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Influence of Macroeconomic Factors in the Capital Structure of Foreign Subsidiarie

ABSTRACT. *This article examines the influence of macroeconomic factors in the capital structure of subsidiaries of foreign multinational companies (SFM) in Brazil by comparing them with local Brazilian companies (LBC) during the period from 1998–2008. Panel data econometrics was used to analyze the data and test the hypotheses. During this period, exchange rate variation was positively associated with local leverage, which supported the hypothesis of income hedging in the context of foreign currency exposure of the head office. We also found less local leverage for foreign multinational companies when the macroeconomics scenario became more stable. Finally, contrary to the initial hypothesis, differences in financing rates between Brazil and the SFMs' head office country were positively related to local leverage.*

KEYWORDS: *capital structure; hedge; subsidiaries of multinational company; leverage; macroeconomic factors*

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Влияние макроэкономических факторов на структуру капитала иностранной дочерней компании

АННОТАЦИЯ. *В настоящей статье рассматривается влияние макроэкономических факторов в структуре капитала дочерних компаний иностранных транснациональных корпораций (SFM) в Бразилии в сравнении с местными бразильскими компаниями в период с 1998 по 2008 г. Временные ряды данных эконометрики использовались для анализа данных и проверки гипотез. В этот период на изменение обменного курса положительно влияли местные финансовые рычаги, что подтверждает гипотезу о хеджировании доходов в контексте валютных рисков для головного офиса. Нами был выявлен меньший уровень влияния местных финансовых рычагов на иностранные транснациональные компании при макроэкономической ситуации приобретения большей стабильности. Наконец, вопреки первоначальной гипотезе, различия в ставках финансирования между Бразилией и страной головного офиса положительно коррелируют с местными финансовыми рычагами.*

КЛЮЧЕВЫЕ СЛОВА: *структура капитала, хедж, дочерние компании транснациональных корпораций, соотношение заемного и акционерного капитала, макроэкономические факторы*

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1. Introduction

The activities of multinationals outside of their countries of origin present a great challenge in regard to financial administration and financing strategies. Internationally, these companies' subsidiaries operate in a totally different environment from a political, economic, and social perspective. Within this context, the capital structure to be adopted by subsidiaries is a significant decision for management.

Political risk is one of key theories explaining the multinational's subsidiaries strategic finance motives. Based on the agency view that external investors have little protection against expropriation in countries with weak legal protection (La Porta et al. 1998), Novaes and Werlang (Novaes, Welang, 1998) analyzed the period between 1985 and 1994, when Brazil was mistrusted by foreign investors because of a high degree of political uncertainty. They showed that compared with Brazilian companies, foreign subsidiaries were more leveraged, and the differences between them grew with the political risk.

Similar results have been confirmed by later studies. Desai et al. (Desai et al., 2004) also found evidence of increased indebtedness in reaction to increased political risk by analyzing the subsidiaries of North American multinationals around the world. Kesternich and Schnitzer (Kesternich, Schnitzer, 2009) also found similar evidence of increased leverage in German subsidiaries. In addition, the authors also found that headquarters exercised less control in response to increased political risk. Recently, Fan et al. (Fan et al., 2012) used three indices to analyze political risk: *common law*, corruption, and contract enforcement. Their results showed that companies in countries perceived as more corrupt tended to be more leveraged and preferred incurring short-term debts.

However, political risk is not the only challenge for internationalized firms. Other systematic risks such as foreign market inflation risk and exchange risk may influence for these financing concerns. Lehmann et al. (Lehmann et al., 2004) demonstrated a positive relationship between leverage and exchange rate risk and introduced the notion of exchange rate hedging by multinationals. Aggarwal and Kyaw (Aggarwal, Kyaw, 2008) showed that differences in interest rates between countries also influenced the funding decisions of multinationals, which used intercompany loans or raised funds externally.

The purpose of this study is to analyze how macroeconomic characteristics relate to the indebtedness of foreign subsidiaries in Brazil between 1998 and 2008. The hypothesis is that subsidiaries use local debt to protect themselves from macroeconomic instability.

