


THE COMPOSITION OF THE FIRMS' INDEBTEDNESS AND THE MACROECONOMY OF CAPITAL: AN ECONOMIC ANALYSIS BUILT THROUGH ACCOUNTING INFORMATION

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ABSTRACT

The objective of this research is to analyze the influence that monetary policies exert on the composition of the indebtedness of Brazilian corporations. From this objective, 2 hypotheses derive. The first analyzes the sample aggregate and the second directs the tests to the productive sectors. The study sample is composed of 220 companies: 84 of consumer goods, 89 of capital goods and 47 of public utility. The data collected refer to the years 2009 to 2019. The methodology used for data analysis is through panel data models, using the GMM approach. According to the results, it can be concluded - in the light of the macroeconomics of capital - that the composition of the firms' indebtedness can be determined by the market moments defined by the monetary policies, so that such influence is different depending on the sector to which the companies are located in the production chain. These results complement the literature that studies the impacts of monetary policies and macroeconomic variables on corporate finance, mainly through econometric modeling based on accounting data.

Keywords: Debt Composition. Capital Macroeconomics. Accounting Information.

Edited in Portuguese and English. Original Release in Portuguese

Received on 5/06/2022. Revised on 06/21/2022. Accepted on 08/10/2022 by Professor PhD. Rogério João Lunkes (Editor-in-Chief). Published on 9/09/2022.

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1 INTRODUCTION

Examining the factors that influence the composition of companies' indebtedness is a subject addressed by academic research, and is also a matter of interest to owners, managers and creditors, since debt decomposition according to their maturity can determine the solvency of a firm. Thus, the interest rate of an economy can influence the forms of firms' indebtedness.

Regarding the monetary policies and their impacts on the economy, the neutrality of currency, resulting from the quantity theory of money, by Fisher (1922), is discussed. This neutrality implies that increases in monetary aggregates should affect only the price level in the economy and not the level of its real product. According to Mollo (2004), the foundation of currency neutrality is based on an efficient market system, in which the following principle predominates: the greater its efficiency – perfect competition, flexible prices and perfect information – the more easily this neutrality is verified.

Thus, the currency neutrality and its effects on the real economy, when they occur, are transient and due to differences between expected and effective variables (Lucas, 1972; Friedman, 1989). As the effects on the real economy occur through relative price changes, the more efficient and flexible they are, the easier the adjustments will be to take place, and thus the faster the overall price level rises and the currency becomes neutral. Thus, the currency becomes neutral in the long term, and the real economy is permanently affected only by real factors.

On the other hand, another explanation for these relations can be found in the Austrian theory of business cycles school – as presented by Mises (1998), Hayek (2008), Soto (2009). Or in the Macroeconomics of Capital, as called by Garrison (2001). According to these authors, monetary policies tend to influence longer-term structures more strongly than short-term ones, since variations in interest rates have more discount power in cash flows with larger time series. Since monetary policies are carried out by Central Banks with the financial sector, interest rate variations flow to the economy through debts obtained by the productive sector from these financial institutions. Therefore, monetary policies would have an influence on the relations between firms' short- and long-term debts, that is, on the indicator of debt composition.

Moreover, according to Mises (1998) and Hayek (2008), the manipulation of interest rates by the Central Banks results in a higher level of indebtedness in firms whose productive projects require more time to carry out it (such as capital goods firms), before companies whose projects require less time (such as consumer goods firms).

The monetary policy rule proposed by Taylor (1993) has the basic interest rate as a monetary policy instrument, relating it to the long-term real interest rate, the inflation rate and the inflation and real product gaps. In Brazil, in 1999, with the establishment of the inflation targeting regime, under the administration of the National Monetary Council, Bacen assumed the role of working through its activity in the open market to maintain the interest rate close to the target set by the Monetary Policy Committee (Copom).

Studies analyzing the firms' capital structure should be pointed out depending on the market timing of the costs of own capital and third parties (Baker and Wurgler (2002), Huang and Ritter (2009), Albanez (2015), Yang et al. (2017)). In agreement with the Capital Macroeconomics, empirical studies on the firms' structure debts – such as those of Eriotis, Frangouli and Ventoura-Neokosmides (2011), Serrasqueiro (2011), Javed and Imad (2012) and Mujahid and Akhtar (2014) – have found that firms have distinct capital structures, depending on the type of activity. In addition, other works - such as those of Brierley and Bunn (2005), Frank and Goyal (2003), Vithessonth, Schwaninger and Müller (2017) and Alter and Elekdag (2020) - have evidenced the presence of effects of monetary policies on the level of company leverage in various countries' markets, like Germany, Switzerland, Thailand, United Kingdom, USA and China.

In the Brazilian economy, between 2009 and 2019, monetary aggregates M1 and M2 increased approximately and 80% and 158% respectively. During the same period, the Selic rate

had a minimum value of 5% and a maximum value of 14.25%. These percentages demonstrate an expansionary scenario of monetary policies and their effects on interest rates in the Brazilian economy.

