

Does environmental expenditure depend on financial slack? A longitudinal study in Brazil

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Abstract

Objective: To evaluate whether environmental expenditures are influenced by financial slack among publicly held Brazilian firms.

Methods: The sample included 53 firms traded on B3, presenting environmental expenditures between 2008-2018, totaling 308 observations. Environmental spending was used as the dependent variable and financial slack was the independent variable, proxied by three metrics: cash and cash equivalents, operating cash flow, and spending/investment capacity (KZ index) (Kaplan & Zingales, 1997). Pooled ordinary least squares estimations were performed, controlling for fixed effects according to industry and year, and other control variables. Time lagging was used.

Results: The main findings show a persistent and negative association between environmental spending and financial slack expressed in cash and cash equivalents. When financial slack was expressed with the more comprehensive KZ index, the association was positive but not persistent.

Contributions: By evidencing the influence of financial slack on the willingness of firms to engage in environmental expenditure, this study contributes to both academic and corporate audiences. Hence, these results indicate a correlation between corporate financial health and the allocation of funds to environmental causes.

Keywords: Financial constraints. Environmental spending. Stakeholders.

1. Introduction

The supposed relationship of dependence between environmental expenditures and financial slack permeates the conflict between those who defend the Stakeholder Theory and Shareholder Theory. On the one hand, it is acknowledged that a company's objectives should align with emerging environmental problems (Freeman, 1994; Heikkurinen & Bonnedahl, 2013; Iatridis, 2013; Middleton, 2015; Vellani & Nakao, 2009). However, on the other hand, there is resistance to financing environmental actions that, according to current thought, are not essential for a business (Fatemi, Fooladi, & Tehranian, 2015; Friedman, 1970; Hassel, Nilsson, & Nyquist, 2005; Jaggi & Freedman, 2015; Friedman, 1970; Hassel, Nilsson, & Nyquist, 2005; Jaggi & Freedman, 1992).

In this sense, the different stakeholders monitor environmental expenditures for different purposes. While some are concerned with expenditure on environmental preservation, control, and recovery, others focus on the company's ability to finance such expenses without compromising the company's operational efficiency (Derwall, Koedijk, & Horst, 2011; Fatemi et al., 2015).

Therefore, financial slack becomes an important strategic variable, highlighting the management's ability to allocate resources to activities considered non-operational. It also serves as an indicator of capitalization (sacrifice) of scarce resources (Daniel, Lohrke, Fornaciari, & Turnr, 2004; Jaggi & Freedman, 1992; Shahzad, Mousa, & Sharfman, 2016; Waddock & Graves, 1997).

According to Lys, Naughton, and Wang (2015), environmental expenditures occur when a firm's management prospects solid financial performance, supporting the thesis that "corporate charity" is sustained only when there is a financial surplus.

The literature (Boso et al., 2017; Campbell, 2007; Daniel et al., 2004; Hong, Kubik, & Scheinkman, 2012; Waddock & Graves, 1997) indicates that as financial slack grows, so does the company's willingness to make environmental expenditures.

It may be true, especially in the case of emerging economies such as Brazil. Scarce resources and financial constraints, a search for accelerated economic growth, and limitations arising from the institutional environment (e.g., restriction to capital and weak capital market development) are barriers to carrying out environmental expenditures (Boso et al., 2017; Lee, 2015).

Given the previous discussion, this study examines whether environmental expenditure is influenced by financial slack within the scope of publicly traded Brazilian companies, considering the firms listed on B3 S/A Brasil, Bolsa, Balcão. The sample comprised 53 companies presenting environmental expenditures between 2008-2018, totaling 308 observations.

The results show that financial slack based on cash and cash equivalents negatively affects spending, and this relationship is persistent. On the other hand, financial slack based on the comprehensive index proposed by Kaplan and Zingales (1997) positively affects environmental expenditure, with no evidence of persistence. The conclusion is that financial slack can influence environmental expenditures. Thus, financing environmental actions involves analyzing a firm's financial situation, but the management's final decision depends on the aspect of the slack considered in this assessment. The influence of an indicator of ample financial slack suggests an intimate relationship between economic and environmental sustainability.

This study is justified by the need to bridge the view defended by the Stakeholder Theory with the thesis conceived by the Shareholder Theory. This study offers a significant theoretical contribution by relating environmental expenditures with financial slack in publicly traded companies in an emerging economy. It reports elements that mediate the preexisting conflict about a business' actual utility function, aligning owners' interests with those of other stakeholders. This study's practical contribution consists in showing that the information alluding to environmental performance must be the object of internal (measurement, report of the generated impacts - accounting and management) and external attention (financial impact and financing capacity). The correlation between environmental expenditures and financial slack suggests that these numbers must have informational utility.

2. Hypothesis Development

Environmental expenditure is defined as an economic sacrifice channeled to finance activities or assets to prevent, correct, or repair environmental impacts caused by a company. Environmental expenditure is adopted in the literature as a proxy for environmental performance because it reflects the firm's ability to decrease environmental risks, indicating its performance in this dimension (Clarkson, Li, & Richardson, 2004; Iatridis, 2013; Lys et al., 2015; Mayor & Martel, 2015).

