INSTITUTO
UNIVERSITÁRIO
DE LISBOA

Department of Marketing, Operations and Management

Determinants of loan spread in project finance: an empirical study of geographic diversification of bank syndicates

João Pedro Gamboia Fonseca

Master in Business Administration

Supervisor:

Doutor Mohamed Azzim Gulamhussen, Professor Catedrático,

ISCTE-IUL

May, 2023

Department of Marketing, Operations and Management

Determinants of loan spread in project finance: an empirical study of geographic diversification of bank syndicates

João Pedro Gamboia Fonseca

Master in Business Administration

Supervisor:

Doutor Mohamed Azzim Gulamhussen, Professor Catedrático,

ISCTE-IUL

May, 2023

This page has been left blank intentionally

An investment in knowledge pays the best interest.

Benjamin Franklin, *The Way to Wealth* (1758)

To my parents Maria da Conceição and Francisco,

for teaching me about life.

Acknowledgments

I would like to express my heartfelt gratitude to my dissertation supervisor, Professor Mohamed Azzim Gulamhussen, for his trust, support and wisdom along the different stages of this process. Thank you Professor.

I am also sincerely grateful to Iscte Business School for the opportunity of coming back to university once more, and experience such an intellectually stimulating, culturally diverse and pedagogically innovative environment. Iscte Business School truly lives by its values, particularly inclusion and this does not go unnoticed.

I would also like to thank all my colleagues with whom I had the privilege to share the amazing journey that was this MSc in Business Administration. Thank you for all your teachings, jokes, disagreements, laughs, and above all friendship.

And I owe one final word of appreciation to all my inspirational friends and family, especially André Silva, Andreia Costa, Darren Conlon, Diogo Ferreira, Francisco Antunes, Francisco Couto, Gonçalo Félix, Jessé Chaveiro, Joana Salminen, João Calvário, Manuel Monteiro, Pedro Félix, Rui Antunes, Joana my sister and Iscte Business School alumna, mom and dad.

Joana, thank you for your guidance and incentive on this one and for your patience on countless others before, your help always means the world to me.

Mom, dad, thank you for being there all the time for me, I am the luckiest for having you both in my life.

Abstract

I investigate the depth of geographic diversification of bank syndicates as a determinant of loan spread in the context of project finance, using a sample of 650 project finance syndicated loans worth $235 billion from 68 different countries over the period 2012-2021.

I hypothesize that the depth of geographic diversification of bank syndicates signals the levels of political, legal and regulatory risk. In that case, ceteris paribus, greater depths of geographic diversification should command a price premium and result in higher loan spreads for the added risk protection.

The findings from this research suggest that the levels of political, legal and regulatory risk of the host country have a significant effect on loan syndication and determine the depth of geographic diversification of the bank syndicate. However, and contrary to my expectations, in terms of total and inter-regional diversification the association occurs in the opposite direction expected. In terms of intra-regional diversification the association occurs in the direction expected. With regard to pricing, I do not find evidence that different depths of geographic diversification of the loan syndicate affect loan spreads in support of a trade-off and financial cost of structuring project finance loans with varying levels of insurance against sovereign interference.

The results and the implications of the findings for the lenders and borrowers are discussed.

Keywords: Project finance; loan spread, geographic diversification; bank syndicate

JEL Classification: F34, G21, G32

Resumo

Investigo a profundidade da diversificação geográfica do sindicato bancário enquanto determinante da margem de crédito em contexto de project finance, utilizando uma amostra de 650 empréstimos sindicados ao nível de project finance no valor de 235 mil milhões de dólares em 68 países diferentes durante o período 2012-2021.

A hipótese que coloco considera que a profundidade de diversificação geográfica do sindicato bancário sinaliza os níveis de risco político, legal e regulamentar. Nesta situação, ceteris paribus, profundidades maiores de diversificação geográfica do sindicato bancário deverão acarretar um prémio de preço e resultar em margens de crédito mais elevadas pela protecção acrescida de risco que conferem.

Os resultados decorrentes desta investigação sugerem que os níveis de risco político, legal e regulamentar do país onde o investimento é realizado têm um efeito significativo na sindicação do empréstimo e determinam a profundidade da diversificação geográfica do sindicato bancário. No entanto, e contrariamente às minhas expectativas, em termos de diversificação global e inter-regional a associação ocorre em sentido oposto ao esperado. Em termos de diversificação intra-regional a associação ocorre no sentido esperado. Sobre o efeito no preço, não encontro provas de que profundidades diferentes de diversificação geográfica do sindicato bancário influenciem as margens de crédito em sustento de um compromisso e custo financeiro decorrente da estruturação de empréstimos no contexto de project finance com níveis variados de protecção contra a interferência soberana.

Os resultados e implicações das conclusões para os devedores e credores são discutidos.

Palavras-chave: Project finance; margem de crédito; diversificação geográfica; sindicato bancário

Classificação JEL: F34, G21, G32

Table of Contents

List of Figures

List of Tables

List of Equations

List of Abbreviations and Symbols

Abbreviation/Symbol	Definition
Bps	Basis points
CAGR	Compound Annual Growth Rate
EMEA	Europe, Middle East and Africa
D/E	Debt to Equity ratio
GDP	Gross Domestic Product
IPP	Independent Power Producers
IMF	International Monetary Fund
LIBOR	London Inter-Bank Offered Rate
LNG	Liquefied Natural Gas
NA	Not Applicable
OLS	Ordinary Least Squares
PF	Project Finance
PFI	Private Finance Initiative
PPP	Public Private Partnership
PURPA	Public Utility Regulatory Policies Act
SD	Standard Deviation
SE	Standard Error
SPV	Special-Purpose Vehicle

Abbreviation/Symbol	Definition
TCE	Transaction-Cost Economics
WGI	Worldwide Governance Indicators

1 Introduction

1.1 Background

Project Finance (hereafter PF) is today still defined in different ways since a universal definition has not been settled yet. For instance, Finnerty (2007) who reviewed his former definition to include explicitly the limited or non-recourse character of PF compared to other financing structures, defines PF as:

> "*the raising of funds on a limited-recourse or nonrecourse basis to finance an economically separable capital investment project in which the providers of the funds look primarily to the cash flow from the project as the source of funds to service their loans and provide the return of and a return on their equity invested in the project.*"

According to Ahiabor (2018) citing (Dailami & Hauswald, 2007, p. 249), PF can be defined as:

> "*a financial technique that involves raising funds to undertake a single indivisible large-scale capital investment project, where cash flows are the sole means to meet financial obligations and to provide returns to investors.*"

And Esty *et al.* (2014) propose:

> "*Project Finance involves the creation of a legally independent project company financed with nonrecourse debt (and equity from one or more corporate entities known as sponsoring firms) for the purpose of financing investment in a single-purpose capital asset, usually with a limited life"*

Nevertheless these definitions all convey the important notions and characteristics that define this particular financing structure. PF is a specialized financing process which is raised on a limited or non-recourse basis and is particularly tailored to fund single-purpose large-scale infrastructure and other long-term capital intensive projects.

The typical setup that distinguishes project financing from conventional corporate financing includes the establishment of the project as a legally independent project company, the special-

purpose vehicle (SPV) entity, to invest in the capital asset (Esty, 2003; Corielli *et al.*, 2010; Girardone & Snaith, 2011; Ahiabor & James, 2018; Ahiabor, 2018). A cash flow based lending on which debt is serviced, in terms of interest and debt repayment, exclusively by the cash flows generated by the project (Dailami & Leipziger, 1998; Bonetti *et al.*, 2010; Subramanian & Tung, 2016; Thierie & De Moor, 2019a; Thierie & De Moor, 2019b). A comprehensive risk sharing structure encompassing the contractual agreements with those parties most competent to evaluate and control the various project risks (Brealey *et al.*, 1996; Dailami & Hauswald, 2000; Esty, 2003; Corielli *et al.*, 2010; Girardone & Snaith, 2011; Ahiabor & James, 2018). PF is sometimes referred to as "contract finance" for this reason (Esty, 2003; Esty & Megginson, 2003; Esty, 2004b). And a limited or non-recourse nature of this financing as creditors have limited recourse or no recourse to project sponsors assets or cash flows in the event of project default, with the sole collateral for the loan being the ring-fenced SPV owned assets (Brealey *et al.*, 1996; Esty, 2003; Girardone & Snaith, 2011; Esty *et al.*, 2014; Ahiabor & James, 2018; Thierie & De Moor, 2019a).

Figure 1 illustrates a typical project structure, consisting of a nexus of contracts that revolve around the project company.

**** Insert Figure 1 about here ****

From a value creation perspective, the advantages associated with project financing structures are the reduction of the cost of agency problems within the project company. Since PF capital structures are typically highly leveraged as observed by Esty & Christov (2002), with 70 percent of the capital procured in the form of debt, the amount of free cash flow is reduced. A condition that plays an important disciplinary role, as it not only prevents wasteful expenditures of free cash flow by management but also deters appropriation attempts from other parties with interests in the project (Brealey *et al.*, 1996; Esty, 2003; Sorge, 2004; Subramanian & Tung, 2016; Alves & Pinto, 2020). In addition, the concentrated debt and equity ownership feature of PF also facilitates the scrutiny of projects and management monitoring by the capital providers (Sorge, 2004).

Another benefit is the reduction of the opportunity cost of underinvestment in the form of debt overhang. As separate incorporation of the project company and non-recourse debt allows

project sponsors to keep funding raised through PF off their balance sheets. Consequently debt ratios and creditworthiness are preserved and so do the ability to access additional corporate financing for future traditional projects (Brealey *et al.*, 1996; Pollio, 1998; Esty, 2003; Bonetti *et al.*, 2010).

In spite of the advantages presented above, PF also has some disadvantages. To start with, PF is more complex to assemble than conventional corporate financing structures due to the greater amount of contracts and parties involved, which tend to result in higher transaction and issuance costs (Pollio, 1998; Buscaino *et al.*, 2012; Alves & Pinto, 2020).

Additionally, the design of project financing structures also takes longer in consequence of thorough due diligence processes conducted by lenders and time consuming negotiations of the numerous financing and non-financing contracts (Esty, 2003; Alves & Pinto, 2020). In comparison to funding an asset through conventional financing, Esty (2003) reports that an additional 6 to 18 months are required to create a project company.

1.2 Problem statement

Loan syndication is an intrinsic feature and a critical component in the structuring of project financings. Research has shown that geographic composition of banking syndicates is interlinked with risk mitigation effects and that there is an economic value associated with the debt-based governance originated from PF loan syndicates (Dorobantu & Müllner, 2019). Furthermore, this economic value is what overcomes the prediction in Williamson's (1988) transaction-cost economics theory, which expects equity finance, due to its greater discretion levels and intrusiveness, to be the preferred financial instrument in projects where asset specificity is high.

However, little is known about the geographic diversification process of loan syndication and the influence that the different levels of this geographic diversification has on the cost of debt in PF.

As the process of loan syndication is very important for borrowers and lenders in project financings, then more needs to be investigated about how geographic diversification of bank syndicates affects the loan spread.

1.3 Purpose of the study

In response to the critical role that creditors play in financing and governing investments in the context of project finance, the purpose of this empirical study is to focus on the different levels of geographic diversification of loan syndicates in PF transactions to determine which of those are significant in determining the cost of debt associated with this financing mechanism.

Geographic diversification was conceptualized at three different levels (total, inter-regional, and intra-regional) consisting of a quantitative score for each level.

The results have important theoretical and practical contributions. Not only they provide new evidence to address conflicting conclusions in past research studies of project finance loan pricing, but also reveal new risk mitigation strategies to improve the structuring and financing of large infrastructure investments.

1.4 Research questions and hypotheses

Building on the work of Dorobantu & Müllner (2019), I investigate empirically the effect of different levels of geographic diversification of loan syndicates on loan pricing. I hypothesize that political, legal and regulatory risk influences the governance role of the bank syndicate, and that the formation of the bank syndicate will adjust in geographic depth in function of these risks.

