How Uncertainty and Mistrust Can Affect Transaction Costs in Project Finance Agreements (PFCs).

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Abstract

The study explores the formation of transaction costs in infrastructure bank financing operations, based on the analysis of project finance contracts (PFCs), typical instruments in this type of venture. Financing costs are usually determined by analyzing each infrastructure project, its risks, guarantees, cash flow, etc.. Through a structural model and quantitative data analysis, the present research follows an alternative route and tries to verify if the financing conditions in the PFCs correspond to other factors, such as uncertainty and distrust of debtor / financed behavior. Accordingly, the transaction cost literature assumes distrust and uncertainty as explanatory factors in the choices of economic agents. A structural model is proposed to evaluate quantitative data extracted from these contracts, using the Partial Least Squares tool (Smart PLS), which allowed the exhibition expansion to 10,000 of the originally 16 contracts raised for the study. The results suggest that, yes, uncertainty and distrust regarding borrower / borrower behavior has effects on some of the transaction costs of PFCs in both the original and synthetic sample.

Keywords: infrastructure, financing, banking, transaction-costs, FDI

I - Introduction

Infrastructure financing is the subject of debate, initiatives, concerns, hopes and, of course, investments. Such investments, in the sense of fixed capital (Luporini & Alves, 2010), correlate with the country's (Ferreira & Azzoni, 2011), regional and social economic growth (Cruz, Teixeira & Braga, 2011; Bertussi & Ellery- Junior, 2012). Without investments in infrastructure, even if the country grows its Gross Domestic Product (GDP), it may be compromised by bottlenecks regarding its internal communication capabilities (internet, telephone), transportation and flow (highways, railways, waterways, pipelines, electrical transmission lines, ports and airports), storage (terminals and warehouses), power generation (hydroelectric, thermoelectric, wind and solar parks), sanitation (water and sewage) and etc. (Santos, 2012). This is due to the fact that economic growth requires renewal and expansion of infrastructure, preventing economic activity from exceeding, for example, the capacity to supply electricity, causing rationing or so-called blackouts. In addition to its potential growth and sustainability, its countries competitiveness in the international market depends not only on manufacturing output, the added value of new technologies and the excellent agricultural and livestock management, but also on the efficiency of its internal infrastructure (Ferreira & Azzoni, 2011). Therefore, the insertion of companies in global value chains also depends on internal infrastructure (Sturgeon & Gereffi, 2013).

The investments deemed necessary for infrastructure are impressive in terms of volume. According to the BNDES (Development Bank in Brazil) estimate, Brazil, for example, would consume in the period 2015-2018 about R $ 598 billion of investments of its kind (Sector Analysis Committee, BNDES, December, 2014). Basically, every project or company consumes resources from two main sources, either its own (investors, owners and project owners) or third parties (loans from financial institutions or debt securities investors such as bonds, promissory notes, debentures, etc.). , acquired by individuals and companies). The decision on the best relationship between equity and third parties is central to business strategies (Famá & Grava, 2000). With regard to third party resources, ie the debt market, the main source available to developing countries for infrastructure projects is bank financing (Jones, Jones & Hertova 2008) through project finance contracts - PFCs (Culp & Forrester, 2009; Subramanian et al, 2008), given the low share of capital markets and institutional investors (Cheikrhouhou, et al 2007; Jones, Jones & Hertova, 2008; Inderst, 2011). There are studies that point out the importance of banks in financing such (Araújo & Cintra, 2008; Gutierrez et al, 2011; Marty & Voisin, 2008; George & Prabhu, 2000; Estache et al, 2015; Abramskiehn et al, 2017). Relationships between infrastructure financing and GDP growth (Trew, 2010) and between financing and corporate absorptive capacity (George & Prabhu, 2000) are also addressed.