In general, this macroeconomic dynamics has the potential to affect the financial and operational structures of Brazilian companies; and specifically, the way in which firms make up their indebtedness. To verify this relation, it is necessary to use the firms' primary information of ; obtained reliably in accounting reports. This allows a complementary analysis between macroeconomic information and its effects on the firms' accounting information. That said, in the light of the theories mentioned, of the empirical results presented by the literature and the Brazilian monetary scenario, the present research problem is raised: **Which are the influences of monetary policies on the composition of the companies' indebtedness in the different sectors listed in B3 in the last decade?**

Nevertheless, this study aims to analyze the influence of monetary policies on the composition of the Brazilian corporations' indebtedness. Therefore, the aim of this research is justified to close an important gap in the literature in finances by verifying the behavior of monetary supply manipulation in the levels of the entities' indebtedness, both in aggregate and by sectors. And this analysis is made with methodological and theoretical robustness, by the sum of theories of fields distinct from the economy, estimated in econometric models structured in accounting data and tested in other markets of worldwide relevance. Thus, this research herein will complement the literature that studies the impacts of monetary policies and macroeconomic variables on corporate finances, particularly regarding the public-traded firms' indebtedness in Brazil.

2 THEORETICAL REFERENCE

2.1 The Accounting Information

Ball and Brown's seminal work (1968) points out the relevance of accounting information in financial and economic evaluations. According to Francis and Schipper (1999), accounting information is relevant when it is used by society in the measurement process. In this sense, relevance is determined by the ability of accounting information to obtain the set of data available in the economy, making economic agents meet their expectations. In this sense, Beaver, Mcanally and Stinson (1997) point out that, in addition to "relevance", it can also be considered as an "informational content".

For Perry and Nölke (2006), accounting is a system for measuring economic activity and, therefore, an important and necessary social practice given an economic world characterized by division and specialization of labor. The resolution of social relations on resources is not simply recorded by post-event accounting; instead, accounting information itself forms the basis for such resolutions. Accounting is not a purely technical issue; accounting numbers provide some of the main economic anchors around which social relationships are structured. Therefore, the accounting information is the main quantitative anchors around which the current economic system organizes itself; what makes them a central parameter in economic relations.

Empirically, studies identifying the relevance of accounting information are observed, evaluating the relation between accounting indicators and market variables; mainly on stock prices (Campos, Lamounier, & Bressan, 2015; Almujaed & Alfrah, 2019; e Chen, Kurt, & Wang, 2020). Whereas the present research aims to broaden the empirical horizon of the use of accounting information, in order to observe the relations of economic agents in a macroeconomic environment; starting from the accounting base to analyze the theories about monetary policies and their effects on the level of corporate debt.

2.2 The Macroeconomics of Capital

Hayek (2008) argues that decisions between savings and investment in an economy should be made at a market-driven interest rate and explains that the market is sensitive to interest control by the Central Banks. Similarly, investment and consumption represent dichotomous functions of resources. In an economic situation with full employment, resources are allocated to both utilities, obtaining the maximum benefit of this *trade-off*.

Thus, Garrison (2001) uses the Production–Possibility Frontier (PPF) to highlight the definition of scarcity by demonstrating theories about capital and interest. The “Investment” consists of the sum between the net investment (which enables the economy growth) and the investment needed to restore the obsolete, depreciated or exhausted capital. Positive net investment denotes the economy growth. Thus, as shown in Figure 1, the PPF expands year after year, from point A to point B, enabling increasing rates of consumption and investment. In this case, the PPF expansion denotes sustainable economic growth.

The level of PPF growth requires several factors. A variation in saving – which triggers an initial PPF movement from point A to point A', as Figure 2 – changes how the PPF develops. Consider that a population becomes more economic, aiming for the future. It will necessarily decrease current consumption, increasing savings. This increase in savings enables a higher level of investment, so that the economy expands at a higher rate, being $B' > B$.

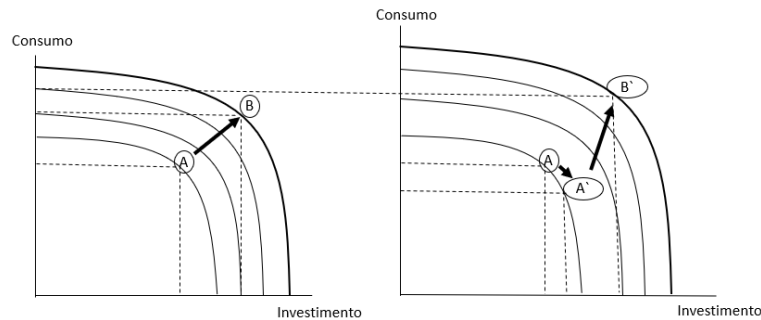


Figure 1. Growth of the production possibility frontier

Source: Garrison (2001)

As also presented in the Solow model (1956), there is no increase in savings, investment and consumption expand at a lower rate. In other words, at the initial moment, the investment grows as opposed to consumption. Subsequently, due to the increased initial investment, consumption and investment expand at a higher growth rate. Thus, the reduction in consumption at the beginning of the period (savings) enabled a higher level of future consumption.

Authors such as Mises and Batson (1953), Hayek (1999) and Soto (2009) use the structure of the credit market when theorizing about the relations among the interest rate, investment and savings. Thus, if agents change their temporal preferences, becoming more oriented to the long term, there is an increase in their savings, resulting in a drop in the interest rate. Therefore, there is greater incentive for entrepreneurs to invest in more projects. Thus, *ceteris paribus*, savings/investment are the determinants for legitimate economic growth, in which the balance between investment (D) and savings (S) generate the value of the interest rate in a market economy.