I test four hypotheses. Three hypotheses H1, H2 and H3 relate political, legal and regulatory risk to geographic diversification of the loan syndicate.

H1. Total geographic diversification of bank syndicates is greater in projects with more political, legal and regulatory risk.

H2. Inter-regional diversification of bank syndicates is greater in projects with more political, legal and regulatory risk.

H3. Intra-regional diversification of bank syndicates is greater in projects with less political, legal and regulatory risk.

And one hypothesis H4 relates geographic diversification of the loan syndicate to project finance loan spread.

H4. At least one of the three geographic diversification measures (a) total diversification, (b) inter-regional diversification, (c) intra-regional diversification is a statistically significant predictor of loan spread.

This dissertation is organized as follows. An overview of the evolution of PF is presented in section 2, including the history of modern PF, and the project financing loan market in the present. In section 3, a review of the available literature on PF loan pricing is conducted. Section 4 presents the dataset and methods. Section 5 includes the results of the empirical analysis of the pricing determinants of PF. In section 6 the dissertation closes with concluding remarks.

2 The evolution of project finance

This section describes the history and growth of modern PF since its origins in the 1970s and also provides an overview of project financings in the present.

2.1 History of modern project finance

Modern project financing dates back to the successful development of the North Sea oil and gas offshore oilfields in the 1970s, where it emerged as the appropriate funding solution for these investments. At that time, PF proved to be the financing mechanism answer to investments of such size and risk for which until then no single company nor group of companies had the capability to take on by using other types of financing solutions (Kleimeier & Megginson, 2000; Esty & Christov, 2002). As a result of this success, PF grew to become an important and effective source of funding for large infrastructure and capital intensive projects (Sorge & Gadanecz, 2008).

During the 1980s the adoption of PF advanced further, following the Public Utility Regulatory Policies Act (PURPA) of 1978 which was passed in the United States in consequence of the energy crisis of the 70s. The PURPA was meant to foster the development of cogeneration and renewable power facilities by requiring power utilities to purchase electricity to independent power producers (IPPs) under long term contracts. This setting has been responsible for the financing of power plants in the US using PF and accounted for more than two-thirds of the total PF investment in the 80s (Esty & Christov, 2002). A wave of privatization and deregulation of the utilities sector worldwide followed and further continued PF development trajectory (Yescombe, 2013).

In the 1990s, the United Kingdom experimented with a specific scheme of PF to fund public infrastructure projects. The Private Finance Initiative (PFI) was a public administration policy designed to encourage private sector capital investment in public projects including roads, hospitals, and schools and aimed at reducing government and taxpayer immediate financing needs (Yescombe, 2013). This policy of competitive tendering for the design, build, financing and operation of public infrastructure and respective contract awards has come to be known as

public-private partnerships (PPPs). Before the decade was out the UK had signed an excess of 250 PFIs arrangements worth of £16 billion and had identified over 1000 projects worth of being included in the PFI program (Esty & Christov, 2002).

From the year 2000 onwards, project financing has been used in a wider range of industries such as oil and gas, power, transportation, and telecommunications worldwide, in both developed and developing nations (Sorge & Gadanecz, 2008).

In the first decade of the 21st century, the trajectory of growth in project financed investment continued strong, only interrupted on two occasions as noticed by Esty *et al.* (2014). The first one in 2002 due to the global recession and financial turmoil caused by the tech bubble burst, and in 2009 in the following of the global financial crisis of 2008. Despite these events, the resilient nature of project financing was evident and the decline in PF lending volume did not take long to recover to pre-crisis values in consequence of the geographical shift occurring in PF deals flow. The 10-year compound annual growth rate (CAGR) for project financing bank loans in this decade was 7%,

Over the last ten years the attractiveness of PF remained unchanged, the application spectrum of such financing structures have expanded beyond infrastructure to encompass more extensively the service sector, and the prominence of infrastructure financing in emerging economies has increased (Refinitiv, 2021; Refinitiv, 2020).

Recent examples of PF loan deals include the $19.0 billion Barakah nuclear power plant in the United Arab Emirates in 2016, the $14.9 billion Mozambique LNG development in 2020, the $12.7 billion Amur gas processing plant in Russia in 2019, the $12.1 billion Taiwan High Speed Rail in 2015, the $11.9 billion Yamal LNG development in Russia in 2016, the $11.5 billion Corpus Christi LNG development in 2015, and the $9.5 billion Malaysia’s refinery and petrochemical integrated development known as RAPID in 2019.

2.2 Project finance loans market in the present

Project financing continued to recover throughout the world in 2021, in spite of the Covid-19 pandemic disruption, as presented in Figure 2.

According to data from Refinitiv (2021; 2020), global PF loan volume increased 7% to reach $306 billion from 918 deals, compared to $278 billion from 901 deals in 2020.

**** Insert Figure 2 about here ****

EMEA region continued to take the lead over the Americas and Asia Pacific & Japan regions in PF loan volumes with a total of $148 billion in proceeds from 354 transactions, corresponding to a 15% increase from 2020 volume figures and to the second highest annual volume on record. Supported by the top three deals in 2021, the $11 billion Eig Pearl Holdings SARL oil pipeline, the $10 billion Sadara Chemical and the $7 billion Jazan Refinery respectively, Saudi Arabia became the leading market in EMEA with project financings worth of $34 billion in 2021 from 11 deals, rising by 486% on the figure from the previous year.

PF loans in the Americas rose 4% from 2020, with total proceeds of $96 billion from 377 deals with the $2 billion Dominion Energy Cove Point LNG deal in the US being the largest project financing to reach financial close in 2021 in this region. The US continued to be the largest PF market accounting for $62 billion from 200 deals, an 11% increase from 2020.

A decline of 4% from was observed in Asia Pacific & Japan region which totaled $61 billion in project financings volume and 187 transactions. The leading market contributor was Australia with $31 billion worth of PF loan volume and 66 deals. The largest transaction in the region was the Australian $3 billion Stella NEL Finance Pty Ltd transportation project.

By sector, the overall distribution, as presented in Figure 3, remained mostly unchanged in comparison to the previous year.

**** Insert Figure 3 about here ****

According to Refinitiv (2021) report, power remained the most significant global contributor with 616 deals worth of $129 billion despite the 2% decrease from 2020 volume figures. Renewables accounted for 68% of the power sector with total proceeds of $88 billion from 496 issues, with the largest one being the $4 billion financing of the massive 1.2GW Dogger Bank C offshore wind farm in the United Kingdom.

In the oil and gas sector, PF loan volume slid from 16% of the total in 2020 and totaled $58 billion from 187 transactions. The $11 billion Eig Pearl Saudi project mentioned earlier was the largest of this sector and the top transaction of the year.

Transportation followed with a growth of 16% in terms of value which totaled $41 billion from 87 deals. The Turkish $7 billion Iga Airport Refinancing project accounted for the largest transaction of the year in this sector.

The telecommunications sector has experienced a dynamic level of activity in project financings in 2021 with a 58% increase in proceeds. 36 transactions worth of $21 billion were recorded and the $3 billion Globalconnect fibre optic network deal in Sweden has been the most significant one.

The remaining sectors including leisure & property, petrochemicals, industry, mining water & sewerage and waste & recycling accounted for a combined total of $56 billion and 111 transactions.

3 Literature review

3.1 Loan pricing

The attractiveness of PF as a financing mechanism can be attributed to its special features such as the ability to undertake projects without diminishing the capacity to borrow for traditional projects or without penalizing debt ratios, to deter agency conflicts through appropriate financial structures or even to provide suitable risk shifting devices from contractual agreements comprehensively designed to transfer risk to the parties best able to control them (Brealey *et al.*, 1996).

However academic literature in the field of PF has not been as prolific as the adoption and growth levels observed in project financing would have anticipated. Kumar *et al.* (2021) argue that conceptual and empirical research in the field of PF over the last forty-five years is found to be lagging in providing conclusive answers that clear out the landscape of views and conclusions, sometimes conflicting, found in the extant literature. In this review, the emphasis is given to one particular stream of the empirical research conducted, the study of PF lending from a loan pricing determinants perspective.

According to the work of Kumar *et al.* (2021), the most influential studies on the determinants of loan pricing for project financing debt instruments were developed by Dailami & Leipziger (1998), Kleimeier & Megginson (2000), Sorge (2004), Blanc-Brude & Strange (2007), Dailami & Hauswald (2007), Sorge & Gadanecz (2008), Corielli *et al.* (2010), Girardone & Snaith (2011), Bouzguenda (2014), Cruz & Sarmento (2018), Ahiabor & James (2018), Thierie & De Moor (2019a).

In addition to the authors identified by Kumar *et al.* (2021), Thierie & De Moor (2019a) also highlight the significant contribution to the body of knowledge of project financing derived from the research of Altunbaş & Gadanecz (2004), and Esty (2004a).

3.2 Micro determinants

3.2.1 Loan-specific

The term structure of PF loans is one of the classic and most recurrent loan related micro determinants investigated within the empirical literature vis-à-vis the impact on the credit spreads, it is however one of the most intriguing because of the conflicting findings.

A negative relation between loan maturity and the cost of debt is observed in the studies of Kleimeier & Megginson (2000), Altunbaş & Gadanecz (2004) and Bouzguenda (2014). The authors argue that this behavior stems from the short-term liquidity constraints that large-scale infrastructure and long-term capital intensive projects tend to have. During the early stages of project development the long construction time and high startup costs defer cash flow generation and this poses an intrinsic financial risk associated with servicing debt repayments. Ceteris paribus extended loan tenors and adjusted repayment schedules reduce borrower default risk over time, thus lowering the pricing of PF loans.

Blanc-Brude & Strange (2007) and Thierie & De Moor (2019a) however, seem to suggest otherwise. Their study reports that loan maturity and spread are positively related. But this finding comes with two caveats - the effect is negligibly small and seems particular of a specific subset of the PF market. Blanc-Brude & Strange (2007) research sample only includes European PPP projects and in the study of Thierie & De Moor (2019a) the statistical significance is lost once the PPP projects are removed from the sample.

Another stream of research points in the direction of a non-linear “hump-shaped” term structure of PF loans (Sorge, 2004; Sorge & Gadanecz, 2008) which the authors attribute to the uncertainty profile of the project life. Credit spread rises during the early stages of the project because it is at this time that risk also exhibits the highest levels. As time passes, risk gradually diminishes and so can the loan spread.

Several studies identified no significant relations between maturity and credit spread (Esty, 2004a; Corielli *et al.*, 2010; Girardone & Snaith, 2011; Cruz & Sarmento, 2018).

Loan size is another factor frequently considered in the existing studies of PF loan pricing. Bouzguenda (2014) advances the possibility of a positive relation as a consequence of the greater risk faced by lenders when larger loan amounts make for larger shares within their loan portfolios. However the author's empirical results point in the opposite direction, larger syndicated credits drive down the spread and support the argument that cost advantages are achieved instead. The same conclusion was observed in other studies which may signal that by committing larger loan amounts lenders can enjoy economies of scale (Altunbaş & Gadanecz, 2004), or alternatively, that banks tend to lend larger amounts to more creditworthy borrowers (Sorge & Gadanecz, 2008; Girardone & Snaith, 2011; Ahiabor & James, 2018).

Evidence suggesting that loan size does not influence the credit spread of PF loans is observed in the research of Kleimeier & Megginson (2000), who find it intriguing and worth of further investigation. Similarly, in the studies of Esty (2004a), Blanc-Brude & Strange (2007), Cruz & Sarmento (2018) and Thierie & De Moor (2019a) this relation is also found to be nonexistent.

Credit enhancement in the form of third-party guarantees is unanimously acknowledged throughout the literature to exert a downward pressure on the spread as one would expect (Kleimeier & Megginson, 2000; Altunbaş & Gadanecz, 2004; Sorge & Gadanecz, 2008; Girardone & Snaith, 2011; Bouzguenda, 2014). Sorge & Gadanecz (2008) find this behavior to be extremely significant and particularly noticeable in developing countries suggesting how important guarantees provided by multilateral development banks and export credit agencies in PF deals are in mitigating political risk effectively. The study further notes that the presence of guarantees appears to reduce ex ante credit spread by approximately one third on average, or 50bps from an average spread of 150bps found in the study sample of PF loans. Kleimeier & Megginson (2000) and more recently Girardone & Snaith (2011) also report an effect of third-party guarantees with the same order of magnitude observing spread reductions of 43bps and of 66bps respectively in their studies.