The focus of the present exploratory research is on transaction costs in infrastructure bank financing operations. Given the significant amounts that easily exceed tens or even

hundreds of millions in financial resources, transaction costs have captured the attention of studies addressing the issue (Jean Tirole, 2007; Cheikrhouhou et al, 2007; Jones, Jones & Hertova, Sawant, 2009 Annamalai & Jain, 2013). To cope with investments, investors become debtors / financiers in PFCs, instruments where one or more banks finance the project under certain conditions governed by contractual relationships. According to the transaction cost theory (Willianson, 1985) contacts are alternatives to other possibilities, such as acquiring a good or service (in this case, credit) in the open market, according to the offer, or using own resources (in this case, financial). The transaction costs literature shows the degree of uncertainty / distrust of economic agents, which leads them to resort to one of the three alternatives mentioned. Opportunistic behavior is therefore a major concern and a major determinant of contractual, market or internalization relationships, which does not mean that agents are always dishonest, but depending on the situation they may behave like that, including lying, stealing and cheating (Pinheiro & Saddi, 2006), giving rise to safeguards and controls (such as contracts) to regulate relations between the parties (Williamson, 1985). For no other reason, studies on transaction costs also concern the relationships of trust between the related parties (Beccerra & Gupta, 1999; Josh & Stump, 1999).

The questions in this research are: (1) whether PFC transaction costs respond to explanatory variables other than those typically captured in the analysis of investments (cash flow, risks, guarantees, etc.), (2) whether uncertainty / distrust are explanatory variables (3) which model can capture the correlation between uncertainty / distrust and transaction costs in PFCs. From the above questions the following is proposed: the project's financed volume and the number of borrowers / financed in the PFCs introduce more uncertainty / distrust, respectively, about credit risk and borrower behavior, requiring lender (bank) control under the conditions set out in the PFCs. In other words, the more funding needed and the more borrowers / financed, the higher the transaction costs for borrowers / financed.

The study finds academic and practical justifications. It allows, on the one hand, to know more about the phenomenon related to bank financing for the infrastructure segment, including proposing guidelines for new studies and, on the other hand, that investors - borrowers of financing - gain tools to manage the alternatives available to them, aiming at the achievement of better conditions in taking bank resources. As already mentioned, given the value of investments, scholars and managers are sensitive to transaction costs related to this aspect.

The research was based on quantitative data from a sample of infrastructure financing contracts that were analyzed using the model that will be described below in the PLS tool. All cases are confined to Brazil and involve projects of electricity - hydro solar, wind -, leisure facilities, hospitals and airports. Although they are projects carried out in Brazil, they were all funded through PFCs, a very common structure in the world, and especially in emerging countries, as the literature review on transaction costs and PFCs will show. Given the small sample of contracts (16 records) we used the bootstraping resampling

method, through the Partial Least Squares (Smart PLS) tool, allowing to explore 10,000 different samples derived from the same initial data set. Importantly, the results of the synthetic sample correspond to the correlations found in the initial sample.
The text involves four movements, besides this introduction (i). A brief description of the transaction costs literature (ii), definition of data collection, methodology and model proposition (iii), presentation of results (iv) and, finally, conclusions and suggestions for further studies (v).

II – Transaction Costs and PFCs

Transaction cost theory is recurrent in economic studies and administration, shedding light on issues such as business association, supply contracts, open market relations, internationalization, institutional environments, internalization, etc. For example, what would determine a firm's choice to go to the market to buy a good, or to establish a contract for its regular supply or to produce internally what it needs? Or why, depending on the case, should one location be chosen over another in the internationalization process? Or finance an investment with third party resources (such as banks) or own? Transaction cost theory is an alternative to explaining those issues. The complexity of relationships, the cognitive limitations of human beings, and the uncertainties regarding future attitudes determine different transaction costs in relationships between different parties and, therefore, different solutions for their occurrence.

