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THE DEGREE OF RIGIDITY OF PRODUCT COSTS AND THE PAYMENT OF DIVIDENDS IN THE BRAZILIAN CAPITAL MARKET

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ABSTRACT

The objective of this research was to analyze the reflection of the degree of rigidity of the products costs sold (CPV) in the dividend payment policy of Brazilian non-financial companies with open capital, from 2005 to 2019. The study is based on the possibility of rigidity in the adjustments of the costs of products for companies that may not follow changes in revenues, including before a scenario of a decrease in the level of activity, compromising the result and its destinations, such as the payment of dividends. Based on the validation of the existence of rigidity in the costs behavior in the selected sample, through a regressive model, an asset intensity *proxy* was adopted to measure the degree of rigidity and its reflex in the payment of dividends, using the fixed effects panel data technique. As a result, evidence was obtained that CPV varies by 0.96% to increase by 1% in Net Sales Revenue, while it decreases by only 0.89% in the reverse. Whereas the increase in the degree of rigidity of costs reflects a decrease of 0.50 in dividends paid, which are also negatively impacted by financial leverage and positively by operational cash flows, according to research data. Thus, the study inferred that entities with a higher degree of rigidity in the cost structure tend to pay a lower level of dividends.

Keywords: Asymmetric Costs. Rigidity. Payment of Dividends.

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1 INTRODUCTION

The growing emphasis of the capital market in the national and international scenarios extends the importance of the information provided by open capital entities, as the results presented interfere with the investors' decisions regarding the application of their resources in securities traded in this environment (Castro & Marques, 2013; Perobelli, Perobelli & Arbex, 2000).

Thus, as a result of the investors' expectations, regarding the return, one of the points of information disclosed by the companies that gain attention in the market is the presented profit distribution model (Neto, Galli & Decourt, 2008). In this context, dividends are of relevance in the field of corporate finance (Ribeiro, 2010).

Initially, the surveys involving dividends started by investigations of Lintner (1956) and Miller e Modigliani (1961), dealing with their influence on the companies' value . Further, several studies have been carried out in order to analyze dividends and understand what factors can impact it (Moreiras, Tambosi Filho & Garcia, 2012; Melo & Fonseca, 2015; Viana Júnior & Ponte, 2016; Simon, Procianoy & Decourt, 2019; He, Tian, Yang & Zuo, 2020).

Thus, studies on the theme continued to be carried out, seeking new variables related to the decisions of the companies' profits distribution. In this context He et al. (2020) , presented evidence that the rigidity resulting from the costs asymmetric behavior has a negative relationship with the dividend policy, since companies with more rigid costs would pay fewer dividends to their shareholders.

In compliance with the understanding of the costs traditional current, it is expected that these will vary in response to changes in the level of activity represented by the revenues, due to the existence of variable costs that would have this character of automatic adjustment (Noreen, 1991). From this understanding, the idea arises that there would be a symmetry in the variables behavior, refuted from the propositions of Anderson, Banker e Janakiraman (2003), by identifying the existence of adjustment costs.

Thus, the costs of adjustments such as those that need managers' intervention are elucidated to suit changes in revenues, such as labor costs or assets intensity. Then, the greater the cost of adjusting the entity structure, the greater its degree of rigidity and the need for agent management (Anderson et al., 2003), which assess the convenience of reducing costs in reducing the revenue level, as a way of minimizing the deduction in the result.

In this perspective, the asymmetry between the variations in costs and revenues in situations of increase or decrease in the level of activity is observed, revealing the companies' challenge to minimize the possible impacts on performance and on profit destinations, such as the payment of dividends, resulting in agency problems by managers' decisions regarding cuts or inserts of new costs, which may lead to subjective or personal aspects (Anderson et al., 2003; He et al., 2020; Jensen & Meckling, 1976).

Following this idea He et al. (2020) , they argue that, because of the shareholder's aversion to the dividend reductions, companies with a higher presence of adjustment costs and, therefore, of greater rigidity, have a lower level of dividends, due to the difficulty managing this structure of rigid costs in scenarios of reductions in revenue, by diverting from the signaling of a volatility in its dividends distribution to the market for maintaining a lower level of supply of these revenues.

