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Analysis of the capital structure and debt heterogeneity of publicly traded companies in the industrial and agribusiness sector

Análisis de la estructura de capital e heterogeneidad de la deuda de las empresas que cotizan en bolsa del sector industrial y agroindustrial

Análise da estrutura de capital e heterogeneidade das dívidas das empresas de capital aberto do setor industrial e do agronegócio

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Abstract

Purpose: In recent years, the subsidized credit provided by the Brazilian government to some sectors of the economy through financing lines, such as FINAME, FIDIC, from BNDES, may have resulted in a reduction in the costs of the capital structure. Thus, the purpose of this work

is to verify if there was a reduction in the cost of capital of publicly traded companies in two important economic sectors, the industrial sector and sectors related to agribusiness.

Methodology: Information regarding financing sources, financing amount, currency and interest rates were collected from the Explanatory Notes to the financial statements of 84 publicly traded companies and used to calculate the weighted average cost of capital of the financing sources at subsidized rates and not subsidized.

Results: The results show that loans with subsidized rates present a great variability in the participation of loans with subsidized rates in the composition of financing of companies, but showing, on average, a low percentage in the composition of indebtedness, and that the effective rates averages of subsidized loans may be higher than the average effective rates of non-subsidized loans, suggesting that subsidized credits, in proportion to which they have been used to compose the financing, may not play a relevant role in reducing the costs of the capital structure of companies

Contributions of the Study: This work contributes to the identification of relevant factors that explain how companies determine their capital structure, providing administrators with indications on which factors are preponderant in the practical performance of companies' capital structure policy.

Keywords: Capital Structure; Subsidized Interest Rates; BNDES.

Resumen

Objetivo: El crédito subsidiado otorgado por el gobierno brasileño a algunos sectores de la economía, en los últimos años, a través de líneas de financiamiento, como FINAME, FIDIC, del BNDES, puede haber resultado en una reducción de los costos de la estructura de capital. Así, el propósito de este trabajo es verificar si, efectivamente, hubo una reducción en el costo de capital de las empresas que cotizan en bolsa en dos importantes sectores económicos, el industrial y los sectores relacionados con la agroindustria.

Metodología: La información sobre fuentes de financiamiento, monto de financiamiento, moneda y tasas de interés se obtuvo de las Notas Explicativas de los estados financieros de 84 empresas que cotizan en bolsa y se utilizó para calcular el costo promedio ponderado de capital de las fuentes de financiamiento a tasas subsidiadas y no subsidiadas.

Resultados: Los resultados muestran que los préstamos con tasas subsidiadas presentan una gran variabilidad en la participación de préstamos con tasas subsidiadas en la composición del financiamiento de empresas, pero mostrando, en promedio, un porcentaje bajo en la composición del endeudamiento, y que las tasas efectivas Los promedios de los préstamos subsidiados pueden ser más altos que las tasas efectivas promedio de los préstamos no subsidiados, lo que sugiere que los créditos subsidiados, en proporción a los que se han utilizado para componer el financiamiento, pueden no desempeñar un papel relevante en la reducción de los costos de la estructura de capital. de empresas

Contribuciones del estudio: Este trabajo contribuye a la identificación de factores relevantes que explican cómo las empresas determinan su estructura de capital, proporcionando a los

administradores indicaciones sobre qué factores son preponderantes en el desempeño práctico de la política de estructura de capital de las empresas.

Palabras clave: Estructura de capital; Tasas de interés subsidiadas; BNDES.

Resumo

Objetivo: O crédito subsidiado fornecido pelo governo brasileiro a alguns setores da economia, nos últimos anos, por meio de linhas de financiamento, tais como FINAME, FIDIC, do BNDES, pode ter determinado uma redução dos custos da estrutura de capital. Assim, a proposta deste trabalho é verificar se, de fato, houve uma redução do custo do capital das empresas de capital aberto de dois importantes setores econômicos, o setor industrial e de setores relacionados ao agronegócio.

Metodologia: Informações referentes às fontes de financiamento, montante do financiamento, moeda e taxas de juros foram coletados das Notas Explicativas das demonstrações financeiras de 84 empresas de capital aberto e utilizadas para calcular o custo médio ponderado de capital das fontes de financiamento com taxas subsidiadas e não subsidiadas.

Resultados: Os resultados apontam que os empréstimos com taxas subsidiadas apresentam uma grande variabilidade na participação de empréstimos com taxas subsidiadas na composição de financiamento das empresas, porém apresentando, em média, um baixo percentual na composição do endividamento, e ainda, que as taxas efetivas médias de empréstimos subsidiados pode ser maior que as taxas efetivas médias dos empréstimos não subsidiados sugerindo que os créditos subsidiados na proporção em que tem sido utilizados para compor o financiamento, podem não exercer um papel relevante na redução dos custos da estrutura de capital das empresas

Contribuições do Estudo: Este trabalho colabora com a identificação de fatores relevantes que explicam a forma como as empresas determinam sua estrutura de capital, fornecendo aos administradores indicações sobre que fatores são preponderantes no desempenho prático da política de estrutura de capital das empresas.

Palavras-chave: Estrutura de Capital; Taxas de Juros Subsidiadas; BNDES.

1. Introduction

Capital Structure can be defined as a combination between the third-party capital and the company's equity capital. This capital composition is used by the company to finance its investments, that is, its operations and its growth (Gomes, & Pereira, 2014). Therefore, decisions on its structure are considered the most important ones in the context of the company financial management.

From the Capital Structure Irrelevance of Modigliani & Miller (1958), several other theoretical models came up to try to explain which the determining factors of the capital structure of the companies are. The Capital Structure Irrelevance model argues that, in conditions of perfect capital market, that is, the inexistence of taxes, transition and bankruptcy costs, inexistence of agency and information asymmetry problems and unlimited access to

credit in the market at a free-risk interest rate, the financing form is not determinant of the company value.