The type of loan or the variety in seniority levels of loan tranches is the last loan-specific micro determinant of credit spread found in the literature of PF loan pricing. Blanc-Brude & Strange (2007) as the sole authors to have conducted research on this relation consider the lack of control for such determinant to be detrimental of existing research studies, since controlling for the

different types of instruments amongst loan tranches contributes considerably to the explanatory power of the authors' model. In mezzanine or subordinated debt the authors observe an upward pressure on the average spread of approximately 250bps while in short-term bridge or revolver-type facilities a decrease on the average spread in the range of 28bps and 38bps. These findings signal the inherently different risk profiles associated with each type of instrument.

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

3.2.2 Project-specific

The first project related micro determinant of this review is capital structure. The empirical literature points in two distinct directions, one which indicates that a positive influence exists and the other which finds no relation.

By exploring the effects of non-financial contracts and leverage on PF transactions, Corielli *et al.* (2010) concluded that lower equity contributions result in more expensive credit. The study reports that a D/E ratio increase of one percentage point yields a loan spread increase between 46bps and 76bps.

On the contrary and against the expectation that more leveraged projects would command higher premiums, Thierie & De Moor (2019a) find that the effects of capital structure on the pricing of the loan tranches analyzed have no statistical significance. The same conclusion had been drawn earlier in the research of Blanc-Brude & Strange (2007).

In terms of industry as an explanatory variable, all studies but one suggest in favor of an influence. By capturing the effect of industry with an indicator variable, Kleimeier & Megginson (2000) counter intuitively find that in PF loans, lenders tend to charge higher spreads to projects from industries rich in tangible, non-specialized assets. The empirical results show a spread increase between 14bps and 21bps on average. However this observation is not unprecedented as the authors point out and two motives might explain the positive relation. The first is that such projects with collateral assets happen to be relatively riskier than average and the second is that projects of such risk can only be funded with project financing structures. The same upward pressure on PF loan spread was found in the research of Altunbaş & Gadanecz (2004) and later

in Bouzguenda (2014) who observes a spread increase of 27bps on average for projects with collateral assets.

The only authors whose investigation finds no relations between borrower's sector and level of spread were Corielli *et al.* (2010).

Project development consists of several phases with particular risks and construction is often the initial one, therefore construction risk is discussed first in this next section.

The construction phase is always critical, mostly due to its duration which is normally long. The main risks associated with this phase are construction delays, cost overruns, contractors or suppliers bankruptcy. By analyzing the cost of PPP debt for the road sector, Blanc-Brude & Strange (2007) conclude that, the control variables for construction risk are statistically insignificant and do not contribute for the explanatory power of the model. As expected, lenders do not price construction risks because these risks are managed contractually by the project company through the construction contractual arrangements.

Revenue risk is the second risk reviewed in this section and consists of the possibility that demand for the goods or services produced by the project does not generate sufficient revenue to service debt obligations. This kind of risk is traditionally managed with off take agreements such as take-or-pay or fixed-price contracts that bring high degrees of certainty vis-à-vis the project long-term cash flows. But in some cases such as transport, this kind of risk management is not feasible and this risk becomes of major concern. The two authors who researched this subject found a positive relation between revenue risk and the cost of debt in project financing. In the results of Blanc-Brude & Strange (2007) credit spread in PPP projects increases by 41bps and 34bps above average in the case where revenues were gained through real tolls and shadow-toll payment mechanisms respectively. The authors further note that in the case of projects where revenues were gained through availability payment arrangements, spread increase above average is the lowest. The results of Thierie & De Moor (2019a) research suggest the same conclusion. By considering an availability payments control variable as a proxy for revenue risk, the authors find that whenever revenues are gained through availability payment arrangements, borrowers get a discount of 28bps on average.

Another major driver of PF credit spread researched often is political risk. As normal project development and long term economic viability can get impaired through interference actions by the host governments, this risk lies in the disruption potential of political actions. Examples of such actions include unexpected changes in taxes, failure to meet contractual obligations by state-owned suppliers or customers, concession termination, expropriation, and political violence including war, sabotage or terrorism. In this matter, all the empirical literature is in agreement, finding that country risk significantly and positively influences the credit spread of PF loans. By measuring country risk with an integer ranking of country risk provided by *Euromoney*, Kleimeier & Megginson (2000) observe that the loan spread increases by 1.5bps on average for each unitary increase of country risk rating. Sorge (2004) and Sorge & Gadanecz (2008), by considering as a country risk proxy the corruption index provided by Transparency International, conclude that country risk is only statistically significant in the results of the emerging economies sample, with banks charging higher premiums to projects developed in riskier political systems. The authors also control for political risk guarantees which they observe to lower loan spread of approximately 50bps on average. In the studies of Girardone & Snaith (2011) and Bouzguenda (2014) who consider the political risk rating from the International Country Risk Guide database loan spread rises 2bps on average for every one point increase in overall political risk rank. Bouzguenda (2014) also finds that the effect of political risk insurance in the form of guarantees is significant, reducing credit spread in the range of 68bps and 89bps on average.

Currency risk arises whenever the financial transactions are denominated in a currency other than the domestic currency, for instance, project revenue generated in a different currency than the one of loan repayment. By controlling for the difference between the currency of the borrower's country of origin and the loan repayment currency, the empirical literature conclusions about this risk divide.

Some research studies conclude that loan spreads in project financings are significantly and negatively influenced by currency risk (Kleimeier & Megginson, 2000; Corielli *et al.*, 2010; Ahiabor & James, 2018). With results from the different studies showing spread reductions of up to 42bps on average in the presence of this risk. One explanation that the authors advance for this

finding is that lenders offer a credit discount to international borrowers who are willing to take the risk of borrowing in dollars or other hard currency; Nevertheless some of these authors seem intrigued about why the borrower's risk of default does not increase instead (Kleimeier & Megginson, 2000).

Bouzguenda (2014) however, finds the control variable to be statistically insignificant in the model hence suggesting that no effect exists.

Legal and regulatory risk is reviewed lastly in this group of determinants. This risk is directly associated with the stability and creditor protection levels provided by the legal and regulatory environment on which the project is developed. It also reflects the extent to which the legal institutions and regulators are independent and capable of enforcing the law in aspects such as prices, public duties, and competition.

By controlling for creditor rights and enforcement, Esty (2004a) observes that PF cost of debt is positively related to legal and regulatory risk. When creditor protection improves of one unit in the author's model, credit spread decreases by 8bps. In addition, when legal enforcement increases of one unit, spread falls by approximately 5bps.

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

3.2.3 Lender-specific

The following set of determinants concerning creditor characteristics starts with the market power of lenders. By investigating syndicated credits granted to developing country borrowers, Altunbaş & Gadanecz (2004) find evidence in favor of lenders exploiting their market power. The empirical results show that loan spread increases in tandem with market power. Because the statistical model controls for the lending share of the borrower's country in world syndicated lending, the authors advance two interpretations of the behavior found. The first is that lenders with stronger reputations can claim additional compensation to those borrowers who are seen to be highly dependent on this loan market and unable to access different funding sources. Alternatively, it can be an indication that banks charge higher premiums due to a perception of risk concentration.

Another explanatory variable found in the literature is the size of the banking syndicate for which the research findings are not in agreement. In the model of Sorge & Gadanecz (2008) the effect of size of the banking syndicate is evaluated with the bilateral loan indicator variable which translates loan deals involving only one banking institution. The findings of this work suggest that a greater number of participating banks reduces the credit spread of PF loans, which the authors attribute to a risk mitigating effect of larger syndicates. In the same way, Thierie & De Moor (2019a) evaluate this effect with a control variable taking into account the number of different financing institutions involved in the deal. Curiously, the reported regression output is consistent with a spread reduction effect due to larger syndicates, however the authors conclude in an opposite direction which raises doubts regarding the study findings.

Altunbaş & Gadanecz (2004), Blanc-Brude & Strange (2007) and Girardone & Snaith (2011) conclude differently. These authors find no evidence in support of a significant relation between size of banking syndicate and PF loan spread.

Bank origin concerns the lender nationality and is the final determinant in this group. This factor was studied by Esty (2004a) who finds evidence that PF loan spreads are positively related to the share of loans arranged by foreign banking institutions. The author argues that this finding suggests that availability of domestic long term financing might be an issue for borrowers or alternatively, that foreign lenders charge a premium for insuring against sovereign interference.

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

3.3 Macro determinants

In the macroeconomic group of determinants, the inflation rate is the first one reviewed. Most research concludes that the role of inflation is prevailing and that the market penalizes PF loans in countries with high rates of inflation (Dailami & Leipziger, 1998; Altunbaş & Gadanecz, 2004; Sorge & Gadanecz, 2008). In the pricing regressions of Dailami & Leipziger (1998), spread is found to increase between 15bps and 26bps for each percentage point increase of the inflation rate. Additionally by controlling for inflation rates higher than 50% per annum in their model, the authors found evidence in favor of nonlinear behavior since loan margins were further penalized when rates of inflation exceeded this threshold.

Opposing evidence on the impact of the inflation rate is found in the recent study of Thierie & De Moor (2019a). Interestingly the authors observe the inflation rate to be negatively associated with the spread of PF credits in two cases, the whole sample of the study consisting of both PPP and non PPP projects and also the subsample of only PPP projects but this time to a greater extent. An increase of one percentage point in inflation rate resulted in a PF loan margin reduction of 26bps and 45bps respectively for whole sample and for PPP only subsample. However for the subsample made of only non PPP projects, no statistical significance was found.

In another PPP related research, Blanc-Brude & Strange (2007) found inflation risk to have no impact on the loan margin. The authors argue that the reason behind this observation is the inflation-indexing practice of toll charges which covers investors and creditors in the event of inflationary pressures.

Governments' debt-to-GDP ratio is another factor of macroeconomic performance investigated often. Altunbaş & Gadanecz (2004), Girardone & Snaith (2011), and Thierie & De Moor (2019a) all establish a positive association between this factor and the loan spread in the context of PF. Hence higher debt-to-GDP ratios result in higher financing costs to infrastructure investment. The results from Thierie & De Moor (2019a) indicate that one percentage point increase in the public debt level raises spread between 6bps and 9bps on average. An additional insight is provided in the work of Altunbaş & Gadanecz (2004), as these authors also tested for the influence of debt rescheduling. They found evidence on the equally positive and significant relation regarding the country's historic record of debt rescheduling whenever this record was present borrowers faced more expensive financing.

In conflict with previous research, Sorge & Gadanecz (2008) failed to observe statistically significant effects related to solvency of the borrower's country.

The role of real GDP growth rate has been considered in a few studies. Again the trio of authors Altunbaş & Gadanecz (2004), Girardone & Snaith (2011), and Thierie & De Moor (2019a) come to concurring conclusions, finding that lenders grant a credit discount to projects developed in countries where the economic outlook is promising. A reduction of approximately 4bps on average is reported in the results of Girardone & Snaith (2011). Thierie & De Moor (2019a)

report a reduction of 17bps for the sub-sample consisting of only PPP projects but finds no statistical significance for the sub-sample of non PPP projects.

In a different conclusion, Sorge & Gadanecz (2008) finds GDP growth rate to have no statistical significance in their study.