In view of this, considering the importance of understanding the determining factors of dividend policy and its relevance to the market, using the degree of rigidity of costs as an instrument in the decision-making process, one wonders: **what is the reflection of the degree of rigidity of the products costs sold in the payment of dividends from the companies listed in the Brazilian capital market?**

Therefore, the objective of this research is to analyze the reflection of the degree of rigidity of the products costs sold in the payment of dividends of Brazilian companies with open capital listed in Brasil, Bolsa e Balcão S.A. – [B][3], in the period from 2005 to 2019, in order to understand

and demonstrate how the costs asymmetry can function as an explanatory variable of the entity's decisions regarding the payment of dividends.

The relevance of the present study stems from the importance of dividends to the capital market that can use it as a parameter for analysis of return and support in the decision-making process on investment (Ribeiro, 2010). Consequently, planning an effective analysis brings security to the investor and increases expectations of obtaining profitable returns, mainly to shareholders and investors who prefer the consideration in the form of dividend distribution (Gomes, Takamatsu & Machado, 2015).

Also, as a highlight, the importance of new metrics for the analysis of dividend policy is highlighted, based on the reinforcement of He et al. (2020) the role of the costs behavior in the corporate decision making. Therefore, using the information provided in the capital market helps users to more assertive directions regarding their investments or opportunities, and the discovery of new instruments enhances this process (Perobelli et al., 2000; Castro & Marques, 2013; Neto et al., 2008).

Thus, the present research seeks to contribute to the academic and business discussions about the determinants of dividends, making an application of the study in He et al. (2020) the Brazilian scenario, in order to analyze how the asymmetry resulting from the rigid costs affect the payment of dividends by Brazilian companies with open capital, whose importance is observed through the relevance of this indicator in investment decisions.

2 LITERATURE REVIEW

2.1 Concept and Theories on Dividends

Dividends constitute one of the ways that companies use to pay their shareholders for the participation in the capital of these entities. When it comes to the Brazilian stock market, it is understood as a dividend the gain earned by investors, provided for in the Brazilian corporate legislation, by the acquisition of shares of entities trading their securities on the stock exchange (Viana Junior & Ponte, 2016).

In the Brazilian legal system, the payment of dividends and interest on equity capital (JCP) are admitted as models of profit distribution, differentiating among other points, the surrounding tax aspects, such as the incidence of income tax on the JCP and the exemption from dividends, since there has been taxation of the legal person's profit (Gomes et al., 2015).

Before a macro view, the dividend policy reports information to shareholders about the current situation and allows for a future prediction about the gains, mainly because these users do not have access to the entity's internal data that would allow a more in-depth analysis of the economic and financial aspects. Therefore, it becomes an essential instrument for subsidizing market examination (Moreiras et al., 2012).

In this context, it is assumed that transactions in the capital market revolve around signs to equip external users, under the perspective of the Signaling Theory, information of interest of the companies' managers or even achieve this with the omission on disclosures and changes. According to González (1998), signaling is analyzed as to its potential to influence investment decisions, given its ability to affect the entity's value and cash flows, including when there are changes in dividend policies.

On the other hand, the dividends policy is directly related to the corporate cash flow, due to the fact that its payment reduces the company's availability. For this reason Procianoy e Poli (1993) , and Neto et al. (2008) deal with agency problems, since the reduction in the funds availability results in a consequent reduction in working capital at the disposal of the administration. Therefore, the problem focuses on deciding between the profit distribution and its retention for use in the activities, and there may be differences between the agent's and the principal's interests, in the perspective of the Agency Theory (Jensen & Meckling, 1976).

A priori, the dividend policy has its mark on the seminal studies carried out by Lintner (1956) and Miller e Modigliani (1961). For Miller e Modigliani (1961), precursors to the Dividend Irrelevance Theory, it is unquestionable that the effects of dividend policy are important to the company's shareholders, in addition to potential investors and the economy in general, since it serves to analyze the stock market operation.