In this case, as Figure 2 shows, the reduction in consumption and the increase in savings move the interest rate value to a lower level ($B > B'$). A lower interest rate gives a new balance point in the market. The economy moves by the PPF extension, seeking, in the present time, a lower level of consumption and a higher level of investment.

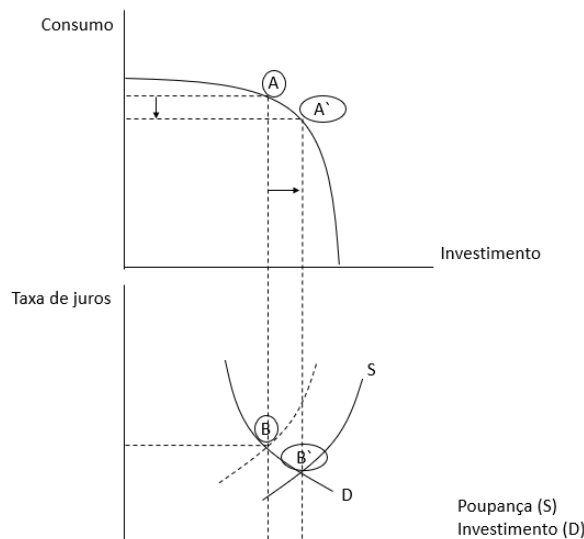


Figure 2. Production possibilities frontier and the credit market

Source: Garrison (2001)

Thus, the credit market shows how interest rates provide a synchronization between investment and savings. Whereas PPF shows how *the trade-off* is limited between investment and consumption. In other words, movements along the PPF necessarily result in opposite movements between investment and consumption. Therefore, adjustments in the market prices of inputs, wages and final products allow the economy to operate in the extension of its PPF.

On the other hand, according to Keynes (2017), reductions in consumer spending result in excess stocks, causing cuts in production and layoffs, which leads to a decrease in income and spending. In this spiral, the economy would enter into recession and entrepreneurs would incur less investments.

Through the approach of capital macroeconomics, there is misunderstanding in Keynes's theory (2017) by disconsidering the entire production structure subdivided into stages, analyzing only the aggregate in the short term. A lower interest rate due to an increase in savings stimulates long-term projects, such as industrial construction or the development of new products.

In the elaboration of Böhm-Bawerk (1890) and Menger (2012), capital goods present heterogeneous characteristics. The production structure consists of final consumer goods (first order goods) and capital goods (higher order goods), relating among the various productive stages through the different levels of complementarity.

In Figure 3, the AC cathetus illustrates the temporal extension, quantified by the number of steps, considering that the quantity of stages varies in direct function with the time of the production chain. The BC cathetus shows the total produced of consumer goods. Whereas the AB hypotenuse represents the production function. The various stages of production from which the AC cathetus is subdivided are capital goods, quantified in values measures.

A crucial point for cycle theory is the mutual correspondence among producer and consumer plans and investor and saver plans (Hayek, 2008). Thus, the triangle illustrates *the trade-off* recognized by Böhm-Bawerk (1890) and Menger (2012), in which investments grow at a certain moment at the expense of consumption and lack of resource idle. Thus, for Hayek (2008), the triangle temporal axis is expanded by investments that demand an application of resources that require more execution time.

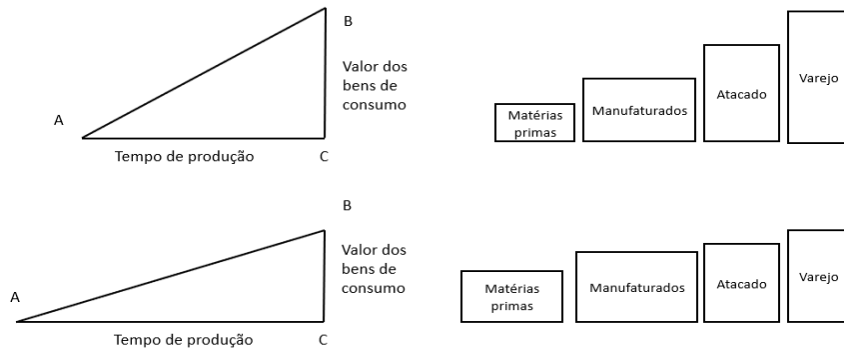


Figure 3. Hayek Triangle

Source: Hayek (2008)

Ceteris paribus, it is known that the changes in the intertemporal preferences will change the shape of the triangle as a consequence of the oscillation in the prediction to be saved, by ruling the cyclic expansions. Once the productive chain reformulation is completed, the higher the equivalent level of consumption will be, because, to be maintained, the new production structure will require higher capital expenditure in relation to the ones disbursed previously (Hayek, 2008).

As Figure 4 shows, in an economic growth situation, the triangle increases its size simultaneously with the increase in the border of production possibilities.