The last macroeconomic related factor considered in the literature is the credit rating of the host country. The majority of research finds evidence that lenders charge borrowers more the worse the sovereign rating, suggesting that banks price country creditworthiness into their loan offerings (Altunbaş & Gadanecz, 2004; Corielli *et al.*, 2010; Ahiabor & James, 2018). Altunbaş & Gadanecz (2004) notice a significant spread penalty for borrowers from countries with lower sovereign ratings, as the credit spread increases from 66bps in the case of a best score to 238bps for the case of a poor score, translating a 173bps difference on average. Similar conclusions are found in the research of Corielli *et al.* (2010) who find this difference to be of approximately 105bps. However, in the case of a default, not rated or undisclosed credit rating, the spread found is lower compared to the other rating classes which the authors citing Gatti *et al.* (2007) attribute to loan restructuring efforts taken by banks in an attempt to prevent projects bankruptcy.

The results of Esty (2004a) suggest that sovereign rating has no effects in loan pricing, because as the author argues, under a project financing structure, sponsors are able to set up project companies that have better credit ratings than the host country, thus allowing banks to accept greater levels of credit risk.

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

**** Insert Figure 4 about here ****

4 Methods

4.1 Data and sample

Loan data for this study is sourced from Refinitiv PF content, an industry-leading database of comprehensive and historical deal information with coverage of global PF loan deals since the 1980s. Moreover, PF loans are typically made of several loan tranches, and the database offers tranche level information. Refinitiv PF content provides loan specific data including tranche size, type (e.g. term loan, bridge loan and revolving credit facility), maturity, currency and pricing. Beyond loan related information, the database also includes project and lender related data namely industry and number of lenders within the loan syndicate.

Macro-economic data is obtained from the International Monetary Fund (IMF), and the World Bank including inflation rate, level of financial depth approximated by private credit to GDP, and real GDP growth. Financial risk data is sourced from Moody's sovereign ratings.

Political, legal and regulatory risk data is proxied with the country estimates of the World Bank's Worldwide Governance Indicators (WGI) which is a research dataset summarizing the views on the quality of governance[1] in developed and developing countries over the last twenty five years. The WGI consists on aggregate indicators in broad dimensions of governance related to political, legal and regulatory risk.

The sample for this study consists of 650 PF loan deals worth $235 billion from 68 different countries that occurred between 2012 and 2021.

[1] According to the World Bank, "Governance consists of the traditions and institutions by which authority in a country is exercised. This includes the process by which governments are selected, monitored and replaced; the capacity of the government to effectively formulate and implement sound policies; and the respect of citizens and the state for the institutions that govern economic and social interactions among them" (Kaufmann *et al.*, 2010).

4.2 Model and estimation procedure

The relations between the geographic diversification of the loan syndicate and the control variables expected to have an influence on this geographic diversification are tested with the statistical models described in equations (1), (2), and (3), using standard OLS regression estimation techniques and adjusting for heteroskedasticity using White's (1980) standard errors.

$$Total = \alpha + \beta_1 PolRisk + \beta_2 MicroCtrls + \beta_3 MacroCtrls + \varepsilon \quad (1)$$

$$Inter = \alpha + \beta_1 PolRisk + \beta_2 MicroCtrls + \beta_3 MacroCtrls + \varepsilon \quad (2)$$

$$Intra = \alpha + \beta_1 PolRisk + \beta_2 MicroCtrls + \beta_3 MacroCtrls + \varepsilon \quad (3)$$

Subsequently, the impact of the geographic diversification of the banking syndicate on PF loan spread is tested with the statistical model described in equation (4) using standard OLS regression estimation techniques and adjusting for heteroskedasticity using White's (1980) standard errors.

$$Spread = \alpha + \beta_1 Total + \beta_2 Inter + \beta_3 Intra + \beta_4 MicroCtrls + \beta_5 MacroCtrls + \varepsilon \quad (4)$$

4.3 Description of variables

4.3.1 Dependent variables

I measure geographic diversification of the loan syndicates at three different levels. Total diversification TOTL Y1 by calculating the number of distinct countries represented in the loan syndicate. Inter-regional diversification NTER Y2 by calculating the number of times all regions are represented with distinct countries in the loan syndicate. And intra-regional diversification NTRA Y3 by calculating the number of distinct countries represented in the region most represented in the loan syndicate.

I measure the cost of debt in PF loans with SPRD Y4, the loan spread over LIBOR, in basis points as per literature standard pricing measures.

4.3.2 Independent variables

I quantify political, legal and regulatory risk with the indexes from the aggregate governance indicators of the World Bank. Voice and accountability VACC X1 reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. Political stability and absence of violence/terrorism PSTA X2 measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism. Government effectiveness GEFF X3 reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. Regulatory quality RQUA X4 reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. Rule of law RLAW X5 reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. Control of corruption CCOR X6 reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

4.3.3 Micro-economic control variables

I control for a number of micro-economic factors in our analysis. SIZE X7 is the amount of the tranche, in US$mil. MATU X8 is the duration between tranche issue date and tranche maturity date, in months. Dummy CURR X9 reflects the loan exposure to currency risk, takes the value of 1 when loan currency denomination differs from the currency of the borrower’s home country and 0 otherwise. NLEN X10 is the number of lenders forming the loan syndicate. And MKTP X11 reflects the combined market share of the loan syndicate in percentage.

4.3.4 Macro-economic control variables

I also control for a number of macro-economic factors in our analysis. INFL X12 is the annual inflation rate, in percentage. FDEP X13 is the level of financial development quantified by the domestic credit to private sector, as a percentage of GDP. GDPG X14 is the real GDP growth annual rate, in percentage. And dummies of sovereign's ratings (best BEST X15, investment grade IGRA X16, speculative SPEC X17, poor POOR X18) constructed using Moody's ratings, which express the sovereign's credit risk, and therefore the sovereign's ability to honor debt service obligations. The conversion table used, proposed in Altunbaş & Gadanecz (2004), is shown in Table 1.

4.4 Variables correlation

The correlations between the independent variables in our dataset are shown in Table 6.

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

As expected it shows that the correlation between the WGI aggregate governance indicators as proxies of political, legal and regulatory risk by country are highly correlated among themselves. The remaining explanatory variables either exhibit non-significant correlation or exhibit significantly low correlations.

5 Data analysis and results

5.1 Descriptive statistics

Table 7 presents some descriptive statistics as an exploratory analysis to understand the characteristics of our loan sample in particular in terms of mean and dispersion. The study sample includes 650 worldwide observations worth $235 billion from 68 different countries that were recorded in the period between 2012 and 2021.

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

The dependent variables measuring the different levels of geographic diversification of the loan syndicates are as follows. The measure of total geographic diversification TOTL Y1 averages 3.91 and varies 2.96 standard deviations, inter-regional diversification NTER Y2 averages 0.82 and varies 0.55 standard deviations, and inter-regional diversification NTER Y2 averages 2.57 and varies 1.97 standard deviations. The last dependent variable SPRD Y4 measuring loan pricing, is observed to have an average value of 265bps.

In terms of the five independent variables, voice and accountability VACC X1 has an average of 0.54 and varies between -1.87 and 1.57. Political stability PSTA X2 averages 0.12 and varies between -2.41 and 1.49. Government effectiveness GEFF X3 has a mean of 0.93 and ranges between a minimum of -1.37 and a maximum of 2.32. Regulatory quality RQUA X4 has a mean 0.94, a minimum of -1.85 and a maximum of 2.23. Rule of law RLAW X5 averages 0.89 and has a minimum of -1.59 and a maximum of 2.00. Lastly control of corruption CCOR has an average of 0.81 and varies between -1.42 and 2.25.

In terms of micro-economic controls, the statistics shows that the average tranche is worth $361 million (SIZE X7) and matures in 131 months or approximately 11 years (MATU X8). Currency denomination of the tranche differs from the currency of the borrower's home country in 42% of the loans (CURR X9). The typical project financing in the sample is funded by a syndicate made of 6.97 lenders, and varies between a minimum of 1 and a maximum of 33 (NLEN X10). The banking syndicate is observed to have on average a combined market power of 9.15% (MKTP X11).

In terms of macro-economic controls, the average annual inflation rate of the host country is 3.29% (INFL X12), financial development exhibits an average ratio of 106.62% (FDEP X13), and real GDP growth an average rate of 1.92% (GDPG X14). With regard to sovereign creditworthiness, the study sample is distributed as follows. 57% of the loans occur in countries belonging to the rating class of best (BEST X15), 11% occur in countries with investment grade ratings (BEST X15), 10% occur in countries belonging to the rating class of speculative (SPEC X17), and 10% occur in countries belonging to the rating class of poor (POOR X18). 12% of tranches occur in host countries with a rating of default, not rated, or not disclosed.

5.2 Empirical results and discussion

As outlined in the introduction, this empirical investigation consists of two parts. The first part investigates the relations between political, legal and regulatory risk of the host country and the geographic diversification of loan syndicates in order to address hypotheses H1, H2 and H3. Regressions 1 through 6 presented in Table 8, use total geographic diversification as the dependent variable and differ on the risk proxies used as the independent variable. Regressions 7 through 12 presented in Table 9 use inter-regional diversification, and regressions 13 through 18, presented in Table 10, use intra-regional diversification. The second part investigates the extents to which the different levels of geographic diversification of the loan syndicate affect loan spread to address hypothesis H4. Regression 19 presented in Table 11 use loan spread as the dependent variable and the different levels of geographic diversification as independent variables.

5.2.1 Total geographic diversification

Looking first at the estimates of Equation (1) presented in Table 8, I observe that all regressions are significant at the 1% level and that regressions 1, 4 and 6 predict 87% of total geographic diversification variation.

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

Surprisingly, I find support in opposite direction of what I anticipated in hypothesis H1 which predicts that higher political, legal and regulatory risk in the host country requires greater geographic diversification of the loan syndicate. In regression 1, the estimated coefficient on

voice and accountability VACC X1 is observed to be positively associated with the dependent variable of total geographic diversification TOTL Y1 indicating that this diversification of the bank syndicate is higher the more political stability exists. Equivalent associations are observed in regressions 4 and 6 with regards to the independent variables of regulatory quality RQUA X4 and control of corruption CCOR X6 respectively. These findings seem to suggest that more political, legal and regulatory stability is associated with more geographic diversification of the loan syndicates.

In the group of micro economic controls, loan SIZE X7 is negative and significant indicating that for each million dollar increase in loan size, the total number of distinct countries represented within the banking syndicate is expected to decrease by 0.0003. The currency risk dummy CURR X9 shows a significantly positive relation with the dependent variable, which means that the existence of currency risk increases the level of total geographic diversification between 0.4050 and 0.5040. Number of lenders NLEN X10 is, as expected, positive and significant, and for each additional lender the response variable increases between 0.4110 and 0.4180 as observed in the results of regressions 1, 4 and 6. The market power of the syndicate MKTP X11 is also found to be positive and significant with a coefficient of 0.02. I find maturity MATU X8, to be non-significant as a predictor of the level of total geographic diversification.

In the group of macro economic controls, I find GDP growth GDPG X14 to be negatively associated with total geographic diversification suggesting that better economic performances tend to require less diversified syndicates. Each unitary increase reduces diversification by 0.03. I also find the credit rating dummy investment grade IGRA X16 to be positive and significant at a meaningful level indicating that the loan syndicate geographic diversification increases when the creditworthiness of the host country rests in this rating class. The remaining control variables have no statistical significance.

5.2.2 Inter-regional diversification

The estimates of Equation (2) presented in Table 9 are all statistically significant at the 1% level, and regressions 7 and 10, with adjusted coefficients of determination of 51%, are the most predictive of inter-regional diversification.

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

Once again, I find support in opposite direction of our hypothesis. H2 predicts that greater levels of political, legal and regulatory risk in the host country will result in greater inter-regional diversification of the bank syndicate and both predictors voice and accountability VACC X1 and regulatory quality RQUA X4 are positive and statistically significant in regressions 7 and 10 respectively. This finding indicates that host countries with more stable political, legal and regulatory systems are associated with more inter-regionally diversified syndicates.

Looking at our micro economic control variables, I find the coefficient of maturity MATU X8 to be negative and significant which shows that for each one month increase in loan tenor the dependent variable inter-regional diversification NTER Y2 reduces by 0.0010. Number of lenders NLEN X10 is again, as expected, positive and significant, the response variable rises of 0.04 per additional lender as shown in regressions 7 and 10. The market power of the syndicate MKTP X11 is also positive and significant, each additional unitary increase in this predictor increases the inter-regional diversification level by 0.0140. The remaining micro controls are non-significant as predictors.