Unlike most existing literature in the field, this study's investigation is not limited to subsidiary financing strategies in developed countries; instead the sample covers Brazil, one of the favored and biggest emerging market for Foreign Direct Investment destination. In addition, this paper contributes to enrich and qualify previous findings relative to capital structure changes in response to changes in other macroeconomics factors such exchange rate volatility, inflation rate and difference in financing rate between Brazil and Foreign market.

Following this introduction, the article is organized under the following headings: literature review and hypotheses; sample and methodology, which introduces the databases, the variables involved in the study, and the econometric models used; the results obtained; and the study's conclusion.

2. Literature Review and Hypotheses

The discussion on the influence of internationalization in the determination of capital structures began with Lee and Kwok (Lee, Kwok,1988) when they compared the leverage of multinational and local companies in

the USA. Using the percentage of taxes paid abroad to differentiate between multinational and local companies and controlling for the effects of size and industry, the authors found that multinationals were less leveraged than local companies. Along the same line, Burgman (Burgman, 1996) found similar results to those of Lee and Kwok (Lee, Kwok,1988) regarding leverage but for different reasons, which will be discussed later in this review.

As previously noted, a company's leverage becomes different because of internationalization. Factors that influence this difference in domestic companies are not the same as those for multinationals. Therefore, before presenting the literature that specifically focused on foreign subsidiaries, we review the studies that did not discriminate between companies regarding control but that examined the factors that influence capital structure. In general, empirical studies have identified a large number of variables that may be associated with leverage; the most common are factors that are inherent to a specific company (firm factors) and macroeconomic factors.

This review begins with studies that analyzed the influence of macroeconomic factors in capital structure decisions. Rajan and Zingales (Rajan, Zingales, 1995) used companies in the developed countries of the G7 and found the companies' leverage to be similar. They concluded that in addition to aspects of the firms, macroeconomic factors specific to each country also played an important role in the companies' decisions about indebtedness. Booth et al. (Booth et al., 2001) used 10 developing countries to analyze company indebtedness. They concluded that the relevant variables for company indebtedness in developing countries were the same as those of developed countries; however, there were differences in how specific factors affected leverage, e.g., GNP growth, interest rates, inflation, and development of the capital market.

In contrast to the previously cited works, Terra (Terra, 2007) found that the macroeconomic factors that should have influenced companies' indebtedness strategies were not decisive in choosing capital structures in Latin American countries such as Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela. During the period of analysis from 1986 to 2000, company-specific variables predominated over macroeconomic variables, namely, GNP growth, inflation, interest rates, and stock returns. This study analyzed companies in general and did not distinguish between foreign and domestic control.

Other studies focused on multinational subsidiaries acting in other countries. Lee and Kwok (Lee, Kwok, 1988) and Burgman (Burgman, 1996) classified companies as multinationals if they paid at least 10% of their taxes abroad, even if their control was not necessarily foreign. Desai et al. (Desai et al., 2004) focused on the capital structure of American multinationals' subsidiaries located in several countries around the world, including both emerging and developed countries. The authors concluded that multinationals structured their debt according to the tax rates and capital market conditions of the country in which they were located. Thus, American subsidiaries had an advantage over their local competitors because of their access to the global financial market through their headquarters. Lehmann et al. (Lehmann et al., 2004), in addition to obtaining results similar to those of Desai et al. (Desai et al., 2004), hypothesized that the indebtedness of multinationals' subsidiaries worked as a hedge between local revenue and the multinationals' consolidated results. Based on American multinationals' subsidiaries in 62 countries, Aggarwal and Kyaw (2008) found that external debt (debt owed to third parties) increased in countries with high credit availability, high levels of corruption, low political risk, and increased exchange rate depreciation.

The main study on the subject in the Brazilian context was developed by Novaes and Werlang (Novaes, Werlang, 1998). Their results showed that foreign subsidiaries were more leveraged in comparison with Brazilian companies in the same categories (same year, sector, and approximate size). Moreover, the increase in leverage was influenced by an increased perception of political risk. Another important Brazilian study by Brito and Lima (Brito, Lima, 2005)

found that foreign companies were generally less leveraged than private national companies but more leveraged than state-owned companies. The available evidence is therefore conflicting and offers an opportunity for another analysis of the period from 1998 to 2008.