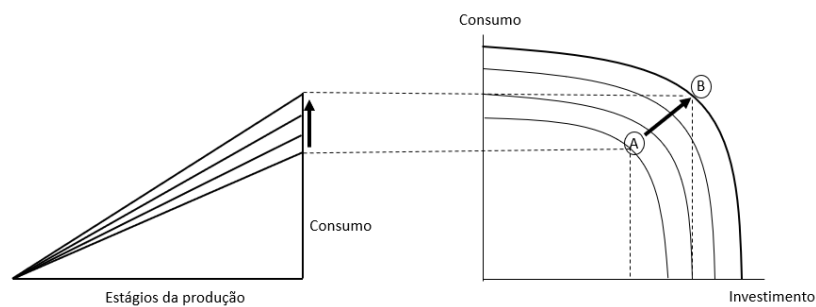


Figure 4. Expansion of the production possibilities frontier and the Hayek Triangle

Source: Garrison (2001)

An increase in savings generates two consequences that act in the capital structure in a complementary way: i) consequence of demand - the lower demand for consumer goods discourages investments in the last stages of production, shortening the vertical part of the Hayek triangle (2008); (II) consequence of the discount rate - a lower interest rate encourages investments in the preliminary stages of production, extending the horizontal part of the Hayek triangle (2008). Figure 5 illustrates this situation.

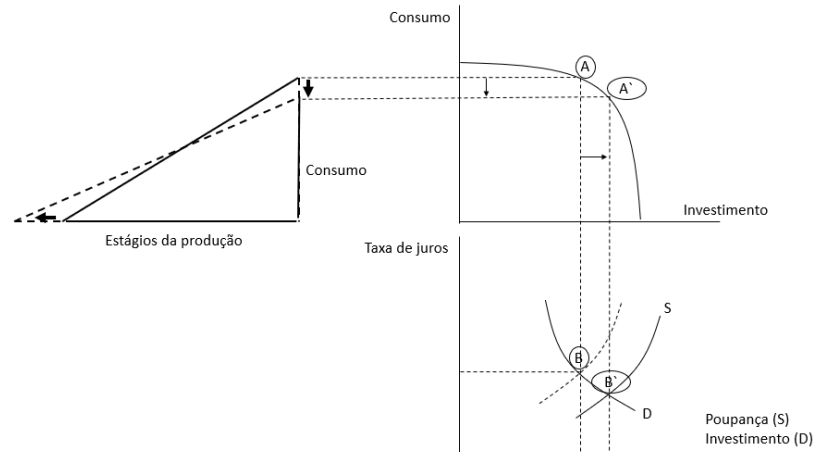


Figure 5. Effects of savings on PPF, the credit market and the Hayek Triangle
Source: Garrison (2001)

At the first moment, greater savings generate consequences on the intensity of investment and the capital formation in its temporal form. As shown by Hayek (2008), the triangle shows that capital promotion is reduced in the last production stages (retail stores, for example), while capital formation increases in the preliminary stages (mineral exploration, for example). In this case, in the production chain, there is a greater interest directed toward the future, which is in line with the savings that made such a reformulation possible. In other words, individuals are currently saving for an increase in consumption in the future.

As presented by the PPF and Hayek's triangle (2008) (Figure 6), consumption reduces, at the first moment, from point A to point A'. However, due to the investments made by the reduction of interest derived from the increase in savings, the rate of growth in consumption exceeds the previous one, so as to provide the economy with a higher level of consumption in the future, moving, at a second moment, from point A' to point B'. That is, consumption reduces while the economy is shaping to a higher growth rate, so consumption grows at a rate higher than the previous one, surpassing the previously projected growth course.

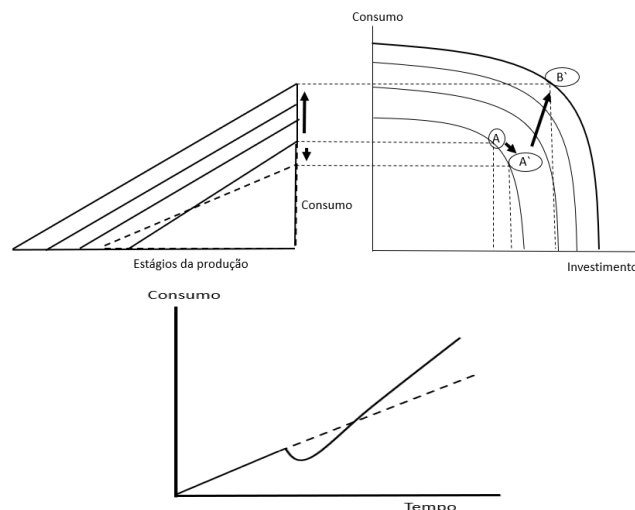


Figure 6. Effects of savings on PPF and Hayek Triangle (second stage)
Source: Garrison (2001)

On the other hand, when central banks increase the monetary base in circulation, the growth of monetary supply flows to the economy through credit markets, as if they were savings (Mises,

1998). That is, resources offer to loans moves to the right regardless of any growth in savings. Figure 7 illustrates, on the supply side, the antagonistic paths of investment and savings when the Central Bank adds a monetary base to the credit market (+ ΔM).

As a result of a lower interest rate, individuals tend to consume more and save less. This new monetary base causes an imbalance which, at the beginning, is covered by the growth of more credit (Soto, 2009). Thus, this increase in the monetary base in credit markets develops a disarrangement between investment and savings.