Later, evolving and opposing to the Capital Structure Irrelevance Theory, the Trade-off and the Pecking Order Theories appeared. According to the Trade-off Theory, there is an optimal combination of equity capital and third-party capital that is able to maximize the company value, in which the financial difficulties or bankruptcy costs are debt limiters while the tax benefits encourage the use of third-party capital so that the balance between both determines the company value (Myers, 1984). On the other hand, in accordance with the Pecking Order Theory, the companies obey a hierarchical funding order. First, they prefer self-funding, that is reinvesting the profits. Then, they turn to indebtedness and, finally, they issue shares (Myers, & Majluf, 1984).

The capital cost is set by the conditions in which the company obtains financial resources in the capital market, which is usually determined by the average between opportunity cost of equity capital and the third-party capital cost, weighted by the participation of each one of the financing sources in the company liability, which is known by weighted average cost of capital – WACC - in finance literature. Knowing the capital cost is essential for the analysis process and the financial decision-making, and thus, it is a criterion to determine the economic attractiveness of the investment proposals directing them to the objective of value maximization to the owners (Assaf, Lima, & Araújo, 2008; Eld, 1996).

According to Eça & Albanez (2021), the greater the heterogeneity of the debt, the lower the capital cost of Brazilian companies from 2010 to 2019. Those findings ratify the need of assessment of this matter for different periods and specific sectors since those with greater or lower access to subsidized resources can present different results regarding the capital structure and cost. These results are evinced in the findings of Póvoa & Nakamura (2014) and confirm the possibility of studies for the sectors presented in this research.

Since the Brazilian government has, in the past years, provided subsidized credit, through financing lines, such as FINAME, FIDIC, BNDES, that is, offering financial resource with cost below the market lines, to some sectors of the economy, and knowing that it is important for the companies to reduce the capital structure cost so that it allows them to invest more in their projects and maximize their value for the shareholders, this paper aims to compare the weighted average cost of subsidized capitals among companies of the industrial sector and the sectors related to agribusiness, being willing to check whether, in fact, there was a reduction in the capital cost of the companies of these economic sectors. Therefore, the specific objectives of this study are calculating, analyzing the participation of subsidized loans and financings in public-held companies of different industrial sectors and sectors related to agribusiness, calculating the weighted average cost of subsidized and non-subsidized capital of these companies in order to determine the importance of the sources of subsidized credit for the economic sectors studied.

2. Literature Review

The theoretical benchmark of this paper will be divided in two sections. The first section discussed some factors and behaviors inherent in companies which can be related to the capital structure choice. And the second section briefly approaches the relevance of subsidized credit in the capital structure of companies and the role of the BNDES as the main offeror of long-term resources for Brazilian companies.

2.1 Capital Structure Determining Factors

The identification of the factors which explain the way the companies determine their capital structure, besides permitting the empirical validation of the theories on capital structure developed along the time, it provides the managers indications on the factors which are preponderant in the practical performance of the capital structure policy of the companies. Therefore, specific traits of the companies, such as the company size, level of business growth, asset structure, uniqueness of the products offered, profitability, resource volatility, risk, income tax level, tax benefits, among others can be relevant for the capital structure adopted. Thus, several empirical research works have sought evidence of which factors determine the capital structure of Brazilian companies.

Eld (1996), in his work to identify the behavior of Brazilian companies regarding the capital structure decision, and the capital cost rate accepted by the companies for their long-term projects, rules out the idea of maintaining a fixed, that is, static relationship, between the amount of own equity and third-party capital, in terms of a minimization of average capital cost, pointing to the seizing of the market opportunities, which means the companies seek the most economically advantageous financing sources, not caring about the capital structure, and he also highlights the existence of a great number of companies which follow a predetermined uptake hierarchy. Nevertheless, the results found out by the author point to bank loans as the first financing source to be taken. The second source is the common shares, and the last alternative is the retained earnings. Such results are different from those expected by the Pecking Order Theory. For this behavior, the author assumes the existence of a possible bias regarding the information asymmetry theory since there are funds which are somehow subsidized, and the insignificant profitability of the Brazilian companies due to the economic crisis which the country was going through at the time the research work refers to, hindering, thus, the use of retained earnings.

For Titman & Wessel (1988), the companies select their capital structure according to their own attributes which determine the several costs/benefits associated with the funding decision and examine the relationship between attributes and the financing tools (short term, long term and convertible debt). The results presented suggest the companies with unique or specialized products (uniqueness attribute) have relatively lower long and short-term indebtedness indices; smaller companies (size attribute) tend to significantly use more short-term indebtedness than bigger companies, possibly motivated by the high costs faced when they issue long-term financing tools, which suggests that such transaction costs can be important in choosing the capital structure; more profitable companies (profitability attribute) have less debt in relation to their equity market value; nevertheless, they present greater long and short-term indebtedness percentage; and there is no evidence a company capital structure is related to the growth expectation, to other tax benefits which are not generated by indebtedness, to the volatility of profit or the asset structure.

The work of Titman & Wessel (1988) was the basis for Perobelli & Fama's (2002) study on public-held companies in Brazil to find the indebtedness driving factors. Analyzing the level of short-term indebtedness, the size of the companies, asset growth and profitability, the authors observed that smaller companies are more likely to short-term indebtedness than bigger companies, probably because they have no access to long-term financing or because they are unable to get attractive rates; growing companies tend to use more short-term financing which have higher rates than the long-term ones; and that there is a negative relationship between the company profitability attribute and the level of short-term indebtedness, indicating the high turnover companies tend to be less indebted in short term than low turnover companies; and

the margin attribute has not presented relationship with short-term indebtedness. Gomes & Leal (2001) have also found a reverse relationship between indebtedness and the profitability factors, growth and size, and a positive relationship between indebtedness and the tangibility and risk factors.

Brito, Corrar & Batistella (2007) argue that theories on capital structure were developed in economic contexts different from those observed in developing countries; therefore, the use of these theories must be carried out according to the peculiarities of the Brazilian market, since the imperfection of the national market which impact the financing decisions of companies are restricted capital market, the economic concentration, restriction of long-term third-party capital sources, high interest rates making the financing cost to be significant and making the companies in Brazil to present low indebtedness levels, and, in the country, the third-party capital cost is not only risk function of the taker, but also of the financing source, thus, long-term credit lines directed to specific investments have lower financial cost than the short-term lines, with lower credit risk for the lender.