To better examine the macroeconomic factors on which the hypotheses to be tested are based, our review is organized into three subsections: Exchange Rate Risk, Differences in Financing Rates, and Macroeconomic Scenario.

2.1. EXCHANGE RATE RISK

In addition to political risk, exchange rate risk is also relevant in multinationals' capital structure decisions. Loans in local currencies by multinationals' subsidiaries reduce their companies' exposure when the local currency lose value (Lee, Kwok, 1988). Concurring with this proposition, Burgman (Burgman, 1996) suggested that multinationals' leverage was positively related to exchange rate risk. This evidence was consistent with the author's hypothesis that multinationals increased their subsidiaries' debt to protect themselves (*hedge*) from exchange rate risk.

Lehmann et al. (Lehmann et al., 2004) also concluded that loans in the local currency of the country where the subsidiaries are located may be incurred so the head office can protect itself from the foreign currency's exchange rate variation. Because multinationals' global results are consolidated in their country of origin, a branch office's leverage is a way for the company to protect itself against currency depreciation.

Given these arguments, *the first hypothesis (H1) states that the greater the exchange rate risk, the greater the leverage of foreign subsidiaries in comparison with Brazilian companies.*

1.1. DIFFERENCES IN FINANCING RATES

Difficulties in obtaining credit and the unavailability of resources resulting from an underdeveloped financial system can affect the leverage of local and foreign companies in different ways. Desai et al. (Desai et al., 2004) concluded that when foreign subsidiaries are faced with an underdeveloped credit market and high financing rates, they opted for debts to the head office, substituting external debts (debts to third parties) with intercompany loans. The authors found that these funding substitutions corresponded to approximately three-quarters more indebtedness to head offices than to local credit markets. The authors suggested that such an alternative intercompany funding source was significantly advantageous for a subsidiary. In countries where the credit market was underdeveloped and financing rates were high, local companies had no other alternative to raising funds at the higher rates. In accordance with Desai et al. (Desai et al., 2004), Lehmann et al. (Lehmann et al.,2004) confirmed the results of less leverage held by foreign branch offices in countries with undeveloped credit markets.

Regarding the differences in financing rates between countries, Graham and Harvey (Graham, Harvey, 2001) found that 44% of their study's respondent companies considered loan interests abroad to be important or very important in making decisions on financing. On the choice between domestic and external indebtedness, Allayannis et al. (Allayannis et al., 2003) found that the difference between local and foreign interest rates is negatively associated with the use of synthetic local currency debt (i. e., hedged foreign currency debt) for East Asian companies. Finally, Aggarwal and Kyaw (Aggarwal, Kyaw, 2008) showed that multinationals used internal debt (from the head office) to overcome financing costs and difficulties.

Given that multinationals' subsidiaries access the global market through their headquarters, differences in interest rates between countries may represent an opportunity for arbitrage.

Thus, *the second hypothesis (H2) is that the greater the difference between the financing rates in Brazil and a multinational's country of origin, the less the financial leverage of the foreign subsidiaries.*

1.1. MACROECONOMIC SCENARIO

Analysis of the macroeconomic scenario between 1998 and 2003 shows that Brazil faced a trust crisis in the second half of 1998

caused by the external shock of the Russian moratorium. In the beginning of 1999, the Brazilian Central Bank made an exchange rate policy transition from a board regime to a floating regime. This transition, which became known as *dollar overshooting*, raised expectations for inflation. In July 1999, a milestone regime for inflation was implemented, and the Special Clearance and Escrow System (Sistema Especial de Liquidação e Custódia – Selic) milestone was raised (with a descending trend) in an attempt to reduce the Brazil's market volatility. In 2000 and 2001, the markets calmed down, inflation was controlled, the Real became stable in relation to the dollar, and financing rates began to drop. In 2002, in addition to the Argentinean crisis, the instability of Brazil's macroeconomic situation was aggravated by the "Lula-risk": Lula's favored status to win the presidential election caused investors to mistrust the country and again increased the dollar's value over the Real. In short, the period from 1998 to 2002 was marked by economic instability.