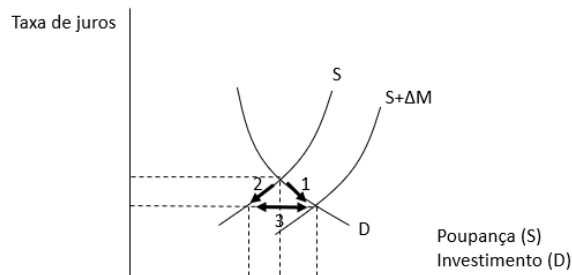


Figure 7. Effects of credit expansion on the credit market

Source: Garrison (2001)

As Figure 8 shows, the investors, taking advantage of lower interest rates for obtaining loans, move in their demand curve, as illustrated by the arrow (1). The savers, reacting to a lower stimulus to accumulate savings, move in their unaltered curve (S), as shown by arrow (2). The divergence between investment and savings is camouflaged by new monetary offers, which *per se* do not reflect new resources, according to arrow (3).

Thus, these credit conditions encourage greater investments, generating a clockwise movement by the PPF extension (arrow 1). As salaried employees are consuming more due to *the trade-off* between consumption and savings, the counterclockwise shift in the PPF extension (arrow 2) has been made. This counter position between investment and savings stems from a conflict between investors and consumers. Analyzing the size of the investment (arrow 1) and the size of consumption (arrow 2), it is observed that the increase in credit has an economic result at a point situated beyond the limits of the PPF (arrow 3).

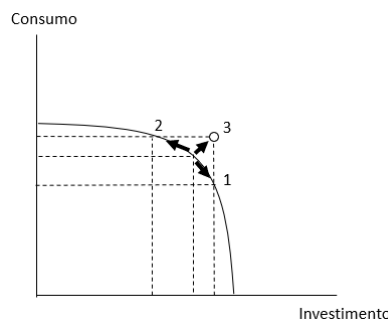


Figure 8. Effects of credit expansion on the production possibilities frontier

Source: Garrison (2001)

The low interest rate, consistent with a more forward-looking orientation, stimulates investment in the early stages of the production chain. But without enough resources saved, a considerable proportion of these investments will not be completed. In addition, increased consumer demand leads part of the resources to the final stages of the production chain, reducing more emphatically the means to meet the resulting capital structure (Mises, 1998).

The dynamics of this cycle generate both excessive investments (bad investments) and consumption in addition to a natural rate (overconsumption), as shown in the PPF diagram and in the lengthening of the Hayekian triangle (Figure 9). Disagreement between investors and consumers leads the economy beyond the limits of the PPF. The reduction in interest rates

encourages investment. The resource limitations are, however, an impediment to economic production reaching beyond the PPF limits. According to Hayek (2008), these temporarily unrelated triangles of the productive chain convert economic growth into a depression, and presumably into a crisis, thus generating economic cycles.

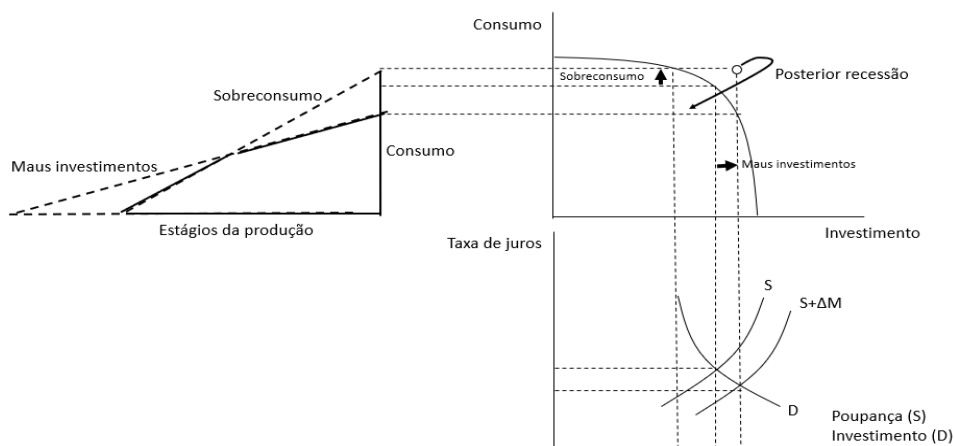


Figure 9. Effects of credit expansion on PPF and on Hayek Triangle
Source: Garrison (2001)

Thus, at the beginning of the economic cycle, the expansion of the monetary base promotes production; however, it creates distortions in the allocation of resources due to the temporal differences of the productive sectors. Whereas at the end of the economic cycle, with the economy in deperation, the decrease in the interest rate slows down the productive recovery due to the continuous temporal disagreement of investments in the production chain. Therefore, the Austrian school also deals with the currency non-neutrality, so that the expansion of the monetary base affects the firms in different ways, depending on the sector and the stage of the economic cycle in which the economy is located. That is, in the NeoKeynesian view, monetary policies conducted by Central Banks play a positive role in economic development, while for the Austrians, these monetary policies are the maximizers or causers of economic crises.

2.3 Research hypotheses

That said, as explained by the Macroeconomics of Capital, monetary policies can influence the firms' short- and long-term relations. Therefore, the first hypothesis tested was:

- 1- H_0 : The monetary policies are relevant to explain the composition of the aggregate indebtedness of the Brazilian firms listed in B3.