The authors analyzed the characteristics of the structure capital of the biggest companies operating in Brazil, investigating the relationship between the indebtedness level and its potential determining factors – profitability, risk, size, asset composition, growth, type of capital (private or public) – to identify which factors explain the way these companies finance themselves. They found out that companies get into debt more with short-term than with long-term financings, possibly due to the lack of long-term credit in the market, becoming more evident for privately-held companies; the public-held companies get into debt with short and long-term financings in similar proportions; companies with the same growth, if they are public ones, they have lower profitability than the private ones; publicly-held companies have greater variability of profitability indices than those privately held; private companies are bigger than the public ones and have higher permanent asset proportion; the factors which explain the most the indebtedness indices are risk and the asset composition; the size and growth factors are determinants of long-term indebtedness, but not for the short-term ones; and the profitability is not a determining factor for indebtedness. Therefore, Brito, Corrar & Batistella concluded that the determining factors of capital structure are risk, size, asset composition and growth, and the not relevant ones for capital structure are profitability and capital type and they suggest the influence of other variables in the way the companies finance themselves in Brazil.

Nakamura *et al.* (2007) developed a study on business indebtedness determinants in the Brazilian reality from 1999 to 2003, analyzing, in accord with the literature in the field, the variables: current liquidity, company size, profitability, growth opportunity, business risk, tax economy and sales growth, tangibility, variation coefficient and bankruptcy risk, and they confirmed that size and company growth had a positive relationship with the indebtedness. On the other hand, factors such as profitability and outer growth expectation had a negative relationship with indebtedness, suggesting the behavior of the decision makers of the Brazilian companies follow a financing hierarchy, valuing flexibility and control, suggested by the Pecking Theory, but with a dynamics of adjustment of short-term optimal indebtedness, Trade-off Theory. Also, that the adjustment speed is lower in countries such as the United States, England, Switzerland, France, suggesting that several other factors, as differences of economic balance, contractual and cost rules, and shortage of capital should also be considered since they would help to explain such difference among countries.

Nevertheless, other factors can also influence the company indebtedness level, such as information asymmetry between managers and investors, tax policies, macroeconomic factors, as economic growth and inflation rate and each country's institutional characteristics, such as the development of the capital market, legal, financial, and accounting systems.

Bastos, Nakamura & Basso (2009) sought to identify which capital structure determinants of the public companies in Latin America (Mexico, Brazil, Chile, Argentina, and Peru) are, considering the specific factors of the companies (current liquidity, tangibility, asset profitability, market-to-book value, growth opportunities, income tax payment, size and business risk) and the macroeconomic and institutional factors of the countries (Gross Domestic Product (GDP) growth, per capita income, annual inflation rate, participation of public companies in the economy, tax burden and average time for opening a business in the country).

The authors found out that the specific determinants of the companies which seem to influence the indebtedness level are: current liquidity index, asset profitability, market-to-book value and size; however, tangibility presented an opposite relationship with indebtedness, showing a behavior contrary to that of the theories. The market-to-book variable presented an inverse relationship with total indebtedness at market value, which is explained by the authors, since the companies with more growth opportunities avoid financial tensions arising from a high indebtedness level, favoring the Trade-off Theory. The index for growth opportunities showed a significant relationship with the short-term indebtedness, and the Income Tax payment had a negative relationship with total indebtedness; therefore, this evidence counters the Trade-off Theory which postulates the companies get into debt more because of the debt tax benefit. The business risk variable presented a positive correlation with short-term indebtedness since the risk influences directly the debt incurrence, especially the long-term ones. Based on the results obtained, the authors concluded that it is the Pecking Order Theory which seems to explain the capital structure in the countries studied, considering the specific factors of the companies.

Regarding the macroeconomic and institutional factors, Bastos *et al.* (2009) found a negative relationship between the GDP growth and the indebtedness, indicating that when there is a country's economic growth, the companies decrease their indebtedness. In this case, the strategy adopted by the companies to finance themselves is in accordance with the Pecking Order Theory since the use of funds generated internally and promoted by the economic growth avoids a market underestimate because of the information asymmetry. The per capita income results have not allowed conclusions about its relationship with indebtedness. Inflation have not indicated significant results, even though a positive relationship with indebtedness was expected, since the growing inflation depreciates the debt nominal amounts, becoming more attractive to the fund taker. The tax burden presented a negative relationship with short-term indebtedness, rejecting the hypothesis that the greater the tax burden, the greater the company indebtedness is because of the tax benefit, according to the Trade-off Theory. The authors explain the behavior observed suggesting that a high tax burden can jeopardize the business efficiency, mainly if the country has high fiscal deficits; moreover, a high tax burden can encumber the third-party capital cost, discouraging its raising. The public capital company variable showed a negative relationship with indebtedness for the Latin America companies. This variable is an important index of the country institutional quality since a sturdy capital market represents a possibly low-cost financing option for the companies and, thus, making the companies less indebted. The business time, which measures how many days, on average, are necessary to open a company, is also another good measure of the institutional environment of a country. In countries where there is a delay to open new businesses, it makes the companies to be less indebted due to transaction and institutional costs, and the results found, for this variable, in Latin America, show a positive relationship for short-term indebtedness, which means that in more fragile institutional environments, the companies seek short-term debts. Regarding the macroeconomic and institutional factors studied, Bastos *et al.* (2009) conclude

that such factors cannot be ignored since they help to explain the behavior regarding the capital structure.