Some studies argue that environmental expenditure is influenced by higher levels of financial slack (Campbell, 2007; Hong et al., 2012; Lys et al., 2015; McGuire, Sundgren, & Schneeweis, 1988; Surroca, Tribó, & Waddock, 2010; Waddock & Graves, 1997). Thus, a financial surplus would explain a company's diversifying objectives, focusing on non-essentially operational activities.

Financial slack can be defined as the available or potential generation of cash, which financially supports activities that can generate some kind of return for the firm and its investors (Daniel et al., 2004; Wruck, 1990).

According to Boso et al. (2017), the literature has not found a consensus on the relationship between environmental expenditure and financial slack. The results are inconclusive on environmental expenses resulting from greater availability of resources based on the financial slack. Approaches to this matter focusing on stakeholders and shareholders are the most predominant (Boso et al., 2017; Jaggi & Freedman, 1992).

Other studies (Lys et al., 2015; Nelling & Webb, 2009; Qiu, Shaukat & Tharyan, 2016) argue that environmental expenditure indicates a forecast of solid future economic and financial performance. From this perspective, environmental expenditure has a purely economic utility, contrary to the idea of corporate charity. According to D'Souza (2020), socio-environmental interests cannot be excluded from this purpose, considering the objective of maximizing results and shareholder wealth.

On the one hand, the company may not survive if it ignores demands arising from the context in which it operates – such as those of an environmental nature. On the other hand, however, some impending contextual matters may conflict with a business purpose. Thus, heeding such matters and specific interests may result in financial restrictions, delaying projects that generate profits. Moreover, such a choice may harm a company's survival (Pfeffer & Salancik, 1978).

According to Boso et al. (2017), McGuire et al. (1988), Shahzad et al. (2016), and Waddock and Graves (1997), this problem applies to environmental expenditures, which generally depend on management discretion. The company may adopt environmentally responsible practices not necessarily because it believes in the added value of these actions but only because of stakeholder pressure (Machado, Machado, & Santos, 2010).

Although the literature suggests that companies invest more in environmental responsibility when there is greater availability of financial resources (Campbell, 2007; Hong et al., 2012; Shahzad et al., 2016; Waddock & Graves, 1997), there is not a consensus on the relationship between environmental expenditure and financial slack.

Some studies (Campbell, 2007; Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997) suggest that decreased financial slack may lead the company to prioritize essential activities related to its economic purpose, to safeguarding the interests of shareholders (Friedman, 1970; Jaggi & Freedman, 1992).

Assuming financial slack as a measure of organizational flexibility (Boso et al., 2017; Campbell, 2007; Hong et al., 2012; Julian & Ofori-Dankwa, 2013; Lys et al., 2015; Wruck, 1990), there is a potential connection between decreased environmental expenditures and variation in a company's financial condition. These studies argue that companies engage in environmental expenditures due to a more significant financial slack. The reason is that there is greater flexibility to allocate cash to activities that are essentially different from the company's primary economic activity.

In this context, environmental expenditures would depend on financial surplus, as they represent a waste of corporate resources (Lys et al., 2015), as suggested by the Theory of the Firm, focusing on shareholders. Coupled with this is the fact that environmental expenditures do not necessarily ensure the generation of future economic benefits (Borghesi, Houston, & Naranjo, 2014; Derwall et al., 2011), leading some investors to avoid environmentally responsible companies.

According to the Theory of the Firm, shareholders consider environmental expenditures to indicate the firm's decreased value (Hassel et al., 2005; Jaggi & Freedman, 1992). Therefore, investors seek information to ensure that such expenditure can be financed and does not jeopardize future cash flows.

The Stakeholder Theory suggests that there are also value-driven investors. In these cases, environmental expenditures can be considered a variable that indicates future economic benefits (Iatridis, 2013; Lys et al., 2015). Nevertheless, Hong et al. (2012) understand that a company's financial condition should always be examined.

Therefore, the level of financial slack may limit environmental and related expenditures whether they have economic motivations or altruistic reasons. The lower the financial constraint, the greater the propensity to invest, and it may suggest better future performance (Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997).

Therefore, the level of financial slack may limit environmental and related expenditures, whether they have economic motivations or altruistic reasons. The lower the financial constraint, the greater the propensity to invest, which may suggest better future performance (Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997).

Given the above, it is assumed that prioritizing profit and maximizing shareholder value would force environmental "divestment". Hence, financial slack would indicate an investment opportunity, a chance to achieve positive future performance, or ensure financial availability for environmental expenditures (Campbell, 2007; Hong et al., 2012).

Despite the argument of organizational flexibility as a contingency of environmental expenditures, business stakeholders may not favor increased financial slack.

Borghesi et al. (2014) and Shahzad et al. (2016) note that financial surplus can induce managers' opportunistic behavior. In this case, discretion may negatively affect the assessment of investors little interested in environmental causes (McGuire et al., 1988; Shahzad et al., 2016).

Along these lines, Aldrighi and Bisinha (2010) understand that a variation in the availability of internal resources interferes with the effective level of investments in strategic areas. However, market opportunities are strong antecedents of such variations.

Considering the characteristics of Brazil, which is restricted in terms of economic development and dependent on the improvement of governance structures, investors may not consider increases in the level of financial slack positive because this could be interpreted as idle resources and an increase in opportunity costs (Aldrighi & Bisinha, 2010; Kim & Bettis, 2014).