Seminal works on transaction costs are from Coase (1937), in which the author refers to the functioning of markets and their agents (firms), determining cost differences, and from Williamson (1985), in which the author incorporates view of different relationships between firms (own governance, buying and selling in the open market and hiring) that also give rise to different costs. According to Martins & de Souza (2014), Coase has established firms as the vehicles through which market relations occur, and institutions as regulators of such relationships. Farina et al (1997), comments that the regulation refers to the imposition of rules to the economic game, rules that, in turn, are part of the set of institutions and the institutional environment. From Williamson's (1985) perspective, firms' decisions range from producing something internally, buying on the open market, or establishing a contract to regulate the supply of goods. Jacobides & Winter (2005) propose that in order to understand the firm's integration it is necessary to look at the capabilities of its suppliers, which would explain many vertical movements, the same point addressed by Azevedo (2000). Although hardly quantifiable, if there is no trust in suppliers, a firm may decide to incorporate functions, the decision being not to be larger, but to reduce costs and achieve efficiency (Zylbersztajn, 2005), as it would be more costly if it decided to depend on suppliers who, for example, interrupt deliveries without warning In Williamson's (1985) perspective, firms could in this case choose to purchase their inputs from the market, produce them, or otherwise establish a contractual relationship with rules to be observed. Contracts, although incomplete and imperfect, as they cannot anticipate everything that can occur in a relationship, have considered enforcement

(depending on the institutional environment) which explains their use in a wide variety of cases (Martins & De Souza, 2014). Opportunistic behavior is therefore a major concern and a major determinant of contractual, market or internalization relationships, which does not mean that agents are always dishonest, but that depending on the situation they may behave like that, including lying, stealing and cheating (Pinheiro & Saddi, 2006), giving rise to safeguards and controls (such as contracts) to regulate relations between the parties (Williamson, 1985).

Another widely recognized thought in transaction cost theory is from Hennart (2010) who uses the concept to explain the internationalization model of companies. For Hennart (2010), the decision on how to act internationally, by contract / license or directly or in a hybrid way, depends on the costs involved. Costs like surveillance, reputational, control, value chain investments, and financing, according to the author, go beyond the considerations of other theories, such as those that identify different rates of interest and returns in different markets as major attractions for Foreign Direct Investment (FDI), as if it behaved like portfolio investment. Hennart (2010) understands that the theory of transaction costs is the one that best explains the internationalization strategy of companies, in an attempt to better measure the expenses and benefits arising from each of the alternatives.

As already discussed by the works above, the option of contracts is an alternative to regulate the relations, given its enforcement. In the case of infrastructure financing, it is the most common model, alternating between seeking resources in the market according to the needs of an investment, which brings together uncertainties, or financing projects with own resources, which requires a large availability of cash. PFC is typically employed in new and complex investments, with large risks and massive informational asymmetries (Kleimeier & Versteeg, 2009). Among other benefits, PFCs contribute to lessening such asymmetries, adding investment oversight, avoiding moral hazard, adverse selection (Marty & Voisin, 2008), forcing environmental and social impact patterns (Lawrence & Thomas, 2004), mitigate political risks when it comes to Foreign Direct Investment (Mullner, 2017), formalize alliances with stakeholders (Mullner, 2107), and prevent investors from taking over leverage levels (Culp & Forrester, 2009), even though contracts are quite costly from the point of view of specificity and thus of the size of the contracts (Esty, 2004). However, as evidenced in the transaction costs literature, they have their costs, which in the financing in question can mean delays, high interest rates (Chan et al 2009), excessive observances (Jean Tirole, 2007), among others.

Importantly, there is some literature indicating that the presence of multiple banks improves conditions for both borrowers (Ivashina, 2005; Maskara, 2006; Sufi, 2007). The present study, however, will take another view, that the larger number of borrowers / financed will have consequences for these, namely higher transaction costs, probably (as suggested by other studies) deployed by the financing banks.

III – Data, methdology and modeling

As mentioned earlier, the data available for analysis comes from infrastructure financing operations in Brazil. All contracts refer to actual investment operations already undertaken, which means that the contracts were signed by all involved and the funds released. The set of contracts was made available to research by brazilian banks with a commitment to bank secrecy not to be disclosed, ie, it is not possible to link debtor names to the financing conditions, which does not harm the study, since it works with aggregate data and statistical inferences from structural equation analysis of the following model. In this respect, the study is linked to the post-positivist proposal that assumes regularities in the world. The idea is to apprehend, if any, regularities regarding the transaction costs of the financing contracts (PFCs) raised in the research.