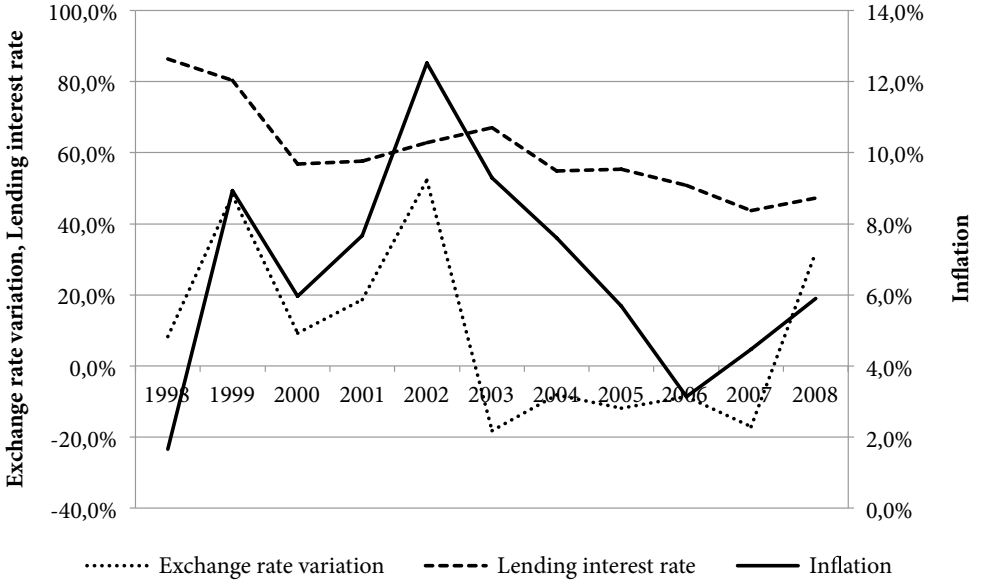
The period after 2003 was more stable. The Lula government retained the previous government's economic policies, and the global economy generally experienced sustainable growth, with controlled inflation and low levels of unemployment. In Brazil, this situation was reflected in the valuation of the Real, a reduction in inflation, and a reduction in financing rates, as presented in Figure 1. Therefore, there was a structural economic break in 2003

The third hypothesis (H3) is that a more stable macroeconomic scenario leads to a less local leverage behavior of foreign subsidiary.

3. Sample and Methodology

The main source of data used in this study is the non-financial company database provided by the Brazilian Institute of Economics (In-

Figure 1. Exchange rate variation, lending interest rate and inflation between 1998 and 2008, Brazil



Source: Elaborated by the authors

Table 1. Possibilities for dependent variables based on the reviewed authors

Leverage	Abbrev.	Definition	Author
Total Financial	TF	Total financial local debt over total assets (%)	Lehmann et al. (Lehmann et al., 2004)
Long Term Financial	LTF	Long term financial local debt over total assets (%)	Novaes and Werlang (Novaes, Werlang 2004)
Short Term Financial	STF	Short term financial local debt over total assets (%)	Novaes and Werlang Werlang (Novaes, Werlang 2004)

Source: Elaborated by the authors

stituto Brasileiro de Economia – IBRE) of the Getúlio Vargas Foundation of Rio de Janeiro (Fundação Getúlio Vargas do Rio de Janeiro – FGV-RJ) for the period from 1998 to 2008. Companies with net revenue below R$ 50 million/year are excluded from the sample due to their reduced relevance. This criterion excludes 7,816 observations and 1,761 individual company names. Classification as under national or foreign control is based on the definition of control according to Law n. 6.404/1976 (Law of S.A.), Article 243, in the first and second paragraphs: the controller is he who possesses at least 50% of the company's voting shares. Companies for which explicit information on their stock division is missing are excluded from the sample. The remaining sample consists of 812 individual companies, 616 of them national and 196 foreign, for which 5,461 observations are available.

