of collateralized debt obligations (CDOs) backed by PF loans and show that market liquidity, time to maturity, and the nature of underlying assets significantly impact CDO spreads. Fabozzi and Vink (2012) find that credit enhancement mechanisms, collateral-type, and level of creditor legal protection determine the pricing of asset-backed securities (ABS) issued in the Euromarket. Marques and Pinto (2020) find that factors such as the number of banks involved, creditor rights, market volatility, and issuing firms' profitability are also important for determining credit spreads on ABS.

Concerning PF loans, Dailami and Leipziger (1998) and Pollio (1998) find that loan spreads are determined by the level of guarantees provided, and both country risk and inflation levels. Kleimeier and Megginson (2000) find that PF loan spreads are directly related to variables such as country risk, the use of covenants in the loan contract, and project leverage. They conclude that a third-party guarantee significantly

reduces PF loan spreads, while PF loan pricing is not a positive function of maturity and loan size. Sorge and Gadanecz (2008) document that whereas credit spreads for both investment-grade and speculative-grade bonds are a positive linear function of maturity, in PF loans the term structure of credit spreads is 'hump-shaped'. Further evidence on the pricing of PF loans is provided by Corielli *et al.*, (2010), who demonstrate that lenders rely upon the network of nonfinancial contracts as a mechanism to control agency costs and project risks. Blanc-Brude and Strange (2007) argue that, in a PF transaction, lenders should price any risk that is not explicitly managed through contracts. Syndication also plays a role in driving credit spreads. Esty and Megginson (2003) show a positive relationship between syndicate size and loan pricing. On the other hand, both Kleimeier and Megginson (2000) report that the presence of larger syndicates reduces credit spreads. Finally, Gatti *et al*. (2013) show that certification can create economic value by reducing loan spreads.

There is only one empirical study related to ours. Dailami and Hauswald (2003) examine the determinants of 105 emerging market PF bond spreads issued between January 1993 and March 2002. Authors find that investors take into consideration the host country's quality of the institutional environment: legal and regulatory obstacles have a relevant and positive impact on bond spreads. Regarding contractual characteristics, authors show that maturity and credit rating are the most important determinants of PF bond pricing. They also provide evidence of the project's industry affecting PF bond spreads, with water and transportation projects having higher spreads, which could be explained by asset-specificity, demand risk and any other specific risk involved.

2.3. Why do firms use project finance?

Extant literature suggests several reasons for firms choosing PF instead of conventional on-balance sheet financing (John and John, 1991; Nevitt and Fabozzi, 2001; Esty 2003, 2004a,b). According to Esty (2003, 2004b), PF deals reduce funding costs by mitigating deadweight costs of market imperfections and frictions, namely agency and asymmetric information problems. Potential lower default renegotiation costs, idiosyncratic risk diversification, and more efficient risk management may also reduce borrowing costs (Esty and Kane 2010). In addition, Corielli *et al.* (2010) argue that PF can reduce the cost of debt by

reducing the amount of assets subject to costs related to financial distress and bankruptcy by separating some assets from their balance sheet.

However, empirical works show that PF deals have higher borrowing costs than traditional corporate debt. Klein *et al.* (1996) find that PF debt is 50-400 bps more expensive than corporate debt because creditors cannot rely on the cross-collateralized cash flows and assets the way they can with corporate debt. Pollio (1998), based on a sample of 330 projects (of which 123 are implemented via PF), finds that average loan spreads are 32 bps higher in PF *vis-à-vis* corporate financing syndicated loans. Similarly, Pinto and Santos (2019) find evidence of higher spreads for European PF syndicated loan deals *versus* corporate bond deals. If PF deals have higher borrowing costs compared to financing a similar asset as part of a corporate balance-sheet, PF structures must entail significant countervailing benefits to offset the incremental transaction and borrowing costs, and time. Esty (2003, 2004a,b) presents four primary reasons for using PF: (*i*) it can be used to mitigate costly agency/conflicts inside project companies and among capital providers - agency cost motivation; (*ii*) it allows companies with little spare debt capacity to avoid the opportunity cost of underinvestment in positive NPV projects - debt overhang motivation (Myers 1977)[9]; (*iii*) it improves risk management - risk management motivation -, as PF arrangements are typically structured as extensive and detailed networks of contracts to transfer a variety of project risks to the parties that are best able to appraise and manage them (Brealey *et al.*, 1996, Corielli *et al.* 2010); and (*iv*) it helps to reduce underinvestment due to asymmetric information problems - asymmetric information motivation (Shah and Thakor, 1987; Kensinger and Martin, 1988).

PF can be used to mitigate costly agency conflicts inside project companies and among capital providers. Large tangible assets with high free cash flows are prone to costly agency conflicts (Jensen, 1986). Through the creation of a legally independent company, PF provides an opportunity to create a new asset-specific governance system to address the conflicts between management and ownership (Finnerty

[9] According to John and John (1991) and Nevitt and Fabozzi (2001), the off-balance-sheet treatment of the funding raised by the SPE is crucial for sponsors since it only has limited impact on sponsors' creditworthiness and does not impact sponsors' ability to access additional financing in the future.

1996, Kensinger and Martin 1988). John and John (1991) and Flannery *et al.* (1993) show that SPEs use joint ownership and high leverage to reduce costly agency conflicts among participants. Therefore, we expect that firms with higher agency costs of free cash flow to select PF to finance large-scale projects.

Brealey *et al.* (1996) and Esty (1999) argue that PF helps to reduce the debt-overhang problem by assigning project returns to new investors rather than existing capital providers. Similarly, John and John (1991) and Flannery *et al.* (1993) show that PF reduces leverage-induced underinvestment through separate incorporation and nonrecourse debt. This structure enhances the verifiability of cash flows by the lender through contractual constraints on cash flows and private enforcement of these contracts (Subramanian and Tung 2016). Under this framework, we expect that firms with high agency costs of debt and with more growth opportunities are more likely to choose PF deals rather than CF bonds.

Esty (1999, 2003) and Corielli *et al.* (2010) point out that PF can help to reduce underinvestment due to asymmetric information problems because the separation of projects from the sponsoring firm(s) facilitates initial credit decisions and it is relatively easy to convey information that would be more difficult in a CF framework. Similarly, John and John (1991) and Gatti *et al.* (2013) argue that PF arrangements are structured as extensive and detailed networks of contracts among the parties involved, which are typically disclosed to lenders, significantly lowering their levels of informational asymmetries. We thus expect that firms with higher information asymmetry prefer PF to CF bond deals.

Shah and Thakor (1987), Kensinger and Martin (1988), John and John (1991), Chemmanur and John (1996), Nevitt and Fabozzi (2001), Esty (2003), and Byoun *et al.* (2013), among others, analyze the advantages and disadvantages of PF in the context of a firm's capital structure. Shah and Thakor (1987) argue that 'project financing enhances the values of some of these projects by permitting higher optimal leverage than with conventional financing.' This allows, as presented by John and John (1991), the value of interest tax shields to be increased, when compared with corporate debt financing. While Chemmanur and John (1996) show that SPEs' leverage depends on the level of control benefits of the project *vis-à-vis* the sponsoring firm, Nevitt and Fabozzi (2001) present the maintenance of financial flexibility as a key benefit for firms when segregating a financing operation such as a PF.

3. Data and variable definition

3.1. Sample selection

Our sample consists of individual bond offers extracted from DCM Analytics and covers the 1993-2020 period. DCM Analytics provides comprehensive information about bond securities issued on the debt capital markets. Although information is available on several types of bonds, we include only those with a deal-type code of 'corporate bond investment-grade' and 'corporate bond high-yield'. As our main focus is that of PF transactions, bonds issued by financial institutions were excluded. DCM Analytics does not have a deal type code of 'project finance bond', so we classified as PF bonds those bonds for which the use of proceeds is 'project finance'. The remaining bonds were classified as CF bonds. To have a more comparable sample and to avoid selection bias problems, we selected only CF bonds for which the issuer industry and country have at least one record of PF bond issuance. We also require that securities have available information on tranche and transaction size. As the unit of observation is a single tranche, multiple tranches from the same PF transaction appear as separate observations in our database. Therefore, to perform a transaction-level analysis in section 5 we aggregate tranche-level data (e.g., credit spread and maturity).

Since we wish to analyze how spreads and pricing processes on PF bonds compare with those of similarly rated CF bonds, we select from our full sample those issues that have the necessary information to compute the spread. We include only bond tranches classified as fixed rate bonds with yield to maturity information. Perpetual bonds, bonds with additional features such as step-up, caps, or floors, and bonds classified as "fixed rate convertible to floating rate note", "fixed rate adjustable", and "fixed rate extendible" are excluded from the database. In order to maximize the survival rate, we search in Datastream for yield to maturity information for those bonds with missing values. As DCM Analytics and Datastream do not have a common identification code, we hand-match borrowers' names. Finally, in order to take possible outliers into account, we winsorize the data for transaction size, maturity, and spread at the 1% and the 99% levels.

These screens yield a sample of 47,196 bonds (36,551 transactions) worth $17,218.1 billion, of which 763 tranches (516 transactions) worth €282.7 billion are classified as PF bonds and 46,433 tranches (36,035 transactions) worth €16,935.3 billion as CF bonds. Panel A of Table 1 presents the industrial distribution of the

full sample of bonds, while Panel B details the bond allocation to an SPE (for PF bonds) or issuers (for CF bonds) in a particular country. Panel A reveals striking differences between PF and CF bond issuance, showing that PF bonds are concentrated in four key industries; i.e., utilities (41.97%), oil and gas (24.21%), transportation (11.85%), and construction/heavy engineering (5.43%) account for 83.5% of all PF bond issuance by volume. CF bond issuance reveals a far less concentrated industrial pattern, with issuers in utilities (14.86%), communications (12.13%), machinery and equipment (11.54%), and services (10.93%) industries receiving the higher percentages. Panel B reveals striking similarities between PF and CF issuance. PF and CF bonds are concentrated in two regions, with issuers located in North America and Europe accounting for 76.5% and 80.9% of all PF and CF issuance by volume, respectively. Perhaps the most remarkable difference is how frequently PF deals are extended to projects in Latin America, the Middle East, and Australia *vis-à-vis* CF deals. On the contrary, while Chinese corporations issue 7.92% of CF bonds, SPEs account for a mere 2.31% of PF issuance.

Panels C provides information in relation to identifying the biggest players and their relative importance in PF and CF bond markets, while Panel D ranks the top 10 bookrunners by value and number of deals. The top 10 PF and CF bond issuers contributed to a different weight, by value of deals: while the top 10 SPEs issue 16.4% of all tranches in our sample, the top 10 CF bond issuers are responsible for only 4.2% of bond issuance. Panel D shows that the top 10 PF and CF bond bookrunners contribute to a weight of 93.1% and 92.0% of all issuance by volume, respectively. It is interesting to note that only 2 banks (RBC Capital Markets and Deutsche Bank) are in the top 10 for PF but not for CF bond issuance.

****** Insert Table 1 about here ******

3.2. Dependent and independent variables

Table 2 provides the detailed definitions and sources for all the variables used, as well as the expected impact of explanatory variables on bond spreads. Summary descriptive statistics are presented in Appendix A. A discussion of the variables used follows.

****** Insert Table 2 about here ******

3.2.1. Spread

Spread corresponds to the price for the risk associated with the bond at closing, defined as the margin yielded by the security at issue above a corresponding currency treasury benchmark with a comparable maturity – the option adjusted spread (OAS). The empirical literature does not tend to corroborate extant theoretical literature that PF transactions allow the reduction of sponsors' cost of borrowing when compared with traditional on-balance-sheet transactions. If this is possible, we expect that PF bonds are issued with lower spreads than similarly rated CF bonds.

3.2.2. Rating

Credit ratings are a central determinant of CF bond spreads (e.g., Collin-Dufresne *et al.*, 2001; Elton *et al.*, 2001; Hull *et al.*, 2004; Titman *et al.*, 2004; Longstaff *et al.*, 2005). Regarding structured finance securities, Cuchra (2005) reports that the importance of credit ratings seems to be far greater than in the case of standard corporate bonds. All tranches in our study have at least one credit rating assigned by S&P or Moody's, which is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=21 (Gabbi and Sironi, 2005; Cornaggia *et al.*, 2017). If a tranche has two credit ratings, we computed the average. Rating scales are inverse scales, so we expect spreads to increase as rating decreases. As some bonds are not rated, we include the dummy variable *rated*, equal to 1 if the bond has a credit rating from S&P and/or Moody's, and 0 otherwise. To examine whether a different rating assigned by S&P and Moody's has any statistically significant impact on credit spreads, we use, as in Gabbi and Sironi (2005), a dummy variable – *rating discordance* – equal to one if the two ratings have a different numeric equivalent value, and zero otherwise. We expect rating agencies' discordance leads to a higher credit spread, reflecting a higher degree of uncertainty concerning the transaction's default risk.