The study proposes several types of transaction costs that can be extracted from any PFC. The non-exhaustive list involves financial and nonfinancial data. Transaction cost theory explores, among other things, contracting costs and contract monitoring costs (Bunduchi, 2008), factors incorporated here through the number of clauses and items inside the clauses in the PFCs. Since it was found that the number of items in each contract, for example, vary considerably from contract to contract, it was interesting not to work solely with the number of clauses. As it is possible to apprehend, besides the financial clauses (spread, term, grace period, etc.), the others were quantifiable exactly by counting items. The central idea is that compliance, ie the transaction cost, increases as the number of non-financial contract items increases. The reason is the monitoring that clauses require as they are established for risk mitigation (Chiles & Mcmackin, 1996), improving the perspective of contractors such as banks (Dupas et al, 2011). It is assumed here that lenders, from this distrust, will carry the clauses of the PFCs, trying to ensure the security of financing and the return on their assets.

Data extracted from the contracts were aggregated according to the classification that will serve as the basis for the structural model, namely:

Financing:
- Bank spread;
- Amount of financing;
- Percentage financed out of total investment; - Total term of the financing; - Grace period for financing.

Hiring:
- Time elapsed between the financing proposal and the hiring;
- Number of banks participating in the loan;

General Monitoring:
- Number of clauses (except guarantees, covenants and early maturity);

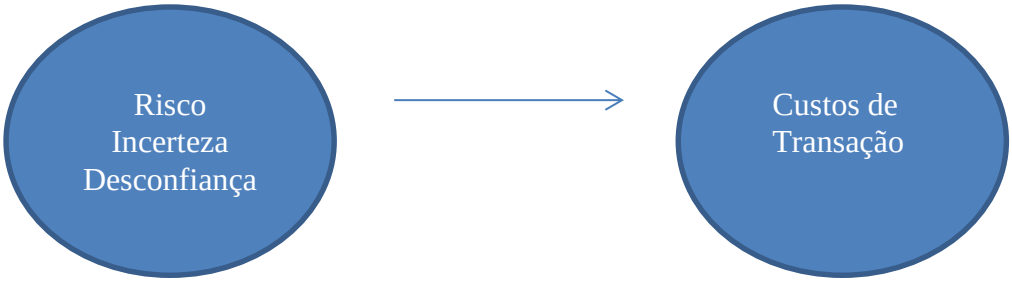
- Number of warranty clauses;
- Number of covenant clauses;
- Number of early maturity (acceleration) clauses.

Social and Environmental Monitoring:
- Number of environmental clauses;
- Number of social clauses;
- Number of anti-corruption clauses.

It is noteworthy that from the above items, the time elapsed between the proposal and the grant (signature) of the financing is not included in the contracts, but was based on the information available in the media about the moment the infrastructure project was released, or the the concession (of a transmission line) was determined by the government. Despite the proposal to include all those contract datas, some of them were not possible to find, like anti-corruption clauses or difficult to find in all of them, like acceleration clauses. The actual contract data utilized in the structural equation are presented in the Figures 4 and 5.

The center of the model correlates two unobservable latent variables (Figure 1) across two sets of observable indicators (Figure 2), resulting in the proposed structural model (Figure 3):