3.1. The Study's Variables

Table 1 shows the candidates for dependent variables, Table 2 lists the possible control variables, and Table 3 shows the variables for the macroeconomic factors. Table 1 presents the various definitions of leverage found in the reviewed articles, including total financial local (TF), long-term financial local (LTF) and short-term financial local (STF).

Table 2 presents five control variables linked to firm factors: profitability, size, tangibility, growth and a binary variable for foreign

Table 2. Control Variables

Firm Factors	Abbrev.	Definition	Expected Sign of Coefficient	Author
Profitability	PROF	Proportion of net profits over total assets – ROA (%)	Negative	Titman and Wessels (Titman, Wessels, 1988); Booth et al. (Booth et al., 2001); Fan et al. (Fan et al., 2012)
Size	SIZ	Natural logarithm of net revenue	Positive	Rajan and Zingales (1995); Novaes and Werlang (1998)
Tangibility	TANG	Proportion of tangible assets over total assets (%)	Positive	Titman and Wessels(Titman, Wessels, 1988)
Growth	GROW	Assets growth rate (%)	Positive	Rajan and Zingales (Rajan, Zingales, 1995); Novaes and Werlang (Novaes, Werlang, 1998)
Foreign Subsidiary	FOR	Binary variable that takes on 1 for firms under foreign control	Negative	

Source: Elaborated by the authors

control. For each variable, the table also shows its abbreviation, definition, the expected sign of the coefficient to be estimated, and the authors who referenced the variable. These factors are the most cited in the literature (Titman, Wessels, 1988; Frank, Goyal, 2003).

Each row in Table 3 presents the exogenous variables of interest, i.e., the variables that are linked to the macroeconomic factors: inflation, exchange rate risk, difference in interest rates and a structural break for time period after 2003.

3.2. ECONOMETRIC MODEL

Because the sample combines observations of various companies over a given time period, panel data econometrics can be used to analyze the data and test the hypotheses formulated in Section 2. According to Hsiao (Hsiao, 2003) and Baltagi (Baltagi, 2005), this combination provides more informative data, greater variability, less collinearity between variables, and more degrees of freedom. Here, the panel is non-balanced, i.e., the number of observations is not the same for each time period; the balance sheet information for some of the companies is not available over the entire period (1998 to 2008). The following equation is used:

$$\begin{aligned} LEVERAGE_{it} = \alpha + \beta_1 PROF_{it} + \beta_2 SIZ_{it} + \\ + \beta_3 TANG_{it} + \beta_4 GROW_{it} + \beta_5 FOR_{it} \\ \beta_6 INFL_t + \beta_7 EXCH_t + \beta_8 EXCH_t * \\ * FOR_{it} + \beta_9 DIFF_INT_t + c_i + \mu_{it} \end{aligned}$$

where i indexes firms and t indexes the time periods. *LEVERAGE* can be the three types of leverage defined in Table 1 (TF, LTF, STF); *PROF*, *SIZ*, *TANG*, *GROW* and *FOR* refer to the control variables described in Table 2 and can change across i and t; *INFL*, *EXCH* and *DIFF _INT* are interest variables described in Table 3 and change across i but not i; c_i is the effect specific to firm i; and μ_{it} are the idiosyncratic errors. An interaction between the dummy variable *FOR* and *EXCH* is also included in the model. The purpose of this procedure is to identify whether, holding other factors fixed, there are differences in the effect of the *EXCH* variable between foreign subsidiaries and Brazilian companies.

A second model is also considered. Its difference from the preceding one is that it includes the interest variable *BREAK*, which is a binary variable that takes on 1 for time period after 2003, and its interaction with *FOR*.

Since there are usually few changes in balance sheet accounts of companies from one year to another, the errors terms μ_{it} may be serially correlated. Therefore, a test for first order serial correlation was conducted (Wooldridge, 2002, p. 282–283).