However, the proposal of Miller e Modigliani (1961) is based on the idea that shareholders will have a preference in the future return of present investments made by the companies with the profit earned, to the detriment of receiving the remuneration for the dividends distribution . Therefore, this expected cash flow would be the driving force for measuring the company's value.

In contrast, the studies performed by Gordon (1963) and Lintner (1956) establish the theory that shareholders or investors would be more interested in receiving the payment of dividends, rather than betting on an uncertain scenario of securities valuation. In view of this, the dividend policy assumes a more important role in the analyzes in the Brazilian stock market, viewed from the Bird in Hand Theory.

In summary, several studies have begun to be carried out on dividends, whether seeking to assess their influence on the determination or creation of value for companies, or on the effects of their payment, with discussion about the conditions or determining factors, such as size of the entity or debt, that may or may not cause changes in the entities 'profit distribution policies (Ribeiro, 2010; Viana Júnior & Ponte, 2016).

Among these aspects Fonteles, Peixoto Júnior, Vasconcelos e Luca (2012) , they present evidence of specific factors of the firm that influence dividend policy, such as profitability, size and cash flows. In this sense, it is observed the relation of dividends with variables that affect the managers' decision on the distributed level, as components of profitability and available cash that influence the payment of more or less dividends.

Due to that, attention to the profit formation becomes understandable, since this variable acts as the starting point for its distribution. Thus He et al. (2020) , they investigate how the costs asymmetric behavior, as a component of the entity's performance, affects the payment of dividends from the existence of rigidity in the cost structure, which requires corporate decisions for its adjustment.

2.2 Asymmetrical Behavior and Rigid Costs

The study is He et al. (2020) based on the Sticky *costs* Theory Anderson et al. (2003), which made a break in the traditional current that predicted a symmetric behavior in costs. By this symmetry, it is understood that the existence of variable costs would lead to an immediate response to changes in revenue level, so that any variation in activity from 1% to more or less would have a similar follow-up in the costs behavior (Noreen, 1991).

It was observed that Anderson et al. (2003) they introduced the idea of asymmetry in the costs behavior, when they found that the variation tended to be higher for increases in demand level (0.55% for 1% increase in revenue) compared to the opposite (0.35% to 1% reduction in revenue), when decreases occurred and costs presented less volatility to follow the attenuation, proposing the existence of rigidity in business expenses.

At this point, it is worth pointing out that Anderson et al. (2003) recognize the existence of costs capable of adjusting automatically to changes in production, i.e., they will vary directly with the quantities produced, due to their nature, and those who need management adjustments to suit changes in product demand, leading to a decision process that may involve difficulty cutting or increasing certain expenses.

Primarily, it is understood that the costs behavior can be managed before environmental factors, such as possible low activity resulting from the demand arising from economic crises affecting the population's purchasing power, and the risks of the business subject, culminating in

an attempt to change rigidity as a way to prevent these threats, giving a volatility to costs to respond immediately to variations (Holzhacker, Krishnan & Mahlendorf, 2015).

Due to the existence of adjustable costs, the companies' structure can be classified between more or less rigid costs, depending on the degree of management possible to align the expenses with possible variations in entity's turnover. And, therefore, it is evident that this rigidity will define the risk of the entity to respond to changes in the level of activity, directly affecting the profit of the period (Anderson et al., 2003; He et al., 2020; Holzhacker et al., 2015).

In principle, the fact that the decrease in costs does not follow the change in revenue is tied to the managers' decisions not to reduce adjustment costs immediately, until the scenario of low demand is confirmed, avoiding precipitations to make cuts and not compromise the result (He, Teruya e Shimizu, 2010). Thus, adjustment costs would be the result of managers' decisions to retain costs during decreases and to add whenever there is an increase in production demand (Bugeja, Lu & Shan, 2015; He et al., 2020).

On the other hand, while managers operate with performance targets, more aggressive reductions in idle costs can be achieved before a decrease in activity level with the aim of meeting management objectives and metrics, even if there are still uncertainties of the presage, creating an incentive environment for faster, more timely decisions, in order not to compromise business performance and achieve attractive results for the users (Kama & Weiss, 2013).