3.2.3. Contractual characteristics

It is widely agreed that bonds with longer maturities tend to be riskier than bonds with shorter maturities. Therefore, investors usually demand higher premiums for longer-term securities. For CF bonds, extant empirical literature typically provides evidence that, on average, the term structure of spreads is upward-sloping. Similarly, Dailami and Hauswald (2003) find, for PF bonds issued to fund large-scale projects in developing countries, a positive relationship between spread and maturity. For structured finance debt, the reported results suggest that the impact of maturity on spreads is non-linear (Sorge and Gadanecz, 2008; Marques and Pinto, 2020; Alves *et*

al., 2021). Therefore, in addition to controlling for *maturity*, we specified the logarithm of maturity in our baseline multiple regression, as a surrogate for any non-linear relationships between credit spread and maturity.

The issue size of a CB is, *ceteris paribus*, positively related to lower uncertainty and higher liquidity than smaller offerings (Gabbi and Sironi, 2005; Chen *et al.*, 2007; Sorge and Gadanecz, 2008). Similarly, Couchra (2005), Vink and Thibeault (2008), and Buscaino *et al.* (2012) find *transaction size* has a negative impact on the spread of securitization bonds. We thus expect larger issues to exhibit lower spreads.

PF structure is typically layered so that each position benefits from the credit protection of all the positions subordinated to it. We use two variables to control for differences in risk existing among different tranches of a deal. First, the *subordinated* dummy variable, which is equal to one for tranches that are subordinated. We expect subordinated bonds to have higher credit spreads than senior bonds. Second, as in Cumming *et al.*, (2019), we use the *number of tranches* as a proxy of the subordination level. We expect this ratio to have a positive impact on credit spread for CF bonds, but a negative relationship for PF bonds.[10]

We expect tranches exposed to *currency risk* to have higher spreads than those that are not. Bank involvement is measured by the *number of banks* supporting the transaction, and we expect a negative relationship for both PF and CF bond spreads (Sufi, 2007). To capture additional differences in bank syndicates, we also control for *bank reputation*, computed according to the yearly Thomson Reuters EMEA bookrunners ranks. As the involvement of banks with a higher reputation may reduce information asymmetries, we expect a negative relationship between bank reputation and spreads (Kara *et al.*, 2016).

Bond tranches for which it is necessary to allocate fixed assets to the operation as an additional bondholders' guarantee may be perceived as a riskier bond issuance. Therefore, we expect the collateralized dummy variable to have a positive impact on spreads. Finally, we include the *callable* dummy variable and expect that the introduction of a call option on both PF and CF bonds increases the spread.

3.2.4. Macroeconomic factors

[10] A tranche belonging to a CB issue with a relatively higher number of tranches is generally seen as less risky in that the deal allows for risk spreading as it is split into several tranches.

To examine the impact of macroeconomic factors on credit spreads, we use *USTB5y-USTB3m*, estimated as the difference between the five-year U.S. Treasury Bond yield and the 3-month U.S. Treasury bill yield, and *market volatility*, measured by the Chicago Board Options Exchange Volatility Index. We expect, for both PF and CF bonds, that increases in the slope of the yield curve should have a negative impact on credit spreads, while a contrary effect is expected for market volatility (Campbell and Taksler, 2003; Titman *et al.*, 2004; Cuchra, 2005; Krishnan *et al.*, 2005; Cremers *et al.*, 2008; An *et al.*, 2011).

We collected Moody's country rating to control for *country risk*. Dailami and Hauswald (2007) and Bonetti *et al.* (2010) report that investors charge higher corporate bond yields to firms that are located in countries with higher sovereign risk. Extant literature argues that laws and institutions of different countries affect financial intermediary development, financial contracting and the cost of borrowing (La Porta *et al.*, 1997, 1998; Esty and Megginson, 2003; Gatti *et al.*, 2013). Stronger investor protection and enhanced and transparent disclosure rules mitigate asymmetric information and agency costs. Dailami and Hauswald (2003) show that legal and institutional frameworks as well as contract enforcement affect PF bond pricing in developing countries. Considering the syndicated loan market, Cumming *et al.* (2019) point out that strong credit protection and efficient debt collection decrease tranche spreads. We thus analyze the impact of *creditor rights* and *enforcement* level on PF and CF bond spreads. Finally, to examine the impact of the supply side conditions of the corporate debt market on credit spreads, we include dummies for *financial crisis* and *sovereign crisis*. We also use industry dummy variables to control for unobserved macroeconomic trends and possible industry-specific variations.

3.2.5. Sponsoring/issuing firms' characteristics

Although PF deals employ bankruptcy remote SPVs, the financial strength of the sponsor, namely for the sponsor holding a controlling position in the vehicle company and in cases of limited-recourse debt, may matter in pricing the debt issued by the SPV (Gorton and Souleles, 2005, 2007). Considering asset securitization securities, Longstaff and Rajan (2008), He *et al.* (2011), and Marques and Pinto (2020) show that originating firms' characteristics affect bond yields. In line with other studies (Chen *et al.*, 2007; Flannery *et al.*, 2012; Lemmon *et al.*, 2014; Marques and Pinto, 2020), we include proxies for sponsoring/issuing firms' size (*log total assets*), financial leverage (*debt to total assets*), asset tangibility (*fixed assets to total assets*), profitability (*return*

on assets), growth opportunities (*market to book*), cash flow generation (*FCF to total assets*), and credit risk (*Z-score*). We expect total assets, fixed assets-to-total assets, ROA, market-to-book, FCF-to-total-assets, and Z-score variables, to have a negative impact on spreads, but a positive relationship between total debt-to-total assets ratio and spreads.

Regarding the choice between PF and CF deals, we also use the previously referred variables as proxies for sponsoring firms' motivations for using PF. First, based on debt choice literature (Denis and Mihov, 2003, Altunbas *et al.*, 2010), we use firm size to capture incentive problems related to information asymmetries and expect it to negatively influence the probability of a sponsoring firm choosing a PF deal rather than a CF deal. We also use the deal's weighted average maturity (*WA Maturity*), computed as the weighted average between the loan maturity, in years, and its weight in the deal size, to capture informational costs associated with liquidity risk induced by debt refinancing. We expect a positive relationship between *WA Maturity* and the probability of a firm choosing a PF deal. Second, to investigate if firms with high agency costs of debt and with more growth opportunities are more likely to choose PF rather than CF, we use debt to total assets and market-to-book ratios (Esho *et al.*, 2001; Denis and Mihov, 2003; Altunbas *et al.*, 2010). We expect that firms with higher deadweight costs resulting from the debt overhang problem, those with higher leverage and investor expectations about future cash flow potential, will prefer PF *vis-à-vis* CF bond deals. Third, we use the free cash flow to assets ratio to examine if firms with higher agency costs of free cash flow increase the likelihood of PF over CF bond deals. Fourth, as in Esho *et al.* (2001) and Denis and Mihov (2003), we use Altman's (1993) *Z-score* as a proxy for a firms' credit risk and expect that sponsoring firms with higher credit risk prefer PF over CF. We also use the bond deals' weighted average spread (*WA Spread*), computed as the weighted average between the bond tranche spread and its weight in the deal size, as a proxy for firms' borrowing costs. Finally, we examine the impact of the firm's profitability and asset tangibility on the choice. We use the return on assets ratio as our surrogate for profitability and expect a negative impact on the probability of PF borrowing. Considering that firms in capital-intensive industries most commonly use PF, we expect asset tangibility to have a positive impact on the likelihood of firms choosing PF *versus* CF.

We collect firm-specific accounting and market data in the fiscal year ending just prior to bond issuance from Datastream. As DCM Analytics does not provide an identification code, we hand-matched the sponsor with the highest equity ownership (if higher than 50%) to the separate PF firm in Datastream by using the sponsor's name. For CF bond deals, data from Datastream is merged with transaction information from DCM Analytics by hand-matching issuers' names. This method allows the deals to be matched with the ultimate party responsible for the financing choice decision.

3.3. Financial characteristics of PF versus CF bonds

We describe the sample, by asset class, in Table 3. This section constitutes the most exhaustive such comparison in the literature. Table 3 also presents Wilcoxon's z-tests and Fisher's exact tests comparing the values of each variable in the PF bond sample with the corresponding values in the CF bond sample. Almost all of the pair-wise comparisons indicate statistically significant differences between the common pricing variables associated with PF *vis-à-vis* CF bonds.

****** Insert Table 3 about here ******

Regarding the relative pricing of PF *versus* CF bonds, Panel A of Table 3 shows that the average spread is economically and statistically higher for PF (241.0 bps) than they are for CF (206.8 bps) bonds. This holds when we break down spreads by credit rating class (Appendix B): mean and median spreads are higher in PF *vis-à-vis* CF bonds for investment-grade classes. We also compare the evolution of spreads by considering a pre-crisis period from January 1, 2000 through to September 14, 2008, and a crisis period from September 15, 2008 (the first trading day after the Lehman Brothers' bankruptcy filing the day before) through to December 31, 2020 (Appendix C). As expected, the evidence strongly supports the assumption that the average spread is significantly higher for both PF (281.74 bps *versus* 232.2 bps) and CF bonds (241.4 bps *versus* 162.4 bps) during the financial crisis and the post-crisis period.[11]

[11] Almost all the pair-wise comparisons presented in Panel A of Appendix C indicate that equality of means for continuous variables can be rejected for PF and CF bonds – except maturity and transaction size for PF and the number of banks for CF. Similar findings are presented in Panel B for dummy variables.

A CF bond of average size matures in 9.6 years, which is a short period if we compare it with the average 13.7 for PF bonds. Average credit ratings for PF (8.5 | BBB) are significantly worse than for CF (6.2 | A-) bonds. This may suggest that PF tranches are riskier than CF lending. However, this can reflect the country rating, since PF issuers are, on average, located in far riskier countries than CF issuers. The average country risk for PF (4.2) SPEs is significantly higher than the corresponding value for CF (2.7), which is in line with the fact that PF deals are more likely to be implemented in developing countries. Similarly, PF bonds are more commonly issued by firms located in countries with lower creditor rights and enforcement levels, when compared with CF.

The average tranche size does not differ significantly between the two asset classes. On the contrary, the average transaction size exhibited by CF bond issues is lower than the average transaction size exhibited by PF bond transactions. This can be explained by the fact that PF is used to finance large-scale projects with highly levered capital structures. Therefore, a significantly larger number of tranches per transaction is issued in a PF transaction: in a typical CF transaction, the average number of tranches per transaction is 1.6, which is smaller than the average of 2.0 for PF. We can thus conclude that PF transactions benefit from tranching to a larger degree than traditional CF transactions.

The average number of banks participating in CF bond issues is 5.9 and is significantly larger than the average of 5.0 for PF. This finding suggests that underwriting banks wish to increase the number of institutions participating in a CF bond issuance of a given size in order to spread risks over a larger number of banks.

Panel B of Table 3 shows that, except for the fixed-assets-to-total-assets ratio, sponsoring firms' characteristics in PF transactions that use the bond market to raise debt differ significantly from those of CF bond issuers. On average, sponsors in PF bonds are typically larger, with an average (median) size of $97.8 billion ($26.2 billion) *versus* $45.1 billion ($17.8 billion) for CF bond issuers. As we expected, PF sponsors are less creditworthy - average Z-score of 1.5 *versus* 2.0 - and profitable - average ROA of 3.7% *versus* 5.5% - and have higher growth opportunities - average market-to-book ratio of 383.5% *versus* 245.8% -, than firms issuing on-balance-sheet CF bonds. The average debt-to-total-assets ratio is 36.4% for CF bond issuers, which is significantly higher than the 34.0% for PF bond sponsoring firms.

The dummy variables detailed in Panel C of Table 3 clearly suggest that PF and CF bonds are fundamentally different financial instruments. PF bonds are more frequently issued with a call option than CB issues (51.8% *versus* 48.8%). While collateralized bonds only represent 7.9% of the CF issues, they account for 37.2% of the PF bonds. PF bonds are much more likely to be subject to currency risk than corporate bonds. While about 3.5% of CF bonds are subordinated, these bonds are only 1.0% of PF bonds issued in the sampling period. Additionally, a significantly small fraction of CF is rated (73.4%) compared to the sub-samples of PF bonds. Finally, CF bonds verify a higher fraction of tranches with rating agencies' discordance, which can be explained by the fact that these bonds are rated *ex-ante versus* PF bonds, typically rated *ex-post*.

Our results indicate that the common pricing characteristics differ significantly in value between PF and CF bonds. Therefore, we would expect the impact on pricing to be bond-specific.

4. The pricing of PF *versus* CF bonds

4.1. Determinants of PF and CF bond spreads

To examine the common pricing determinants of individual PF and CF bonds, we use the model described in equation (1).[12] The dependent variable is the *spread*, in basis points. We employ OLS regression techniques and adjust for heteroskedasticity. Due to time varying risk premia and cross-country differences, we estimate standard errors clustered by year and country.

$$Spread_{i,t} = \alpha_0 + \beta_1 Rated_{i,t} + \sum_{n=2}^{21} \beta_n \, Rating\ dummy_{n,i,t} + \beta_{22}\, rating\ discordance_{i,t} + \gamma\, Contractual\ characteristics_{i,t} + \varphi\, Macroeconomic\ factors_t + \varepsilon_{i,t} \quad (1)$$

A Chow test for a structural break is used to examine whether the spreads associated with PF and CF bonds are influenced differently by common pricing characteristics. In essence, we are testing whether the pricing characteristics used in equation (1) are significant in both PF and CF tranches and, if so, whether they have the same coefficient values. Cornaggia *et al.* (2017) and Marques and Pinto (2020) show that ratings present significant differences across asset classes. We thus perform the same methodology to examine if PF and CF

[12] We use a reduced-form model along the lines of existing pricing models for corporate bonds (e.g., Campbell and Taksler, 2003; Gabbi and Sironi, 2005; Chen *et al.*, 2007; Marques and Pinto, 2020).

bonds are priced differently. We conclude that PF and CF tranches are distinct financial instruments and that they are financial instruments influenced differently by common pricing characteristics because of the Chow test statistic of 41.5 (69.1 if we include firms' characteristics as additional control variables in equation (1)) is higher than the critical level. Hence, we examine the determinants of spreads for each bond instrument separately.