In relation to macro controls, inflation rate INFL X12 and GDP growth GDPG X14 are significant predictor variables, influencing positively the level of inter-regional diversification with 0.01 increases per unitary change. I find with surprise that the dummy variables of rating classes speculative SPEC X17 and POOR X18 are negatively associated with the level of inter-regional diversification. For rating class Speculative SPEC X17 coefficients vary between -0.2630 and -0.2210 and for rating class POOR X18 coefficients vary between -0.2360 and -0.1770. Remaining controls are not statistically significant.

5.2.3 Intra-regional diversification

I find the estimates of Equation (3) presented in Table 10 to be all statistically significant at the meaningful level of 1%, and regressions 16, 17 and 18, with adjusted coefficients of determination of 76%, to be the ones that predict the most variation on the relation between political, legal and regulatory risk and intra-regional diversification.

**** Insert Table 10 about here ****

In these models, I find strong support of our hypothesis H3 which predicts that intra-regional diversification of the banking syndicate is greater in projects with less political, legal and regulatory risk. The positive and significant coefficients of regulatory quality RQUA X4, rule of law RLAW X5 and control of corruption CCOR X6 suggest that in host countries with higher levels political, legal and regulatory stability, intra-regional diversification NTRA Y3 is higher.

In the group of micro economic controls, I find loan SIZE X7 to influence negatively the response variable by 0.0003 for each million dollar increase in loan size. The coefficient of loan tenor MATU X8 is positive and narrowly significant in regressions 16 and 17, increasing the level of intra-regional diversification by 0.0010 for each additional month of loan maturity. Currency risk dummy CURR X9 is another significant predictor. The presence of this risk increases the dependent variable between 0.3340 and 0.3670. The coefficient of 0.29 observed for number of lenders NLEN X10 is positive and significant. Market power of the banking syndicate MKTP X11 is negative and significant and the coefficient observed varies between -0.0200 and -0.0180 in regressions 16, 17, and 18.

In the group of macro economic control variables, inflation rate INFL X12 has a significantly negative relation with the response variable, decreasing by 0.02 for each additional unitary increase in this predictor. GDP growth GDPG X14 is also a significant predictor variable, with a negative effect. Each unitary increase reduces the intra-regional diversification level by 0.04. We find creditworthiness of the host country to be statistically significant. Dummies investment grade IGRA X16, speculative SPEC X17 and POOR X18 are positively associated and the coefficients observed suggest that worse credit ratings are translated into more intra-regionally dispersed syndicates.

5.2.4 Loan pricing

Finally, looking at the estimates of Equation (4) on the pricing of PF loans summarized in Table 11, I observe that regression 19 is significant at the 1% level and that the model explained 24% of the observed variation in credit spreads.

**** Insert Table 11 about here ****

Contrary to my expectations, the model fails to confirm the importance of geographic diversification depth in defining the credit spread in project finance. Hypothesis H4 predicts that at least one of the three geographic diversification measures, TOTL X1, NTER X2, and NTRA X3, affects the credit spread in project finance but none of the relations found is statistically significant.

In the group of micro economic controls I observe that the estimated coefficient of maturity MATU X8 is negative and significant, which means that for each one month increase in maturity, spread is reduced by 0.21bps. Since project financings are characterized by long-term capital intensive ventures, this finding seems to suggest that increasing loan tenor provides a dampening effect with regards to potential liquidity issues faced by project companies and therefore be perceived as less risky than shorter term loans. Number of lenders NLEN X10 is negative and narrowly significant indicating that for each additional lender, borrowers can expect to benefit of about 3bps on average in the cost of PF, suggesting a risk mitigating effect derived from a larger syndicate. The market power of the banking syndicate MKTP X11 is negative and significant at a meaningful level. The estimated coefficient indicates that each unitary increase in market power decreases the loan syndicate by approximately 3bps. I find no statistical significance that could indicate an influence of the variables loan SIZE X7 and currency risk CURR X9 on the spread.

In the group of macro economic controls I find that financial depth FDEP X13 is a predictor of loan spread, I observe unsurprisingly a negative coefficient, meaning that sponsors benefit of more affordable financing the more efficient the access to banking and financial services is. For each unitary increase of financial deepening, loan spread decreases of approximately 0.27bps. My model also signals the importance of sovereign credit risk to lenders in defining project finance loan spreads, with higher risk levels leading to increases in the spread level. The dummy of sovereign rating class BEST X15 is negative, which means that a project developed in countries of very low sovereign credit risk are approximately 72bps less expensive. In the case of low sovereign credit risk, investment grade IGRA X16, loans benefit from a 55bps decrease in credit spread. On the other side of the sovereign credit risk spectrum, projects sponsors may expect to face more expensive financing and be penalized of about 62bps as observed in POOR

X18. In contrast, I find inflation rate INFL X12 and GDG growth GDPG X14 to be irrelevant to pricing definition.

6 Conclusion

The popularity and attractiveness of PF has remained unchanged over the last decades, and its importance as a financing structure of choice has expanded beyond infrastructure into the service sector. This dissertation explores the relations between the levels of political legal and regulatory risk of the host country and the geographic diversification of banking syndicates in the global PF loan market from 2012 to 2021. Our research further explores the effects of the different levels of geographic diversification of PF banking syndicates on loan pricing.

By using a unique dataset containing information on 650 PF loans across 68 different countries, this dissertation reveals new insights on these associations. Surprisingly, the empirical findings reveal positive and statistically significant relation between political legal and regulatory stability and total geographic and inter-regional diversification of the loan syndicates. This result seems to suggest that higher levels of total geographic and inter-regional dispersion of the loan syndicates are associated with governmental and political action of low interference and disruption potential, strong creditor protection, reliable legal enforcement and effective regulatory systems. As expected, with regards to intra-regional dispersion, the results reveal a positive association with political legal and regulatory stability indicating that higher levels of intra-regional diversification align with dependable host country governance, and creditor rights. Also contrary to the expectations, the study does not suggest that the degree of geographic diversification influences loan spreads in the context of project financings.

At a more specific level, the surprising findings raise interesting questions on the dynamics of banking syndicates dispersion and the process of loan syndication and for this reason, offers a promising avenue for future research. In addition, while this dissertation does not settle the debate surrounding the underlying PF loan pricing determinants, it does expand our understanding of the topic by providing new empirical evidence about conflicting findings in past research studies.

At a more general level, the results in this dissertation can offer valuable strategic guidance to all market participants including lenders and borrowers and ultimately contribute to improve the structuring and financing of large infrastructure investments.

7 Bibliography

Ahiabor, F. S. (2018). *Determinants of project finance loan terms.* Doctoral dissertation, Loughborough University.

Ahiabor, F. S., & James, G. A. (2018, October). Domestic lead arranger certification and the pricing of project finance loans. *International Journal of Finance and Economics, 24*(1), 150-167.

Altunbaş, Y., & Gadanecz, B. (2004, June). Developing country economic structure and the pricing of syndicated credits. *The Journal of Development Studies, 40*(5), 143-173.

Alves, P. P., & Pinto, J. M. (2020). *The choice between project financing and corporate financing: evidence from the corporate syndicated loan market.* Working Paper, Universidade Católica Portuguesa, Católica Porto Business School.

Blanc-Brude, F., & Strange, R. (2007). How banks price loans to public-private partnerships: evidence from European markets. *Journal of Applied Corporate Finance, 19*(4), 94-106.

Bonetti, V., Caselli, S., & Gatti, S. (2010, April). Offtaking agreements and how they impact the cost of funding for project finance deals: a clinical case study of the Quezon Power Ltd Co. *Review of Financial Economics, 19*(2), 60-71.

Bouzguenda, N. (2014, April). Project finance: determinants of the bank loan spread. *International Journal of Business and Social Science, 5*(5), 144-155.

Brealey, R. A., Cooper, I. A., & Habib, M. A. (1996). Using project finance to fund infrastructure investments. *Journal of Applied Corporate Finance, 9*(3), 25-39.

Buscaino, V., Caselli, S., Corielli, F., & Gatti, S. (2012, November). Project finance collateralised debt obligations: an empirical analysis of spread determinants. *European Financial Management, 18*(5), 950 - 969.

Byoun, S., & Xu, Z. (2014, June). Contracts, governance, and country risk in project finance: theory and evidence. *Journal of Corporate Finance, 26*, 124-144.

Chaney, P. K., & Thakor, A. V. (1985, March). Incentive effects of benevolent intervention: the case of government loan guarantees. *Journal of Public Economics, 26*(2), 169-189.

Corielli, F., Gatti, S., & Steffanoni, A. (2010, October). Risk shifting through nonfinancial contracts: effects on loan spreads and capital structure of project finance deals. *Journal of Money, Credit and Banking, 43*(7), 1295-1320.

Cruz, C. O., & Sarmento, J. M. (2018, October). The price of project finance loans for highways. *Research in Transportation Economics, 70*, 161-172.

Dailami, M., & Hauswald, R. (2000). *Risk shifting and long-term contracts: evidence from the Ras Gas Project.* Policy Research Working Paper 2469, World Bank, Washington, DC.

Dailami, M., & Hauswald, R. (2007, October). Credit-spread determinants and interlocking contracts: a study of the Ras Gas project. *Journal of Financial Economics, 86*(1), 248-278.

Dailami, M., & Leipziger, D. (1998, July). Infrastructure project finance and capital flows: a new perspective. *World Development, 26*(7), 1283-1298.

Dorobantu, S., & Müllner, J. (2019). Debt-side governance and the geography of project finance syndicates. *Journal of Corporate Finance, 57*, 161-179.

Esty, B. C. (2003). *The economic motivations for using project finance.* Working Paper, Harvard Business School.

Esty, B. C. (2004a). *When do foreign banks finance domestic projects? New evidence on the importance of legal and financial systems.* Working Paper, Harvard Business School.

Esty, B. C. (2004b). Why study large projects? An introduction to research on project finance. *European Financial Management, 10*(2), 213–224.

Esty, B. C., & Christov, I. L. (2002, April). An overview of project finance - 2001 update. *Harvard Business School Supplement 202-105*.

Esty, B. C., & Megginson, W. L. (2001). *Legal risk as a determinant of syndicate structure in the project finance loan market.* HBS Finance Working Paper No. 02-067.

Esty, B. C., & Megginson, W. L. (2003, March). Creditor rights, enforcement, and debt ownership structure: evidence from the global syndicated loan market. *Journal of Financial and Quantitative Analysis, 38*(1), 37-59.

Esty, B. C., Chavich, C., & Sesia, A. (2014, July). An overview of project finance - 2014 update. *Harvard Business School Supplement 214-083*.

Finnerty, J. D. (2007). *Project financing: asset-based financial engineering* (2nd ed.). Wiley.

Gatti, S., Rigamonti, A., Saita, F., & Senati, M. (2007, January). Measuring value-at-risk in project finance transactions. *European Financial Management, 13*(1), 135-158.

Girardone, C., & Snaith, S. (2011). Project finance loan spreads and disaggregated political risk. *Applied Financial Economics, 21*(23), 1725–1734.

Kaufmann, D., Kraay, A., & Mastruzzi, M. (2010). *The Worldwide Governance Indicators: methodology and analytical issues.* World Bank Policy Research Working Paper No. 5430.

Kleimeier, S., & Megginson, W. L. (2000). Are project finance loans different from other syndicated credits? *Journal of Applied Corporate Finance, 13*(1), 75-87.

Kleimeier, S., & Megginson, W. L. (2001). *An empirical analysis of limited recourse project finance.* Working Paper, University of Oklahoma.

Kumar, A., Srivastava, V., & Tabash, M. I. (2021, June). Infrastructure project finance: a systematic literature review and directions for future research. *Qualitative Research in Financial Markets, 13*(3), 295-327.