Similarly, managers evaluate economic issues that can intervene in the process of adjusting costs that end up limiting the performance capacity. In line with this, the holders of decision-making power, as exemplified Anderson et al. (2003), can analyze the possibility of incurring in severance costs or new hiring in cases of labor adjustment. At the same time, they tend to avoid decisions that can generate personal conflicts (He et al., 2010).

In the meantime, several studies, focusing on the Brazilian scenario, sought to understand which factors cause the asymmetry phenomenon, based on the entities' operational characteristics, with the intensity of the assets being evidenced as the main driver of the rigid cost, or adjustment costs (Bugeja et al., 2015; Matiolli Grejo, Abbas, Camacho & Junqueira, 2019; Reis & Borgert, 2019; Richartz, Borgert & Lunkes, 2014). This is due to the difficulty of companies undoing these assets whenever there is low demand.

Above all, the greater the existence of these adjustment costs, the greater the rigidity in the entity's cost structure (Anderson et al., 2003). Therefore, rigidity compromises the managers' discretionarity and requires greater performance to reduce the reflection on company performance, as costs represent the majority of the expenses that consume the revenues generated by the companies.

Thus He et al. (2020) , presented evidences that entities with greater rigidity due to the presence of adjustment costs preserve a lower level of dividend payment, due to the fact that this causes for companies to be able to respond to decreases in revenues immediately, maintaining their result. According to the authors' evidence, companies with a higher degree of rigidity tend to pay fewer dividends, according to the authors.

Based on the authors, it is worth noting that the share of costs that is not reduced transits the result, consuming part of the gains. Thus, the profit is deducted from the adjustment costs, maintained before the decline in the level of sale and thus reducing the values to be distributed, including the dividends. And, in order to avoid this impact on the payment of dividends, companies with strict costs prefer to maintain lower levels of dividends, avoiding signaling a volatility in the payments (He et al., 2020).

Therefore, faced with the inflexibility due to the existence of rigid costs, and as this causes the maintenance of the entities' performance and their subsequent destinations, such as the payment of dividends, toward the propositions of He et al. (2020) about the managers' motivation and challenges in facing this rigidity, the following research hypothesis is formulated:

H_1: The degree of rigidity of the products costs has a negative influence on the payment of dividends by the Brazilian companies with open capital.

3 METHODOLOGICAL PROCEDURES

3.1 Research delimitation

The research universe was made up of companies listed in Brasil, Bolsa e Balcão S.A. – [B]^3, except for the sample the companies of the financial and insurance segment, depending on the special regulations that the companies of the sector are subject to and their peculiar capital structure, with a high financial leverage, able to send the inferences in relation to the other companies. In addition, companies that did not provide the necessary information on income, costs and dividend payments were excluded for the realization of econometric procedures, resulting in a sample of 316 companies.

As for the period, it was delimited between the years 2005 and 2019, comprising a total of 15 years, because this time period allows an adequate analysis of the variables behavior. For this purpose, the data were collected through the Economática© database, which gathered the accounting information made available by the companies in their accounting statements published compulsorily on the [B]^3.portal^3.

3.2 Stage 1: Validation of rigidity in the sample

Initially, to certify that in the selected sample there is an asymmetric behavior and, in a similar way, He et al. (2020)it is necessary to use a *proxy* that determines this phenomenon in the second stage, an adaptation of the original model with Anderson et al. (2003) the linear regression technique by Ordinary Least Squares (OLS) , using the Sold Products Costs (CPV), by virtue of the portion of the result that these costs consume, according to equation 1:

$$\ln\left[\frac{CPV_{i,t}}{CPV_{i,t-1}}\right] = \beta_0 + \beta_1 \ln\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] + \beta_2 * Dummy\_Dim_{i,t} * \ln\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] + \varepsilon_{i,t} \qquad (1)$$

The following meanings are adopted for the understanding of the estimator above, identifying the components:

- ***CPV:*** the Products Sold Costs in company *i*, in period *t* and previous period in *t - 1*;
- ***RLV:*** the Sales Net Revenue in company *i*, in period *t* and previous period in *t - -1*;
- ***Dummy_Dim:*** *Dummy* variable for decrease in Net Sales Revenue (RLV), being 0 when not decreased and 1 when there is decrease, in entity *i* and period *t*; and
- **Ɛ***:* model error term.