Figure 1: Latent variable – Not observable

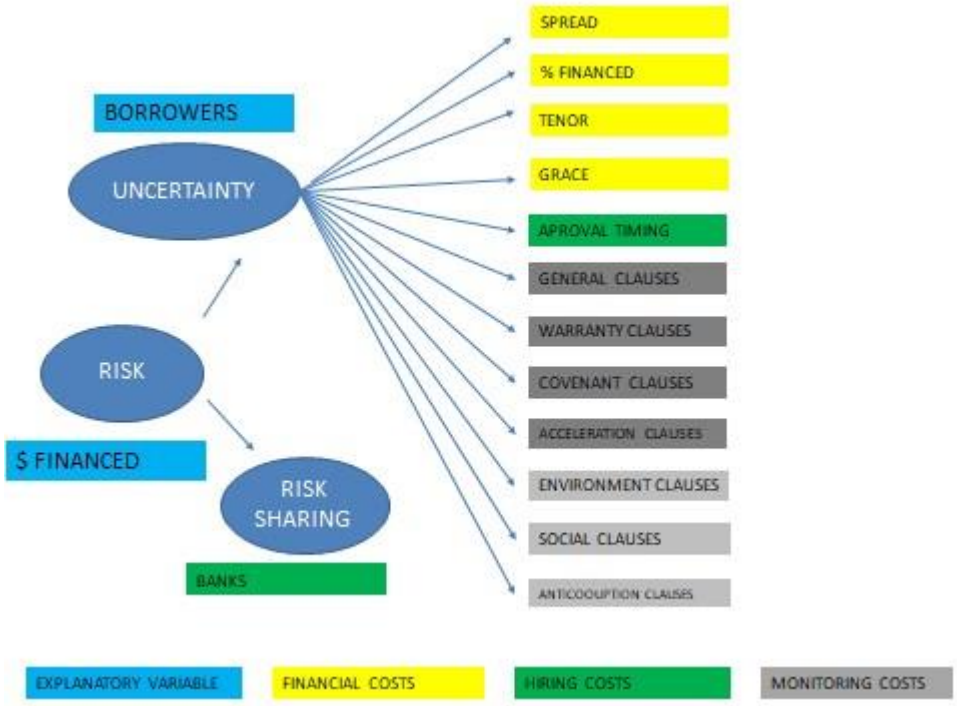


Source: Author

Figure 2: Observable variables

Source: Author

Figure 3: Model



Source: Author

The direct reading of the model (Figure 3) is: the risk (composed by the project's funded value) determines the degree of uncertainty / distrust (composed by the number of borrowers / financed) which, in turn, determines the project transaction costs. (expressed in quantifiable items taken from PFCs). The risk also influences its sharing (expressed in number of banks), which we also consider here as a transaction cost, since the addition of banks increases the hiring cost to borrowers.

The PLS-SEM modeling, called Partial Least Squares, used here, from the Smart PLS application, works with a series of least squares regressions, depending on the proposed model, allowing the partial evaluation of them. However, it does not generate a simultaneous general estimation of the overall fit of the entire model (Lee et al., 2011). Latent constructs or variables (not directly observable) generate effects or are formed by observable variables. In reflexive models, here utilized, latent variables generate effects on observables. This is the most commonly used model in the literature. In formative, latent variables are the effect of observables. Visually, the model is composed of circles (latent variables), squares (observables) and arrows indicating the relationships and causal paths. Thus, by combining several items that make up the theoretical model, it is possible to indirectly measure the abstract concept of interest (Hair Jr. et al, 2009), in this case the effects of distrust / uncertainty on the transaction costs of PFCs. The PLS path consists of two elements: structural model, which highlights the relationships (paths) between constructs, and the measurement model, of relationships between the constructs and observable variables. (Hair Jr. et al., 2014). Model estimation provides empirical measures of the relationships between constructs (structural model) and between

indicators and constructs (measurement models). Empirical measurements allow the comparison of structural models with the theoretically established reality, thus allowing to determine if the theory fits the data behavior. High external loads on the same construct indicate that the associated indicators have much in common with the phenomenon captured by the latent construct. This feature is known as indicator reliability. External loads for all indicators should be statistically significant, so standard values with external loads greater than 0.708 are expected. Indicators with external loads between 0.40 and 0.70 should be eliminated only if this procedure results in increased compound reliability (Hair Jr. et al., 2011).

The structural model of partial least squares is appropriate to the present research, given the possibility of individually evaluating the relationships between the variables, eventually changing the model, excluding the observable variables with low representativeness (low explanatory force), improving the model without relinquish the theoretical relationship presented in the latent variables, as shown in Figure 1. It also allows resampling from the initial sample.