Pollio, G. (1998, August). Project finance and international energy development. *Energy Policy, 26*(9), 687-697.

Refinitiv. (2020). *Project Finance Review Full Year 2020 | Managing Underwriters.*

Refinitiv. (2021). *Project Finance Review Full Year 2021 | Managing Underwriters.*

Rugman, A. M., & Verbeke, A. (2008). A new perspective on the regional and global strategies of multinational services firms. *Management International Review, 48*(4), 397-411.

Sorge, M. (2004, December). The nature of credit risk in project finance. *BIS Quarterly Review*.

Sorge, M., & Gadanecz, B. (2008). The term structure of credit spreads in project finance. *International Journal of Finance and Economics, 13*, 68–81.

Soumaré, I., & La, V. S. (2016, December). An analysis of government loan guarantees and direct investment through public-private partnerships. *Economic Modelling, 59*, 508-519.

Staub-Bisang, M., Alfen, H. W., & Weber, B. (2016). *Infrastructure as an asset class: investment strategy, sustainability, project finance and PPP* (2nd ed.). Wiley.

Subramanian, K. V., & Tung, F. (2016, January). Law and project finance. *Journal of Financial Intermediation, 25*, 154-177.

Thierie, W., & De Moor, L. (2019a, May). Determinants of bank loan spread in project finance. *International Journal of Managing Projects in Business, 12*(1), 161-186.

Thierie, W., & De Moor, L. (2019b, October). Loan tenor in project finance. *International Journal of Managing Projects in Business, 12*(3), 825-842.

Verbeke, A., Kanob, L., & Yuan, W. (2016). Inside the regional multinationals: a new value chain perspective on subsidiary capabilities. *International Business Review, 25*(3), 785-793.

White, H. (1980). A heteroskedasticity-consistent covariance matrix estimator and a direct test for heteroskedasticity. *Econometrica, 48*, 817-838.

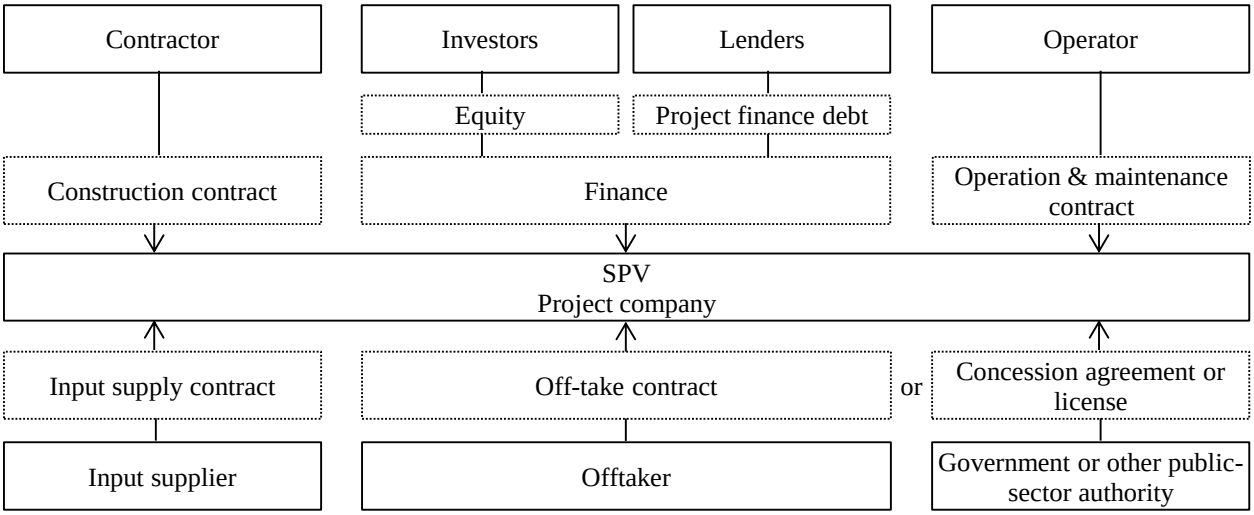
Williamson, O. E. (1988). Corporate finance and corporate governance. *The Journal of Finance, 43*(3), 567-591.

Yescombe, E. R. (2013). *Principles of project finance* (2nd ed.). Academic Press.

Appendices

Appendix A Typical project finance structure

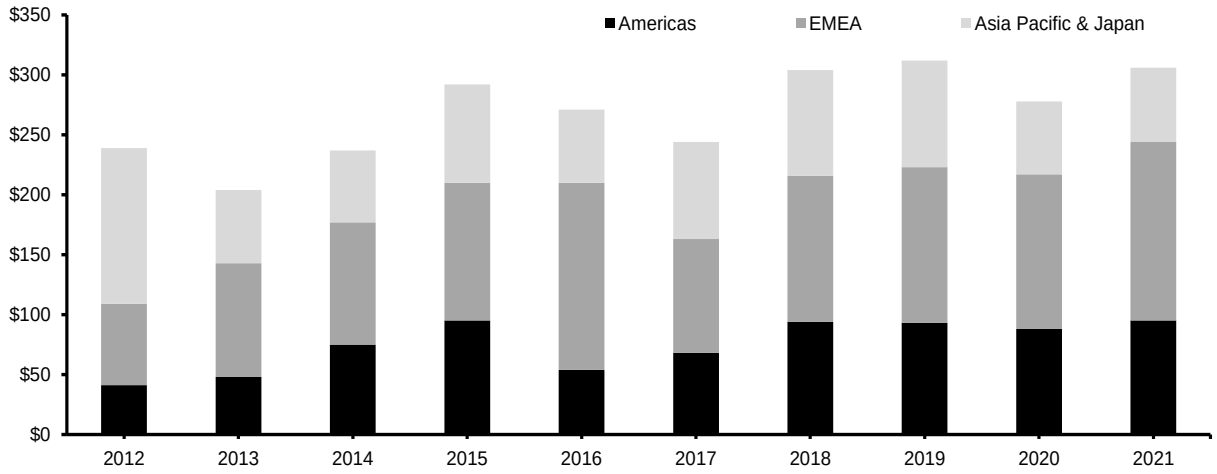
Figure 1: Typical project finance structure



Source: Adapted from Yescombe (2013)

Appendix B Global project finance loans 10-yr volume

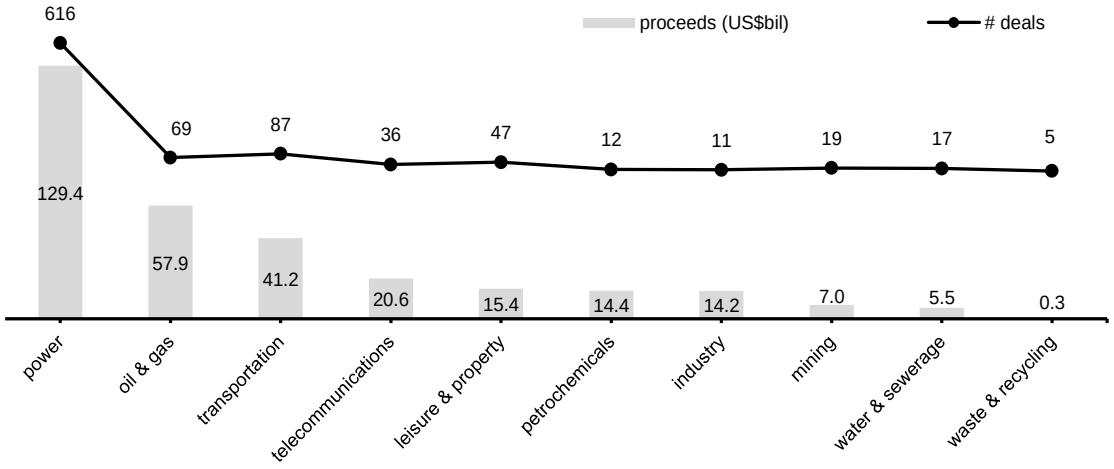
Figure 2: Global project finance loans 10-yr volume (US$bil)



Source: Adapted from Refinitiv (2021)

Appendix C Global project finance loans 2021 - by sector

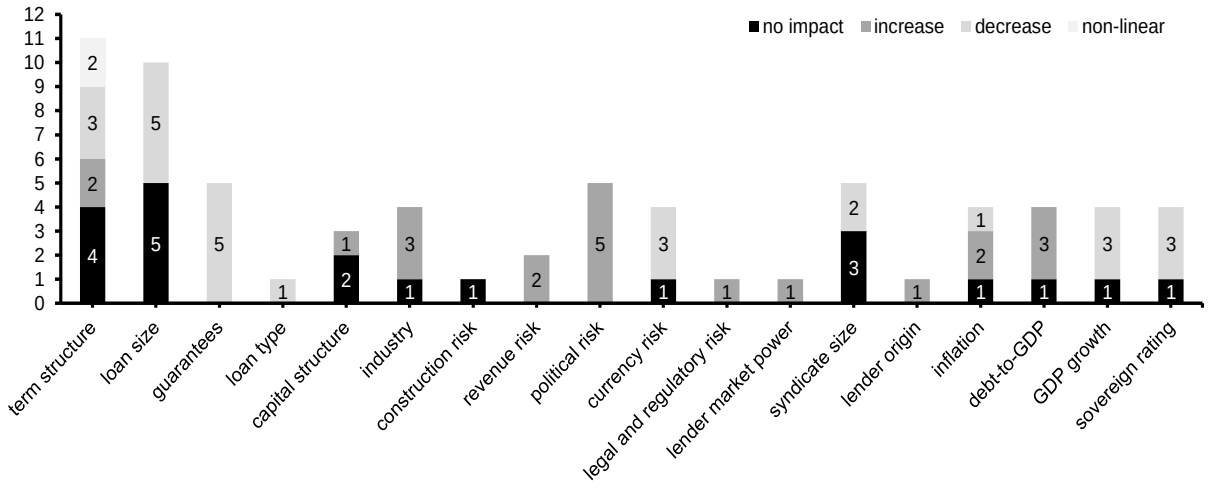
Figure 3: Global project finance loans 2021 - by sector



Source: Adapted from Refinitiv (2021)

Appendix D Literature summary of loan spread determinants

Figure 4: Literature summary of loan spread determinants



Source: Author compilation

Appendix E Sovereign rating classes

Table 1: Conversion of Moody's sovereign ratings into rating classes

Rating	Rating class
Investment grade	
Aaa	Best
Aa1	
Aa2	
Aa3	
A1	
A2	Investment grade
A3	
Baa1	
Baa2	
Sub-investment grade	
Baa3	Speculative
Ba1	
Ba2	
Ba3	Poor
B1	
B2	
B3	
Caa1	
Caa2	
Caa3	
Ca	
Ca1	
Ca2	
Ca3	Default, not rated, or not disclosed
C	
C1	
C2	
C3	
WR	
NR	

Source: Author compilation

Appendix F Literature summary of loan spread micro determinants loan-specific

Table 2: Literature summary of loan spread micro determinants loan-specific

Micro determinants Loan-specific	No impact	Increase	Decrease	Non-linear
Term structure	Esty (2004a), Corielli *et al.* (2010), Girardone & Snaith (2011) and Cruz & Sarmento (2018)	Blanc-Brude & Strange (2007) and Thierie & De Moor (2019a)	Kleimeier & Megginson (2000), Altunbaş & Gadanecz (2004) and Bouzguenda (2014)	Sorge (2004) and Sorge & Gadanecz (2008)
Loan size	Kleimeier & Megginson (2000), Esty (2004a), Blanc-Brude & Strange (2007), Cruz & Sarmento (2018) and Thierie & De Moor (2019a)	-	Altunbaş & Gadanecz (2004), Sorge & Gadanecz (2008), Girardone & Snaith (2011), Bouzguenda (2014) and Ahiabor & James (2018)	-
Third-party guarantees	-	-	Kleimeier & Megginson (2000), Altunbaş & Gadanecz (2004), Sorge & Gadanecz (2008), Girardone & Snaith (2011) and Bouzguenda (2014)	-
Type of loan	-	-	Blanc-Brude & Strange (2007)	-