Cheng, Ioannou, and Serafeim (2014) and Zhang et al. (2018) state that environmental performance is associated with low levels of financial constraint, corroborating the notion that financial slack, a measure of organizational flexibility, would encourage environmental spending. However, Boso et al. (2017) and Julian and Ofori-Dankwa (2013) present divergent results.

Barnett and Salomon (2012), Bhandari and Javakhadze (2017), Fatemi et al. (2015), Fujii, Iwata, Kaneko, and Managi (2013), and Pekovic, Grolleau and Mzoughi (2018) present evidence that there is an optimal level of environmental expenditures that managers should pursue to avoid compromising the company economically and financially.

Considering the economic characteristics of emerging economies (Boso et al., 2017), which would prevent companies from prioritizing environmental expenditures, this study expects that such expenditures will become prominent in the face of favorable financial conditions (Campbell, 2007; Waddock & Graves, 1997). Therefore, the following hypothesis is proposed:

H₁: Environmental expenditure is positively affected by financial slack.

3. Method

Data from the companies in the sample are made available by Thomson Reuters™ secondary database. This study's universe covers the Brazilian capital market, considering the firms listed on B3 S.A. Brasil, Bolsa, Balcão. The sample comprises companies that recorded environmental expenditures in the 2008-2018 period.

Of the 410 companies in the secondary base, 53 (12.9%) presented environmental expenditures in at least one of the years analyzed, totaling 308 observations.

This timeframe was chosen for two reasons: to maximize the volume of data and because it coincided with the period when the new accounting standard came into effect in Brazil. The first year of the period (2008) is when Brazilian accounting standards converged to the International Financial Reporting Standards (IFRS), in compliance with the provisions of Law No. 11,638, from December 28th, 2007, which amended Law No. 6,404, from December 15th, 1976, called “*Lei das Sociedades por Ações*” [Brazilian Corporation Law], with technical pronouncements issued by the Accounting Pronouncements Committee (CPC). In turn, 2018 corresponds to the last accounting year, and the financial statements had been published up to the data collection.

Equation 1 is used to test the hypothesis.

$$GA_{i,t} = \beta_0 + \beta_1 FF_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 ROA_{i,t} + \beta_5 IND_{i,t} + \beta_6 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_{i,t} \quad (\text{Equation 1})$$

$GA_{i,t}$ is the first variable of interest and represents the environmental expenditure of firm i in year t equated to the net revenue of company i in year t ; measure based on Boso *et al.* (2017) and Pekovic *et al.* (2018). This approach assesses the magnitude of the financial effect of environmental expenditure on the company's main source of income.

The model was also considered from the perspective of a one-year time lag for $GA_{i,t}$, that is, $GA_{i,t+1}$, to verify the persistence of the correlation.

One of this study's limitations is the fact that this variable does not discriminate between expenses, costs, investments, and environmental losses, as the database does not provide this level of detail.

$FF_{i,t}$ is the second variable of interest and represents the measure of financial slack of company i in year t . Some studies (Daniel et al., 2004; Hadlock & Pierce, 2010; Kaplan & Zingales, 1997; Lee, 2015; Li, Li, & Zhang, 2006; Shahzad et al., 2016) indicate that, as a construct, financial slack presents different variants. Thus, one can investigate the ability to finance marginal expenditures (investments), considering multiple aspects that indicate a company's better/worse financial condition.

In this study, financial slack is considered from three perspectives: availability, cash generation, and financial constraint (Daniel et al., 2004; Lamont, Polk, & Saá-Requejo, 2001; Lee, 2015). Thus, the variable is represented by $FF1_{i,t}$, $FF2_{i,t}$ and $FF3_{i,t}$ in this sequence. The first two variants consider the firm's unique aspects. Proxy $FF1_{i,t}$ comprises cash and cash equivalents in relation to the Assets of company i in year t . $FF2_{i,t}$ assumes the value of the operating cash flow equated by the Assets of company i in year t .

The suggested proxies are based on the literature addressing the effect of financial slack on firms' investments and strategies and the relationship with equity price and returns, citing Bhandari and Javakhadze (2017), Burke and Wieland (2017), Daniel et al. al. (2004), Kaplan and Zingales (1997), Khatami, Marchica and Mura (2015), Kim and Bettis (2014), Lamont et al. (2001), Lee (2015), Lys et al. (2015), Qiu et al. (2016) and Shahzad et al. (2016).

The third approach, $FF3_{i,t}$ is based on the metric called $KZ Index_{i,t}$, which assesses financial slack from a comprehensive perspective. It combines several indices to classify firms according to their ability to make expenditures/investments (Kaplan & Zingales, 1997; Lamont et al., 2001). $KZ Index_{i,t}$ was used by Baker, Stein, and Wurgler (2003), Cheng et al. (2014), Iatridis (2013), Lamont et al. (2001), and Li et al. (2006).

$KZ Index_{i,t}$ assumes that measures based on cash and cash flow are proxies for future investment opportunities because, at a satisfactory level, they lead to the timely application of resources in more profitable alternatives (Kaplan & Zingales, 1997). $KZ Index_{i,t}$ is measured according to Equation 2 (Kaplan & Zingales, 1997; Lamont et al., 2001).

$$KZ Index_{i,t} = -1,002FC_{i,t} - 39,368DIV_{i,t} - 1,135C_{i,t} + 3,139PE_{i,t} + 0,283Q_{i,t} \quad (\text{Equation 2})$$

$FC_{i,t}$ refers to operating cash flow; $DIV_{i,t}$ corresponds to dividends; refers to cash; and $PE_{i,t}$ represents Liabilities, all of company i in year t . $FC_{i,t}$, $DV_{i,t}$, $C_{i,t}$ and $PE_{i,t}$ were adjusted by $Total Assets_{i,t-1}$; $Q_{i,t}$ is a proxy for future investment opportunity and represents the market value plus the Liabilities Divide by $Total Assets_{i,t-1}$.