Table 4 presents the results of estimating equation (1) using the samples discussed in section 3.3. We start by comparing spreads among securities. To do that we use equation (1) and create one dummy variable set equal to 1 if the bond is a PF bond, and 0 if it is a CF bond – models [1] and [2]. Results presented in column 1 of Table 4, for the full sample, suggest that PF bonds are, on average, associated with 30.9 bps higher spreads than similarly rated CF bonds. In the previous model, the PF bond dummy may suffer from endogeneity, due to the lack of plausibly exogenous variation in the choice between PF and CF. Second, both PF and CF bond transaction sizes are determined endogenously. Since PF deals are larger, they might be riskier and have higher financing rates. Third, in the full sample, PF bonds are about 2% of the total sample. As suggested by Casu *et al.* (2013) and Roberts and Whited (2013), we re-estimated model [1] for a matched sample, by using a propensity score matching (PSM) approach. To create a matched sample of CF bonds we employ a PSM, by creating a 1 to 1 matching algorithm that captures the most identical bond in the same year, industry and country, using the following characteristics: transaction size and maturity. Results presented in column 2 of Table 4 show that PF bond spread is 51.2 bps higher than that of matched CF bonds. These results are contrary to the arguments of PF theoretical literature (John and John, 1991; Nevitt and Fabozzi, 2001; Esty 2003, 2004a,b), but in line with the empirical findings of Klein *et al.* (1996), Pollio (1998), and Pinto and Santos (2019), which show that loans spreads are higher in PF *vis-à-vis* corporate financing syndicated loans. We will analyze this further in section 4.2, when using endogenous switching regression models and computing average treatment effects.

****** Insert Table 4 about here ******

Models [3] and [4] present pricing regression results for a sample of 763 PF bonds and 46,433 CF issues.[13] Regarding the impact of credit risk on spread, Table 4 shows the exact results expected; rated bonds

[13] Estimations have also been carried out by including year fixed effects multiplied by country fixed effects and results are available from the authors.

have lower spreads and the higher the credit risk, the higher the credit spread. For example, A- bonds have 103.3 bps and 19.0 bps higher credit spreads than AAA tranches for PF and CF bonds, respectively. However, it should be noted that the relationship between spread and rating is not linear; the impact of one unit increase in *credit rating* increases as the credit rating deteriorates. We also estimate models [3] and [4] considering only rated and credit rating dummies as independent variables and find that models yield adjusted R2 values of 0.29 and 0.39, respectively. This confirms credit ratings as the most important determinant of spreads in both PF and CF issues. Furthermore, the adjusted R^2 value increases, on average, 0.24 for PF bonds and 0.17 for CF bonds with the inclusion of additional contractual and macroeconomic variables, which shows that credit rating is not the only determinant of spread. In fact, investors do not rely exclusively on ratings, and this effect is higher for PF *vis-à-vis* CF bonds: they consider other factors when pricing PF and CF bonds, and therefore do rely on information beyond the assigned credit rating. Additionally, we find that credit rating discordance between S&P and Moody's has a substantial positive impact (26.4 bps) on the spread for CF bonds only. This result shows that rating agencies' discordance is incorporated by investors in the pricing of CF bonds, requiring an additional risk premium to compensate for a greater degree of uncertainty concerning the issuer's default risk.

As we expected, a positive relationship between spread and maturity appears strongly significant for CF bonds in model [4]. Contrary to what is presented by extant literature on the term structure of spreads in PF syndicated loans, which finds a hump-shaped relationship between spreads and maturity, the relationship between spreads and maturity is significant and positive for PF bonds. This result is in line with Dailami and Hauswald's (2003) findings for a sample of PF bonds in developing countries. The influence of *transaction size* on spread is negative and significant for both bond types, suggesting that increasing the transaction size of a PF or a CF bond by €100 million will reduce the required credit spread by 73.6 bps and 18.1 bps, respectively. Therefore, our results indicate a positive price liquidity effect related to the size of the bond issuance.

Subordinated, currency risk and callable dummy variables behave differently for PF bonds than for CF bonds. As expected, subordinated CF bonds have higher spreads, after adjusting for the other factors included in the regression. On the contrary, the subordinated variable does not impact spreads in PF bonds. Similarly, the influence of currency risk, as well as the inclusion of a call option on spread, is insignificant for PF bonds, but

positive and significant for CF bonds: a mismatch in the currency of the deal's nationality and the currency of the bond issue significantly increases the rate charged by 41.6 bps, while callable CF bonds are associated with 48.6 bps higher spreads. As we expected, collateralized bonds have higher spreads, while spread and the *number of banks* have a significant and negative relationship for the two security types. In addition, models [3] and [4] show that both bank reputation and the number of tranches per transaction do not affect bond spreads.

As expected, *country risk* is significantly positively related to spread for PF and CF issues, indicating that lending to a borrower located in a country with a rating of BB+ (BB+=11) *versus* one with a rating of AAA (AAA=1) will increase the credit spread by 86.0 bps and 51.3 bps for PF and CF bonds, respectively. The impact of the creditor rights index is, as expected, negative and significant for CF bonds, but insignificant for PF bonds. Contrary to what we expected, CF securities issued in countries with a strong legal enforcement system pay higher yields. As for the creditor rights index, the enforcement level does not impact PF bond spreads. These results do not corroborate Dailami and Hauswald's (2003) findings that institutional frameworks and contract enforcement levels affect PF bond pricing. This might be explained by the fact that, in our sample, the percentage of bond issuances from PF SPEs located in developed countries (80%) is significantly higher than those located in developing countries (20%).

As we use year fixed effects, *financial crisis* and *sovereign crisis* dummies capture the impact of bonds issued between the starting date of each crisis and the end of that year, which can explain the fact that both crises do not affect bond spreads for both PF and CF. Contrary to the results presented by Hu and Cantor (2006) and Sorge and Gadanecz (2008), the slope of the yield curve, *EUTB5y-USTB3M*, does not impact CF bond spreads. In addition, and contrary to what we expected, a steeper yield curve is associated with higher spreads on PF. Finally, spread and market volatility are significantly positively related for CF bonds, but this relationship is insignificant for PF bonds.

To examine further the pricing of PF and CF issues, we re-estimate our models for the high-information sample; i.e., by including firms' characteristics as control variables. When comparing regression results for PF and CF bonds in models [5] and [6] with those in models [3] and [4], we can conclude that the sign and significance of the coefficients are basically the same, with the following differences to be noted: (*i*) both

currency risk and financial crisis variables, as we expected, affect the spread for PF bonds positively; and (*ii*) the coefficient on the number of tranches, which has an insignificant impact on spreads in models [3] and [4], becomes significantly negatively related to spread for both PF and CF bonds; and (*iii*) there is a change of sign regarding the impact of transaction size on CF bond spreads: while in model [4] a larger transaction decreases the spread, in model [6] there is a positive relationship between these variables.

Results reported in model [5] indicate that sponsoring firms' characteristics do not impact PF bond spreads. Regarding CF bonds, results in column 6 of Table 4 show, as expected, that larger firms and those with higher profitability pay lower spreads. Additionally, fixed-assets-to-total-assets ratio and spread have a significant negative relationship. Again, our results show that investors rely on information beyond the credit ratings when pricing both PF and CF bonds and that issuing firms' characteristics play a significant role in the pricing of standard corporate bonds. So far, our results corroborate our arguments that the common determinants of CF bond spreads affect those of PF bonds differently. In fact, the specific characteristics of PF transactions, namely the 'bankruptcy remoteness' feature, the non-recourse or limited-recourse nature of PF debt, and the design and structure of PF deals as a nexus of contracts, can explain the fact that, contrary to traditional on-balance-sheet CF bonds, PF bond spreads depend essentially on the project creditworthiness - proxied by credit rating variables - and other contractual and macroeconomic variables and not on the sponsors' accounting and financial characteristics.

4.2. Bond pricing and borrowing choice

Results in Table 3 show that PF and CF bonds have significantly different characteristics (e.g., the average maturity of PF bonds is 13.7 years *versus* 9.6 years for CF bonds and the last have A/A- average ratings *versus* BBB+/BBB average credit ratings for PF bonds). Therefore, the selection is important in this context. Additionally, in our sample sponsoring firms can choose between project and corporate financing. Table 5 shows that switchers, firms that use both PF and CF deals to fund their investment projects, are responsible for 4,175 deals worth $2,381.4 billion, switching 142 times between such deals.

****** Insert Table 5 about here ******

As the choice between PF and CF deals may be endogenous to spreads, to test the robustness of our results we use an endogenous switching regression model (Lokshin and Sajaia, 2004) to study the pricing, taking into consideration the potential self-selection by firms between issuing PF *versus* CF bonds. We perform a full information maximum likelihood (FIML) method on the credit spread samples of our model specifications – models [5] and [6] of Table 4 – simultaneously with a probit selection equation, where the choice between PF and CF is a function of contractual and firm's characteristics, and macroeconomic factors.[14] The empirical model consists of the following three equations:

$$Spread\ PF\ bond_{i,t} = \alpha_0 + \beta_1 Rated_{i,t} + \beta_2 Rated * Rating_{i,t} + \beta_3\ Rating\ discordance_{i,t} + \\ + \gamma\ Contractual\ characteristics_{i,t} + \varphi\ Macroeconomic\ factors_t + \omega\ Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \quad (2)$$

$$Spread\ CF\ bond_{i,t} = \alpha_0 + \beta_1 Rated_{i,t} + \beta_2 Rated * Rating_{i,t} + \beta_3\ Rating\ discordance_{i,t} + \\ + \gamma\ Contractual\ characteristics_{i,t} + \varphi\ Macroeconomic\ factors_t + \omega\ Firm\ characteristics_{i,t-1} + \varepsilon_{i,t} \quad (3)$$

$$I^*_{i,t} = \delta_0(Spread\ PF\ bond_{i,t} - Spread\ CF\ bond_{i,t}) + \beta_1 Rated_{i,t} + \beta_2 Rated * \\ Rating_{i,t} + \beta_3\ Rating\ discordance_{i,t} + \gamma\ Contractual\ characteristics_{i,t} + \\ + \varphi\ Macroeconomic\ factors_t + \omega\ Firm\ characteristics_{i,t-1} + u_{i,t} \quad (4)$$

where the third equation models bond selection: if $I_i^* > 0$, then firm *i* issues a PF bond; otherwise, it issues a CF bond. We adjust for heteroscedasticity and due to time varying risk premia and cross-country differences, we estimate standard errors clustered by year and country. Considering the Wald test statistics of independent equations presented in Table 6, we reject the hypothesis of equations being independent, meaning that the sponsoring firms' choice between on- *versus* off-balance-sheet funding via the bond market affects the pricing of such securities.

To examine further if characteristically similar bond tranches that differ by bond type have different spreads, we computed the average treatment effect (ATE) for spreads of PF *versus* CF. We used model [7] and obtained the correct standard errors (as we account for the errors in the selection equation) for these ATEs through bootstrapping. We show, as presented in Table 4, that PF bonds are, on average, associated with 41.1 bps higher spreads than CF bonds. We can use two lines of research to explain why PF bonds have higher spreads

[14] We implement an FIML method to simultaneously estimate binary and continuous parts of the model in order to yield consistent standard errors. For further analysis, see Lokshin and Sajaia (2004).

than similarly rated CF bonds. The first, related to PF, is based on the specificities of PF transactions. As pointed out by Dailami and Hauswald (2003), in PF bonds there is no cross-insurance as in the case of CF bonds: the moment the single source of cash flows ceases to exist, the issuer experiences a liquidity crisis that might force it to default on its bonds. In addition, projects suffer from asset-specificity and, when used in developing countries, projects typically suffer from often ill-defined or ill-enforced property rights, and bilateral monopoly settings, leading to higher financial risk. The second studies a mispricing phenomenon in bond markets, namely asset securitization bonds *versus* corporate bonds. Brennan *et al.* (2009) and Coval *et al.* (2009a, 2009b) argue that, as asset-backed securities carry large systematic risks relatively neglected by credit ratings, which are constructed to reflect only physical default probabilities (S&P) or expected losses (Moody's), securitized assets are expected to offer higher yields than similarly rated corporate bonds. Empirically, Wojtowicz (2014) and Cornaggia *et al.* (2017) show that, in the U.S., structured finance bonds exhibit higher yields than similarly rated corporate bonds. Similar results are presented by Marques and Pinto (2020) for a sample of European CDO tranches, corroborating the hypothesis that investors should demand larger spreads for holding securities that carry higher systematic risks.

