Country Factors and Dynamic Capital Structure in Latin American Firms

(Fator País e Estrutura Dinâmica de Capital nas Empresas da América Latina)

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Abstract

We develop partial adjustment and duration models to test the relevance of country idiosyncrasies in determining the capital structure of publicly-traded Brazilian, Chilean and Mexican firms. Our data panel, ranging from the 4th quarter of 1996 to the 2nd quarter of 2010, consists of 4403 firm-quarter observations pertaining to 139 firms. Our findings suggest that capital structure dynamics vary by country, local idiosyncrasies are key determinants of firms' leverage among Brazilian, Chilean and Mexican firms, and that factors other than firm-specific characteristics influence the financing decision processes of Latin American managers.

***Keywords*:** capital structure; adjustment costs; dynamic models; country-specific factors; firm-specific factors.

JEL codes: C33; C34; C41; G32.

Resumo

Desenvolvemos modelos de ajuste parcial e de duration para testar a relevância de fatores específicos de países na determinação da estrutura de capital de empresas listadas nas bolsas de valores brasileira, chilena e mexicana. Utilizamos dados em painel, em um período que se estende do quarto trimestre de 1996 ao segundo trimestre de 2010, abrangendo 4403 observações relacionadas a 139 empresas diferentes. Os resultados obtidos sugerem que: a dinâmica da estrutura de capital varia por país; idiossincrasias locais são determinantes-chave dos níveis de alavancagem das empresas brasileiras, chilenas e mexicanas; e outros fatores além de características específicas das empresas influenciam os processos de decisão de financiamento dos gestores latino americanos.

***Palavras-chave*:** estrutura de capital; custos de ajustamento; modelos dinâmicos; fatores específicos de país; fatores específicos de empresa.

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1. Introduction

This paper investigates to which extent country idiosyncrasies contribute to the capital structure behavior of publicly traded Brazilian, Chilean and Mexican firms in the period between 1996 and 2010. We analyze the evolution of firms' leverage ratios against a set of candidate firm-specific determinants, controlling for firm's country of origin, and verify that the estimated results exhibit a significant component that is country-specific.

Our approach is to identify whether firms of a given country present a capital structure behavior relatively consistent and diverse from that of the remaining countries' firms. In our empirical analysis, we use two dynamic specifications that model leverage ratio fluctuations under the hypothesis of active capital structure rebalancing performed by firms' managers.

First, we estimate a partial adjustment model not only to determine which classically tested firm characteristics (such as size and profitability) properly explain capital structure behavior, but also to investigate whether the contribution of such determinants to the estimated speed of adjustment suggests that other factors (i.e. country idiosyncrasies) may play a significant role in the evolution of leverage ratios. However, under the hypothesis that firms avoid active capital structure rebalancing unless critical leverage ratios are achieved, periods of relative inactivity of capital structure adjustments may mislead the interpretation of the results of a partial adjustment model. Therefore, we perform a duration analysis to verify whether the violation of a quasi-optimal leverage ratio range triggers active capital structure rebalancing that otherwise would not take place. We test which cost proxies determine the observed path of leverage ratios and whether results depend on firms' country of origin.

In both models we employ dummy variables to flag Chilean and Mexican observations so as to evidence the dissimilar capital structure behavior of each individual country's firms in comparison to their Brazilian counterparts. Similarly, we employ the interactions of the aforementioned country dummies with firm-specific determinants to verify how differently such determinants influence leverage levels across countries. To the extent of our literature research, such a use of dummy variables and interactions to capture the effects of country-specific factors implicit to the specifications is a novel approach in this field of research.

The remainder of this paper is organized as follows: Section 2 presents the literature review and briefly discusses the theoretical foundations of the capital structure theories; Section 3 describes the and empirical methodologies and sample data, Section 4 discusses the obtained results and Section 5 offers the concluding comments.