Gonçalves, Pires & Silva, and Borges (2018) argue that the institutional features such as legal, financial and accounting systems are determining factors for understanding the capital structure and the financing type of companies in a certain country, and, in this case, Brazil suffers strong influence from the market and credit features of financial institutions, presenting a more regulated legal model, the Code Law which follows the tradition of Roman Law, in contrast to the Common Law model, and with strong influence from the government in the economy, guided by a high level of detailing of accounting rules, in which the financial statements are not prepared to inform the investors, but to meet tax and regulatory requirements. Assuming that the Brazilian company financing structure can be influenced by institutional traits, such as the legal system and the accounting model of the country, and that, in Brazil, the publicly-held companies keep on being financed by public and/or private banks, the authors looked into the financing type of publicly-held Brazilian companies after the change of the institutional feature of accounting standards in Brazil with the adoption of a new accounting standard based on international accounting standards (IFRS), promulgated by the Law #11,638/2007. The results reached indicated the financing profile had the self-financing as the main source, followed by debt issuance and finally, issuance of shares, which is in accordance with the order of the Pecking Order Theory. Nevertheless, analyzing the secondary financing source, the authors observed that the Trade-off Theory would fit in better to explain the context of Brazilian companies. Moreover, Gonçalves, *et al.* (2018) concluded that even having Brazil adopted the international accounting standard model with strong participation of investors' funds in the capital structure of companies, the financing profile has not followed such rationale, that is, the companies are still being preferably financed by financial institutions (banks), which evinces the weak influence of this accounting model on the type of financing.

2.2 Subsidized Credits and Capital Structure

It is known that some economic activities present certain features in terms of risk and return which hinder the financing of their investment in capital market or credit market requiring, thus, a special financing source or institutional guarantee scheme. In this respect, in Brazil, the BNDES (*Banco Nacional de Desenvolvimento Econômico e Social* – National Bank of Economic and Social Development) is an important institutional factor which, along the decades, has offered long-term funds with subsidized interest rates for financing investment projects in the industrial, infrastructure, agriculture, commerce and service sectors, besides reimbursable investment directed to education, health, basic sanitation and public transport (Prates, Cintra, & Freitas, 2002; Santos, & Guimarães, 2014).

For accomplishing its aims, BNDES has several government financing sources, and the Workers' Assistance Fund -*Fundo de Amparo ao Trabalhador* (FAT) and the National Treasure are the most representative financing sources. According to data of the bank, the funds of the FAT and the National Treasure represented together, in 2017, 2018, 2019 and 2020, 77.2%, 75.7%, 71.4%, 69%, respectively. Besides those, other government funds, such as the Navy Merchant Fund -*Fundo da Marinha Mercante* (FMM), Government Severance Indemnity Fund -*Fundo de Garantia do Tempo de Serviço* (FGTS) and its Investment Fund (FI-FGTS) and the Amazon Fund - *Fundo da Amazônia* (FA), resources arising from repo operations, overseas funding-raising through operations with multilateral institutions and government agencies and, external security issuance (bonds), private issuance of financial bills are also sources of the funds used by the bank (*Banco Nacional de Desenvolvimento Econômico e Social* [BNDES],

2021). The allocation of resources from the BNDES occurs through funds, programs and programs associated to financing lines with preset values and specific conditions according to each category, operation features and economic activity sector (BNDES, 2021; Leme, Rigo, & Cherobim, 2016).

Since it was created, the BNDES has gone through several phases, and it has played an important role in the consolidation of the Brazilian industry, especially commodities, in the 1950's, and capital goods in the early 1970's. Up to the mid-1960's, a great amount of the bank disbursement was allocated to state-owned companies, with little participation of private companies. During the military governments, a shift took place, and the bank began to emphasize the private companies over the state-owned ones. From 1980 to 1990, the BNDES took the role of privatization manager of state-owned companies and promoter of the insertion of local companies in the international trade. After 2000, the bank took an important position in the concentration and centralization of capitals, acting directly in the capital subscription in stock exchange of national companies and supporting the accomplishment of direct investment abroad (Santos, & Guimarães, 2014; Santos, 2015).

Torres (2009), Torres & Macahyba (2012) argue about the limits of the Brazilian banking credit market since the BNDES has become one of the main sources of long-term investment funding due to its funding sources, volume, costs and deadlines, as well as the low level of the capital market in the country, especially the stock market and the corporate debt securities market because, in order to compete with public debt securities, regarding profitability and liquidity, the companies face high cost for the issuance of commercial papers since, in general, they are securities with reduced terms and profitability higher to the interbank deposit rate (DI), which is tied to the Selic rate.

Oliveira & Wolf (2016), while studying the credit market dynamics in Brazil from 2007 to 2015, noticed that private banks were responsible for the 2003 – 2008 credit expansion cycle, which ended in September/2008 in face of the uncertainties provoked by the international crisis, thus, reducing the loan volume, increasing costs, and shortening the terms. The authors argue that, since then, to mitigate the worldwide crisis effect in the Brazilian economy, expansive monetary and tax policies were adopted, and the public banks began leading the credit offer, especially credits with directed resources, a process which lasted up to 2014. Within the period studied, four moments of this credit expansion cycle were identified. The first period presented little growth, and it was followed by a second period of sharp growth, reaching 50% of the total of credit when compared to other credit types (rural credit with regulated and market taxes, and mortgage lending with regulated and market taxes), a decrease in the growth rate in the third period up to the stabilization corresponding to 40% of the total of loans in the fourth period, in face of the growing need of resource allocations from the National Treasury and the reduction of the demand for credit.

In this same work, Oliveira & Wolf (2016) confirmed that among the credit operations with directed funds offered to legal entities, the greatest amount was from the BNDES, especially those indexed to the *TJLP* (long-term interest rate), but they also evinced they had noticed the participation of other programs subsidized by the federal government and operationalized by the *Banco do Brasil*, *Caixa Econômica Federal*, *Banco do Nordeste*, *Banco da Amazônia* and credit lines with resources from constitutional funds for the development of the Central-western, Northern and Northeastern regions of the country. The authors explain that, during the period studied, since the *TJLP* (long-term interest rate) always remained below the Selic rate, and since the bank raise funds at Selic rate via the National Treasury and lends them at *TJLP* (long-term interest rate), these loan operations are, therefore, subsidized by the country.