****** Insert Table 6 about here ******

Results in Table 6 show, again, that the impact of sponsoring (for PF bonds) and issuing (for CF bonds) firms' characteristics on bond spreads is significantly different for PF *vis-à-vis* CF bonds. As in model [6], larger issuing firms and those with higher asset tangibility and profitability face lower CF spreads. For PF bonds, our proxies for size, asset tangibility, profitability, and growth opportunities do not affect spreads. The only difference from the models in Table 4 is that the spreads of both bonds are now positively affected by the debt-to-total-assets ratio. If this result is expected for CF bonds, meaning that more levered issuing firms pay higher spreads, it is surprising for PF bonds. This can be explained by two reasons. First, some PF transactions are financed through limited-recourse debt; i.e., debt upon which a financier can claim certain but not all assets of the sponsor if the SPE defaults. Second, there are projects in which sponsors are also constructors or operators, and off-takers. In this case, a sponsoring firm's higher leverage level increases the overall risk of the project, leading to a higher PF bond spread. This result is in line with extant structure finance literature, showing that

although asset securitization deals employ bankruptcy remote SPVs, the financial strength of the originator may matter in pricing the debt issued by the SPV (Gorton and Souleles, 2007; Landsman et al., 2008). Longstaff and Rajan (2008) show that CDO credit spreads are driven by firm-specific factors, while He *et al.* (2011) find that MBS issued by larger originating firms are sold at higher yields. Marques and Pinto (2020) find that ABS originating from European nonfinancial firms, with more profitability, have lower credit spreads.

Results reported in model [7] for contractual and macroeconomic factors show that the significance and sign of the coefficients are in line with those included in Table 4, with the following differences to consider: (*i*) as expected, rating discordance and volatility variables become significantly positively related to spread for PF bonds; and (*ii*) the coefficients on both bank reputation and sovereign crisis dummy become significant and positive for both security types.

Overall, our results show that PF and CF issues are priced differently by common pricing factors. In our analyses, it is worth noting that investors do consider factors other than credit ratings, some of which are already considered by rating agencies in assessing ratings, not only for CF bonds but also for PF bonds.

Although a thorough analysis of the determinants of bond choices between PF and CF is conducted in section 5, Table 6 presents some interesting results. Findings suggest that sponsoring firms choose PF bonds *vis-à-vis* standard CF bonds when they are relatively smaller and less profitable and levered. In addition, firms resorting to PF bonds have higher asset tangibility, and tend to have larger growth opportunity sets.

4.3. Additional sensitivity tests

We perform a number of additional robustness checks that further control for results in Table 4. First, we re-estimate our models controlling for fees, and find that *management fee* and *gross spread* are significantly and positively correlated with spreads and CF bonds, supporting the idea that risk is priced jointly through spreads and fees for these bonds, but insignificantly for PF bonds.[15] Second, we test the sensitivity of our results to the inclusion of *Z-score* and *FCF-to-total-assets* ratio as additional control variables. We find that, as expected, while there is a significant and negative relationship between these variables and CF bond spreads, the

[15] We did not include these variables in the models presented in Tables 4 and 6 due to the significant reduction of the sample that this imposes. Results are available from the authors upon request.

impact of *Z-score* and *FCF-to-total-assets* ratio on PF bond spreads is insignificant. In addition, we run estimations including year multiplied by country fixed effects. Overall, estimates in Table 4 appear robust to the inclusion of these variables.

5. The sponsoring firms' choice between project financing and corporate financing

This section presents univariate and multivariate analyses examining how sponsoring firms' characteristics and contractual variables influence the choice between PF and CF deals while controlling for macroeconomic factors. Our sample comprises deals that are divided into smaller bond tranches. Therefore, in this section, our descriptive and econometric analyses are based on the deals.

5.1. Firms' characteristics

After applying the procedures mentioned in section 3.2.5., we identified 516 and 36,035 firms that were sponsors and issuers of PF and CF bonds, respectively. Of these firms, 53 were sponsors of PF bonds only - category [I] -, 13,136 were issuers of CF bonds only - category [II] -, and 3,599 were classified as switchers - category [III]. Table 7 reports the characteristics of firms segmented into three categories according to their issuance record. Results show that, on average, firms that used only PF deals are typically less levered and have lower profitability and lower fixed-assets-to-total-assets and FCF-to-total-assets ratios, than those accessing CF bond markets, exclusively. While firms' size and creditworthiness do not differ at the 1% significance levels for the two subsets of firms, firms that used only CF deals have a lower market-to-book ratio than firms that used only PF. Firms utilizing both markets are larger than those reliant on PF or CF only. They have relatively higher asset tangibility and profitability, but lower Z-scores than firms in categories [I] and [II] do. Firms that used PF and CF simultaneously are more levered and have a higher FCF-to-total-assets ratio when compared with firms that issued PF only, but these ratios are lower than those belonging to firms in category [II]. Finally, the market-to-book ratio is significantly higher for firms that use both debt types than for those that use CF deals only. Thus, so far, our results are in line with the argument that PF transactions allow sponsors to mitigate debt overhang problems, working as a funding source diversification mechanism, and improving profitability ratios - the off-

balance-sheet treatment of the funding raised by the SPV is crucial for sponsors since it only has limited impact on sponsors' performance.

****** Insert Table 7 about here ******

5.2. Do AS transactions have a lower cost of borrowing than CB?

To investigate the choice determinants between off-balance-sheet financing, via PF, and on-balance-sheet financing, via CF, we utilize a logistic regression model. Our dependent variable, choice of debt, is a binary variable equal to 1 if the firm closes a PF deal and 0 if it closes a CF deal.

$$Choice\ of\ debt_{i,t} = \alpha_0 + \beta \times Corporate\ characteristics_{i,t-1} + \gamma \times Contractual\ characteristics_{i,t} + \varphi \times Macro\ factors_t + \varepsilon_{i,t} \quad (5)$$

where the subscripts refer to deal *i* at time *t*. Coefficients were estimated based on heteroskedasticity-consistent standard errors clustered by year and firm. Furthermore, in Tables 8 and 9, we report coefficients, rather than odds ratios (exponential coefficients) because our main interest is in the direction of the effects, rather than their magnitude.

Table 8 reports the results of the logistic regression (5). Estimations were developed following a stepwise approach, focusing firstly, on deals for which we have no loss of observations due to lack of information on firms' characteristics. Second, we introduce the *Z-score* and *FCF to total assets* variables one at a time to assess the impacts of firms' creditworthiness and cash flow generation capacity on the choice process. Third, we focus on a sub-sample of sponsoring firms that use PF and a matched sample of firms that borrow through comparable CF deals. To create a matched sample of firms that use CF, we employ a PSM approach, by creating a 1 to 1 matching algorithm that captures the most identical deal in the same year, industry, and country, using the following characteristics: transaction size and WA Maturity. This allows us to examine what is correlated at firm level with the choice between PF and CF based on a comparable sample of deals. Finally, in Table 9, the same estimation method was extended to also include

firms that used both instruments during the period of study, the switchers, to guarantee that our results are unbiased and that firms can in fact choose between PF and CF.[16]

Results reported in all models of Table 8 show that, as expected firms with potential asymmetric information problems, relatively smaller ones, prefer project financing. Moreover, our findings document that coefficients of the *WA Maturity* variable are significant and positive, which support the security design literature (Flannery 1986, Diamond 1991, 1993): borrowers seeking to minimize informational costs associated with liquidity risk induced by debt refinancing will choose PF rather than CF. PF arrangements are structured as extensive and detailed networks of contracts, enhancing the predictability of expected cash flow streams and, consequently, allowing SPVs to raise funding with longer maturities (John and John 1991, Gatti *et al.* 2013). Therefore, we corroborate our prediction that sponsors with higher information asymmetry prefer PF to CF deals.

****** Insert Table 8 about here ******

Results from models [8] to [11] document that firms' financial leverage does not impact their likelihood of accessing PF markets. We only find a significant positive relationship between the *market-to-book* variable and the likelihood of observing a PF deal in model [8]. Similarly, we only find evidence of sponsors with a larger growth opportunity set increasing the probability of observing a PF deal in model [11]. So far, our results do not corroborate the debt overhang motivation of sponsoring firms to use PF. We will examine this topic further in section 5.3, when focusing our analysis on switchers.

We find that, when controlling for other micro and macro variables, profitability reduces the likelihood of accessing the PF market, which is in line with the argument that firms with lower profitability use PF rather than CF to implement large, risky projects. In line with PF literature (Nevitt and Fabozzi 2001, Gatti 2008), we thus show that firms choose off-balance-sheet over on-balance-sheet financing to

[16] In unreported estimations, we examine whether results presented in Table 8 and 9 are robust by considering firm fixed effects to address possible time invariant firm-level issues. As results remain robust in these models and we re-estimate our models for switchers only, we present results including industry fixed effects only. We also re-estimate our models by using year times industry and country times industry fixed effects, and results are qualitatively the same. Results are available from the authors if required.

improve or maintain sponsors' key financial ratios. Results also show that firms that employ both PF and CF lending within our sample period – switchers – are more likely to choose PF deals when issuing new debt. Sponsors that have already participated in PF face lower transaction costs, which is no surprise as PF transactions are expensive to orchestrate and take longer to execute.

To examine if sponsoring firms use PF to mitigate underinvestment problems due to distress costs; i.e., if off-balance-sheet financing can create value especially for sponsoring firms that are risky, in model [9], we include the Z-score as an additional control variable. We find, as expected, that the less creditworthy firms, on average, prefer PF to CF deals. Hence, firms with lower Z-scores prefer PF as it prevents contamination risk: the separation of projects in an SPV prevents the new project from contaminating the firm or other projects with a positive NPV. Thus, our results support the risk management motivation of using PF, as these SF deals are more relevant for sponsors with higher expected costs of distress, either from a higher probability of distress or higher costs given distress.

In model [10], we re-estimate model [8] by including the free cash flow to total assets ratio as an additional independent variable. We find no evidence of firms with higher agency costs of free cash flow increasing the likelihood of PF *vis-à-vis* CF. Therefore, using firm-level data, our results do not corroborate those of Subramanian and Tung (2016), who find a positive relationship between industry's free cash flow to total assets' averages and the sponsoring firms' choice of a PF transaction.

Concerning contractual determinants, we find that deal size positively affects the probability of observing a PF deal in all models of Table 8. Sponsoring firms choose PF over CF when issuing large amounts of debt due to issuance costs; i.e., PF is used for relatively large amounts of debt to economize on scale. In addition, and building on the evidence obtained in section 4 that PF bonds have higher spreads than CF bonds, we analyze how borrowing costs affect the choice process. Concerning the impact of *WA Spread* on the choice between PF and CF deals, results for our samples document that there is a significant positive relationship between our cost of borrowing proxy and the probability of observing a PF deal. This can be in part explained by the negative relationship between *WA Rating* and the likelihood of observing PF deals.

Our results corroborate Esty (2003) and Corielli *et al.* (2010), who point out that PF is most commonly used in riskier countries, for all models in Table 8. We also find a significant and negative impact of the financial crisis on the choice process. While the *creditor rights* variable significantly and positively affects the sponsors' choice of PF over CF deals in all models, the impact of the enforcement level is significant and negative. Finally, results also document that market volatility negatively affects the probability of observing a PF deal.

In short, by comparing PF and CF debt choices, we find evidence that firms use PF to reduce underinvestment due to asymmetric information problems. So far, we do not find evidence that the debt choice is related to the agency cost motivation: results do not corroborate that firms with higher deadweight costs resulting from the debt overhang problem, and those with higher agency costs of free cash flow, are more likely to choose PF. We also find that firms choose PF rather than CF when issuing relatively large amounts of debt because of the potential economies of scale in relation to issuance costs for PF. Results show that firms with lower profitability use PF rather than CF to implement large, risky projects. PF deals allow sponsors to maintain financial flexibility by creating non-recourse vehicle entities. In turn, this helps sponsors protect or improve their financial ratios, with a limited impact on sponsors' creditworthiness. Finally, our results support the risk management motivation of using PF, but not extant literature that argues that firms use PF to reduce the cost of borrowing.

5.3. A switcher-focused analysis

Sponsors that switch between PF and CF, those that use extensively both on-and off-balance-sheet syndicated debt, may provide interesting insights into the choice determinants. Additionally, a switcher-focused analysis will solve endogeneity concerns that may arise in the choice between PF and CF in the previous sections. In fact, we do not know whether PF was chosen because the firm had high credit risk and did not get access to CF or because the firm had the option to choose between PF and CF and decided to choose PF. We start by re-estimating model [8] for switchers only. Second, we re-estimate model [12] by including the free cash flow to assets ratio as an additional control variable, to examine again if firms with

higher agency costs of free cash flow increase the likelihood of PF *vis-à-vis* CF (model [13]). Finally, we re-estimate model [12] by including the Z-score, a proxy for a firm's creditworthiness (model [14]).

Columns 1 to 3 of Table 9 show that the significance and sign of the coefficients are in line with those presented in Table 8. Our results corroborate the asymmetric information motivation for sponsoring firms using PF; i.e., firms that switch between PF and CF, with higher information asymmetry, prefer PF to CF to implement large projects. We find that while the variable *log total assets* has a significant negative effect on the choice of PF, the higher WAM increases the probability of observing a PF deal for all models. We find that switchers choose PF for relatively large amounts of debt to economize on scale, as deal size positively affects the choice of PF deals, and firms resorting to PF are less profitable.