The higher the value of $KZ Assets_{i,t}$, the greater the restriction the company may face (Kaplan & Zingales, 1997). To make the proxy mathematically consistent in models $FF1_{i,t}$ and $FF2_{i,t}$, $KZ Index_{i,t}$ was multiplied by -1 . Thus, the larger $FF1_{i,t}$, $FF2_{i,t}$ and $FF3_{i,t}$, the higher the level of financial slack. Khatami et al. (2015) and Lamont et al. (2001) performed a similar adjustment.

The other proxies are used to control the model and are based on Iatridis (2013), Lys et al. (2015), Nelling and Webb (2009), Orlitzky, Schmidt, and Rynes (2003), Qiu et al. (2016), Shahzad et al. (2016) and Zhang et al. (2018), which are aligned with this study's objective.

Thus, according to Equation 1, variable $Size_{i,t}$ is measured using the natural logarithm of Assets of company i at time t . β_3 is expected to be statistically significant and positive, suggesting that larger companies spend more on the environment.

Variable $Age_{i,t}$ is measured by the natural logarithm of the number of years since the foundation of company i . In this case, β_4 can be positively or negatively statistically significant. The relationship between maturity and environmental commitment is nuclear.

Variable $ROA_{i,t}$ is calculated by the quotient between the net income and the Assets of company i at time t . The expectation is that will be statistically significant and positive. As a result, higher economic returns would encourage environmental expenditures.

The dummies $IND_{i,t}$ and $YEAR_{i,t}$, were included to control fixed effects by sector and year, as in Baboukardos (2018) and Matsumara, Prakash, and Vera-Muñoz (2014). $IND_{i,t}$ identifies whether the company is part of a potentially polluting industry according to Law No. 10,165, from December 27th, 2000 (Política Nacional do Meio Ambiente); some studies support that such industries spend more on the environment (Clarkson et al., 2004; Clarkson, Fang, Li, & Richardson, 2013; Cormier & Magnan, 2007; Rover, Tomazia, Murcia, & Borba, 2012). $YEAR_{i,t}$ identifies the period.

To perform the proposed models, multiple linear regression estimations were performed with panel data using Pooled Ordinary Least Squares (POLS), including dummies by industry and year, to control the fixed effects of this order. Thus, each company in each year was considered a unit of analysis, generating a large cross-section.

Similar to Baker et al. (2003), continuous variables were winsorized at the 1st and 99th percentiles to reduce the influence of outliers in the sample. The tests described were performed using the STATA[®] software version 13.0. The models' Heteroscedasticity, multicollinearity, and endogeneity were verified.

4. Results

4.1 Descriptive analysis

The annual quantitative distribution of companies with environmental expenditures in the period analyzed is highlighted (Figure 1).

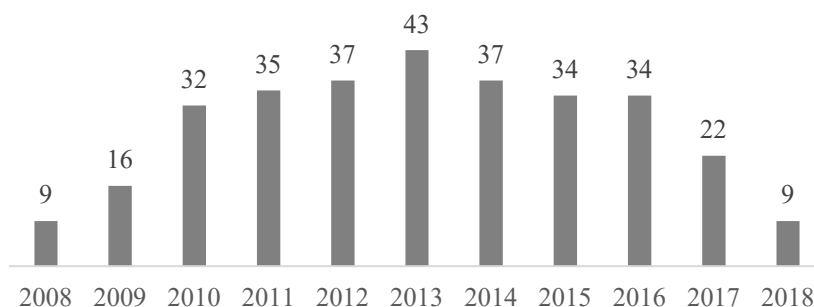


Figure 1. Annual quantitative distribution of the companies in the sample with environmental expenditures recorded in the 2008-2018 period.

Source: developed by the authors.

This context suggests that the longitudinal section can be examined at two points in time. First, between 2008 and 2013, there was an annual growth in the number of companies with environmental expenses, from 9 to 43 (377.8%). In turn, there was an inverse trend from 2014 onwards, dropping from 43 to 9 companies (79.1%) by the end of the period.

Some studies (Derwall et al., 2011; Heikkurinen & Bonnedahl, 2013; Mayor & Martel, 2015) suggest that greater engagement with environmental management, which would lead to more environmental expenditures, is due to two main factors: more sensitized markets and environmental risks and their effects on income and equity.

Note that no legal or regulatory framework in Brazil justifies the periods of increase/decrease identified between 2008 and 2018. The economic recession that hit Brazil in 2009, and aggravated in 2015, is perhaps one of the factors behind such a decline in the second half of the period (Martins & Paulo, 2016).

Consequently, the “crisis effect” would support the notion that emerging economies face greater difficulty or are less interested in financing environmental expenditure due to the country’s economic and institutional aspects (Boso et al., 2017).