In European Union countries, such as Germany, France, Ireland, the Netherlands, Sweden, Greece, among others, as well as in other important world economies, such as in Japan and Korea, there is also an important scheme of capital subsidy. Studies reveal that the effects of capital subsidy on the performance of the companies, especially the financial and productive performance, are minimal or negative, and the question of why companies compete for subsidized capital remains (Beason, & Weinstein, 1996; Bergstrom, 2000; Ford & Suyker, 1990; Hart, Scott, Keegan, & Gudgin, 1993; Lee, 1996; Tzelepis & Skuras, 2004; Tongeren, 1998).

While Tzelepis & Skuras (2006) point out that the subsidy has positive impact on the long-term strategic guideline, such as market growth and optimal operation scale, and it is able to help companies either to follow a more aggressive market-oriented guideline, or to build a more productive capacity. These strategic guidelines may not be reflected on financial results, though. Bergstrom (2000) observed that, in Swedish companies, the capital subsidy was positively correlated to the growth of the added value in the first year after the subsidy granting, but, after that period, the subsidized capital seemed to be negatively correlated to the increase in productivity.

In the Brazilian scenario, Lazzarini, Musacchi, Bandeira-de-Melo & Marcon (2014) ascertained that the BNDES loans and equity allocations do not have consistent effect on performance and investment decisions, except the reduction of financial costs due to the government subsidy, and, thus, it suggests a different way of government credit allocation, since the BNDES lends to companies that are not altering their performance and investment conditioned to new loans, but which could probably finance their projects with other capital sources, this fact is inhibiting the emergence of a private market for long-term loans because only the high-risk companies are left to the private creditors.

Tarantin & Valle (2015), assessing how different financing sources (capital market and sources with subsidized interest rates and the financial institutions) impact the capital structure of publicly-held Brazilian companies to understand which resource types are offered in each one of the markets and which companies raise their resources in each market, they found an average indebtedness period considered low, about 2.5 years, and regarding the financing sources, noticing that the publicly-held Brazilian companies are still strongly based on banking resources, representing 45.7% of the amount of debt of the companies, justifying, therefore, the low maturity of the debts. They observed that the debt with subsidized interest rates is a relevant source of funds to companies, corresponding, on average, to 29.8% of the company debt amount which suggests the companies seem to respond to the policy adopted by the BNDES since they have also observed an increase in the offer of this financing type with cost below the market lines enabling the companies to finance their new investments at lower costs or even reducing their general capital cost. On the other hand, they have also observed that the funds coming from the capital market represent, on average, 20.8% of the debt amount tending to rise from 2009 on. And, as expected, they have observed that companies with greater debt proportion with subsidized interest rates also present greater debt maturity than the other ones since the BNDES is considered the main long-term resource offeror in the Brazilian economy with greater maturity than the debts obtained in the capital market as well.

The literature about debt heterogeneity presents extensive literature (Demirgüç-Kunt & Maksimovic, 1999; Faulkender & Petersen, 2006; Rauh & Sufi, 2010; Zhang, Li, Zhou & Zhou 2014). Moreover, Eça & Albanez (2021) point out that the greater the debt heterogeneity, the lower the Brazilian company capital cost is in the period from 2010 to 2019. The research indicates these results are not the same to the whole sample, indicating that the agency cost is a determining factor in the assessment. Póvoa & Nakamura (2014) point out that debt

homogeneity or heterogeneity of Brazilian companies are associated with factors such as company size, market-book value, and company rating level.

These findings are aligned with the literature discussion previously presented and ratify the possibility of study for the sectors shown in this research, industrial and agribusiness sectors, in accordance with the hypotheses presented next.

H1: There is difference in the subsidized and non-subsidized capital cost for public-held companies in the industrial and agribusiness sectors.

The assessment of this hypothesis aims to compare that weighted average cost of subsidized capital of companies of specific sectors which can be relevant to determine the importance of these subsidized credits for composing the capital structure of these companies.

3. Methodological Procedures

To compare the weighted average cost of subsidized capital of publicly-help companies whose shares are traded in the B3, the information regarding the financing sources, loan and financing amount, national or foreign currency, interest rates and indices were gathered through the Explanatory Notes in standardized financial statements of the last accounting year disclosed at the electronic website of CVM (*Comissão de Valores Mobiliários* – Securities and Exchange Commission).

The chosen companies were categorized in accordance with the economic sector, and the information related to these companies' use of financing sources were classified in financing sources with subsidized interest rates (lines of credit of the BNDES, FINAME, FIDIC, FINEP, FINEM, FINISA and state funds) and financing sources with non-subsidized interest rates.

After gathering the data, the descriptive statistical analysis was carried out, followed by the performance of the average difference tests through the analysis of variance (ANOVA) between the sectors analyzed. And finally, the results found were correlating to the existing literature about the phenomenon of research via an essay analysis.

4. Results and Analysis

The sample of this work is comprised by information regarding financing sources, amount of loans and financing in national and foreign currencies, interest rates, and indices, of 84 publicly-held companies with shares traded in the B3 and which had been chosen and categorized according to the economic sector, gathered from the Explanatory Notes of standardized financial statements referring to the accounting year ending on December 31, 2019 and disclosed at the electronic website of CVM (*Comissão de Valores Mobiliários* – Securities and Exchange Commission). The information related to these companies' use of financing sources were later classified in financing sources with subsidized interest rates (lines of credit of the BNDES, FINAME, FIDIC, FINEP, FINEM, FINISA and state funds) and financing sources with non-subsidized interest rates. Table 1 shows the relationship and the classification according to the economic sector of the companies researched.