The regressions were estimated in two alternative specifications: 1) considering the specific effect c_i as fixed, therefore through the estimation of fixed effect regressors; 2) considering the effect c_i as random, therefore through the estimated equation's formulation with compos-

Table 3. Variables of interest: Macroeconomic Factors

Macroeconomic Factors	Abbrev.	Definition	Expected Sign of Coefficient	Source
Inflation	INFL	Annual IPCA (Brazilian National Consumer Price Index) variation (%)	Negative	IBGE
Exchange Rate Risk	EXCH	Annual exchange rate variation (%)	Positive	Central Bank of Brazil
Difference in Interest Rates	DIFF_INT	Mean annual difference between the real interest rates for loans in Brazil and the head office country real rates (%)	Negative/Positive	World Bank
Structural break	BREAK	Binary variable that takes on 1 for time period after 2003	Negative	

Source: Elaborated by the authors

ite errors $(c_i+\mu_{it})$ and the estimation using random effect regressors. The Hausman test was used to select consistent estimators[1].

Results

First, a comparison of the means of the Brazilian and foreign companies' leverage is presented; next, the regression results are analyzed.

Table 4 presents a comparison of means for total financial (TF), long term financial (LTF) and short term financial (STF) local leverage measures. The comparison is made by calculating the difference between foreign subsidiaries and Brazilian companies´ means and testing if the difference is statistically significant. The analysis is undertaken in three different ways: first, considering each year separately; then, taking the entire sampling period (1998–2008); and last, considering two sub-periods, before and after 2003.

Considering the entire sampling period (1998–2008), it is not possible to reject the null hypothesis that foreign subsidiaries and Brazilian companies have the same leverage mean, according to the t-test for equal mean values of the three indices considered. However, the results presented separately for each year show a

Table 4. Difference of Means between Foreign Subsidiaries and Brazilian Companies

Year	Total Financial (TF)	Long Term Financial (LTF)	Long Term Financial (LTF)	Short Term Financial (STF)
1998	0.0064	0.0019	0.0019	0.0045
1999	0.0371*	0.0259	0.0259*	0.0112
2000	0.0489**	0.0393	0.0393**	0.0097
2001	0.0487**	0.0304	0.0304*	0.0183
2002	0.0290	0.0127	0.0127	0.0163
2003	0.0164	0.0000	0.0000	0.0164
2004	–0.0069	0.0027	0.0027	–0.0097
2005	–0.0165	–0.0080	–0.0080	–0.0085
2006	–0.0482***	–0.0321	–0.0321**	–0.0162
2007	–0.0517***	–0.0363	–0.0363***	–0.0154
2008	–0.0500**	–0,0325	–0,0325**	–0.0175
1998–2008	0.0015	0.0005	0.0005	0.0010
Year < 2003	0.0340***	0.0220	0.0220***	0.0120**
Year ≥ 2003	–0.0262***	–0.0177	–0.0177***	–0.0085*

Source: Elaborated by the authors

Notes: 1,335 foreign subsidiaries observations, 4,126 Brazilian companies´ observations. Types of leverage according to Table 1. P-values reported for t-test with H0: foreign and national companies have the same mean. ***, **, and * denote significance for p-values ≤ 0.01, ≤ 0.05, and ≤ 0.10, respectively.

1 In the case where there is a correlation between explicative variables and the specific effect, i.e., the case in which the Hausman test rejects the null hypothesis, the fixed effect estimators are consistent and possibly efficient, while the random effect estimators are inconsistent. Conversely, if there is no correlation between the specific effect and the model's explicative variables, the use of fixed effect estimators would lead to an unnecessary loss of information because the intra-transformation would eliminate the time-invariant variables and the effects. In this case, because there is no correlation between the specific time-invariant effect and the explicative variables, the specific effect ci could be treated as orthogonal to the independent variables and therefore as the composite error. This alternative represents the null hypothesis of the Hausman test which, if not rejected, favors the use of random effect estimators over fixed effect estimators because they are efficient in this case, even if both are consistent.

trend in which the foreign companies become less leveraged than the Brazilian ones.

Considering the sub-period until 2003, the leverage of the foreign companies remains higher, and the hypothesis of equality between the two classes of companies is rejected. For the sub-period beginning in 2003, this trend is inverted, and Brazilian companies become more leveraged than the foreign ones. The reason for this result may lie in the influence of macroeconomic factors during the two periods, i.e., before and after 2003, as discussed previously in section 2.3.