2. Literature Review

Notwithstanding the vast body of knowledge developed throughout the last decades, results of capital structure research are still not consistent in clarifying

the key factors behind firms' financing decisions. The three main established approaches to capital structure (i.e. the trade off, the pecking order and the agency theories) state that the combination of multiple factors determines firms leverage ratios. Although past research has focused on firm-specific factors as leverage determinants, recent evidences point out that country, institutional and economic factors have significant influence over capital structure behavior and thus their omission from previous studies would represent a shortcoming to the discussion hitherto. In face of this, an increasing number of theoretical and empirical studies call attention to the influence of country-specific factors over capital structure, specially testing the significance of institutional and macroeconomic parameters.

A number of studies propose that country-specific factors are not as relevant as firm-specific factors to explain the behavior of leverage ratios. Among these, Booth *et al.* (2001) find that the effects of firm-specific determinants are similar across countries, even when comparing developed and developing ones. Kayo & Kimura (2011) conclude that country and industry-specific factors are less important than firm-specific factors to explain leverage behavior, result that varies from developed to emerging countries. Mitton (2008) also conclude that country factors are less important than firm-specific factors, focusing on a set of emerging countries. Likewise, Copat (2009), Kirch *et al.* (2008) and Jörgensen & Terra (2003) analyze several leverage ratio determinants to find that firm-specific factors respond for the observed capital structure behavior of Latin American and Eastern European firms. Céspedes *et al.* (2010) evaluate the capital-structure determinants of seven Latin American firms and find a relation between leverage and ownership concentration that is consistent in all countries. Their results, particularly strong for Brazilian and Chilean firms, suggest that firms with highly concentrated ownership avoid issuing equity because they do not want to lose control.

Nevertheless, other researchers stand in favor of the significant role of country-specific factors as leverage determinants. Demirgüç-Kunt & Maksimovic (1998) and Jong *et al.* (2008) verify that country-specific factors, together with firm factors, are significant determinants of capital structure. Cheng & Shiu (2007) propose that institutional factors are at least as relevant as firm-specific factors to explain leverage behavior on emerging countries firms and Joeveer (2006) concludes that country-specific factors are key determinants of leverage for small and private firms, while industry-specific factors play the same role for publicly-traded firms. Bastos *et al.* (2009) performed a multivariate panel data regression of firms belonging to the five largest Latin American economies, in order to identify the determinants of capital structure, and contrasted the relevance of macroeconomic and institutional factors to firm-specific ones. They concluded that the pecking order theory is more robust in explaining the obtained results and that the idiosyncrasies of each country contribute to the observed behavior of leverage ratios.

Although a number of researchers have ventured in this field of investigation, results are still not conclusive. A few papers, such as Kayo & Kimura (2011), made use of new approaches and methods in an attempt to enlighten the discussion on

country factors as determinants of leverage ratios: they applied hierarchical linear modeling to assess the relative importance of time, firm, industry and country factors to capital structure definition. In a broader perspective, dynamic models have been progressively employed by researchers to capture the effects of adjustment costs and of changing target leverage ratios along time. Several recent studies found evidence supporting that firms actively adjust their leverage toward target levels, following a mean-reverting behavior consistent with the trade off theory (Dang *et al.*, 2009). Ozkan (2001) and Flannery & Rangan (2006) employed partial adjustment models to find that American and British firms do rebalance their capital structures aiming at target leverage ratios. Lemmon *et al.* (2008) further explore the partial adjustment model and speeds of adjustment to find evidences that rather than being explained by time-varying determinants, leverage is mostly driven by permanent effects and concluded that leverage eventually reverts to a given target level essentially determined by factors other than time-varying firm characteristics. Similarly, Dang *et al.* (2009) develop an asymmetric partial adjustment model to evaluate the role of financial flexibility and adjustment costs to explain the capital structure of UK firms, finding that highly leveraged firms are quicker to adjust capital structure in order to avoid bankruptcy and liquidation costs.