It is worth noting that studies addressing companies operating in Brazil indicate that, despite improvements, the informational level in the environmental dimension is still insufficient or unclear to investors (Gomes, Rebouças, Melo, Silva, & Santos, 2019; Vasconcelos & Pimentel, 2018).

Table 1 shows the distribution of the observations considering environmental expenditures and industries according to their polluting potential as of Law No. 10,165/2000.

Table 1

Environmental expenditures and polluting potential of economic sectors

	High polluting potential sector	Other sectors	Total
No. of observations of environmental expenditures between 2008-2018	82	226	308
Proportion of observations of environmental expenditures between 2008-2018 (%)	26.6	73.4	100.0

Source: developed by the authors.

Mayor and Martel (2015) and Vellani and Nakao (2009) explain that firms’ environmental expenditures are related to the conservation, protection, minimization, and/or correction of environmental impacts arising from their respective economic activities. This assumption justifies the findings of Clarkson et al. (2004, 2013) and Jaggi and Freedman (1992); however, it was not identified in this sample. More than 70% of environmental expenses refer to companies operating in industries with a medium or small polluting potential. It may indicate that the environmental issue would permeate different companies in the most different economic sectors, also considering some aspects of environmental performance. On the other hand, environmental expenditures may indicate financial accountability for previous actions.

According to Law No. 10,165/2000, which provides for the *Política Nacional do Meio Ambiente* [National Environmental Policy], the following are industries with high polluting potential: i) extraction and treatment of minerals (e.g., well drilling and production of oil and natural gas); ii) metallurgical industry (e.g., steel and steel products); iii) pulp and paper industry (e.g., pulp, paper and cardboard manufacturing); iv) leather and skins industry (e.g., manufacturing of various leather and skin artifacts); v) chemical industry (e.g., production of substances and manufacture of chemical products); and vi) transport, terminals, warehouses and trade (e.g., transport of dangerous goods, transport by pipelines, ports).

The potentially polluting firms in this study’s sample spent with the environment, but those conducting environmental expenditures do not necessarily belong to an industry with high polluting potential. According to Rover et al. (2012), a company’s sector is no longer a determining factor in environmental practices when institutional aspects, such as the recognition of sustainable firms and sustainability reports, are taken into account.

Table 2 presents the descriptive statistics and the correlation test between the variables to test the hypothesis.

Table 2

Descriptive statistics of the variables in the models and correlation test

Panel A: Descriptive statistics						
Variable	No. of observations	Mean	Standard Deviation	Minimum	Median	Maximum
(1) $GA_{i,t}$	308	0.0086	0.0123	5.1E-07	0.0047	0.0696
(2) $FF1_{i,t}$	308	0.0876	0.0742	3.0E-05	0.0650	0.3184
(3) $FF2_{i,t}$	308	0.0828	0.0587	-0.0350	0.0777	0.2781
(4) $FF3_{i,t}$	308	-1.1397	1.8199	-4.9574	-1.2690	6.5083
(5) $Size_{i,t}$	308	23.4401	1.4493	21.1943	23.2199	26.8696
(6) $Age_{i,t}$	308	3.6052	0.7270	1.9459	3.8712	5.3181
(7) $ROA_{i,t}$	308	0.0445	0.0592	-0.1327	0.04184	0.2309
Panel B: Correlation test						
	(2)	(3)	(4)	(5)	(6)	(7)
(1)	-0,0998	-0,1023	0,0458	-0,0190	0,02189	-0,0827
<i>p-value</i>	*	*	NS	NS	***	NS
(2)		0,0584	-0,0684	-0,0319	0,0814	0,0366
<i>p-value</i>		NS	NS	NS	NS	NS
(3)			0,6118	-0,2683	-0,2303	0,5097
<i>p-value</i>			***	***	***	***
(4)				-0,2853	0,6730	-0,1323
<i>p-value</i>				***	***	**
(5)					0,4221	-0,2651
<i>p-value</i>					***	***
(6)						-0,0778
<i>p-value</i>						NS

Note: Variables 1 and 2 in the minimum column appear in scientific notation because they have very low values.

(***) significant at 1%; (***)significant at 5%; (*)significant 10%.

NS = non significant.

Legend: $GA_{i,t}$ – environmental expenses; $FF1_{i,t}$ – financial slack based on availabilities; $FF2_{i,t}$ – financial slack based on cash generation; $FF3_{i,t}$ – financial slack based on financial constraint; $Size_{i,t}$ – size; $Age_{i,t}$ – age; $ROA_{i,t}$ – return on assets.

Source: developed by the authors.

The range of environmental expenditures is high (from less than 1% to almost 7% of revenues) even though the number of observations has grown in the period's first window (2008-2013). The same behavior is observed in the proxies of financial slack. The correlation tests reveal that, in this group, environmental expenditures have a statistically significant but weak correlation with financial slack based on cash measures – cash and cash equivalents and operating flow. Among the controls, there is a correlation only between environmental expenditures and maturity.

Environmental expenditures (are infrequent among Brazilian firms listed on B3. Only 53 firms were identified with this type of expenditure. Additionally, it appears that the impact of these expenditures on revenues is small. Over the 11 years analyzed, the highest average percentage refers to 2009, recording 1.14% of company revenues, followed by 2015 (1.02%) and 2008 (1.08%). The lowest averages are observed in 2018, 2010, and 2016: respectively, 0.58%, 0.064%, and 0.074%.