The regression results are discussed next. The Hausman test was significant at the 1% level for all models. However, this test assumes homoskedasticity. In addition, the test for first order serial correlation was significant. Hence, the Mundlak test – which copes with heteroscedasticity and serial correlation – was applied. The result proved significant, thus rejecting the null hypothesis that the coefficients estimated by the random effects estimator are consistent. Our analysis will then consider results obtained with the fixed effects estimator, which are reported on Table 5.

First, we will examine the results of model 1. Foreign companies show lower levels of short term leverage: controlling for other factors, subsidiaries have a ratio of short term financial leverage over total assets (STF) by 7.9 p. p. lower than Brazilian companies, according to the coefficient associated to FOR. This occurs because in the short term they prefer to raise funds with the head office. However, when long term financial leverage (LTF) is considered, the difference is not statistically significant.

Coefficients on exchange rate risk (EXCH) are in line with hypothesis 1 (H1). Considering total financial leverage (TF) as the dependent variable, a 1 p. p. increment in exchange rate variation, holding other factors fixed, increases by 0.03 p. p. Brazilian companies ratio of local leverage over total assets, and by 0.08 p. p. foreign subsidiaries ratio. If long term leverage (LTF) is considered the effect is of about 0.03 p. p. and 0.07 p. p. for Brazilian companies and foreign subsidiaries, respectively. However, for short term leverage (STF) the effect is not statistically significant, even at the 10% level.In line with previous studies by Lehmann et al. (Lehmann et al.,

Table 5. Panel Regressions, 1998 to 2008

	Model 1			Model 2		
	TF	LTF	STF	TF	LTF	STF
Cons	6.76	–4.95	11.71***	–2.73	–11.25**	8.52**
PROF	–0.27***	–0.13***	–0.14***	–0.26***	–0.12***	–0.14***
SIZ	1.13***	1.13***	0.00	1.90***	1.64***	0.26
TANG	-0.02	0.03**	–0.05***	–0.03*	0.02*	–0.05***
GROW	0.01*	0.01**	0.00	0.01	0.01*	0.00
FOR	–11.24***	–3.34	–7.91***	-0.21	4.95*	–5.17**
INFL	0.15**	0.00	0.15***	0.16***	0.00	0.16***
EXCH	0.03***	0.03***	0.01	0.03**	0.02***	0.00
EXCH*FOR	0.05***	0.04***	0.01	–0.03*	–0.02	–0.01
DIFF_INT	0.17***	0.08***	0.10***	0.06*	–0.01	0.07***
BREAK				–0.66	–0.32	–0.33
BREAK*FOR				–7.81***	–5.90***	–1.91**

Source: Elaborated by the authors

Notes: 1,335 foreign observations, 4,126 national observations. Types of leverage according to Table 1. ***, **, and * denote significance for p-values ≤ 0.01, ≤ 0.05, and ≤ 0.10, respectively.

2004) and Aggarwal and Kyaw (2008), the positive relationship between local financial leverage and exchange rate risk suggests exchange rate risk hedging by the multinationals. However, it must be noted that exchange rate risk hedging through leverage occurs in the long term rather than the short term because foreign subsidiaries are concerned with exchange rate depreciation in the long term. Lehmann et al. (2004) found similar results regarding the term of indebtedness. Increased leverage brought about by exchange rate risk occurs in the long term due to uncertainty about governmental interference in the currency market.

When it comes to the effect of the difference between the financing rates in Brazil and a multinational's country of origin (DIFF_INT), results are the opposite of what would be expected, according to H2. One p. p. variation in DIFF_INT increases foreign subsidiaries local leverage ratio by 0.17 p. p. Thus, there is no evidence that the subsidiaries in the sample replace their local debt for debts with the head office. We expected that the difference between local financing rates and the financing rates in the headquarters' country would make a multinational use more intercompany debts; however, this expectation is not confirmed by the results.