Leary & Roberts (2005) and Machado (2009) innovated through applying a duration model to corroborate that the persistence of shocks to leverage results from costly adjustment rather than management unconcern for capital structure deviations. Given that costly adjustment creates disincentives for firms to immediately offset shocks to capital structure and firms would not engage in active rebalancing until its associated marginal gains exceed the adjustment costs, the authors advocate for the existence of a range within which leverage floats erratically. Leary & Roberts (2005) emphasize that the oversight of adjustment costs to the dynamics of capital structure has misguided researchers throughout past studies. They propose that costly adjustment responds for the observed persistence of shocks to leverage and explains the apparent indifference of firms to leverage oscillations.

3. Hypotheses and Econometric Models

3.1 Objectives of the research

Dynamic models are employed in this study to verify that country effects play a key role in determining the capital structure of firms. Rather than looking for macroeconomic or institutional determinants of the leverage levels, we aim at observing how severely results vary across countries due to their idiosyncrasies. The next subsection will further detail our purpose and its implementation.

3.2 The relevance of firms' country of origin

We investigate whether and how the estimated results for Brazilian, Chilean and Mexican firms suffer major variations when analyzed across countries. Even

though Latin American countries share somewhat similar history, culture and legal systems, one may expect dissimilarities in the social, institutional and economic spheres among these countries that may affect the coefficients of the dynamic models. Whereas all three countries show varied maturity in the decoupling of institutions from the political cycles, other factors such as investment grade, GDP growth, exchange rates, level of economic freedom and inflation may account for disturbances in the estimated results.

To the extent of our literature review, previous studies do not provide structured and exhaustive comparisons between Latin American countries in terms of institutional and macroeconomic environments. Rather, they identify potential determinants of capital structure and develop reasoning for their employment. Our approach is not to develop such comparison but to examine directly from estimation results whether countries matter for the analysis of capital structure behavior.

We use dummy variables to segregate observations by country so as to evidence the capital structure behavior and contribution to the dependent variables of each individual country's firms. We define Brazil as the country of reference, therefore both dummies CL and MX are constructed to identify whether a firm is, respectively, Chilean or Mexican: CL equals 1 when the observation is related to a Chilean firm and 0 otherwise, while MX equals 1 when the observation is related to a Mexican firm and 0 otherwise. Should both dummies concurrently equal zero, the observation is related to a Brazilian firm.

We also employ the interactions of the aforementioned country dummies with firm-specific determinants to capture how differently such determinants influence leverage levels across countries. These interactions are built through the multiplication of each main effect by the country dummies CL and MX. As an example, CL*SIZE represents an interaction equal to the product of the dummy CL and the main effect SIZE, serving as an indicator of how much the contribution of SIZE consistently differs when firms are grouped by their countries of origin.

Finally, we control for periods of financial distress in each country through dummies that identify quarters during which the major local stock exchange indexes (IBOV, IGPA and IPC, respectively from Brazil, Chile and Mexico) dropped by 10% compared to the previous period. These dummies are named BR_Crisis, CL_Crisis and MX_Crisis.

3.3 Partial adjustment model

Our purpose is to estimate a partial adjustment model not only to identify firm characteristics (such as size and profitability) that properly explain capital structure behavior, but also to investigate whether the contribution of such determinants differs across countries suggesting that other factors (i.e. country idiosyncrasies) play a significant role in determining leverage ratios.

A noteworthy contribution of researchers that ventured in the dynamic approach, such as Flannery & Rangan (2006) and Dang *et al.* (2009), is the development of partial adjustment models in which the optimal capital structure is

determined endogenously. Following Dang *et al.* (2009), who further developed the models employed by Ozkan (2001) and Flannery & Rangan (2006), a general partial adjustment model may be given by:

$$LEV_{it} = (1 - \delta)LEV_{it-1} + \pi X_{it-1} + \alpha_i + \omega_{it} \quad (1)$$

where LEV_{it} represents the observed leverage ratio for firm i at time t; X_{it} is a vector of exogenous factors; α_i are firm-specific, time-unvarying components of the regression error term; ω_{it}, are observation specific error terms; and δ, the speed of adjustment, is a measure of the rate at which firms close the gap between their actual and target leverage levels each period.