Equation 1 estimates how much change in revenue impacts the change in the product sold cost in β1, including *the dummy* variable in β2 to identify the same impact that this change in activity level has when there are reductions in net sales revenue. Thus, the change when β2 assumes zero value corresponds to the response of the CPV to the positive variation of 1% in the RLV, while the presence of β2 when taking a value of 1 predicts the change in the CPV to negative variations in the RLV, through the combination of the regression coefficients, according to the model. Anderson et al. (2003)

3.3 Stage 2: Analysis of the research hypothesis

The rigidity within a cost structure is observed by the existence of several adjustment costs, which are those that cannot automatically adjust to variations in the level of activity, requiring the managers' intervention. According to He et al. (2020), there are several *proxies* to measure the

degree of costs rigidity, due to the implications that some variables have of impact for the presence of this rigidity, opting for the use of the asset intensity in relation to the income, observed in Table 1.

It was opted for the use of this *proxy*, since several Brazilian studies have already verified its influence on asymmetric behavior (Bugeja et al., 2015; Matiolli Grejo et al., 2019; Reis & Borgert, 2019; Richartz et al., 2014), possibly a rigid cost, or adjustment cost, since the adequacy of these assets in low income scenarios may not be easily performed. The objective of testing the influence of the rigid cost, rather than the asymmetry phenomenon, which occurs because of it, is emphasized at this point.

Table 1
Research Variables

Variable	Function	*Proxy*	Expected signal	Reference
Dividends	Dependent	Logarithm of the total dividends paid by the entity.	-	-
Degree of costs rigidity	Independent	Rigidity = log (Total Asset/Sales Net Revenue)	(-)	(Anderson et al., 2003; He et al., 2020)
Operational cash flow	Control	Logarithm of the Cash Generated in the Operational Activities.	(+)	(Fonteles et al., 2012)
Leverage	Control	Leverage = ROE/ROA	(-)	

Source : Authors' Elaboration (2021).

It was opted for controlling the model based on the financial leverage variables and cash flows, only in view of problems of multicollinearity with the inclusion of other variables. Both are expected to have a significant impact on the companies' decisions in the payment of dividends (Fonteles et al., 2012; Silva, 2004). To this end, the ratio between the PL profitability and the asset (ROE and ROA) was used as *a proxy* for leverage, which may restrict the dividends distribution due to the result consumption by the financial expenses generated, and for cash flow, the natural logarithm of the flow generated in operational activities, which may encourage the payment of dividends by cash availability.

Then, in the second stage, equation 2 is used to estimate how the degree of costs rigidity, an independent variable, measured by the *proxy* above, influences the payment of dividends by Brazilian companies with open capital, constituting the research dependent variable:

$$lnDivPag_{i,t} = \beta_0 + \beta_1 lnRigidez_{i,t} + \beta_2 lnFCO_{i,t} + \beta_3 Alavancagem_{i,t} + \varepsilon_{i,t} \qquad (2)$$

To understand the regression model, the following meanings are assumed:

- ***DivPag:*** The total dividends paid by company *i* in the period *t*;
- ***Rigidity:*** the entity *i* cost rigidity *proxy* in the period *t* measured by the asset intensity in relation to the RLV;
- ***FCO:*** Company *i* operating cash flow in the period *t*;
- ***Leverage:*** company *i* financial leverage in the *t* period; and
- **Ɛ:** model error term.

Thus, the panel data technique is used by adopting equation 2. In addition, it is noteworthy that the tests were performed to verify the existence of heteroscedasticity and multicollinearity, as well as the F tests of *Chow*, *Breusch-Pagan LM* and *Hausman*, identifying the panel data regression by fixed effects as more appropriate for the model, with a significance level of 5%.