Table 1*Relationship, quantification, and sectorial classification of the companies analyzed*

Economic Sectors	Number of companies	Companies
Food and Beverages	13	BRF, Cosan, Josapar, Exelsior Alimentos, Ambev, JBS, Minerva, Minupar Participações, M. Dias Branco, Marfrig Global Foods, São Martinho, Vigor Alimentos and Conservas Oderich
Textile	16	Alpargatas, Arezzo Indústria e Comércio, Industrial Cataguases, Cambuci, Fiação Tecidos Cedro Cachoeira, Tecidos Norte de Minas Coteminas, Dohler, Guararapes Confecções, Grendene, Kasten, Pettenati Indústria Têxtil, Restoque, Tecido Santanense, Springs Global Participações, Têxtil Renauxview and Vulcabras Azaleia
Steel and Metal Industry	15	Haga Indústria e Comércio, Hercules, Electro Aço Altiona, Gerdau, Cia Ferro Ligas Bahia Ferbasa, Kepler Weber, Mangels Industrial, Metalgrafica Iguazu, Metisa Metalurgica Timboense, Mundial, Paranapanema, Cia Siderurgica Nacional, Taurus, Tekno and Usiminas
Vehicles and vehicle parts	11	Embraer, Fras-le, Iochpe Maxion, Marcopolo, Mahle-Metal Leve, Metalurgica Riosulense, Plascar Participações Industriais, Randon, Recrusul, Schulz and Tupy
Chemicals	8	Bombрил, Braskem, Elekeiroz, Nortec Química, Nutriplant, Ouro Fino Saúde Animal, Ultrapar Participações and Unipar Carbocloro
Oil and Gas	4	CEG, COMGAS, Enauta Participações and Petro Rio
Software and Data	5	Cielo, Linx, Quality Software, Sinqia and Totvs
Industrial Machines	3	Indústrias Romi, WEG and Metalfrio Solutions
Paper and Pulp	3	Irani Papel e Embalagem, Cia Melhoramentos de São Paulo and Suzano
Non-metal Minerals	2	Nadir Figueiredo and PBG
Agriculture and Fishing	3	Biosev, Brasilagro and SLC Agrícola
Electronics	1	Positivo Informática

Source: research data.

Table 2 shows the percentage of the financing raised in foreign currency per economic sector in the composition of the indebtedness of the companies.

Table 2*Percentage of indebtedness raised in foreign currency*

Economic Sector	Minimum Raising	Maximum Raising	Average Raising ± Standard Deviation
Agriculture and Fishing (n=3)	0%	88%	36% ± 46%
Food and Beverages (n=13)	0%	97%	52% ± 36%
Industrial Machines (n=3)	3%	91%	49% ± 45%
Electronics (n=1)			65%
Paper and Pulp (n=3)	0%	71%	26% ± 39%
Chemicals (n=8)	0%	96%	21% ± 35%
Oil and Gas (n=4)	0%	97%	27% ± 47%
Vehicles and Vehicle Parts (n=11)	0%	98%	40% ± 33%
Non-Metal Minerals (n=2)	7%	9%	8% ± 2%
Software and Data(n=5)	0%	27%	5% ± 12%
Steel and Metal Industry (n=15)	0%	99%	39% ± 40%
Textile (n=16)	0%	95%	26% ± 32%

Source: *research data.*

It is seen there is a great variability in the percentage of loans and financings raised in foreign currency, composing on average $34\% \pm 36\%$ of total indebtedness, with companies financing themselves almost exclusively in foreign currency until the total lack of foreign loan in some companies. The food and beverage sector is the one which presented greater proportion of financing in foreign currency in its indebtedness composition, followed by the industrial machine and vehicle and vehicle part sectors. It is worth highlighting here that only three companies disclosed the use of financial tools of foreign exchange protection in their explanatory notes regarding Loans and Financings – one of the agriculture and fishing sector, two of the food and beverage sector, and one of the electronics sector. For the calculations of the effective rate, the Exchange variations of loans in foreign currencies were ignored.

Although it was not the objective of this work, a brief analysis of the accounting disclosure level regarding the disclosure of information on Loans and Financings was necessary since the calculation of the weighted average cost of subsidized and non-subsidized capital are sensible to the quality of the disclosure of the variables studied. During the performance of this work, the intervallic disclosure of the rates of loans and financings taken in the same financial institution were seen to be frequent. 39 out of the 84 companies analyzed, which corresponds to approximately 46% of the sample, evinced interest rates of loans in intervallic way. For the calculation of effective rates carried out later, the use of the midpoint of the range was chosen so that 50.3%, on average, of the amounts of loans and financings of the 39 companies which adopt this disclosure practice had the calculation of the effective rates jeopardized.

It was also seen that the non-disclosure of the rates of the loans taken and/ or the non-disclosure of the indices in the cases of post-fixed loans, or the use of not usually used indices, such as, international interest rates little used or disused in the country. Twenty-eight (28) companies presented these features in their financial statements, representing about 30% of the sample analyzed. Consequently, the values presented were excluded from the calculation of

effective rates, representing, on average, approximately 23% of the total value financed by the companies.

Table 3 shows the number of companies of each economic sector and the average financing percentage with rates disclosed in an intervallic way and the average financing percentage with non-disclosed or unusual rates and indices.

Table 3

Average percentage of financing with rates disclosed in an intervallic way and financings with non-disclosed and/or unusual rates or indices

Economic Sector	Number of companies with disclosure of financing rates in an intervallic way	Average financing percentage with rates disclosed in an intervallic way	Number of companies with non-disclosed or unusual financing rates or indices	Average financing percentage with non-disclosed or unusual rates and indices
Agriculture and Fishing (n=3)	1	100.0%	-	-
Food and Beverages (n=13)	3	33.5%	4	45.1%
Industrial Machines (n=3)	3	45.1%	3	28.2%
Electronics (n=1)	-	-	-	-
Paper and Pulp (n=3)	1	51.7%	1	0.04%
Chemicals (n=8)	2	7.0%	1	100.00%
Oil and Gas (n=4)	1	28.6%	1	3.7%
Vehicles and Vehicle Parts (n=11)	7	57.8%	5	4.70%
Non- Metal Minerals (n=2)	-	-	1	0.2%
Software and Data (n=5)	3	65.1%	4	0.4%
Steel and Metal Industry (n=15)	7	42.2%	4	61.8%
Textile (n=16)	11	57.9%	4	3.1%
Total of companies (n=84)	39		28	
Average		50.30%		23.30%

Source: research data.