Other results of interest related to the control variables indicate that profitability has a negative relationship with the various types of leverage. When return on assets (PROF) increases by 1.0 p. p., total leverage reduces by 0.27 p. p., all else constant. The results for this variable are justified by the *Pecking Order* theory, according to which more profitable companies have more resources of their own to invest in projects, thus discarding new debts. Our results are in accord with Titman and Wessels (Titman, Wessels, 1988), Rajan and Zingales (1995), and Booth et al. (Booth et. al., 2001) for foreign studies and with Brito and Lima (Brito, Lima, 2005) and Oliveira et al. (Oliveira e.a., 2012) for national studies.

Size is positively associated with leverage. Therefore, the results favor the theory that the larger the company, the greater its tendency to take on debt because it has better access to the means of financing, a better credit history, less risk of *default*, and less financial costs. These results agree with the Brazilian study by Novaes and Werlang (Novaes, Werlang1998) and the international work of Bae and Goyal (Goyal, 2009).

Regarding tangibility, the results are distinct for both the short term and the long term. For short-term leverage, a negative relationship with indebtedness is found, contrary to what we expected but in accordance with the *Pecking Order* theory. In the case of long-term leverage, the positive effect corroborates the expected relationship, whereby tangible assets are used as a guarantee to reduce the costs of indebtedness. As a matter of planning and to preserve liquidity, companies generally prefer long-term debts over short-term debts. Therefore, less tangibility may lead to reductions in the terms of debts, making this relationship negative (Moreira, Brito, 2006).

We next examine the results of model 2, which differs from model 1 by the inclusion of binary variable BREAK and its interaction with FOR. The coefficient on BREAK captures the effect of a breakpoint after 2003 on leverage measures, holding other factors fixed, for Brazilian companies. The sum of the coefficients on BREAK and BREAK*FOR estimates the same effect for foreign subsidiaries.

Coefficients on BREAK and FOR are in line with hypothesis 3 (H3). They suggest that even controlling for macroeconomics factors as inflation rate, exchange rate variation and difference in interest rates, the new scenario after 2003 brought a reduction in leverage. However this effect is significant only for foreign subsidiaries, as only the coefficient associated to the interaction term BREAK*FOR is statistically significant.

Conclusions

We analyze the capital structure of foreign subsidiaries acting in Brazil during the period from 1998 to 2008 and examine how macroeconomic factors influence foreign companies' leverage. We empirically study the impact of ex-

change rate risk, differences in financing rates and differences in macroeconomics scenarios on multinational subsidiaries leverage decisions.

Overall, the foreign subsidiaries were more leveraged than the Brazilian companies. However, the results over time showed a change in trend in 2003, when the Brazilian companies became more leveraged than the foreign subsidiaries. A brief macroeconomic analysis of these two periods, until and after 2003, reveals a change in Brazil's overall situation, whereby the first period was politically and economically less stable.

Our results also suggest that multinationals subsidiaries use local debt to hedge their local income against potential Brazilian currency devaluation. This finding is in line with previous studies by Lehmann et al. (2004) and Aggarwal and Kyaw (2008), who found a positive relationship between local financial leverage and exchange rate risk. It should be noted that these results hold for long-term leverage only.

As macroeconomic scenario become more stable, foreign subsidiaries tend to use less local debt to hedge their local income. Controlling for macroeconomics factors as inflation rate, exchange rate variation and difference in interest rates, we found a reduction in local leverage for foreign subsidiaries after 2003 new Brazilian scenario.

Finally, in contrast to what was suggested by costly external financing literature, the higher the difference between Brazilian financing rate and the head office country rate, the higher the local debt for foreign subsidiaries.

The present study takes a more hedge approach. It considers the strategy of hedging against local currency devaluation and sees local currency loan as one way to partially overcome them. Difficulties in measuring foreign subsidiaries' composition of debt within a year require detailed investigation. There are also significant differences in tax rates between countries. This effect may cause tax inefficiencies due to compensation amounts and may incentivize or inhibit global companies from taking on debts in other countries. This is an exciting but challenging agenda for future research on capital structure, and particularly for foreign subsidiaries in emerging markets.

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