4 RESULTS

The first stage of the research focused on identifying the existence of asymmetry in the costs behaviors and, consequently, the rigidity resulting from this variation. According to Anderson et al. (2003), changes in revenue are not accompanied by symmetrical variations in costs. Since this variation is lower, when the revenues decrease, rigidity is identified from costs that do not automatically adjust to the demand level, and culminates in the need for the managers' adjustments.

Table 2 shows the proportion of the revenue consumed by the products costs (CPV) per sector, which shows that, on average, 70% of the RLV is used to cover the costs incurred in production, and thus the relevance of this variable in the result is perceived. With 83%, the oil, gas and biofuels sector has the highest percentage between costs and revenues, as opposed to the information technology sector, with the lowest indicator, of about 57%.

Table 2
Relation between RLV and CPV by sector throughout the analysis period

Economic sector	Mean	Standard deviation	p25	p50	p75
Industrial goods	0.76	0.30	0.66	0.75	0.83
Communications	0.71	0.60	0.50	0.54	0.63
Cyclic consumption	0.66	0.26	0.56	0.68	0.76
Non-cyclic consumption	0.71	0.20	0.61	0.74	0.82
Basic materials	0.77	0.24	0.66	0.77	0.87
Oil, gas and biofuels	0.83	0.60	0.61	0.81	0.93
Health	0.60	0.19	0.44	0.67	0.73
Information technology	0.57	0.20	0.35	0.62	0.74
Public Utilities	0.64	0.22	0.53	0.68	0.78
Total	**0.70**	**0.29**	**0.59**	**0.71**	**0.81**

Source : Authors' Elaboration (2021).

The behavior of the relation between RLV and CPV per year is shown in Table 3. It is possible to realize that the period analyzed shows some slight variations in increases and decreases, which between 2005 and 2019 varies only by 6 percentage points.

Table 3
Relation between RLV and CPV per year

Year	Mean	Standard deviation	p25	p50	p75
2005	0.65	0.18	0.58	0.67	0.77
2006	0.66	0.23	0.56	0.66	0.77
2007	0.65	0.19	0.56	0.66	0.78
2008	0.65	0.19	0.57	0.67	0.76
2009	0.67	0.19	0.59	0.70	0.79

2010	0.67	0.18	0.57	0.70	0.78
2011	0.68	0.20	0.59	0.71	0.79
2012	0.69	0.21	0.58	0.72	0.80
2013	0.70	0.35	0.59	0.72	0.81
2014	0.70	0.20	0.59	0.73	0.81
2015	0.73	0.29	0.61	0.73	0.83
2016	0.78	0.57	0.61	0.73	0.84
2017	0.73	0.33	0.60	0.72	0.83
2018	0.70	0.22	0.58	0.71	0.82
2019	0.71	0.33	0.59	0.71	0.81
Total	**0.70**	**0.29**	**0.59**	**0.71**	**0.81**

Source : Authors' Elaboration (2021).

Table 4 shows the results of OLS regression in the first stage, which aims to evaluate the existence of cost rigidity in the selected sample. Tests VIF (1.00) and *Breusch-Pagan* (Chi^2: 15.48, Prob>Chi^2: 0.0001) were performed and identified the existence of mild multicollinearity and heteroscedasticity, however, in a way that it does not compromise the results validity, with a total of 3,308 observations, seeking normality as a result of the central limit theorem.

Table 4
Validation of rigidity in the sample by Anderson et al. (2003)

Variables	Coefficients	Standard error	t-Statistics	P-value
logVariation_RLV	0.965	0.012	77.47	0.000
dummy_dimRLV	-0.074	0.017	-4.27	0.000
_cons	0.003	0.004	0.28	0.777
Tests	F (2.3305) = 6978.67	Prob>F = 0.000	R^2 = 0.8085	Adj R^2 = 0.8084

Source : Authors' Elaboration (2021).