Furthermore, according to Austrian economists, monetary policies exert distinct influences on companies, depending on their sector in the production chain. Therefore, the second hypothesis tested was:

- 2- H_0 : The monetary policies impact increasingly the indebtedness composition depending on the production sector.

3 METHODS

3.1 Sample

The sample consisted of the companies listed in B3, with annual data available during the period from 2009 to 2019, according to classifications presented by Economática®, which presented the data needed for this research. The initial database (675 non-financial companies) was made up of all firms in all sectors that had already had negotiations conducted in the analyzed

period. The financial sector was excluded due to its accounting differences in the account plans in relation to the other sectors, in addition to being the sector corresponding to the channels of transmission of monetary policies between Bacen and the productive sector.

After the companies' exclusion from other sectors that did not contain the historical series of variables needed to meet the objectives outlined, the final sample totaled 220 firms, representing 32.59% of the initial universe.

Table 1
Economic sectors of B3

Consumption goods	Quantity	Total
Cyclic Consumption	66	
Non-Cyclic consumption	18	
Total		84
Capital Goods	Quantity	
Industrial Goods	51	
Basic Materials	30	
Oil and Gas	8	
Total		89
Public Utility	Quantity	
Others	8	
Public Utility	39	
Total		47
Total		220

Source: Economática®.

This period is justified by the post-crisis global context in 2009, during which Bacen adopted expansionist monetary policies as anti-crisis measures. In addition, during this period, there was the process of convergence of accounting standards. This provides greater standardization of accounting information in the temporal cut-off used.

As in the Brazilian market there is the presence of a significant number of companies in the public sector (predominantly in the electrical sector), we chose to analyze the data in addition to that described by the Austrian school. Thus, the sectors of consumer goods and capital goods are added to the public utility companies, which are used as a control group in the construction of sectoral *dummies*.

3.2 Methods and Variables

For Barros, Bergmann, Castro and Silveira (2020), the generic solution to any problem of endogeneity is the use of instrumental variables external to the model. In cases where the researcher does not have such variables, the estimation methods for panels based on *the Generalized method of moments* (GMM) method are presented as effective and viable alternatives to mitigate or even eliminate the problems of endogeneity. This is because this model is part of the assumption of sequential exogeneity of the regressors.

Thus, according to the variables already specified – and generally considering the works of Frank and Goyal (2003), Brierley and Bunn (2005), Baker and Wurgler (2002), Huang and Ritter (2009), Yang et al. (2017) and Alter and Elekdag (2020), and specifically, the Albanez work (2015) for the Brazilian market, were estimated by regression with panel data using the Generalized Moments Method (GMM), testing hypotheses 1 and 2, as follows:

$$CE_{it} = \beta_0_i + \lambda CE_{i,t-1} + \beta_1 Selic_{t-1} + \beta_2 LnAT_{i,t-1} + \beta_3 LO_{i,t-1} \quad (1)$$

$$+ \beta_4 ROA_{i,t-1} + \beta_5 \frac{M}{B}_{i,t-1} + \beta_6 AL_{i,t-1} + \beta_7 Liq_{i,t-1} + \beta_7 FCO_{i,t-1} + \beta_8 Dummy1_{i,t}$$

$$+ \beta_9 Dummy2_{i,t} + \beta_{10} Dummy1I_{i,t} + \beta_{11} Dummy2I_{i,t} + \beta_{12} Dol_{i,t-1} + u_{it}$$

Where:

CE = Composition of Indebtedness;

β_0_i = interception of each company i ;

$Selic$ = variation of the basic interest rate over time (Selic and SelicHP);

λ = estimated persistence coefficient for the lagged dependent variable used as a regressor;

$LnAT$ = natural logarithm of the Total Asset;

LO_{it} = annual variation rate of Operating Profit;

ROA_{it} = return on asset;

M/B = market-to-book indicator;

AL = Leverage indicator – Total debt on Total assets;

Liq = liquidity indicator - Available on Total Asset;

FCO = Operational cash flow over Total Asset;

$Dummy$ = dummies variables related to the sectors of consumer goods ($Dummy1$) and capital ($Dummy2$);

$DummyI$ = interaction between the *dummies* variables of sectors and monetary *policy proxies* ($Mn_t * Dummy1_{i,t}$);

$u_{it} = a_i + \varepsilon_{it}$; a_i is the individual effect and ε_{it} is the term random error;

i = i -th company;

t = t -th period of time.

The *dummy* variables ($Dummy_{i,t}$) represent the sectors in which each company is inserted, according to the classifications presented by Economática®. Quantification and qualification of the heterogeneity of responses to different sectors are relevant to improve the understanding of how monetary policies can affect the indebtedness composition. Thus, seeking greater robustness in this analysis, the *dummies* variables will also be used in interaction with the monetary policy variables. Such interaction is represented by the expression $Selic_t * Dummy_{i,t}$. These variables are responsible for demonstrating if the monetary policies impact sectors in different ways, as advocated by the Macroeconomics of Capital and thus defined in hypothesis 2.