Table 4 shows the distribution of the absolute frequency of the subsidized loan percentage of companies in the economic sectors analyzed. It is seen that out of the 84 companies analyzed, 22 have not presented financing with subsidized rates (6 of them are companies in the steel and metal industry, 5 of them in the food and beverage sector, 3 of them in the vehicles and vehicle part sector, 2 in the Industrial machine sector, and the remaining 6

were companies in the paper and pulp, chemicals, oil and gas, non-metal minerals, software and data, and textile sector). Only 3 companies had the total amount of their loans composed exclusively of subsidized financing rates, corresponding to 1 company in the food and beverage sector, 1 in the Chemicals and the other one in the software and data sector. In general, it is seen that 39 companies, approximately 46% of the sample researched, presented up to 10% of their financings composed of loans with subsidized rates, in which 11 companies were in the textile sector, 6 in steel and metal, 5 in the food and beverage sector, 4 in the chemicals sector, 3 companies in the vehicles and vehicle parts and also in the agriculture and fishing sectors, 2 companies in the paper and pulp, oil and gas and software and data sectors, and 1 company in the non-metal mineral sector. A great variability in the percentage of subsidized loans in the composition of the financing of the companies studied is seen.

Tabela 4

Distribution of the percentage frequency of subsidized loans

Percentage Span of Subsidized Loans	Total of companies	Agriculture and Fishing	Food and Beverage Sector	Industrial machine Sector	Electronics Sector	Paper and Pulp Sector	Chemicals Sector	Oil and Gas Sector	Vehicles and Vehicle Part	Non-Metal Mineral Sector	Software and Data	Steel and Metal Sector	Textile Sector
0%	22	0	5	2	0	1	1	1	3	1	1	6	1
0 – 10%	39	3	5	0	0	2	4	2	3	1	2	6	11
10 – 20%	8	0	1	0	1	0	1	0	3	0	1	0	1
20 – 30%	3	0	0	0	0	0	0	0	0	0	0	0	3
30 – 40%	2	0	1	0	0	0	0	0	0	0	0	1	0
40 – 50%	0	0	0	0	0	0	0	0	0	0	0	0	0
50 – 60%	3	0	0	0	0	0	0	1	2	0	0	0	0
60 – 70%	2	0	0	0	0	0	1	0	0	0	0	1	0
70 – 80%	2	0	0	1	0	0	0	0	0	0	0	1	0
80 – 90%	0	0	0	0	0	0	0	0	0	0	0	0	0
90 – 100%	3	0	1	0	0	0	1	0	0	0	1	0	0
Total of companies	84	3	13	3	1	3	8	4	11	2	5	15	16

Source: research data.

Table 5
Average Percentage of Subsidized Loans

Economic Sector	Average ± Standard Deviation
Agriculture and Fishing	2.69% ± 1.08%
Food and Beverages	11.85% ± 27.94%
Industrial Machines	24.33% ± 42.15%
Electronics	16.94%
Paper and Pulp	2.25% ± 3.23%
Chemicals	24.17% ± 36.94%
Oil and Gas	15.99% ± 25.42%
Vehicles and Vehicle Parts	13.69% ± 19.77%
Non-Metal Minerals	4.34% ± 6.14%
Software and Data	25.38% ± 42.17%
Steel and Metal Industry	12.25% ± 24.53%
Textile	7.13% ± 9.36%

Source: *research data.*

Table 5 shows the average participation of the subsidized loans per economic sector of the companies analyzed. It is seen that, on average, the loans with subsidized rates represent about 13.10% ± 24.25% (average ± standard deviation) of the total financing composition. It is highlighted the software and data, industrial machines, chemicals sectors are the ones which have greater average proportion of subsidized loans, about 25%, while the agriculture and fishing sector was the one having the lowest average proportion of subsidized loans in their financing composition. It is also possible to see the great variability in the participation of loans of subsidized rates in the financing composition of the companies, observing the average dispersion measure used in this study, the standard deviation.

Table 6 presents the minimum and maximum effective rates as well as the average effective rate of the total of loans of the companies of the economic sectors analyzed. The electronics sector had the lowest average effective rate of 3.62% of loans and financings, while the chemicals sector presented the highest average effective financing rate, 8.95%. It is worth highlighting that the average of the effective financing rates among all the sectors analyzed was 7.37%.

Table 6

Effective Minimum, maximum and average rates of the total of loans and financings per economic sector

Economic Sector	Minimum Effective Rate	Maximum Effective Rate	Average Effective Rate \pm Deviation
Agriculture and Fishing (n=3)	4.61%	11.15%	7.81% \pm 0.92%
Food and Beverages (n=13)	0.18%	19.54%	6.63% \pm 2.61%
Industrial Machines (n=3)	-0.22%	13.22%	3.94% \pm 2.07%
Electronics (n=1)	0.00%	10.50%	3.62%
Paper and Pulp (n=3)	0.40%	15.40%	7.99% \pm 2.38%
Chemicals (n=8)	2.80%	56.00%	8.95% \pm 6.30%
Oil and Gas (n=4)	2.94%	13.42%	6.78% \pm 1.24%
Vehicles and Vehicle Parts (n=11)	0.33%	354.15%	7.84% \pm 3.93%
Non-Metal Minerals (n=2)	3.00%	8.20%	6.97% \pm 0.22%
Software and Data (n=5)	2.14%	13.16%	8.59% \pm 2.32%
Steel and Metal Industry (n=15)	1.00%	21.60%	7.63% \pm 4.17%
Textile(n=16)	2.52%	95.60%	7.19% \pm 2.76%
Average \pm Standard Deviation			7.37% \pm 3.48%

Source: research data.

Table 7 illustrates comparatively the average of the effective rates of the subsidized and non-subsidized loans of the economic sectors analyzed. Among the 84 companies which had their standardized financial statements analyzed, the lowest effective rate was -0.22% per year regarding a loan with non-subsidized rates for working capital in foreign currency (Euro) and indexed to Euribor, taken by a company in the industrial machine sector. This index presented the aforesaid percentage, and we highlight that, in this work, the calculations of the effective rates for foreign currencies disregard the exchange variation of the period. The highest annual effective rate was 354.15% per year referring to the credit limit with 13.44% a month rate taken by a company classified in the vehicle and vehicle part sector. The lowest effective rate of a subsidized loan was 2.67% per year referring to a loan taken by a company in the food and beverage sector at Secretaria de Fazenda de Goiás at a rate of 0.22% a month. The highest effective rate seen in subsidized loans was 16.77% a year for working capital at an average cost of 1.3% a month taken by a company in the textile sector.