In accordance with the *Sticky costs* Theory , Anderson et al. (2003)it is observed that costs vary in a lower proportion when the RLV decreases, compared to the increase, demonstrating the existence of rigidity in the cost structure, as shown in Table 5 that shows the variations.

Table 5
Analysis of rigidity by coefficients and interaction of the *dummy* variable

Variations	RLV increases 1%	RLV decreases 1%
CPV	0.96%	0.89%

Source : Authors' Elaboration (2021).

As shown in Table 5, when there is a positive 1% variation in net sales revenue, CPV varies by 0.96%. However, when the RLV also decreases by 1%, costs decrease by only 0.89%, evidencing an asymmetric costs behavior, due to the interaction of marginal effect of the β1 and β2 in the regression. Thus, as the cost has a lower variation when there is a decrease in revenue, compared to its variation before the increase, the existence of adjustments costs that attribute the rigidity character in the sample is evident.

Given that there is rigidity in the cost structure, managers need to make manual adjustments to follow the activity level, toward the findings of Anderson et al. (2003). Thus, the above results ensure the advance of the second stage, with the aim of verifying how the degree of rigidity of costs influences the entities 'payment of dividends.

It is important to perform this validation, in order to ensure that within the CPV there is this rigidity and, therefore, there are costs of adjustments that compromise the result in the decrease in the activity level. As observed in He et al. (2020), there are several costs that have this adjustment character, or rigid cost, such as the intensity of the use of assets that are not easily adaptable to variations in revenue, and depend on the managers' decisions for possible cuts.

Initiating the second stage, Table 6 represents the dividends paid, on average, per year of research analysis. There is a higher level of dividends distribution in 2011, while the lowest payment occurred in 2007.

Table 6
Descriptive statistics of dividends paid per year

Year	Mean	Standard deviation	p25	p50	p75
2005	531,277	1,008,607	39,294	101,580	559,170
2006	484,218	1,078,376	28,598	161,955	351,962
2007	407,546	1,058,897	16,900	60,000	326,589
2008	411,868	1,066,879	11,871	48,158	275,335
2009	524,947	1,844,784	18,012	45,000	286,050
2010	503,669	1,670,985	12,556	62,505	278,600
2011	755,542	2,676,578	20,568	84,439	296,652
2012	632,630	1,839,509	17,813	84,333	299,441
2013	619,489	1,727,554	20,500	83,583	321,652
2014	646,773	2,051,037	20,487	100,305	313,527
2015	533,607	1,978,155	23,056	104,080	271,856
2016	520,420	1,814,431	16,136	104,061	299,305
2017	603,450	2,450,171	20,688	130,071	376,737
2018	705,313	2,670,275	31,117	172,314	443,536
2019	528,502	1,261,921	24,985	153,050	484,173
Total	**573,183**	**1,908,245**	**19,841**	**90,649**	**329,529**

Source : Authors' Elaboration (2021).

A rate of drop in the level of dividend payments in the years 2006, 2007, 2010, 2012, 2013 is observed, 2015, 2016 and 2019. In comparison to the information in Table 3, most of these years present an increase in the proportion between the products costs and the RLV, which means an increase in production costs, which invariably reflects on the organizations 'performance and, therefore, on the profit used to distribute remuneration to the shareholders.

Pearson's correlation, presented in Table 7, shows that only operational cash flows have a strongly positive correlation with the dividends paid, with an index of about 70%. Thus, it is inferred that the greater the cash flow generated in the operational activities of a company, the higher the level of dividend payment, which supports the FCO inclusion as a control variable.

Table 7
Pearson's correlation among the variables

	DivPag	Rigidity	FCO	Leverage
DivPag	1			
Rigidity	-0.0071***	1		
FCO	0.7017***	-0.0064***	1	
Leverage	0.0050***	0.0001*	0.0020***	1

Note. ***/**/* significant at 1%, 5% and 10%, respectively.
Source : Authors' Elaboration (2021).

Meanwhile, although it does not show a strong relation with the dividends, it is noteworthy that the CPV index and the leverage have negative correlations, since both variables are expected to decrease the companies' net result, which may lead to lower dividend distribution, walking in opposite directions.