Source: Author compilation

Appendix G Literature summary of loan spread micro determinants project-specific

Table 3: Literature summary of loan spread micro determinants project-specific

Micro determinants Project-specific	No impact	Increase	Decrease	Non-linear
Capital structure.	Blanc-Brude & Strange (2007) and Thierie & De Moor (2019a)	Corielli *et al*. (2010)	-	-
Industry	Corielli *et al*. (2010)	Kleimeier & Megginson (2000), Altunbaş & Gadanecz (2004) and Bouzguenda (2014)	-	-
Construction risk	Blanc-Brude & Strange (2007)	-	-	-
Revenue risk	-	Blanc-Brude & Strange (2007) and Thierie & De Moor (2019a)	-	-
Political risk.	-	Kleimeier & Megginson (2000), Sorge (2004) and Sorge & Gadanecz (2008), Girardone & Snaith (2011) and Bouzguenda (2014)	-	-
Currency risk	Bouzguenda (2014)	-	Kleimeier & Megginson (2000), Corielli *et al*. (2010) and Ahiabor & James (2018)	-
Legal and regulatory risk	-	Esty (2004a)	-	-

Source: Author compilation

Appendix H Literature summary of loan spread micro determinants lender-specific

Table 4: Literature summary of loan spread micro determinants lender-specific

Micro determinants Lender-specific	No impact	Increase	Decrease	Non-linear
Market power	-	Altunbaş & Gadanecz (2004)	-	-
Syndicate size	Altunbaş & Gadanecz (2004), Blanc-Brude & Strange (2007) and Girardone & Snaith (2011)	-	Sorge & Gadanecz (2008) and Thierie & De Moor (2019a)	-
Nationality	-	Esty (2004a)	-	-

Source: Author compilation

Appendix I Literature summary of loan spread macro determinants

Table 5: Literature summary of loan spread macro determinants

Macro determinants	No impact	Increase	Decrease	Non-linear
Inflation rate	Blanc-Brude & Strange (2007)	Dailami & Leipziger (1998), Altunbaş & Gadanecz (2004) and Sorge & Gadanecz (2008)	Thierie & De Moor (2019a)	-
Debt-to-GDP ratio	Sorge & Gadanecz (2008)	Altunbaş & Gadanecz (2004), Girardone & Snaith (2011) and Thierie & De Moor (2019a)	-	-
Real GDP growth rate	Sorge & Gadanecz (2008)	-	Altunbaş & Gadanecz (2004), Girardone & Snaith (2011) and Thierie & De Moor (2019a)	-
Sovereign credit rating	Esty (2004a)	-	Altunbaş & Gadanecz (2004), Corielli *et al.* (2010) and Ahiabor & James (2018)	-

Source: Author compilation

Appendix J Correlation matrix

Table 6: Correlations between independent variables

		X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13	X14	X15	X16	X17	X18
	Ind.																		
X1	VACC	1.00																	
X2	PSTA	**0.53 (<.001)**	1.00																
X3	GEFF	**0.69 (<.001)**	**0.74 (<.001)**	1.00															
X4	RQUA	**0.75 (<.001)**	**0.71 (<.001)**	**0.96 (<.001)**	1.00														
X5	RLAW	**0.75 (<.001)**	**0.76 (<.001)**	**0.96 (<.001)**	**0.96 (<.001)**	1.00													
X6	CCOR	**0.71 (<.001)**	**0.78 (<.001)**	**0.95 (<.001)**	**0.95 (<.001)**	**0.97 (<.001)**	1.00												
	Micro ctrls																		
X7	SIZE	**-0.12 (<.001)**	0.03 -0.41	0.03 -0.39	0.01 -0.78	0.02 -0.56	0.03 -0.46	1.00											
X8	MATU	**-0.34 (<.001)**	**-0.09 -0.03**	**-0.14 (<.001)**	**-0.15 (<.001)**	**-0.16 (<.001)**	**-0.09 -0.03**	**0.08 -0.03**	1.00										
X9	CURR	**-0.67 (<.001)**	**-0.42 (<.001)**	**-0.68 (<.001)**	**-0.67 (<.001)**	**-0.73 (<.001)**	**-0.66 (<.001)**	0.05 -0.18	**0.21 (<.001)**	1.00									
X10	NLEN	-0.03 -0.46	**0.13 (<.001)**	0.07 -0.09	0.06 -0.11	**0.09 -0.03**	**0.09 -0.02**	**0.49 (<.001)**	0.05 -0.24	0.01 -0.79	1.00								
X11	MKTP	0.03 -0.41	**0.12 (<.001)**	**0.12 (<.001)**	**0.11 -0.01**	**0.13 (<.001)**	**0.14 (<.001)**	**0.41 (<.001)**	0.04 -0.28	-0.02 -0.58	**0.81 (<.001)**	1.00							
	Macro ctrls																		
X12	INFL	**-0.15 (<.001)**	**-0.35 (<.001)**	**-0.45 (<.001)**	**-0.45 (<.001)**	**-0.44 (<.001)**	**-0.40 (<.001)**	-0.06 -0.14	**-0.09 -0.02**	**0.32 (<.001)**	**-0.10 -0.01**	**-0.12 (<.001)**	1.00						
X13	FDEP	**0.54 (<.001)**	**0.41 (<.001)**	**0.62 (<.001)**	**0.59 (<.001)**	**0.65 (<.001)**	**0.59 (<.001)**	-0.02 -0.53	**-0.14 (<.001)**	**-0.66 (<.001)**	0.00 -0.95	0.04 -0.29	**-0.38 (<.001)**	1.00					
X14	GDPG	**-0.16 (<.001)**	**-0.14 (<.001)**	**-0.19 (<.001)**	**-0.17 (<.001)**	**-0.19 (<.001)**	**-0.22 (<.001)**	0.00 -0.94	**-0.10 -0.01**	**0.20 (<.001)**	**-0.13 (<.001)**	**-0.23 (<.001)**	**0.08 -0.04**	**-0.33 (<.001)**	1.00				
X15	BEST	**0.40 (<.001)**	**0.45 (<.001)**	**0.70 (<.001)**	**0.74 (<.001)**	**0.70 (<.001)**	**0.73 (<.001)**	0.00 -0.99	0.00 -0.97	**-0.45 (<.001)**	0.04 -0.37	**0.15 (<.001)**	**-0.31 (<.001)**	**0.34 (<.001)**	**-0.23 (<.001)**	1.00			
X16	IGRA	**-0.17 (<.001)**	**-0.27 (<.001)**	**-0.34 (<.001)**	**-0.28 (<.001)**	**-0.41 (<.001)**	**-0.43 (<.001)**	-0.03 -0.46	0.07 -0.08	**0.22 (<.001)**	-0.05 -0.17	**-0.11 -0.01**	0.00 -1	**-0.19 (<.001)**	0.08 -0.06	**-0.40 (<.001)**	1.00		
X17	SPEC	**-0.25 (<.001)**	**-0.34 (<.001)**	**-0.37 (<.001)**	**-0.38 (<.001)**	**-0.39 (<.001)**	**-0.40 (<.001)**	-0.07 -0.06	0.06 -0.11	**0.36 (<.001)**	0.04 -0.26	0.03 -0.5	**0.16 (<.001)**	**-0.29 (<.001)**	**0.12 (<.001)**	**-0.39 (<.001)**	**-0.12 (<.001)**	1.00	
X18	POOR	**-0.39 (<.001)**	**-0.38 (<.001)**	**-0.56 (<.001)**	**-0.58 (<.001)**	**-0.50 (<.001)**	**-0.48 (<.001)**	0.02 -0.55	0.05 -0.17	**0.38 (<.001)**	-0.03 -0.5	**-0.11 (<.001)**	**0.50 (<.001)**	**-0.36 (<.001)**	0.06 -0.13	**-0.38 (<.001)**	**-0.12 (<.001)**	**-0.11 (<.001)**	1.00

Correlations in bold denote significance at the 1% (2-tailed) level

Source: Author compilation

Appendix K Variable description and summary statistics

Table 7: Variable description and summary statistics

Jan 2012 - Dec 2021	Description	Source	Obs.	Mean	SD	Min	Max
Dependent							
Y1 TOTL	Total number of distinct countries represented in the loan syndicate	Author's construct from Eikon Datastream Database	650	3.91	2.96	0.00	17.00
Y2 NTER	Total number of times all regions are represented with distinct countries in the loan syndicate	Author's construct from Eikon Datastream Database	650	0.82	0.55	0.00	2.67
Y3 NTRA	Total number of distinct countries represented in the region most represented in the loan syndicate	Author's construct from Eikon Datastream Database	650	2.57	1.97	0.00	13.00
Y4 SPRD	Tranche spread over LIBOR in basis points	Eikon Datastream Database	650	265.73	138.52	1.38	1250.00
Independent							
X1 VACC	Reflects perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media	World Bank WGI Database	650	0.54	0.89	-1.87	1.57
X2 PSTA	Political Stability and Absence of Violence/Terrorism measures perceptions of the likelihood of political instability and/or politically-motivated violence, including terrorism	World Bank WGI Database	650	0.12	0.66	-2.41	1.49
X3 GEFF	Reflects perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy	World Bank WGI Database	650	0.93	0.78	-1.37	2.32

Jan 2012 - Dec 2021	Description	Source	Obs.	Mean	SD	Min	Max
	formulation and implementation, and the credibility of the government's commitment to such policies						
X4 RQUA	Reflects perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development	World Bank WGI Database	650	0.94	0.79	-1.85	2.23
X5 RLAW	Reflects perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence	World Bank WGI Database	650	0.91	0.89	-1.59	2.00
X6 CCOR	Reflects perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests	World Bank WGI Database	650	0.81	0.93	-1.42	2.25
Micro-economic controls							
X7 SIZE	Tranche amount in US$mil	Eikon Datastream Database	650	361.43	543.95	0.03	4135.00
X8 MATU	Tranche tenor in months	Eikon Datastream Database	650	130.80	78.25	7.00	360.00
X9 CURR	Dummy that takes the value of 1 when loan currency denomination differs from the currency of the borrower's home country and 0 otherwise	Author's construct from Eikon Datastream Database	650	0.42	0.49	0.00	1.00
X10 NLEN	The number of lender(s) who participated in the loan	Eikon Datastream Database	650	6.97	6.38	1.00	33.00

Jan 2012 - Dec 2021	Description	Source	Obs.	Mean	SD	Min	Max
X11 MKTP	The combined market share of the lenders who participated in the loan	Eikon Datastream Database	650	9.15	10.25	0.00	48.43
Macro-economic controls							
X12 INFL	Annual inflation rate, in percentage	IMF Database	650	3.29	5.42	-2.70	53.50
X13 FDEP	Domestic credit to private sector, as a percentage of GDP	World Bank Database	650	106.62	71.26	0.00	216.56
X14 GDPG	Real GDP growth annual rate, in percentage	IMF Database	650	1.92	3.43	-9.30	11.70
X15 BEST	Dummy of rating class of Best includes A+ to AAA ratings	Moody's Database	650	0.57	0.50	0.00	1.00
X16 IGRA	Dummy of rating class of Investment Grade includes BBB to A ratings	Moody's Database	650	0.11	0.31	0.00	1.00
X17 SPEC	Dummy of rating class of Speculative includes BB to BBB– ratings	Moody's Database	650	0.10	0.30	0.00	1.00
X18 POOR	Dummy of rating class of Poor includes CC to BB- ratings	Moody's Database	650	0.10	0.30	0.00	1.00