Considering just the subsidized and non-subsidized loans and disregarding the rating of the companies per economic sector, the results obtained show the average of the weighted effective rates of subsidized loans (7.41% \pm 2.71%) seems to be greater than the average of the weighted effective rates of all the non-subsidized loans (7.29% \pm 3.49%), suggesting that subsidized credits do not play a role for the cost reduction of the capital structure of the companies in the proportion they have been used to compose the financing of the companies analyzed.

Table 7

Comparative between the averages of the effective rates of subsidized and non-subsidized loans of the economic sectors analyzed

Economic Sector	Subsidized Loans			Non-Subsidized Loans		
	Minimum Effective Rate	Maximum Effective Rate	Average Effective Rate \pm Deviation	Minimum Effective Rate	Maximum Effective Rate	Average Effective Rate \pm Deviation
Agriculture and Fishing	9.53%	10.00%	8.27% \pm 2.50%	4.61%	11.15%	7.82% \pm 1.03%
Food and Beverages	2.67%	12.96%	6.99% \pm 2.13%	0.18%	19.54%	6.51% \pm 2.45%
Industrial Machines	4.00%	13.22%	5.40%	-0.22%	11.90%	3.67% \pm 2.44%
Electronics	3.00%	10.50%	7.16%	0.00%	8.61%	2.90%
Paper and Pulp	5.20%	15.40%	10.45% \pm 2.65%	0.40%	13.54%	7.90% \pm 2.44%
Chemicals	3.00%	12.20%	6.96% \pm 1.45%	2.80%	56.00%	9.21% \pm 6.52%
Oil and Gas	3.50%	11.95%	7.90% \pm 0.18%	2.94%	13.42%	6.32% \pm 1.80%
Vehicle and Vehicle Parts	2.75%	11.85%	8.25% \pm 2.17%	0.33%	354.15%	7.16% \pm 4.51%
Non-Metal Minerals	3.00%	6.66%	6.55%	4.04%	8.20%	6.98% \pm 0.20%
Software and Data	3.75%	8.92%	7.53% \pm 0.99%	2.14%	12.90%	9.58% \pm 3.16%
Steel and Metal Industry	4.00%	10.50%	7.67% \pm 4.10%	1.00%	21.60%	7.65% \pm 3.43%
Textile	2.98%	16.77%	6.79% \pm 3.54%	2.52%	95.60%	7.23% \pm 2.89%
Average \pm Standard Deviation			7.41% \pm 2.71%			7.29% \pm 3.49%

Source: research data.

The average difference test by the analysis of variance (ANOVA), having the equality between the average effective rates of subsidized and non-subsidized loans as null hypothesis (H0) and the existence of difference between the average effective rates of subsidized and non-subsidized rates as alternative hypothesis (H1), revealed that for a significance level $p < 0.05$ there is no statistically significant difference between the average of the effective rates of the subsidized loans and the non-subsidized ones, whether testing the differences of the averages ignoring the sector economic ranking or testing the differences of the averages intra-sectorially.

Valle & Albanez (2012), while analyzing the capital structure of 83 Brazilian companies from 1997 to 2006 to understand the financing composition and the participation of the sources of subsidized credits, they observed the financing lines with subsidized rates represented 32% to 37% of the financing composition of the companies, a percentage higher than that seen in the present work, and that the financings in foreign currency represented 46% of the financing composition, percentage also higher than that seen in the this work. And due to the results observed, Valle & Albanez (2012) concluded that Brazilian companies used financing in foreign currency and financings with subsidized interest rates to get rid of the high domestic interest rates within the period studied.

Therefore, the results found in this work can confirm the results reached by Eld (1996) in which the companies seek funding sources economically cost-effective not caring about the capital structure, and at the same time, they present new data indicating a percentage variability of capital participation with subsidized interest rates in the indebtedness composition of the companies, and that possibly a reduction of this participation has taken place since Tarantin & Valle (2015) observed that the debts with subsidized interest rates corresponded on average to approximately 30% of the debt amount. Moreover, the results of this work indicate it is possible

these capital costs of loans with subsidized rates is higher than the loans with non-subsidized rates, or even that the difference between these costs does not exist. Such results are different from those found by Lazzarini et al. (2014), who observed a reduction of the financial expenses due to the government subsidy. Moreover, the results contribute with the studies of Eça & Albanez (2021) and Póvoa & Nakamura (2014) indicating that this relationship is not unique for all the economic sectors. Thus, questions such as those proposed by Tzelepis & Skuras (2004) on the reasons why managers compete for subsidized capital since they cannot improve the financial results of the companies, and what the relevance of subsidized credit in elaborating the capital structure policy of the companies is, remain and stimulate future studies regarding the theme.

5. Final Considerations

The aim of this study was to assess whether the subsidized credit provided by the Brazilian government through BNDES financing lines offers capital cost reduction for the publicly-held companies, comparing the weighted average cost of capital of subsidized and non-subsidized loans of companies in the industrial sectors and those related to agribusiness to determine the importance of subsidized credit sources for the economic sectors.

The results point out the loans with subsidized rates present a great variability in the participation of subsidized rate loans in the composition of the financing of the companies; however, they present, on average, a low percentage in the indebtedness composition, and also that the average effective rates of subsidized loans can be greater than the average effective rates of non-subsidized loans, which suggests the subsidized credits in the proportion they have been used to compose the financing cannot play a relevant role in the cost reduction of the capital structure of the companies.

First, the limitations of the present study are related to the low quality of accounting disclosure regarding the disclosure of information on Loans and Financing in the Financial Statements, and second, the fact that the sample has been limited to just one accounting year. Thus, a greater sample of companies of the sectors studied as well as a greater number of accounting years are suggested for future research. Moreover, the limitations regarding the sample profile, cross-sectional, which analyzes only a period, must be highlighted. That is, the results are limited to this period of analysis.

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