****** Insert Table 9 about here ******

Results do not corroborate, again, the debt overhang motivation for switchers as proxies for leverage level and growth opportunities do not affect firms' choice between PF and CF. Similarly, as with model [10] in Table 8, model [14] again shows no evidence in favor of the agency cost motivation for sponsoring firms using PF *versus* CF, as the free cash flow to total assets variable has an insignificant impact on the probability of observing a PF deal.

In model [13], we also control for Z-score and corroborate the findings obtained previously: less creditworthy firms, on average, prefer PF to CF deals, which provides evidence in favor of the risk management motivation of using PF. Finally, switchers do not use PF deals to reduce the cost of borrowing.

Considering the impact of macroeconomic factors on the choice, results show, again, that PF transactions are chosen to implement projects in riskier than average countries and with lower contract enforcement, which is in line with the law and finance literature. This literature argues that legal systems that protect investors through effective contract enforcement promote financial development and facilitate external financing, new firm formation and efficient capital allocation (La Porta *et al.*, 2000; Beck and Levine, 2002; Levine, 2002). In addition, our results are also in line with those of Esty and Megginson (2003) and Dailami and Hauswald (2007): legal and institutional frameworks of the host country affect financial contracting and the cost of borrowing.

Hence, PF transactions allow sponsors to obtain funding with longer maturities, maintain financial flexibility and protect their credit standing and future access to credit lending by creating non-recourse vehicle entities to carry the debt. In addition, sponsors use PF deals to diversify their funding sources while improving risk management and mitigating problems associated with information asymmetry.

6. Summary and conclusions

The 2008 financial crisis and the more recent recession caused by the COVID-19 pandemic have forced many governments in both advanced and emerging market economies to implement strong intervention aimed at increasing the level of private investment in an effort to improve the infrastructure capital of the country and strengthen their economies. This goal is, however, limited by serious budget constraints that many governments (e.g., in southern European countries) are already facing today. Thus, in a scenario where the need for private investment in public infrastructure becomes critical, project finance (PF) is destined to play a key role, with the PF bond market being fundamental in such a process. A comparative analysis of PF and traditional corporate finance (CF) bond spreads and pricing factors along with an examination of the choice determinants of PF *versus* CF transactions has never been addressed before in academic literature. With this paper, we intend to fill this gap by using a cross-section of worldwide bonds closed in the 1993-2020 period.

We find that PF and CF bonds are securities influenced differently by common pricing characteristics, PF bonds have higher spreads than CF bonds and spreads convey information beyond credit ratings across PF and CF bonds. A detailed analysis of how sponsoring firms' characteristics affect bond spreads reveals that the debt to total assets ratio is the unique determinant of PF bond spreads, while sponsoring firms' choice between PF and CF bonds affects the pricing of such securities. By comparing firms' debt choices, our results are consistent with the use of PF *vis-à-vis* CF deals as a mechanism that facilitates the reduction of the deadweight costs from asymmetric information problems and improves risk management. Interestingly, we find that firms resorting to PF are less profitable, public firms choose PF for relatively large amounts of debt to economize on scale, and legal and institutional frameworks of the host country as well as its creditworthiness affect the choice between PF and CF.

Considering the increasing role of PF in a post-Basel III scenario, where syndicated long-term lending is more and more strangled by capital requirements, we believe that this study is important not only to investors but also to policymakers. Considering the important role of PF in promoting public investment and as a driver of economic growth (Kleimeier and Versteeg, 2010), we believe that policymakers should have better knowledge of PF bond instruments, allowing for more precise and efficient regulatory interventions.

In addition, our findings indicate that credit ratings may be limited in this purpose, since investors do not rely exclusively on ratings when pricing bonds, and this effect is higher for PF *vis-à-vis* CF bonds. Given the contracting complexity of PF transactions and the frequent unavailability of detailed information about the nexus of contracts used and the underlying cash flows, many investors do not have the expertise, or the incentive, to price these bonds correctly and have to rely on credit ratings, or incur free riding (Brennan *et al.*, 2009; Pagano and Volpin, 2012). We argue that improving transparency and disclosure standards in PF bond markets, mainly through rating agencies (e.g., methodological information, key assumptions, underlying data used, and fees), may improve markets informational efficiency and make it possible for non-institutional investors to access these markets as well. In addition, the 'rating inflation' observed in structured finance products, mainly for CDO, during the 2008 financial crisis (Griffin and Tang, 2012; Griffin *et al.*, 2013; Cornaggia *et al.*, 2017) led legislators and regulators to propose that credit ratings should be applied consistently across asset classes. We show that a standardized credit rating approach for PF and CF classes can be dangerous, since we document significant differences in spreads and pricing of PF *versus* CF bonds.

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Table 1: Industrial and geographic distribution, and top issuers and bookrunners

Panel A: Industrial distribution

Industrial category of issuer	Project finance bonds			Corporate finance bonds		
	Number of Bonds	Total Value ($ Million)	Percent of total value	Number of Bonds	Total Value ($ Million)	Percent of total value
Commercial and Industrial						
Agriculture, Forestry and Fishing	2	525	0.19%	885	244,570	1.44%
Communications	33	11,239	3.97%	3,836	2,053,958	12.13%
Construction/Heavy Engineering	59	15,359	5.43%	4,162	1,053,221	6.22%
Manufacturing						
Chemicals. Plastic and Rubber	6	3,380	1.20%	1,641	554,985	3.28%
Food and Beverages	1	1,000	0.35%	1,946	748,540	4.42%
Machinery and Equipment	9	3,387	1.20%	4,408	1,955,066	11.54%
Steel, Aluminum and other Metals	1	175	0.06%	1,314	403,651	2.38%
Other	2	73	0.03%	1,602	579,175	3.42%
Mining and Natural Resources	17	3,238	1.15%	847	391,875	2.31%
Oil and Gas	118	68,447	24.21%	3,386	1,618,532	9.56%
Real Estate	39	12,845	4.54%	4,124	1,066,607	6.30%
Real Trade	5	738	0.26%	1,475	580,250	3.43%
Services	28	5,877	2.08%	4,591	1,851,508	10.93%
Utilities	330	118,662	41.97%	7,837	2,516,095	14.86%
Transportation	94	33,504	11.85%	3,629	1,078,324	6.37%
Public Administration/Government	18	4,196	1.48%	21	5,114	0.03%
Other	1	100	0.04%	729	233,859	1.38%
Total	**763**	**282,745**	**100.00%**	**46,433**	**16,935,330**	**100.00%**

Panel B: Geographic distribution

Geographic location of issuer	Project finance Bonds			Corporate finance Bonds		
	Number of Bonds	Total Value ($ Million)	Percent of total value	Number of Bonds	Total Value ($ Million)	Percent of total value
North America	391	152,450	53.92%	22,117	8,845,470	52.23%
United States	244	108,729	38.45%	19,654	8,011,426	47.31%
Canada	99	25,967	9.18%	1,877	630,372	3.72%
United Kingdom	76	42,052	14.87%	5,463	3,219,262	19.01%
Western Europe	51	14,330	5.07%	2,337	1,109,361	6.55%
Eastern Europe	10	4,681	1.66%	337	176,738	1.04%
Northern Europe	9	2,826	1.00%	1,733	348,118	2.06%
Middle East	14	11,045	3.91%	292	161,359	0.95%
Qatar	7	5,630	1.99%	21	15,223	0.09%
South Africa	3	3,250	1.15%	94	31,218	0.18%
South East Asia	64	18,593	6.58%	7,602	1,676,338	9.90%
China	31	6,527	2.31%	6,174	1,340,691	7.92%
Malaysia	13	6,575	2.33%	112	26,245	0.15%
Australia	36	12,049	4.26%	677	218,146	1.29%
Latin America	99	17,552	6.21%	1,849	341,671	2.02%
Brazil	61	6,998	2.48%	1,359	235,825	1.39%
Chile	11	3,675	1.30%	165	61,709	0.36%
Other	10	3,917	1.39%	3,932	807,649	4.77%
Total	**763**	**282,745**	**100.00%**	**46,433**	**16,935,330**	**100.00%**

(Continued)

Table 1: Industrial and geographic distribution, and top issuers and bookrunners
(continued)

Panel C: Top 10 issuers

Project Finance Bonds			Corporate Finance bonds		
	By value of deals	By number of deals		By value of deals	By number of deals
Sabine Pass Liquefaction LLC	4.37%	1.18%	China Railway Corporation	0.69%	0.16%
Pemex Project Funding Master Trust	2.23%	0.92%	BP Capital Markets plc	0.60%	0.25%
North West Redwater Partnership	1.76%	1.70%	BMW Finance	0.40%	0.15%
Pemex Finance Ltd	1.72%	2.10%	IBM	0.39%	0.16%
Calpine Corporation	1.23%	1.05%	Telefonica Emisiones SAU	0.39%	0.12%
NGPL PipeCo LLC	1.06%	0.39%	John Deere Capital Corp.	0.37%	0.29%
Iberdrola International BV	1.05%	0.39%	GE Capital	0.35%	0.09%
Mexico City Airport Trust	0.99%	0.26%	AT&T Inc.	0.35%	0.09%
Gatwick Funding Ltd	0.99%	0.79%	Électricité de France, SA	0.34%	0.12%
Cheniere Corpus Christi Holdings	0.97%	0.26%	Petróleos Mexicanos	0.32%	0.17%

Panel D: Top 10 bookrunners

Project Finance Bonds			Corporate Finance bonds		
	By value of deals	By number of deals		By value of deals	By number of deals
Citigroup Inc.	34.56%	34.86%	Citigroup Inc.	45.51%	38.72%
Bank of Tokyo Mitsubishi	17.83%	13.00%	Bank of America Merril Lynch	12.02%	12.15%
Bank of America Merril Lynch	10.40%	9.31%	Bank of Tokyo Mitsubishi	9.99%	9.58%
JP Morgan	9.51%	9.01%	JP Morgan	9.63%	9.75%
Crédit Agricole CIB	6.23%	4.28%	HSBC	3.83%	3.27%
HSBC	4.56%	5.91%	Crédit Agricole CIB	2.90%	1.92%
Barclays	2.89%	3.40%	BNP Paribas	2.73%	2.02%
Credit Suisse	2.86%	3.25%	Barclays	2.05%	2.19%
RBC Capital Markets	2.37%	4.28%	Credit Suisse	1.79%	4.56%
Deutsche Bank	1.93%	0.89%	Goldman Sachs	1.58%	2.08%

Panel A describes the industrial distribution of bonds, whereas Panel B details the bond allocation to issuers in a particular country. Panel C provides information on the biggest players and their relative importance in PF and CF bond markets, while Panel D ranks the top 10 bookrunners by value and number of deals. Data are for bonds with spread and tranche/transaction amount available, closed by worldwide issuers during the 1993-2020 period.

Table 2: Definition of variables, sources, and the expected impact on credit spread