Source: Author compilation

Appendix L Total geographic diversification OLS regression output

Table 8: Total geographic diversification OLS regression output

	Model	(1)	(2)	(3)	(4)	(5)	(6)
	Dependent	TOTL	TOTL	TOTL	TOTL	TOTL	TOTL
	Independent						
	(Intercept)	0.6470 ***	0.8430 ***	0.8330 ***	0.5710 ***	0.6710 ***	0.6130 ***
		(0.1980)	(0.2050)	(0.2030)	(0.1960)	(0.2020)	(0.2000)
X1	VACC	0.2310 ***					
		(0.0730)					
X2	PSTA		0.0020				
			(0.0870)				
X3	GEFF			0.0130			
				(0.1080)			
X4	RQUA				0.3420 ***		
					(0.1140)		
X5	RLAW					0.1800	
						(0.1110)	
X6	CCOR						0.2960 ***
							(0.0950)
	Micro ctrls						
X7	SIZE	-0.0003 **	-0.0003 ***	-0.0003 ***	-0.0003 **	-0.0003 ***	-0.0003 **
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
X8	MATU	-0.0002	-0.0010	-0.0010	-0.0005	-0.0010	-0.0010
		(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
X9	CURR	0.5040 ***	0.3310 ***	0.3340 ***	0.4260 ***	0.4020 ***	0.4050 ***
		(0.1270)	(0.1210)	(0.1250)	(0.1230)	(0.1290)	(0.1230)
X10	NLEN	0.4180 ***	0.4180 ***	0.4180 ***	0.4120 ***	0.4140 ***	0.4110 ***
		(0.0180)	(0.0180)	(0.0170)	(0.0180)	(0.0170)	(0.0180)
X11	MKTP	0.0180 *	0.0190 *	0.0190 *	0.0220 **	0.0210 **	0.0220 **
		(0.0100)	(0.0100)	(0.0100)	(0.0100)	(0.0100)	(0.0100)
	Macro ctrls						
X12	INFL	-0.0040	0.0030	0.0030	0.0050	0.0040	0.0020
		(0.0070)	(0.0070)	(0.0070)	(0.0070)	(0.0070)	(0.0070)
X13	FDEP	-0.0010	-0.0002	-0.0002	-0.0010	-0.0010	-0.0010
		(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
X14	GDPG	-0.0300 **	-0.0300 **	-0.0300 **	-0.0330 **	-0.0310 **	-0.0280 **
		(0.0130)	(0.0130)	(0.0130)	(0.0130)	(0.0130)	(0.0130)
X15	BEST	0.1160	0.1500	0.1460	-0.0400	0.0960	0.0380
		(0.1300)	(0.1290)	(0.1410)	(0.1500)	(0.1380)	(0.1370)
X16	IGRA	0.3390 *	0.3150	0.3210 *	0.4450 **	0.4870 **	0.6620 ***
		(0.1860)	(0.1990)	(0.1880)	(0.1860)	(0.2080)	(0.2140)
X17	SPEC	0.1240	0.0740	0.0800	0.2560	0.2190	0.3800 *
		(0.1850)	(0.2070)	(0.1850)	(0.1850)	(0.1930)	(0.1970)
X18	POOR	0.0160	-0.1310	-0.1200	0.1950	0.0530	0.2440
		(0.2230)	(0.2400)	(0.2500)	(0.2560)	(0.2510)	(0.2500)
	Observations	650	650	650	650	650	650
	R2	87%	87%	87%	87%	87%	87%
	Adjusted R2	87%	86%	86%	87%	86%	87%
	F Statistic	323.27 ***	317.44 ***	317.45 ***	322.11 ***	318.76 ***	322.21 ***

*** Significant at the 1% level; ** Significant at the 5% level; and * Significant at the 10% level

Source: Author compilation

Appendix M Inter-regional diversification OLS regression output

Table 9: Inter-regional diversification OLS regression output

	Model	(7)	(8)	(9)	(10)	(11)	(12)
	Dependent	NTER	NTER	NTER	NTER	NTER	NTER
	Independent						
	(Intercept)	0.4570 ***	0.5220 ***	0.4840 ***	0.4280 ***	0.5040 ***	0.5300 ***
		(0.0760)	(0.0780)	(0.0740)	(0.0720)	(0.0770)	(0.0790)
X1	VACC	0.0660 ***					
		(0.0220)					
X2	PSTA		-0.0190				
			(0.0310)				
X3	GEFF			0.0330			
				(0.0390)			
X4	RQUA				0.1060 ***		
					(0.0370)		
X5	RLAW					0.0090	
						(0.0400)	
X6	CCOR						-0.0220
							(0.0360)
	Micro ctrls						
X7	SIZE	0.0001	0.0000	0.0000	0.0000	0.0000	0.0000
		(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
X8	MATU	-0.0010 ***	-0.0010 ***	-0.0010 ***	-0.0010 ***	-0.0010 ***	-0.0010 ***
		(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)	(0.0002)
X9	CURR	0.0250	-0.0230	-0.0160	0.0050	-0.0200	-0.0300
		(0.0470)	(0.0450)	(0.0450)	(0.0450)	(0.0460)	(0.0450)
X10	NLEN	0.0390 ***	0.0400 ***	0.0390 ***	0.0380 ***	0.0390 ***	0.0400 ***
		(0.0050)	(0.0060)	(0.0050)	(0.0050)	(0.0050)	(0.0050)
X11	MKTP	0.0140 ***	0.0140 ***	0.0140 ***	0.0150 ***	0.0140 ***	0.0140 ***
		(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)	(0.0030)
	Macro ctrls						
X12	INFL	0.0070 ***	0.0090 ***	0.0090 ***	0.0090 ***	0.0090 ***	0.0090 ***
		(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)	(0.0020)
X13	FDEP	0.0002	0.0003	0.0002	0.0001	0.0003	0.0003
		(0.0003)	(0.0003)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
X14	GDPG	0.0120 **	0.0120 **	0.0120 **	0.0110 **	0.0120 **	0.0120 **
		(0.0050)	(0.0050)	(0.0050)	(0.0050)	(0.0050)	(0.0050)
X15	BEST	-0.0260	-0.0200	-0.0280	-0.0750	-0.0190	-0.0080
		(0.0500)	(0.0500)	(0.0530)	(0.0570)	(0.0530)	(0.0530)
X16	IGRA	0.0060	-0.0190	0.0210	0.0400	0.0080	-0.0270
		(0.0760)	(0.0750)	(0.0770)	(0.0740)	(0.0830)	(0.0870)
X17	SPEC	-0.2630 ***	-0.2990 ***	-0.2570 ***	-0.2210 ***	-0.2710 ***	-0.3010 ***
		(0.0670)	(0.0760)	(0.0680)	(0.0630)	(0.0730)	(0.0760)
X18	POOR	-0.2360 ***	-0.3000 ***	-0.2440 ***	-0.1770 **	-0.2690 ***	-0.3070 ***
		(0.0760)	(0.0870)	(0.0840)	(0.0780)	(0.0880)	(0.0920)
	Observations	650	650	650	650	650	650
	R2	52%	51%	51%	52%	51%	51%
	Adjusted R2	51%	50%	50%	51%	50%	50%
	F Statistic	52.32 ***	51.36 ***	51.40 ***	52.25 ***	51.31 ***	51.36 ***

*** Significant at the 1% level; ** Significant at the 5% level; and * Significant at the 10% level

Source: Author compilation

Appendix N Intra-regional diversification OLS regression output

Table 10: Intra-regional diversification OLS regression output

	Model	(13)	(14)	(15)	(16)	(17)	(18)
	Dependent	NTRA	NTRA	NTRA	NTRA	NTRA	NTRA
	Independent						
	(Intercept)	0.4800 ***	0.5500 ***	0.6230 ***	0.4040 **	0.3520 *	0.2890
		(0.1760)	(0.1840)	(0.1830)	(0.1870)	(0.2030)	(0.2010)
X1	VACC	0.0960					
		(0.0670)					
X2	PSTA		0.0250				
			(0.0890)				
X3	GEFF			-0.0700			
				(0.0940)			
X4	RQUA				0.1980 **		
					(0.0980)		
X5	RLAW					0.2170 **	
						(0.1020)	
X6	CCOR						0.3500 ***
							(0.0950)
	Micro ctrls						
X7	SIZE	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **	-0.0003 **
		(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)	(0.0001)
X8	MATU	0.0010 *	0.0010	0.0010	0.0010 *	0.0010 *	0.0010
		(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)	(0.0005)
X9	CURR	0.3510 ***	0.2770 **	0.2620 **	0.3340 ***	0.3650 ***	0.3670 ***
		(0.1240)	(0.1160)	(0.1210)	(0.1200)	(0.1260)	(0.1200)
X10	NLEN	0.2980 ***	0.2970 ***	0.2990 ***	0.2940 ***	0.2930 ***	0.2890 ***
		(0.0180)	(0.0180)	(0.0180)	(0.0180)	(0.0180)	(0.0180)
X11	MKTP	-0.0220 **	-0.0210 **	-0.0220 **	-0.0200 **	-0.0200 **	-0.0180 **
		(0.0090)	(0.0090)	(0.0090)	(0.0090)	(0.0090)	(0.0090)
	Macro ctrls						
X12	INFL	-0.0230 ***	-0.0200 ***	-0.0210 ***	-0.0190 ***	-0.0190 ***	-0.0220 ***
		(0.0060)	(0.0050)	(0.0050)	(0.0050)	(0.0050)	(0.0060)
X13	FDEP	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010	-0.0010 *
		(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)	(0.0010)
X14	GDPG	-0.0410 ***	-0.0400 ***	-0.0400 ***	-0.0420 ***	-0.0420 ***	-0.0390 ***
		(0.0130)	(0.0130)	(0.0130)	(0.0130)	(0.0130)	(0.0130)
X15	BEST	0.1900 *	0.2080 **	0.2290 **	0.0940	0.1380	0.0720
		(0.0970)	(0.0990)	(0.1000)	(0.1070)	(0.1000)	(0.0980)
X16	IGRA	0.3150 **	0.3280 **	0.2580 *	0.3810 ***	0.5150 ***	0.7180 ***
		(0.1370)	(0.1660)	(0.1460)	(0.1450)	(0.1780)	(0.1930)
X17	SPEC	0.5260 ***	0.5320 **	0.4590 ***	0.6100 ***	0.6830 ***	0.8690 ***
		(0.1750)	(0.2060)	(0.1760)	(0.1800)	(0.1980)	(0.2100)
X18	POOR	0.5710 ***	0.5370 **	0.4350 **	0.6980 ***	0.7350 ***	0.9550 ***
		(0.2070)	(0.2110)	(0.2150)	(0.2290)	(0.2320)	(0.2470)
	Observations	650	650	650	650	650	650
	R2	76%	76%	76%	76%	76%	77%
	Adjusted R2	76%	76%	76%	76%	76%	76%
	F Statistic	155.39 ***	154.72 ***	154.83 ***	155.77 ***	156.05 ***	159.39 ***

*** Significant at the 1% level; ** Significant at the 5% level; and * Significant at the 10% level

Source: Author compilation

Appendix O Loan pricing OLS regression output

Table 11: Loan pricing OLS regression output

	Model	(19)	
	Dependent	SPRD	
	Independent		
	Constant	378.2590	***
		(32.9820)	
Y1	TOTL	-2.8940	
		(9.2850)	
Y2	NTER	17.3600	
		(16.8720)	
Y3	NTRA	12.0940	
		(8.9750)	
	Micro ctrls		
X7	SIZE	-0.0060	
		(0.0080)	
X8	MATU	-0.2120	***
		(0.0570)	
X9	CURR	11.9500	
		(14.2150)	
X10	NLEN	-3.6500	*
		(1.9980)	
X11	MKTP	-2.7670	***
		(0.7380)	
	Macro ctrls		
X12	INFL	-1.3590	
		(1.6560)	
X13	FDEP	-0.2670	**
		(0.1120)	
X14	GDPG	2.2100	
		(1.5610)	
X15	BEST	-71.7300	***
		(19.7210)	
X16	IGRA	-54.8460	**
		(25.6750)	
X17	SPEC	-17.2970	
		(29.5540)	
X18	POOR	62.4120	**
		(31.3950)	
	Observations	650	
	R2	26%	
	Adjusted R2	24%	
	F Statistic	14.93	***
	F Statistic	221.83	***

*** Significant at the 1% level; ** Significant at the 5% level; and * Significant at the 10% level

Source: Author compilation