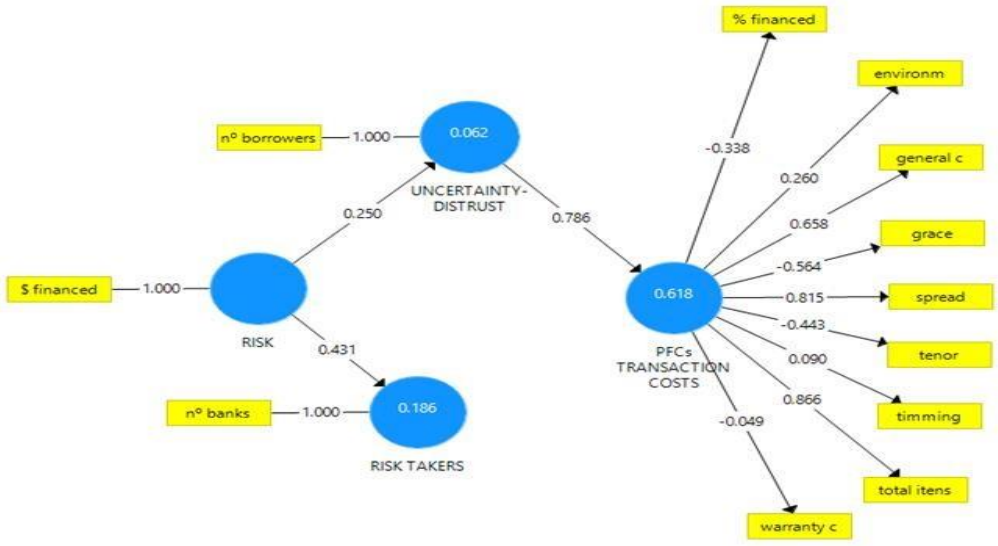
The basic proposition of the model to be explored is:

Q1: The higher the amount of financing and the number of borrowers / financed, the higher the transaction costs in the PFCs.

IV – Results

PLS algorithm:

Figure 4: Output Smart PLS Uncertainty > Transaction Costs



Source: Author, from Smart PLS

Adopting the Partial Least Square model on the PLS platform, we arrived at the following outputs:

Table 1: PLS Augoritm output

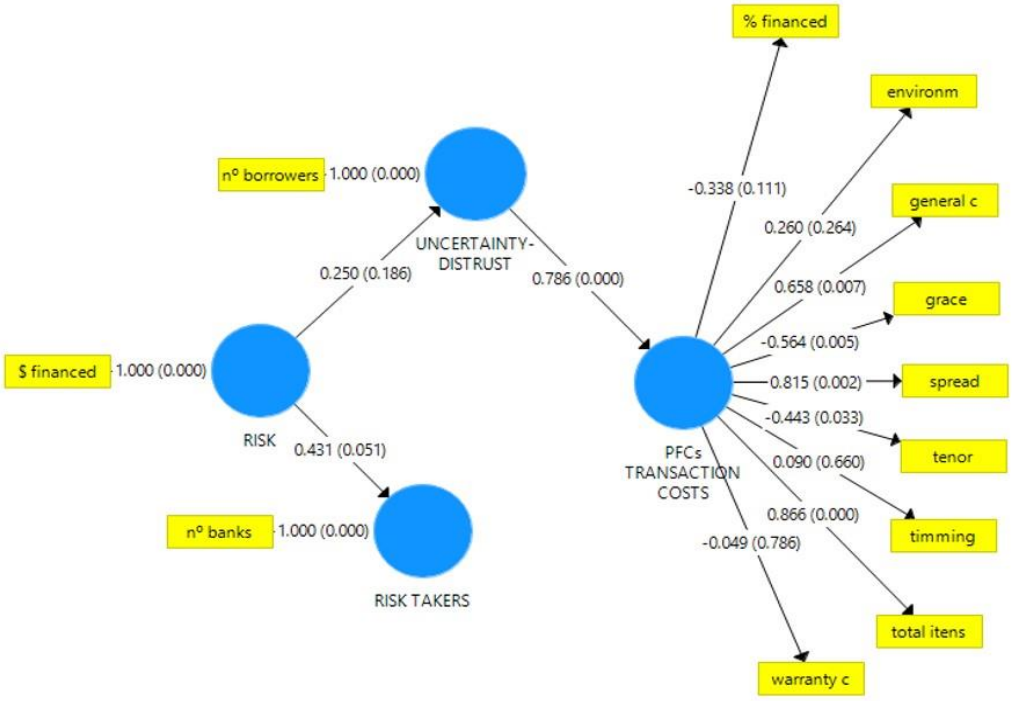
Relationship	Loads
Uncertainty> Transaction Costs> total items	0,866
Uncertainty> Transaction Costs> Spread	0,815
Uncertainty> Transaction Costs	0,786
Uncertainty> Transaction Costs> general clauses	0,658
Uncertainty> Transaction Costs> grace	-0,564
Uncertainty> Transaction Costs> tenor	-0,443
Risk> Risk Takers	0,431