Variable Name	Variable definition	Source	Expected impact on spread	
			PF bonds	CF bonds
Dependent Variables:				
Spread	Margin yielded by the security at issue above a corresponding currency treasury benchmark with a comparable maturity (OAS).	DCM Analytics		
Choice of debt	Dummy equal to 1 if the firm closes a PF deal and 0 if it, instead, closes a CF deal.	Authors'		
Independent variables:				
Contractual characteristics				
Rated	Dummy equal to 1 if the bond has a credit rating from S&P or Moody's, and 0 otherwise.	DCM Analytics	-	-
Rating	Bond rating based on the S&P and Moody's rating at the time of bond issuance. The rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22.	DCM Analytics	+	+
Rating discordance	Dummy equal to 1 if S&P and Moody's assign a different credit rating for the same tranche, and 0 otherwise.	DCM Analytics	+	+
Maturity	Maturity of bonds, in years.	DCM Analytics	**NL**/ +	+
Transaction size	Bond transaction size, computed as the sum of all tranches per deal/transaction. Transaction size is converted into $ millions when necessary.	DCM Analytics	-	-
Subordinated	Dummy equal to 1 for tranches that are subordinated, and 0 otherwise.	DCM Analytics	+	+
Number of tranches	The number of tranches per transaction.	DCM Analytics	-	+
Currency risk	Dummy equal to 1 for bonds that are denominated in a currency different from the currency in the deal's nationality, and 0 otherwise.	DCM Analytics	+	+
Number of banks	The number of financial institutions participating in bond issuance, as bookrunners, underwriters or servicers.	DCM Analytics	-	-
Bank reputation	Bookrunners rank according to Thomson Reuters League Tables. Ranks range from 1 (worst) to 25 (best).	Thomson Reuters DMI	-	-
Collateralized	Dummy equal to 1 if a bond is collateralized, and 0 otherwise.	DCM Analytics	+	+
Management fee	Fees (in bps) that are periodically paid to the bank syndicates.	DCM Analytics	+	+
Gross spread	Gross spread (in bps) per tranche as given by bookrunner.	DCM Analytics	+	+
Callable	Dummy equal to 1 if the bond has a call option, and 0 otherwise.	DCM Analytics	+	+
Firm characteristics				
Log total assets	Natural logarithm of firm total assets measured in $ million.	Datastream	-	-
Debt to toal assets	The ratio of total debt to total assets.	Datastream	+	+
Fixed assets to total assets	The ratio of fixed assets to total assets. Fixed assets includes property, plant and equipment.	Datastream	-	-
Market to Book	The sum of book value of liabilities and market value of equity divided by the book value of assets.	Datastream	-	-
Return on Assets	The net income before preferred dividends minus preferred dividend requirement, divided by total assets.	Datastream	-	-
Log Z-score	Logarithm of Altman's (1993) Z-score. Altman's Z-score is calculated as Z= 1.2 (Working Capital/Total Assets) + 1.4 (Retained Earnings/Total Assets) + 3.3 (Earnings Before Interest and Taxes/Total Assets) + 0.6 (Market Value of Equity/Book Value of Liabilities) + 0.999 (Net Sales/Total Assets).	Datastream	-	-
FCF to total assets	The ratio of Free Cash Flow to total assets.	Datastream	-	-
Macroeconomic factors				
Volatility	The Chicago Board Options Exchange Volatility Index (VIX). VIX reflects a market estimate of future volatility.	Datastream	+	+
USTB5y-USTB3m	The slope of the U.S. Treasury swap curve. Obtained as the difference between the five-year U.S. Treasury Bond yield and the 3-month U.S. Treasury bill yield.	Datastream	-	-
Country risk	Moody's country credit rating at close. The rating is converted as follows: Aaa=1, Aa1=2, and so on until C=22.	Moody's Global Rating	+	+
Financial crisis	Dummy equal to 1 if the closing date falls within the 2007-2008 financial crisis period (September 15, 2008 – December 31, 2014) and 0, otherwise.	Authors'	+	+
Sovereign crisis	Dummy equal to 1 if the closing date falls within the sovereign debt crisis period (April 24, 2010 – December 31, 2016) and 0, otherwise.	Authors'	+	+
Creditor rights	Measured using La Porta, Lopez-de-Silanes, Shleifer and Vishny's (1998) indices. We use four creditor rights variables (no automatic stay on assets; secured creditors first paid; restrictions for going into reorganization; management does not stay in reorganization) and added up the scores to create an index as in Esty and Megginson (2003).	LLSV (1998)	-	-
Enforcement	Measured using La Porta, Lopez-de-Silanes, Shleifer and Vishny's (1998) indices. We use five enforcement variables (efficiency of judicial system; rule of law; corruption; risk of expropriation; risk of contract repudiation) and added up the scores to create an index.	LLSV (1998)	-	-

The following characters mean: – = negative impact on the credit spread | + = positive impact on the credit spread | NL = Not linear |

Table 3: Univariate statistics - pricing features associated with bonds compared

Variable of interest	Project finance bonds	Corporate finance bonds	Variable of interest	Project finance bonds	Corporate finance bonds
Panel A | Univariate analysis - continuous variables | Contractual characteristics					
Credit spread (bps)			**Transaction size ($ Million)**		
Number	763	46,433	Number	763	46,433
Mean	241.0	206.8 ***	Mean	611.0	593.0 ***
Median	195.0	145.7	Median	450.0	321.0
Rating [1-22 weak]			**Tranche size ($ Million)**		
Number	592	45,603	Number	763	46,433
Mean	8.5	6.7 ***	Mean	371.0	365.0
Median	9.0	7.0	Median	282.0	250.0
Maturity (years)			**Number of banks**		
Number	763	46,433	Number	763	46,433
Mean	13.7	9.6 ***	Mean	5.0	5.9 ***
Median	10.0	7.1	Median	4.0	4.0
Number of tranches			**Country risk [1-22 weak]**		
Number	763	46,433	Number	763	46,433
Mean	2.0	1.6 ***	Mean	4.2	2.7 ***
Median	1.0	1.0	Median	1.0	1.0
Creditor rights [0-4 strong]			**Enforcement [32-85 strong]**		
Number	763	46,433	Number	763	46,433
Mean	1.5	1.6 ***	Mean	66.6	70.2 ***
Median	1.0	1.0	Median	68.7	72.0
Panel B | Univariate analysis - continuous variables | Firm characteristics					
Total assets ($ million)			**Return on assets**		
Number	364	22,499	Number	364	22,499
Mean	97,794.5	45,116.6 ***	Mean	3.7%	5.5% ***
Median	26,165.6	17,779.7	Median	3.7%	5.0%
Fixed assets to total assets			**Market to book**		
Number	364	22,499	Number	364	22,499
Mean	46.3%	44.7%	Mean	383.5%	245.8% ***
Median	57.4%	43.9%	Median	212.1%	181.1%
Debt to total assets			**Z-score**		
Number	364	22,499	Number	281	20,068
Mean	34.0%	36.4% ***	Mean	1.5	2.0 ***
Median	34.3%	35.4%	Median	0.8	1.1
Panel C | Univariate analysis - dummy variables | Contractual charcteristics					
Callable			**Currency risk**		
Nr. of tranches	763	46,433	Nr. of tranches	763	46,433
Nr. of tranches with d=1	395	22,659 ***	Nr. of tranches with d=1	244	9,806 ***
% of total	51.80%	48.80%	% of total	32.00%	21.10%
Collateralized			**Subordinated**		
Nr. of tranches	763	46,433	Nr. of tranches	763	46,433
Nr. of tranches with d=1	284	3,671 ***	Nr. of tranches with d=1	8	1,633 ***
% of total	37.20%	7.90%	% of total	1.00%	3.50%
Rated			**Rating discordance**		
Nr. of tranches	763	46,433	Nr. of tranches	763	46,433
Nr. of tranches with d=1	592	34,074 ***	Nr. of tranches with d=1	186	13,435 ***
% of total	77.60%	73.40%	% of total	24.40%	28.90%

This table reports summary statistics for a sample of PF and CF bonds issued during the 1993-2020 period. Information on the characteristics of bond issuances was obtained from DCM Analytics and Datastream. We test for similar distributions using Wilcoxon's rank-sum test for continuous variables and Fisher's exact test for discrete ones. ***, **, and * indicate significant difference at the 1%, 5%, and 10% levels, respectively, between the sample of PF bonds and the sample of CF bonds. Bond rating is based on the S&P and Moody's rating at the time of bond issuance. The rating is converted as follows: AAA=Aaa=1, AA+=Aa1=2, and so on until D=22. For a definition of the variables, see Table 2.

Table 4: Regression analyses of the determinants of credit spreads

Dependent variable: Spread (bps)	[1] PF and CF bonds	[2] PF and CF bonds | matched sample	[3] PF bonds	[4] CF bonds	[5] PF bonds | with firms' characteristics	[6] CF bonds | with firms' characteristics
Independent variables:						
Intercept	211.52 ***	88.97	650.41 ***	115.25	371.35	-231.08 ***
	(0.002)	(0.174)	(0.000)	(0.102)	(0.117)	(0.000)
PF bond	30.85 **	51.24 ***				
	(0.033)	(0.000)				
Rated	-97.23 ***	-106.60 ***	-131.60 ***	-92.92 ***	-86.22 **	-68.83 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.01)	(0.000)
AA+	-29.85 ***	-6.12	55.17	-34.56 ***	-89.59	-52.29 ***
	(0.002)	(0.637)	(0.245)	(0.000)	(0.121)	(0.000)
AA	-26.39 **	-19.91	63.87 *	-31.65 ***	37.49 **	-34.73 ***
	(0.023)	(0.224)	(0.052)	(0.006)	(0.039)	(0.008)
AA-	-18.41 **	-0.84	150.30 ***	-23.34 ***	8.03	-9.76
	(0.015)	(0.940)	(0.000)	(0.002)	(0.882)	(0.248)
A+	-3.14	22.34 **	42.92	-7.93	-16.25	-6.35
	(0.684)	(0.047)	(0.198)	(0.299)	(0.645)	(0.36)
A	9.94	33.28 ***	58.14 **	4.85	16.05 *	5.40
	(0.2)	(0.006)	(0.027)	(0.523)	(0.065)	(0.457)
A-	24.00 ***	50.60 ***	103.30 ***	18.97 **	23.47 **	18.25 **
	(0.002)	(0.000)	(0.000)	(0.012)	(0.037)	(0.017)
BBB+	54.91 ***	79.31 ***	133.50 ***	49.33 ***	10.87	43.83 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.735)	(0.000)
BBB	72.75 ***	101.07 ***	128.40 ***	67.82 ***	93.18 ***	62.75 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.000)
BBB-	113.40 ***	142.62 ***	185.50 ***	107.70 ***	141.40 ***	102.00 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BB+	187.90 ***	220.10 ***	213.00 ***	182.90 ***	232.30 ***	177.00 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BB	204.00 ***	243.78 ***	291.40 ***	198.00 ***	201.60 ***	200.50 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
BB-	264.80 ***	286.27 ***	409.70 ***	258.80 ***	334.60 ***	246.90 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
B+	317.10 ***	326.36 ***	390.00 ***	311.00 ***	178.40 ***	300.30 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
B	365.50 ***	366.83 ***	400.90 ***	360.00 ***	502.90 ***	340.50 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
B-	408.50 ***	421.54 ***	505.20 ***	402.80 ***	172.50	385.50 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.127)	(0.000)
CCC+	498.60 ***	497.16 ***	562.10 ***	492.50 ***	544.70 ***	481.80 ***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
CCC	545.30 ***	516.07 ***		539.80 ***		573.40 ***
	(0.000)	(0.000)		(0.000)		(0.000)
CCC-	511.50 ***	517.25 ***	-180.90 ***	545.60 ***		500.90 ***
	(0.000)	(0.000)	(0.001)	(0.000)		(0.000)
CC	478.90 ***	567.92 ***	510.80 ***	558.20 ***		
	(0.000)	(0.000)	(0.000)	(0.000)		
C	357.20 ***	453.73 ***		354.10 ***		426.80 ***
	(0.000)	(0.000)		(0.000)		(0.000)
Rating discordance	26.55 ***	24.63 ***	17.58	26.43 ***	-5.48	18.27 ***
	(0.000)	(0.000)	(0.204)	(0.000)	(0.722)	(0.000)
Maturity	1.04 ***	1.61 *	1.30 *	1.02 ***	0.35	1.34 ***
	(0.000)	(0.056)	(0.059)	(0.000)	(0.738)	(0.000)
Log maturity	0.05	2.99	20.57 **	10.35 ***	14.66 **	9.50 ***
	(0.986)	(0.254)	(0.041)	(0.000)	(0.024)	(0.000)
Log transaction size	-9.20 **	1.38	-36.81 ***	-9.03 **	-13.02 *	6.61 **
	(0.012)	(0.527)	(0.000)	(0.015)	(0.083)	(0.021)
Subordinated	-85.61 ***	-79.43 ***	38.65	85.92 ***	87.97	72.69 ***
	(0.000)	(0.000)	(0.411)	(0.000)	(0.279)	(0.000)
Currency risk	41.03 ***	33.10 ***	17.56	41.57 ***	29.04 **	29.89 ***
	(0.000)	(0.000)	(0.262)	(0.000)	(0.036)	(0.000)

(Continued)

(continued)

Dependent variable: Spread (bps)	[1] PF and CF bonds	[2] PF and CF bonds | matched sample	[3] PF bonds	[4] CF bonds	[5] PF bonds | with firms' characteristics	[6] CF bonds | with firms' characteristics
Independent variables:						
Collateralized	63.22 ***	47.17 ***	35.61 **	64.81 ***	19.29	35.22 ***
	(0.000)	(0.000)	(0.035)	(0.000)	(0.041)	(0.000)
Callable	47.79 ***	21.64 ***	6.31	48.62 ***	5.84	34.25 ***
	(0.000)	(0.001)	(0.588)	(0.000)	(0.691)	(0.000)
Number of banks	-1.37 ***	-0.88 **	-2.60 *	-1.36 ***	-0.86 *	-0.59 **
	(0.001)	(0.015)	(0.086)	(0.001)	(0.063)	(0.036)
Bank reputation	-0.01	-0.70 **	-0.35	0.00	-0.18	0.34
	(0.982)	(0.037)	(0.744)	(0.998)	(0.899)	(0.304)
Number of tranches	1.45	0.35	2.87	1.50	-13.03 **	-7.07 ***
	(0.769)	(0.863)	(0.588)	(0.769)	(0.042)	(0.004)
Country risk	5.36 ***	4.97 ***	8.60 ***	5.13 ***	-0.92	-1.52
	(0.000)	(0.000)	(0.000)	(0.000)	(0.756)	(0.367)
Creditors rights	-7.16 ***	-7.35 ***	-8.07	-7.16 ***	2.93	-2.41 **
	(0.001)	(0.005)	(0.162)	(0.001)	(0.728)	(0.022)
Enforcement	0.69 *	0.68 **	0.90	0.66 *	-1.70	0.71
	(0.079)	(0.049)	(0.230)	(0.100)	(0.16)	(0.128)
Volatility	2.65 ***	3.70 ***	-0.16	2.69 ***	-1.51	3.13 ***
	(0.000)	(0.000)	(0.920)	(0.000)	(0.352)	(0.000)
USTB5y-USTB3m	-0.07	-0.06	0.36 *	-0.07	0.39 *	-0.08
	(0.201)	(0.363)	(0.086)	(0.159)	(0.054)	(0.125)
Financial crisis	61.06	20.85	79.59	59.97	137.40 **	69.40
	(0.178)	(0.770)	(0.542)	(0.185)	(0.01)	(0.18)
Sovereign crisis	43.60	8.38	-23.63	41.92	17.35	47.18
	(0.358)	(0.907)	(0.779)	(0.375)	(0.845)	(0.379)
Log total assets					3.68	-10.19 ***
					(0.376)	(0.000)
Fixed assets to total assets					32.82	-24.95 ***
					(0.379)	(0.000)
Debt to total assets					36.23	2.83
					(0.443)	(0.727)
Return on assets					0.09	-0.77 ***
					(0.897)	(0.009)
Market to book					-1.06	0.01
					(0.146)	(0.584)
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Number of observations	47,196	1,526	763	46,433	364	22,499
Adjusted R^2	0.56	0.62	0.53	0.56	0.63	0.63
Rated and rating dummies as independent variables only						
Adjusted R^2	0.38	0.39	0.29	0.39	0.43	0.44
Differences in adjusted R^2	0.18	0.23	0.24	0.17	0.20	0.19

Table 4 presents the results of an OLS regression analysis of the determinants of bond spreads for: (*i*) a sample of 763 PF bonds and 46,433 CF bonds – models [1] to [4]; and (*ii*) a sample of 364 PF bonds and 22,499 CF bonds for which there is available information on sponsoring (for PF bonds) and issuing (for CF bonds) firms' characteristics – models [5] and [6]. For each independent variable, the first row reports the estimated coefficient, and the second row reports the *p*-value. Standard errors are heteroskedasticity robust and clustered at the country-year level. ***, ** and * indicate that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. For a definition of the variables, see Table 2.