4 RESULTS

Table 2 shows significant dispersion values in the variables, which allows us to infer on the data marked variability in relation to the mean value of the dependent variables. This finding is possibly linked to the heterogeneous nature of the sample used in this study, which is composed of companies of different sizes and sectors. In order to avoid this situation, the outliers were withdrawn using the *Z-score* method in the following interval: $= - (\text{observed} - \text{average}) / SD$ and $= + (\text{Observed} - \text{average}) / SD$. Where *observed*: values assumed by the sample; *average* value : value; *SD*: standard deviation (square root of the variance). This method corresponds to the variable standardization and the discrepant values are those found to be more than 3 (three) deviations of the mean of the data analyzed (SwarupaTripathy, Saxena and Gupta, 2013). It is also observed, through the Phillips and Perron unit root test (1988), the compliance with the assumption of the regressors stationarity.

Table 2
Descriptive statistics and stationarity test

Dependent variables						
	Maximum	Minimum	Mean	Median	Standard deviation	
CE	54.2069	-1.0000	0.3109	0.0086	2.3151	
Variables of interest						
	Maximum	Minimum	Mean	Median	Standard deviation	Stationarity
Δ SELIC	0.3216	-0.6751	-0.0736	0.0230	0.3152	38.4189
SELICHP	0.0309	-0.0305	-0.0016	0.0029	0.0195	16.9590***
Independent variables						
	Maximum	Minimum	Mean	Median	Standard deviation	Stationarity
TAM	19.6730	7.3159	14.0161	0.3154	1.9799	19.4903***
TANG	0.9374	0.0000	0.2773	0.2406	0.2336	43.0035***
ROA	2.6653	0.0001	0.0898	0.0536	0.1642	21.6277***
M/B	6.9876	-23.1751	1.0734	1.0006	1.1417	16.1108***
LC	8.2660	0.0050	1.6108	1.3675	1.1279	21.1994***
DOL	0.5019	-0.2700	0.0701	0.1205	0.2016	44.4356***

The statistical significance of the Phillips-Perron Stationarity tests is represented by the following symbology: *10%; **5%; ***1%.

As shown in Table 2, by the Arellano and Bond self-correlation test (1991), the compliance was verified with the assumption that there was no second-order autocorrelation for all variables. Regarding the proposed instruments, the analysis of their viability was based on the Hansen's test, due to its greater robustness. Thus, the Hansen's test showed, for all the models, the non-rejection of its null hypothesis, thus assuming the suitability of the instruments used in the proposed model.

Regarding the choice between GMM approaches in differences and GMM-systemic, it is verified that the Diff-Hansen test showed, for all the models proposed, the non-rejection of its null hypothesis, assuming the suitability of GMM-systemic as an approach to obtaining the estimated parameters. Finally, the global significance models evidenced in this research is verified by Wald's test, which points to the rejection of its null hypothesis, assuming the existence of global significance of the proposed model. Once the GMM approach adjustment assumptions are met, the results obtained by its use can be analyzed as follows.

Table 3
Empirical results

DEPENDENT VARIABLE: CE			
GMM Systemic		GMM Systemic	
$CE_{i,t-1}$	-0.0668** (0.0370)	$CE_{i,t-1}$	-0.0673** (0.0340)
Δ SELIC	0.4365** (0.0160)	SELICHP	5.0570** (0.0240)
LOGTAM	-0.7788 (0.3130)	LOGTAM	-0.9822 (0.1820)
TANG	-0.1664 (0.6340)	TANG	-0.1556 (0.6740)
ROA	1.0801** (0.0250)	ROA	1.0691** (0.0280)
MB	0.0961 (0.3190)	MB	0.1173 (0.2280)
LC	0.3407*** (0.0020)	LC	0.3559*** (0.0010)
DUMMY1	-0.2960** (0.0270)	DUMMY1	-0.3107** (0.0350)
DUMMY2	-0.1925* (0.0880)	DUMMY2	-0.2145* (0.0620)
DUMMYII	-0.0613	DUMMYII	-5.5660*

	(0.8380)		(0.0820)
<i>DUMMY2I</i>	-0.0681	<i>DUMMY2I</i>	-0.0604
	(0.7990)		(0.9870)
<i>DOL</i>	-0.3548*	<i>DOL</i>	-0.2207
	(0.0810)		(0.2660)
<i>CONSTANT</i>	1.8704	<i>CONSTANT</i>	2.3642
	(0.3440)		(0.2090)
AR(1)	-3.45***	AR(1)	-3.45***
AR(2)	0.3	AR(2)	0.17
Sargan's Test	319.02***	Sargan's Test	322.76
Hansen's Test	204.44	Hansen's Test	208.35
Difference In-Hansen Test	4.12	Difference In-Hansen Test	8.04
Wald's Test	51.75***	Wald's Test	43.76***
Number of notes	1764	Number of notes	1764
Number of groups	213	Number of groups	213
Number of Instruments	269	Number of Instruments	269

Source: Research data.

Notes. AR(1) and AR(2) - verification of the existence of first and second order autocorrelation among the terms of errors; Sargan's and Hansen's tests verify the assumption of the instruments exogeneity; Diff-Hansen - validity of the GMM approach - Systemic. The tests statistical significance is represented by the following symbology: *10%; **5%; ***1%.