Source: Author, a partir do Smart PLS

From Figure 4 and Table 1, it's noted that the paths with the greatest influence of the latent uncertainty / distrust variable are towards the number of items (contractual paragraphs), spread, general clauses, grace period and total term of financing (tenor), the latter two with negative reason, ie , as the number of debtors / financed increases (along with uncertainty / distrust), the grace and financing periods decrease. Risk (another factor of uncertainty / distrust) seems to influence only the number of lenders and not borrowers. From Smart PLS, which worked with only 16 financing contracts, the resampling technique was used to generate 10,000 random samples from the original 16 PFCs. In this step, the loads and p-values (in parentheses) are presented below in order to further explore the relationships identified above.

Bootstrapping:

Figure 5: Output Bootstrapping Uncertainty > Transaction Costs



Source: Author, from do Smart PLS

Table 2: PLS Augoritm output

Relação	Carregamento	P-Value	Significância
Uncertainty> Transaction Costs> total items	0,866	0,0000	***
Uncertainty> Transaction Costs> Spread	0,815	0,0200	**
Uncertainty> Transaction Costs	0,786	0,0000	***
Uncertainty> Transaction Costs> general clauses	0,658	0,0070	***
Uncertainty> Transaction Costs> grace	-0,564	0,0050	***
Uncertainty> Transaction Costs> tenor	-0,443	0,0330	**
Risk> Risk Takers	0,431	0,0510	*

Source: Author, a partir do Smart PLS

The relationships of the PLS algorithm are maintained (Figure 5, Table 2) with interesting p-values (10% or better), leading to further studies on the relationships presented here that, based on the model and platform, seem to confirm the relationship between uncertainty / distrust and transaction costs in PFCs.

V – Conclusions

The present study aims to contribute to the disclosure of transaction costs in PFCs. To this end, it conducted a quantitative data analysis via structural model using the Partial Least Squares algorithm and Bootstrapping on the Samrt PLS platform in order to gain support for the following relationship: uncertainty / distrust increase transaction costs in PFCs. We found a relationship with loadings above 0.40 and significance of 10% at least on number of items (paragraphs in contracts), spread, number of general clauses, grace period, total term and number of banks participating in the financing from what we consider here as elements of risk or / uncertainty / distrust, in obseervable terms, the size of the finance and the number of debtors / financed. The main contribution of the study is transaction cost theory test, regarding uncertainty and distrust, since quantitative studies on this topic are rare. Another contribution is disclosure of other factors that affect the PFCs, besides the analysis of the project, its cash flow and its guarantees. In this respect, it conforms a predictive tool. This may influence agents involved in investments, as the evidence relates to when contracts will be adverse, accessible, benign or attractive to investors. The limitations are due to the small sample and the resampling tool that together do not determine a confirmatory hypothesis model, but exploratoty.

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