Whereas in order to estimate the influence of these variables on the payment of dividends using panel data, the F tests of *Chow*, *Breusch-Pagan LM* and *Hausman* were carried out, which pointed to the regression model by fixed effects as the most appropriate, presenting a significance level of 5%, generating a total of 2,103 observations, according to Table 8.

Table 8
Influence of rigidity in dividends payments

Variables	Coefficients	Standard error	t-Statistics	P-value
lnRigidity	-0.5044	0.122	-4.14	0.000
lnFCO	0.701	0.042	16.54	0.000
Leverage	-0.001	0.000	-2.93	0.003
_cons	2.236	0.561	3.98	0.000
Validation tests	R^2 within	0.1464	Number Note:	2,013
	R^2 between	0.4868	F(3.1766)	100.99
	R^2 overall	0.4790	Prob > F	0.000

Source : Authors' Elaboration (2021).

The results show a negative relation between the degree of costs rigidity, measured by the asset intensity by RLV, and the payment of dividends. For each 1% variation in this degree of rigidity, there is a negative variation of 0.50% in the dividends. In other words, the greater the rigidity in the costs behavior, the lower the value of the distributed dividends, toward the signal expected by the research hypothesis.

In comparison with the argument that He et al. (2020) companies with more rigid costs pay less dividends, the results of this research show the corroboration and applicability of this preposition in the Brazilian stock market. Thus, Brazilian entities with open capital with more rigid costs tend to pay fewer dividends.

It should be noted that for the use of cost rigidity *proxy* for the sample, validation of the existence of this rigidity was performed using the model of Anderson et al. (2003). Thus, it is revealed in agency problems in which managers who face greater rigidity in costs tend to maintain a lower level of dividend distribution to minimize the impact of this rigidity on results, before a scenario of activity decline, and consequently on the dividend, avoiding signaling situations that cause aversion in investors.

In addition, the financial leverage variable also has a negative impact of -0.001 on the payment of dividends, bearing in mind that the creditors' remuneration through financial expenses, when an enterprise is leveraged, consumes the net profit of the period. Whereas the cash flows

reflect positively in the dividends distribution, with a coefficient of 0.701. Thus, it is expected that entities that manage more cash flows from their operational activities will have more availability to pay dividends.

5 CONCLUSION

The objective of this research was to evaluate the degree of rigidity of the sold products costs in the payment of dividends from Brazilian companies with open capital from 2005 to 2019. Before the propositions of He et al. (2020), increasing the understanding of the dividends determinants, the authors found evidence that companies with more rigid costs, in the context of cost asymmetry, pay fewer dividends.

Using an adaptation of Anderson et al. (2003)the model, the existence of asymmetry and rigidity in the costs behavior was identified in alignment with the authors. It was found that when there is a positive variation of 1% in net sales revenue, CPV varies by 0.96%. However, when the RLV also decreases by 1%, the costs only decrease by 0.89%.

Thus, as costs fall less in comparison to their increase, before the increase in revenue, it is understood that there are adjustment costs, which attribute this character of rigidity, and make the management of this structure inflexible, bringing a greater impact by decreasing the companies' result , and requiring the managers' intervention .

Before the sample validation, and using the intensity of the assets as a *proxy* for the costs rigidity, a reflex of this variable was identified in the payment of dividends, with each variation in this rigidity generating a variation of 0.50 negative points in the dividends, toward the results of He et al. (2020), that companies with more rigid costs pay fewer dividends to investors, according to the application of the study in the Brazilian scenario.

It was also evidenced that financial leverage has a negative effect on the dividends distribution, since highly leveraged companies consume more of the result for the creditors' remuneration. Meanwhile, the cash flow variable has shown a positive impact, indicating that companies that generate more cash flows from operational activities have better dividends payments.

In addition, the research was limited to investigating the relation between the costs behavior of the products sold, as well as the control with the variables of financial leverage and cash flows, whose significance was observed in the regression. However, there is room to analyze which other variables could increase the capacity of the model to explain the level of payment of dividends.

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