Comparatively, Boso et al. (2017) analyzed companies in Nigeria, reporting an average of 6% of environmental expenditures of revenues. Pekovic et al. (2018) indicate an average of 20% in the companies in France. Baboukardos (2018) states that emerging countries face more significant barriers to financing environmental sustainability as they seek to advance economic development (Boso et al., 2017).

Regarding the proxies of financial slack, measures $FF1_{i,t}$ and $FF2_{i,t}$ based on cash and operating cash flow, represent between 8% and 9% of the Asset's value on average. With average negative $FF3_{i,t}$, as well as the median (-1.27), several companies are not in better financial condition. Note that the period analyzed is sufficiently large, and captures several changes in the market.

4.2 Hypothesis testing

Table 3 presents the analysis's results concerning the relationship between financial slack and environmental expenditures among the companies in the sample.

Table 3

Relationship between environmental expenditures and financial slack

Model 1		$GA_{i,t} = \beta_0 + \beta_1 FF_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 ROA_{i,t} + \beta_5 IND_{i,t} + \beta_6 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_i$				
Model 2		$GA_{i,t+1} = \beta_0 + \beta_1 FF_{i,t} + \beta_2 Size_{i,t} + \beta_3 Age_{i,t} + \beta_4 ROA_{i,t} + \beta_5 IND_{i,t} + \beta_6 \sum_{2010}^{2018} YEAR_{i,t} + \varepsilon_i$				
Variables	Parameters					
	Model 1a	Model 1b	Model 1c	Model 2a	Model 2b	Model 2c
Constante	0.04***	0.04***	0.03***	0.05***	0.05***	0.04**
t	(3.45)	(3.27)	(3.07)	(2.82)	(2.64)	(2.48)
$FF1_{i,t}$	-0.02***	-	-	-0.03***	-	-
t	(-3.06)	-	-	(-2.61)	-	-
$FF2_{i,t}$	-	-0.01	-	-	-0.02	-
t	-	(-0.95)	-	-	(-1.17)	-
$FF3_{i,t}$	-	-	0.001***	-	-	0.001
t	-	-	(3.14)	-	-	(1.49)
$Size_{i,t}$	-0.001***	-0.002***	-0.002***	-0.002***	-0.002**	-0.002**
t	(-3.48)	(-3.24)	(-2.98)	(-2.71)	(-2.45)	(-2.36)
$Age_{i,t}$	0.004***	0.004***	0.005***	0.006***	0.005***	0.006***
t	(4.83)	(4.45)	(4.85)	(3.89)	(3.54)	(3.98)
$ROA_{i,t}$	-0.02	-0.01	-0.04***	-0.005	0.003	-0.03
t	(-1.57)	(-0.84)	(-2.98)	(-0.39)	(0.18)	(-1.36)
Year	Yes	Yes	Yes	Yes	Yes	Yes
Industry	Yes	Yes	Yes	Yes	Yes	Yes
F test	4.35***	4.06***	4.43***	3.74***	4.03***	3.82***
R ²	0.1356	0.1169	0.1312	0.1151	0.0946	0.0944
R ² adjusted	0.0912	0.0715	0.0866	0.0581	0.0362	0.0360
VIF mean	3.12	3.17	3.23	3.25	3.32	3.40
Obs.	308	308	308	232	232	232

Note: (***) significant at 1%; (**) significant at 5%; (*) significant 10%.

Standard errors were estimated with correction for White's heteroscedasticity, as the hypothesis of homoscedastic variances was rejected.

No statistically significant correlations were detected between the residuals of the equations and predictors (Gujarati & Porter, 2011); The application of the VIF test (Variance Inflation Factor) did not heteroscedasticity significant multicollinearity problems in the models, assuming values lower than 10 (Hair, Black, Babin, Anderson, & Tatham, 2009).

Legend: $GA_{i,t}$ – environmental expenses; $GA_{i,t+1}$ – environmental expenditures lagged in $t + 1$; $FF1_{i,t}$ – financial slack based on availabilities; $FF2_{i,t}$ – financial slack based on cash generation; $FF3_{i,t}$ – financial slack based on financial constraint; $Size_{i,t}$ – size; $Age_{i,t}$ – age; $ROA_{i,t}$ – return on assets; $SET_{i,t}$ – dummy for sector; $YEAR_{i,t}$ – dummy for year.

All the models are initially significant at 1%, indicating that at least one of the independent variables is statistically different from zero. However, the low explanatory power of these models stands out, varying between 9.4% and 13.5% (R²) and between 3.6% and 9.1% (adjusted R²).

The results in Table 5 indicate that the models that consider the financial slack based on availabilities indicate a relationship opposite to the expected. Note the occurrence of a negative relationship between (independent) and , and (dependent), at 1%. Therefore, an increase in the availabilities of these firms decreases their respective environmental expenditures.

In this context, the management in the group of companies that spend on environmental causes has chosen to keep cash instead of investing in environmental preservation, protection, control, and correction activities. This evidence is related to the low number of companies adhering to this strategy. Furthermore, among such firms, environmental “investment” was not very representative in relation to revenue (around 1% on average). It may show some conservatism among companies’ managers concerning expenditures of this nature.