Table 5: Industrial distribution of deals closed by switchers

Industrial category of issuer	Number of Deals	Number of switchers	Total Value ($ Million)	Percent of total value
Commercial and Industrial				
Agriculture, Forestry and Fishing	7	1	3,250	0.14%
Communications	492	9	433,047	18.18%
Construction/Heavy Engineering	70	4	32,994	1.39%
Manufacturing				
Chemicals. Plastic and Rubber	51	2	33,063	1.39%
Food and Beverages	72	2	62,110	2.61%
Machinery and Equipment	41	1	31,356	1.32%
Other	30	1	5,409	0.23%
Mining and Natural Resources	28	3	19,056	0.80%
Oil and Gas	485	27	348,342	14.63%
Real Estate	177	11	92,400	3.88%
Real Trade	46	1	29,202	1.23%
Services	126	6	90,440	3.80%
Utilities	2,341	60	1,048,324	44.02%
Transportation	190	12	130,318	5.47%
Public Administration/Government	5	1	895	0.04%
Other	14	1	21,209	0.89%
Total	**4,175**	**142**	**2,381,415**	**100.00%**

Table 5 displays the number of PF and CF bond deals closed by switchers - firms that use both deal types in our sampling period. Data are for bonds with spread and tranche/transaction amount available, closed by worldwide issuers during the 1993-2020 period.

Table 6: Endogenous switching regression models

Dependent variable:	[7]	
Spread (bps)	PF bonds | with firms' characteristics	CF bonds | with firms' characteristics
Independent variables:		
Intercept	466.88	-115.18 ***
	(0.137)	(0.005)
Rated	-169.89 ***	-271.66 ***
	(0.000)	(0.000)
Rating*rated	26.19 ***	32.45 ***
	(0.000)	(0.000)
Rating discordance	55.72 ***	19.84 ***
	(0.001)	(0.000)
Log transaction size	-25.40 *	17.02 ***
	(0.067)	(0.000)
Maturity	-0.39	0.58 ***
	(0.673)	(0.000)
Log maturity	22.03 *	-1.78
	(0.053)	(0.627)
Subordinated	162.39	53.70 ***
	(0.290)	(0.000)
Currency risk	36.55 ***	30.40 ***
	(0.010)	(0.000)
Collateralized	-16.98	53.59 ***
	(0.825)	(0.000)
Callable	11.51	46.43 ***
	(0.371)	(0.000)
Number of Banks	-0.19 *	-0.38 **
	(0.087)	(0.016)
Bank reputation	3.69 ***	1.06 ***
	(0.002)	(0.000)
Number of Tranches	-0.17 *	-13.20 ***
	(0.097)	(0.000)
Financial crisis	-24.81	135.35 ***
	(0.607)	(0.000)
Sovereign crisis	41.80 **	51.49 ***
	(0.016)	(0.000)
Volatility	3.49 **	3.54 ***
	(0.035)	(0.000)
USTB5y-USTB3m	0.03	-0.11 ***
	(0.786)	(0.000)
Creditor Rights	2.44	-0.83
	(0.735)	0.382
Log total assets	-0.25	-6.62 ***
	(0.979)	(0.000)
Fixed assets to total assets	12.75	-14.17 ***
	(0.624)	(0.000)
Debt to total assets	124.21 ***	18.33 ***
	(0.003)	(0.002)
Return on assets	0.68	-1.02 ***
	(0.636)	(0.000)
Market to book	-0.55	0.01
	(0.222)	(0.381)

(Continued)

(continued)

Dependent variable:	
Probability of observing:	PF *versus* CF bonds
Independent variables:	
Rated	-0.56 ***
	(0.000)
Rating*rated	0.00
	0.784
Rating discordance	-0.34 ***
	(0.000)
Log transaction size	0.15 ***
	(0.000)
Maturity	0.01 ***
	(0.000)
Log maturity	-0.77 ***
	(0.000)
Subordinated	-1.28 ***
	(0.000)
Currency risk	-0.10 **
	(0.023)
Collateralized	1.10 ***
	(0.000)
Callable	0.04
	(0.554)
Number of Banks	0.00
	(0.694)
Bank reputation	-0.01
	(0.112)
Number of Tranches	-0.06 **
	(0.043)
Financial crisis	-0.72 ***
	(0.000)
Sovereign crisis	0.17 ***
	(0.002)
Volatility	-0.03 ***
	(0.001)
USTB5y-USTB3m	0.00 ***
	(0.000)
Creditor Rights	0.03
	(0.401)
Log total assets	-0.13 ***
	(0.000)
Fixed assets to total assets	0.25 **
	(0.040)
Debt to total assets	-0.38 **
	(0.033)
Return on assets	-0.02 ***
	(0.000)
Market to book	0.00 **
	(0.045)
Number of observations	22,863
Average treatment effect	41.10 ***
	(0.000)
Wald chi2	700.18 ***
Log pseudolikelihood	-142,448.35
Wald test of indep. equations	25.32 ***

Table 6 presents the results of estimating endogenous switching regression models on a sample of 364 PF bonds and 22,499 CF bonds for which there is available information on sponsoring (for PF bonds) and issuing (for CF bonds) firms' characteristics. We implement the full information maximum likelihood (FIML) method to simultaneously estimate binary and continuous parts of the model in order to yield consistent standard errors. For each independent variable, the first row reports the estimated coefficient, and the second row reports the *p*-value. Standard errors are heteroskedasticity robust and clustered at the country-year level. ***, ** and * indicate that the reported coefficients are significantly different from zero at the 1%, 5% and 10% levels, respectively. For a definition of the variables, see Table 2.

Table 7: Descriptive statistics for firms' characteristics

Variable of interest		Firms categorized according to choice of deals		
		[I]	[II]	[III]
		PF deals only	CF deals only	PF and CF deals (switchers)
Total assets ($ million)	Number	53	13,136	3,599
	Mean	129,000 [b]	33,000 [c]	68,800 [b,c]
	Median	10,600	11,600	32,800
Fixed assets to total assets	Number	53	13,136	3,599
	Mean	29.15% [a,b]	43.62% [a,c]	56.43% [b,c]
	Median	12.81%	40.33%	62.16%
Debt to total assets	Number	53	13,136	3,599
	Mean	28.11% [a,b]	37.77% [a,c]	36.39% [b,c]
	Median	26.85%	36.58%	35.79%
Return on assets	Number	53	13,136	3,599
	Mean	0.28% [a,b]	0.38% [a,c]	4.73% [b,c]
	Median	0.26%	0.36%	4.50%
Market to book	Number	53	13,136	3,599
	Mean	489.79% [a]	252.34% [a,c]	183.28% [c]
	Median	251.90%	176.84%	210.23%
Z-score	Number	38	11,498	3,295
	Mean	1.57 [b]	2.21 [c]	1.42 [b,c]
	Median	1.14	1.18	0.76
FCF to total assets	Number	52	12,914	3,479
	Mean	3.30% [a,b]	13.34% [a,c]	10.47% [b,c]
	Median	3.08%	7.52%	6.81%

Table 7 presents the descriptive statistics for firms' characteristics by category. We test for similar distributions in public firms' characteristics across samples via Wilcoxon's rank-sum test. [a] denotes statistical difference at the 1% level between 'PF deals only' and 'CF deals only' subsamples; [b] denotes statistical difference at the 1% level between 'PF deals only' and 'PF and CF deals' subsamples; [c] denotes statistical difference at the 1% level between 'CF deals only' and 'PF and CF deals' subsamples. For a definition of the variables, see Table 2.

Table 8: Determinants of firms' debt choice between PF and CF

Dependent variable:	[8]	[9]	[10]	[11]
Choice of debt	PF and CF deals | with firms' characteristics	PF and CF deals | with firms' characteristics	PF and CF deals | with firms' characteristics	PF and CF deals | matched sample
Independent variables:				
Intercept	-4.649 **	-4.338 *	-4.749 **	-5.130 *
	(0.035)	(0.075)	(0.031)	(0.056)
Log total assets	-0.170 **	-0.304 ***	-0.166 **	-0.159 **
	(0.022)	(0.000)	(0.028)	(0.048)
Debt to total asset	0.078	-0.201	0.049	0.257
	(0.903)	(0.719)	(0.939)	(0.676)
Fixed assets to total assets	-0.720 *	-0.194	-0.514	-0.633
	(0.051)	(0.631)	(0.102)	(0.139)
Market to book	0.001	-0.001	0.001	0.001 **
	(0.16)	(0.883)	(0.198)	(0.014)
Return on assets	-0.031 **	-0.001 *	-0.018 **	-0.033 ***
	(0.048)	(0.095)	(0.041)	(0.002)
Switcher	3.117 ***	3.388 ***	3.107 ***	3.302 ***
	(0.000)	(0.000)	(0.000)	(0.000)
Log Z-score		-0.612 ***		
		(0.004)		
FCF to total assets			-4.298	
			(0.134)	
Log transaction size	0.306 ***	0.389 ***	0.335 ***	0.286 **
	(0.006)	(0.002)	(0.003)	(0.024)
WA Spread	0.003 ***	0.003 ***	0.003 ***	0.003 ***
	(0.000)	(0.000)	(0.000)	(0.000)
WA Maturity	0.017 ***	0.018 ***	0.017 ***	0.013 *
	(0.005)	(0.006)	(0.005)	(0.051)
WA Rating	-0.115 ***	-0.118 ***	-0.120 ***	-0.111 ***
	(0.000)	(0.000)	(0.000)	(0.001)
Number of tranches	-0.026	-0.071	-0.037	-0.055
	(0.834)	(0.647)	(0.773)	(0.708)
Currency risk	-0.211	-0.236	-0.170	-0.119
	(0.302)	(0.303)	(0.431)	(0.586)
Number of banks	-0.014	-0.021	-0.011	-0.012
	(0.423)	(0.291)	(0.544)	(0.48)
Bank reputation	-0.014	-0.020	-0.011	-0.020
	(0.358)	(0.224)	(0.439)	(0.201)
Financial crisis	-1.406 **	-1.542 **	-1.313 **	-1.417 **
	(0.019)	(0.016)	(0.028)	(0.016)
Sovereign crisis	-0.199	-0.084	-0.166	-0.247
	(0.369)	(0.733)	(0.448)	-0.291
Country risk	0.097 **	0.078 *	0.099 **	0.103 **
	(0.015)	(0.077)	(0.017)	(0.018)
Creditors rights	0.356 ***	0.379 ***	0.376 ***	0.395 ***
	(0.000)	(0.003)	(0.000)	(0.000)
Enforcement	-0.045 ***	-0.051 ***	-0.050 ***	-0.034 **
	(0.007)	(0.006)	(0.003)	(0.047)
Volatility	-0.036 **	-0.032 *	-0.038 **	-0.060 ***
	(0.023)	(0.059)	(0.012)	(0.001)
USTB5y-USTB3m	-0.002	-0.002 **	-0.002	-0.001
	(0.112)	(0.03)	(0.145)	(0.306)
Industry fixed effects	Yes	Yes	Yes	Yes
Number of observations	16,788	14,831	16,445	612
Wald statistic	445.76 ***	448.47 ***	432.16 ***	443.32 ***
Correct predictions	98.49%	98.58%	98.52%	98.53%
Pseudo-R^2	0.216	0.240	0.224	0.233

Table 8 presents the results of logistic regressions which predict firms' choice between PF and CF. The dependent variable equals 1 when a firm selects PF deals and 0 when it chooses a CF deal. WA Maturity is the deal's weighted average maturity, computed as the weighted average between the loan maturity, in years, and its weight in the deal size; WA

Spread is the bond deals' weighted average spread, computed as the weighted average between the bond tranche spread and its weight in the deal size; WA Rating is the bond deals' weighted average credit rating, computed as the weighted average between the bond tranche credit rating and its weight in the deal size. To create a matched sample of firms that use CF – model [11], we employ a propensity score matching (PSM) approach, by creating a 1 to 1 matching algorithm that captures the most identical deal in the same year, industry, and country, using the following characteristics: transaction size and WA Maturity. For each independent variable, the first row reports the estimated coefficient and the second row reports the *p*-value. Standard errors are heteroskedasticity robust and clustered at the firm-year level. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a definition of the variables, see Table 2.