Using the results presented in Table 3, the significance of the EC variable lagging can be verified, which highlights the importance of using the dynamic panel for the treatment of the data included in the sample of this study, since the presence of statistical significance in the lagging of the debt composition indicator (CE) is observed. This result was obtained in both models with the presence of Selic and SelicHP interest variables.

It should be pointed out that the variables Selic and SelicHP were not included in the work of Baker and Wurgler (2002), Huang and Ritter (2009) and Albanez (2015), Alter and Elekdag (2020). Therefore, the insertion and statistical relevance of these *proxies* in econometric models presented relevant results to empirical studies on the subject.

According to Garrison (2001), the monetary policies tend to influence longer-term structures more strongly than short-term ones. In this way, tight monetary policies derived from interest increases tend to reduce long-term debt. Similarly, quantitative easing from interest reductions tend to increase long-term debt. Consequently, as shown in Table 3, the positive and significant parameter of the Selic variable, showing that increases in this rate decrease long-term indebtedness, and therefore increase the short-term composition of the debt.

To verify the cycles of expansion or contraction of monetary policies through the use of the Selic rate, a "natural" rate is estimated through the trend estimated by the Hodrick–Prescott filter (HP). Thus, when Selic is below this trend, there is the presence of an expansionist monetary policy. And, when Selic is above this trend, there is the presence of a contractionary monetary policy. Thus, the filtered Selic (SelicHP) is obtained by subtraction between the Selic rate and its value softened by the HP filter. The use of this filter for monetary policy variables is also verified in studies such as Cogley and Nason (1995), Belongia and Ireland (2017) and Goyal and Kumar (2019).

Contributing to the model adjustment, it can be observed that the SelicHP monetary policy *proxy* impacted the indebtedness expansionist monetary policy (CE) positively and significantly. This result also indicates, for the aggregate sample, that interest increases decrease the long-term debt ratio, contributing to the theories that explain the currency non-neutrality and to the Macroeconomics of Capital (Garrison, 2001; Mises, 1998; Soto, 2009).

Likewise, Dummy1 (consumer goods sector) interaction and SelicHP monetary policy *proxy* have a negative and significant influence on CE. This indicates that increases in interest rates have lower short-term indebtedness in companies classified as consumer goods. This result

points to the distinct effects that monetary policies cause in firms depending on the sectors and sites in the production chain, as explained by Hayek (2008), Garrison (2001) and Soto (2009).

The *dummies* representing the consumer goods and capital goods sectors affected the CE variable negatively and significantly. Therefore, it is observed that the Public Utility sector has a higher level of short-term indebtedness than the consumer goods and capital goods sectors. This result evidencing the differences in capital structure depending on the sector is added to the results presented by Frank and Goyal (2009), Mujahid and Akhtar (2014) and Serrasqueiro (2011).

This, based on the results presented, it can be seen the statistical relevance of Selic and SelicHP *proxies* for the explanation of the companies' indebtedness composition. Thus, empirically contributing to the Macroeconomics of Capital, hypothesis 1 is not rejected, evidencing the relevance of monetary policies on the indebtedness composition of the aggregate of the sample firms.

The statistical relevance of sectoral *dummies* (consumer goods) was also observed, in interaction with the SelicHP variable. Therefore, as another empirical contribution to the Macroeconomics of Capital, hypothesis 2 was not rejected, which demonstrates that monetary policies tend to influence the firms' indebtedness in different ways, depending on their sector in the production chain.

5 FINAL CONSIDERATIONS

This Article aimed to analyze the influence monetary policies have on the indebtedness composition of Brazilian corporations. So, first, it is important to highlight the relevance of the tested *proxies*. In addition to the econometric models presented by Frank and Goyal (2003), Brierley and Bunn (2005), Baker and Wurgler (2002), Huang and Ritter (2009), Albanez (2015), Yang et al. (2017) and Alter and Elekdag (2020), the relevance of the Selic rate in the aggregate of the sample and SelicHP was verified both in the aggregate and in the interaction with the sectoral *dummies*.

Due to these results, it can be concluded, for hypothesis 1, that monetary policies had a significant influence on the composition of the aggregate indebtedness of the companies studied, which adds empirically to the Macroeconomics of Capital Theory. It can also be concluded, for hypothesis 2, that monetary policies influence the firms' indebtedness composition in different ways, depending on their production sector, adding empirically to the Austrian Theory of Business Cycles.

Therefore, in response to the research problem, after the results of the hypotheses tested, this research argues that: **the composition of firms' indebtedness can be determined by monetary policies, so that such influence is distinct from the sector of the production chain in which the companies are located.**

Regarding the limitations of the present study, the sample size is observed. The Brazilian stock market is still incipient, generating a limitation on the number of companies that present the data needed for the estimations. This limitation prevented the temporal series from being divided to better describe the cycles, as described by the Austrian school, since regressive systemic GMM models require a high number of degrees of freedom for the models estimation. In addition, the sample is made up of a group of companies that do not represent the totality of Brazilian firms statistically. Therefore, the results obtained and the conclusions presented are limited to this sample studied.

This being said, it is suggested to expand the sample as well as apply the models in other markets. Furthermore, a study with a time horizon that goes through the crises of 2001, 2008 and 2020 will contribute greatly to a better identification of economic cycles and a better understanding of how the indebtedness position behaves before the monetary policies over time.

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