According to Fatemi et al. (2015), this finding is relevant to the debate that divides studies antagonizing the view of maximizing shareholder wealth with that of maximizing stakeholder wealth (Freeman, 1994; Friedman, 1970). There is evidence suggesting a non-linear relationship between environmental commitment and performance among companies. It means that the economic-financial performance of firms has increased only at so-called moderate levels of environmental investment (Fatemi et al., 2015).

Additionally, in the view of Kim and Bettis (2014), attention should be paid to the notion that cash can function as an important strategic asset, acting as a timely facilitator of adaptive advantages. Hence, companies may prefer to act by protecting and retaining these resources instead of directing them to projects not considered very economically interesting. The management of such firms may be waiting for the right moment to make these expenditures.

Fujii et al. (2013) and Pekovic et al. (2018) present results correlated to what was reported. In this sense, the apparent conservatism concerning environmental expenditures can be justified. According to Baber, Fairfield, and Haggard (1991), expenses of a discretionary nature are significantly lower when they may compromise the achievement of positive or increasing results.

Additionally, the decision to decrease environmental spending may be based on the idea that for many companies, these expenditures are considered investments with uncertain returns over the long term. As a result, there is much uncertainty about the ability to generate future economic benefits and, consequently, incremental cash flows for the firm due to environmental engagement (Baboukardos, 2018; Barnett & Salomon; 2012; Hassel et al., 2005).

Boso et al. (2017) suggest that the scarcity of resources is more significant in emerging countries, especially among smaller companies, due to these markets’ fragile development conditions. Usually, these economies face weak legal protection, information asymmetry, high concentration of ownership, and political and economic instability (Gong & Wang, 2016; Iatridis, 2013; Middleton, 2015). This environment tends to alienate investors due to a greater perception of risk.

Therefore, the main side effects of these economic environments are financial prudence and the option to preserve capital, which would lead management to avoid optional operations not clearly related to the company’s economic purpose, as is the case with environmental expenditures (Boso et al., 2017).

Considering availabilities, this result contradicts part of the literature on financial slack, according to which there is a greater propensity to invest in activities focused on the environment when financial constraints diminish (Daniel et al., 2004; Hong et al., 2012; Waddock & Graves, 1997).

Evidence is in line with the findings of Boso et al. (2017), Iatridis (2013), Julian and Ofori-Dankwa (2013), and Shahzad et al. (2016). However, the results reported by Lys et al. (2015), Surroca et al. (2010), and Zhang et al. (2018) diverge, while Pekovic et al. (2018) partially corroborate this study's evidence, and Qiu et al. (2016) reported inconclusive results on the relationship addressed here.

Nevertheless, Model 1c gathers evidence that contradicts the results regarding financial slack based on availabilities. There is a positive correlation between $FF3_{i,t}$ (independent) and $GA_{i,t}$ (dependent), as advocates of the theory suggest, that is, the greater the financial slack, the greater the spending on the environment (Daniel et al., 2004; Shahzad et al., 2016; Waddock & Graves, 1997).

This result reinforces the notion of heterogeneity of the financial slack construct since is a more comprehensive measure concerning the diagnosis of a company's financial situation. Attributes such as profit distribution policy and the opportunity to make investments are aspects not captured by $FF1_{i,t}$ or $FF2_{i,t}$.

The $FF3_{i,t}$ proxy is based on the *KZ index*, which assesses financial constraints, a feature that leads to its recurrent use in the literature (Baker et al., 2003; Cheng et al., 2014; Iatridis, 2013; Khatami et al., 2015; Lamont et al., 2001; Li et al., 2006).

These results are in line with Lys et al. (2015), Surroca et al. (2010), and Zhang et al. (2018); however, they differ from Boso et al. (2017), Iatridis (2013), Julian and Ofori-Dankwa (2013) and Shahzad et al. (2016). In addition, Cheng et al. (2014) indicate significant differences in the financial constraints measured by the *KZ index* between firms with high and low socio-environmental performance.

However, two important aspects of the relationship between financial slack and environmental expenditures should be highlighted. First, the $FF3_{i,t}$ measure has greater power to explain the firm's financial situation because the proxy derives from several other components. On the other hand, $FF1_{i,t}$ is more persistent regarding the relationship with environmental expenditures (relation verified with t e $t+1$). Therefore, the hypothesis should be accepted, considering the financial slack based on the financial constraint.

Regarding the control proxies, a similar behavior was observed in most of the models tested. Even so, they must be discussed separately.

Company size has a statistically significant and negative correlation with environmental expenditures at the 1% level. Hence, among firms that spend on the environment, the larger ones have directed fewer resources to environmental expenditures, diverging from what the literature shows (Iatridis, 2013; Surroca et al., 2010; Zhang et al., 2018). Smaller companies may be using the environmental dimension as a way to enter the market.

Maturity has a positive relationship with environmental expenditures. Therefore, older companies would direct more resources to finance activities focused on the environment. Younger firms would be aware of the need to grow and face competition. Without the solidity of more mature companies, younger companies may prioritize their financial condition over environmental concerns. Boso et al. (2017) and Iatridis (2013) found no relationship between the variables, while Julian and Ofori-Dankwa (2013) showed a negative relationship.

Only one of the models presents a negative correlation between profitability and environmental expenditures. Firms with better economic performance are decreasing their spending on the environment, results that differ from those observed by Iatridis (2013) and Surroca et al. (2010).