Table 9: Determinants of debt choice for switchers

Dependent variable:	[12]	[13]	[14]
Choice of debt	PF and CF deals | switchers	PF and CF deals | switchers	PF and CF deals | switchers
Independent variables:			
Intercept	-4.278	-4.809	-4.317
	(-0.117)	(-0.107)	(-0.113)
Log total assets	-0.271 ***	-0.302 ***	-0.262 ***
	(-0.001)	(0.000)	(-0.003)
Debt to total asset	0.761	0.514	0.837
	(-0.327)	(-0.478)	(-0.271)
Fixed assets to total assets	-0.186	0.427	-0.080
	(-0.676)	(-0.391)	(-0.848)
Market to book	0.001	0.002	0.001
	(-0.682)	(-0.95)	(-0.661)
Return on assets	-0.051 **	-0.013 **	-0.044 **
	(-0.014)	(-0.046)	(-0.016)
Log Z-score		-0.541 *	
		(-0.07)	
FCF to total assets			-1.181
			(-0.696)
Log transaction size	0.478 ***	0.518 ***	0.491 ***
	(0.000)	(0.000)	(0.000)
WA Spread	0.004 ***	0.004 ***	0.004 ***
	(0.000)	(0.000)	(0.000)
WA Maturity	0.005 **	0.006 **	0.006 **
	(-0.046)	(-0.037)	(-0.038)
WA Rating	-0.145 ***	-0.123 ***	-0.151 ***
	(0.000)	(-0.002)	(0.000)
Number of tranches	-0.017	-0.039	-0.023
	(-0.905)	(-0.83)	(-0.872)
Currency risk	-0.085	-0.201	-0.104
	(-0.722)	(-0.404)	(-0.685)
Number of banks	-0.022	-0.031	-0.019
	(-0.203)	(-0.119)	(-0.282)
Bank reputation	-0.036 *	-0.044 **	-0.029
	(-0.065)	(-0.04)	(-0.134)
Financial crisis	-2.801 ***	-2.609 ***	-2.722 ***
	(0.000)	(-0.001)	(0.000)
Sovereign crisis	-0.245	-0.213	-0.230
	(-0.321)	(-0.404)	(-0.348)
Country risk	0.098 *	0.082 *	0.096 *
	(-0.074)	(-0.059)	(-0.088)
Creditors rights	0.303 ***	0.399 ***	0.344 ***
	(-0.009)	(-0.004)	(-0.007)
Enforcement	-0.029	-0.037 **	-0.035 *
	(-0.111)	(-0.042)	(-0.068)
Volatility	-0.036 **	-0.037 *	-0.041 **
	(-0.043)	(-0.052)	(-0.02)
USTB5y-USTB3m	-0.003 **	-0.003 ***	-0.003 **
	(-0.014)	(-0.007)	(-0.021)
Industry fixed effects	Yes	Yes	Yes
Number of observations	3,599	3,295	3,479
Wald statistic	521.12 ***	554.95 ***	412.62 ***
Correct predictions	94.50%	94.72%	94.51%
Pseudo-R^2	0.108	0.125	0.112

Table 9 presents the results of logistic regressions which predict firms' choice between PF and CF. The dependent variable equals 1 when a switcher - firms that close both PF and CF deals during our sampling period - selects PF deals and 0 when it chooses a CF deal. WA Maturity is the deal's weighted average maturity, computed as the weighted average between the loan maturity, in years, and its weight in the deal size; WA Spread is the bond deals' weighted average spread, computed as the weighted average between the bond tranche spread and its weight in the deal size; WA Rating is the bond deals' weighted average credit rating, computed as the weighted average between the bond tranche credit rating

and its weight in the deal size. For each independent variable, the first row reports the estimated coefficient and the second row reports the *p*-value. Standard errors are heteroskedasticity robust and clustered at the firm-year level. ***, ** and * denote statistical significance at the 1%, 5% and 10% levels, respectively. For a definition of the variables, see Table 2.

Appendix A: Descriptive statistics for PF and CF bond samples

Panel A: Continuous variables

Variable of interest	Project finance bonds						Corporate finance bonds					
	Number	Mean	Median	Std.Dev.	Min	Max	Number	Mean	Median	Std.Dev.	Min	Max
Contractual characteristics												
Spread (bps)	763	241.0	195.0	180.3	1.2	1,025	46,433	206.8	145.7	193.3	-4.8	1,092
Rating [1-22 weak]	592	8.5	9.0	3.5	1.0	20.0	45,603	6.7	7.0	5.1	0.0	21.0
Maturity (years)	763	13.7	10.0	9.7	1.5	100.0	46,433	9.6	7.1	8.4	1.0	100.4
Transaction size ($ Million)	763	611.0	450.0	522.0	12.0	3,000.0	46,433	593.0	321.0	704.0	3.2	3,990.0
Tanche size ($ Million)	763	371.0	282.0	332.0	3.8	2,000.0	46,433	365.0	250.0	345.0	0.1	3,800.0
Number of tranches	763	2.0	1.0	1.7	1.0	12.0	46,433	1.6	1.0	1.2	1.0	21.0
Number of banks	763	5.0	4.0	4.3	1.0	24.0	46,433	5.9	4.0	5.1	1.0	46.0
Bank reputation [1-25 best]	763	7.3	3.0	8.0	1.0	25.0	46,433	8.2	3.0	9.2	1.0	25.0
Macroeconomic factors												
Country risk [1-22 weak]	763	4.0	1.0	4.2	1.0	17.0	46,433	2.7	1.0	2.9	1.0	21.0
Volatility	763	17.6	15.9	6.4	9.4	45.8	46,433	17.8	16.0	7.0	9.1	80.9
USTB5y-USTB3m (bps)	763	96.5	91.8	65.2	-85.4	284.2	46,433	108.5	105.0	71.8	-86.7	307.5
Creditor rights	763	1.5	1.0	1.1	0.0	4.0	46,433	1.6	1.0	0.9	0.0	4.0
Enforcement [32-85 strong]	763	66.6	68.7	8.6	32.4	84.1	46,433	70.2	72.0	6.6	32.4	84.1
Firm characteristics												
Total assets ($ million)	364	97,794.5	26,165.6	266,351.5	2.6	2,397,369.3	22,499	45,116.6	17,779.7	85,501.9	0.7	2,294,473.7
Debt to total assets	364	34.0%	34.3%	19.1%	0.0%	93.1%	22,499	36.4%	35.4%	17.9%	0.0%	56.0%
Fixed assets to total assets	364	46.3%	57.4%	30.9%	0.0%	97.2%	22,499	44.7%	43.9%	28.1%	0.0%	89.5%
Return on assets	364	3.7%	3.7%	7.5%	-76.1%	30.0%	22,499	5.5%	5.0%	22.4%	-17.9%	336.6%
Market to book	364	383.5%	212.1%	1131.9%	-1548.1%	3879.7%	22,499	245.8%	181.1%	458.2%	-1734.2%	4806.7%
Z-score	281	1.5	0.8	5.8	-1.3	88.2	20,068	2.0	1.1	46.7	-8.2	566.2
FCF to total assets	352	9.6%	5.5%	60.0%	-33.2%	1109.9%	22,116	12.7%	7.5%	305.3%	-55.3%	372.5%

Panel B: Dummy variables

Variable of interest	Project Finance Bonds			Corporate Finance Bonds		
	Number	% of total	Std. Dev.	Number	% of total	Std. Dev.
Rated	763	77.6%	0.42	46,433	73.4%	0.44
Subordinated	763	1.0%	0.10	46,433	3.5%	0.18
Collateralized	763	37.2%	0.48	46,433	7.9%	0.27
Currency risk	763	32.0%	0.47	46,433	21.1%	0.41
Rating discordance	763	24.4%	0.43	46,433	28.9%	0.45
Callable	763	51.8%	0.50	46,433	48.8%	0.50
Financial crisis	763	2.6%	0.16	46,433	5.6%	0.23
Sovereign crisis	763	35.9%	0.48	46,433	40.0%	0.49

This table presents the descriptive statistics of PF and CF bond samples issued during the 2000-2020 period worldwide. Information on the characteristics of bond issuances was obtained from DCM Analytics and Datastream. For a definition of the variables, see Table 2.

Appendix B: PF and CF bonds mean and median spreads by credit rating

Credit rating (S&P / Moody's)	Project Finance Bonds			Corporate Finance Bonds		
	Number	Credit spread		Number	Credit spread	
		Mean	Median		Mean	Median
AAA / Aaa	43	81.8	65.0	559	67.5	45.0
AA+ / Aa1	7	88.0	80.0	366	85.2	70.0
AA / Aa2	7	131.0	122.5	1,025	63.9	45.0
AA- / Aa3	14	188.3	160.0	1,628	66.0	55.0
A+ / A1	20	132.8	99.0	2,111	92.9	83.7
A / A2	29	121.7	112.0	3,570	106.1	95.0
A- / A3	91	152.8	144.7	3,715	119.7	110.0
BBB+ / Baa1	84	224.9	195.0	4,204	151.6	136.9
BBB / Baa2	85	201.2	200.0	4,287	172.1	160.0
BBB- / Baa3	82	249.4	263.8	2,596	206.4	195.0

This table displays number, mean and median spread for PF and CF bonds by initial S&P and/or Moody's credit rating. Only investment-grade bonds were included.

Appendix C: The impact of the financial crisis on pricing characteristics of PF and CF bonds

Panel A: The impact of the financial crisis on pricing characteristics - continuous variables

Variable of interest	Project finance bond				Corporate finance bonds			
	Number	Mean	Median	Wilcoxon z-test	Number	Mean	Median	Wilcoxon z-test
Spread (bps)								
pre-crisis	283	232.2	195.0	-3.33 ***	15,295	162.4	98.0	-51.70 ***
crisis and post-crisis	294	281.4	225.0		21,196	241.4	175.0	
Rating [1-22 weak]								
pre-crisis	266	8.8	9.0	2.39 **	14,465	8.7	10.0	48.57 ***
crisis and post-crisis	193	8.3	8.0		21,196	5.9	6.0	
Maturity (years)								
pre-crisis	283	13.3	10.0	-1.17	15,295	10.9	250.0	30.72 **
crisis and post-crisis	294	14.7	10.0		21,196	9.1	7.0	
Transaction size ($ million)								
pre-crisis	283	645.0	469.0	0.75	15,295	299.0	200.0	-28.48 ***
crisis and post-crisis	294	568.0	400.0		21,196	664.0	400.0	
Number of tranches								
pre-crisis	283	2.2	2	2.16 **	15,295	1.4	1.0	-17.16 ***
crisis and post-crisis	294	1.9	1.0		21,196	1.6	1.0	
Number of banks								
pre-crisis	283	3.4	3.0	-5.65 ***	15,295	4.4	3.0	-43.54
crisis and post-crisis	294	5.7	4.0		21,196	6.6	5.0	
Country risk [1-22 weak]								
pre-crisis	283	4.5	1.0	1.31	15,295	2.2	1.0	-35.63 ***
crisis and post-crisis	294	3.6	1.0		21,196	2.8	1.0	

Panel B: The impact of the financial crisis on pricing characteristics - dummy variables

Variable of interest	Project Bond				Corporate Bonds			
	Number	Number (d=1)	% of total	Fisher's exact test	Number	Number (d=1)	% of total	Fisher's exact test
Currency risk								
pre-crisis	283	162	57.2%	0.000 #	15,295	3,604	23.6%	0.000 #
crisis and post-crisis	294	51	17.3%		21,196	4,226	19.9%	
Collateralized								
pre-crisis	283	77	27.2%	0.000 #	15,295	846	5.5%	0.000 #
crisis and post-crisis	294	129	43.9%		21,196	1,753	8.3%	
Subordinated								
pre-crisis	283	5	1.8%	0.278	15,295	1,403	9.2%	0.000 #
crisis and post-crisis	294	1	0.3%		21,196	179	0.8%	
Callable								
pre-crisis	283	133	47.0%	0.244 #	15,295	7,753	50.7%	0.000 #
crisis and post-crisis	294	153	52.0%		21,196	9,972	47.0%	

This table reports statistics for PF and CF bonds separated into two sub-samples: pre-crisis period (from January 1, 2000 through to September 14, 2008) and crisis and post-crisis period (from September 15, 2008 through to December 31, 2020). We test for similar distributions using Wilcoxon's rank-sum test for continuous variables (Panel A) and Fisher's exact test for discrete ones (Panel B). In Panel A, ***, **, and * indicate significant difference at the 1%, 5%, and 10% levels, respectively. In Panel B, # indicates that there is a statistically significant relationship between the dummy variable and the 2007-2008 financial crisis.