Although Daniel et al. (2004) used profitability measures as a proxy for financial slack, this practice is critically analyzed. is based on the firm's profit or loss, and this book value is constituted by the accruals. Thus, this measure may anticipate financial flows instead of considering them current and better expresses the relationship between financial condition and discretionary spending.

Nevertheless, the mainstream literature on financial slack (e.g., Daniel et al., 2004; Waddock & Graves, 1997) supports the hypothesis that the greater the profitability, the greater the environmental commitment and expenditures of this nature. Lys et al. (2015) point out that, in reality, this relationship would result from management behavior deviation, which, by anticipating solid future economic performance, acts in favor of environmental issues.

Finally, we should briefly discuss the industry variable, which indicates the company's polluting potential derived from its primary activity. This variable has always been statistically significant at the 1% level, suggesting that potentially polluting businesses are more likely to make environmental expenditures.

Studies addressing Brazilian firms often associate the economic sector with the management's environmental commitment. Therefore, this argument is supported by two aspects: i) firms suffer significant pressure from society and other stakeholders; hence, there is some level of coercion based on legitimacy; and ii) the more significant the polluting potential, the greater the probability that a company endures legal sanctions or environmental disasters.

Brazilian studies (Machado et al., 2010; Vasconcelos & Pimentel, 2018; Viana & Crisóstomo, 2016) disagree regarding the role of the economic sector in this relationship. International studies such as Boso et al. (2017) did not identify a relationship between the sector and environmental expenditures. Cormier and Magnan (2007) align with this study's findings.

5. Conclusion

This study's objective, which was to examine whether environmental expenditures made by publicly traded Brazilian companies are influenced by financial slack, was fully achieved. The results explain some pertinent aspects.

Even though some argue in favor of the upward movement in raising awareness of the market and investors around environmental matters, few companies recorded environmental expenditures during the period addressed here, while the impact of such expenditures on revenues was small. Therefore, the results do not suggest the emergence of a group of firms intensely engaged with environmental issues in the emerging Brazilian context.

The antagonism between shareholder orientation and stakeholder orientation, which supports studies in this field, should be further discussed. A company's objective function is subject to these views, but both meet the assumption of existence and continuity. It equates to being primarily financially profitable. Therefore, the literature mistakenly suggests that the Stakeholder Theory proposes the priority of environmental commitment, despite the business value; however, this argument is not supported. It is because, when adhering to environmentally sustainable practices, the firm needs to direct resources that fail to finance other strategic areas.

Note that most of the observations in this study concerning environmental expenditures do not come from sectors considered to have a high polluting potential. Therefore, other motivations may explain this practice beyond the intrinsic pressures of an economic-sectorial nature.

One cannot rule out the interference of the institutional environment in the expenditure scenario at the company level and from the investment perspective. The characteristics of the Brazilian market, the conditions of scarce resources, political interference, economic instability, and a search for accelerated growth probably discourage these expenditures.

Considering these aspects, it is more challenging to identify the gains derived from environmental responsibility. Amidst so many uncertainties, one chooses not to "invest" in the environment, or if so, prudence prevails in financing expenditures.

Firms can favor a superior comprehensive financial condition instead of individual aspects when assessing expenditures on the environment. It can be noticed by the inverted signs of financial slack measures based specifically on cash and financial constraint.

Thus, a higher level of financial constraint may lead to environmental expenditures, but the same cannot be said for cash and cash equivalents. In this sense, the comprehensive measure for financial slack may be more accurate regarding the decision to undertake environmental expenditures. However, one cannot ignore that the cash-based measure is more persistent.

The hypothesis proposed here cannot be rejected, provided that multiple indicators are considered in the assessment of financial slack to allow a clearer picture of the company's condition concerning its ability to finance these expenditures.

It may not be prudent to accumulate cash in environments of uncertainty and as a measure of protection against actions to expropriate principals. Some managers would dare to use the resources for their benefit, such as, for example, managing results or through ineffective actions to preserve, control, or correct environmental impacts.

Another debatable aspect concerns the comparative size/maturity of companies. The second aspect seems to be more favorable than the first concerning environmental expenditures. Older and more experienced companies can be more certain about their condition, financial capacity, and strategic solidity to promote actions involving environmental issues in the short, medium, or long term.

Size, in turn, does not suggest a greater or better operational structure favorable to these expenses. As a result, smaller firms would spend proportionally more on the environment; this is what research might suggest.

As for profitability, a relationship different from the expected was found, and it can be analyzed the same way as what was discussed regarding the first proxy of financial slack. Cash and cash equivalents reflect cash flows and the investment policy and maintenance of available cash, which allows direct access to managers. Profitability, in turn, is influenced by the accruals generated on an accrual basis. This proxy's coefficient proved superior to those obtained with the other financial slack proxies.

This study has limitations that must be considered when comparing results with other studies. These limitations represent opportunities future studies might address.

Intersectoral studies are of great value in analyzing the characteristics that moderate the variables of interest. Although the industry emerged as a control for fixed effects in this study, future research may explore economic activities individually. The proxies related to the variable financial slack can be expanded or improved, especially with assessment considering several indicators.

Comparing countries is a logical aspiration in this type of study. It was more important to investigate the nature of expenditures (e.g., expenditure, investments, or costs) and their purpose (how and where they are applied) though. Hence, this study's evidence can gain greater evidence in the debate between shareholder orientation and stakeholder orientation views.

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