Equation (1) approximates firms' capital structure behavior and presupposes that leverage eventually reverts to its target level. Given that the lagged term LEV_{it-1} brings forth the issue of auto-correlation, the Arellano-Bond estimator is employed to address the concerns of dynamic panel estimation. We refer to Dang *et al.* (2009) for a further discussion regarding the econometric issues. Target leverage derives from πX_{it-1}, and, assuming that the exogenous factors contained in X_{it} are significant, the exclusion of any of them from the specification should reduce the estimated speed of adjustment: the rationale is that the actual target leverage and the one being modeled would differ. Lemmon *et al.* (2008) mention that such procedure corresponds to adding measurement error to the target leverage, similarly to the experiment performed by Flannery & Rangan (2006) to illustrate the speed reduction due to decreases in the signal to noise ratio of the target estimate.

The selected time-varying factors and their respective expected impacts over leverage are shown in Table 1.

Table 1
Parameters employed in the partial adjustment model

Parameter	Alias	Effect	Rationale
Ratio of cash and near cash to total assets	CASH	neutral	Leary & Roberts (2005)
Basic interest rate in each country	INTEREST	–	Rochman *et al.* (2009)
Ratio of market value to book value	MKT2BOOK	–	Flannery & Rangan (2006), Lemmon *et al.* (2008)
Ratio of the 1-period difference of operational income to total assets	OINCVOL	–	Leary & Roberts (2005)
Ratio of operational income to total assets	PROFIT	+	Flannery & Rangan (2006), Lemmon *et al.* (2008)
Log of total assets	SIZE	+	Flannery & Rangan (2006), Lemmon *et al.* (2008)
Ratio of fixed assets to total assets	TANG	+	Flannery & Rangan (2006), Lemmon *et al.* (2008)
Ratio of total debt to the sum of market value of equity and total debt	LEV	not applicable	Flannery & Rangan (2006), Lemmon *et al.* (2008)

Source: developed by the author.
Notes: The first column identifies the variable; the second identifies its alias in the database; the third describes its expected effect over leverage levels in the partial adjustment model; the fourth column describes the source of the respective economic rationale laying behind the expected effects.

3.4 Duration analysis

By analyzing the influence of country factors over the duration of the intervals of time without active rebalancing, we aim at evaluating whether the costly adjustment framework helps explaining the capital structure evolution in the three countries under analysis. Moreover, differing results across countries would indicate that country peculiarities affect the dynamics of costly adjustment, providing additional evidence that country-specific cultural, macroeconomic and institutional factors exert major influence over capital structure decisions.

We follow Cottrell & Lucchetti (2008) to model duration through maximum likelihood, wherein the regressors are the parameters that govern a probability distribution function, $f(t, X, \theta)$, to which we hypothesize durations obey and where t is the length of time in the state in question, X is a matrix of covariates, and θ is a vector of parameters. The probability distribution function is factored into two components: the survivor function, S, which gives the probability that a state (i.e. capital structure inactivity) lasts at least as long as a period of time t; and the hazard function, λ, which gives the probability that a state that persisted as long as t ends within a short increment of time (Cottrell & Lucchetti, 2008). This yields the log-likelihood:

$$\sum_{i=1}^{n} log f(t_i, X_i, \theta) = \sum_{i=1}^{n} log\lambda(t_i, X_i, \theta) + logS(t_i, X_i, \theta) \qquad (2)$$

We refer to Cameron & Trivedi (2005) and Kleinbaum & Klein (2005) for a detailed discussion regarding the econometric aspects and implementation of equation (2). The dependent variable, duration, is defined as the number of consecutive periods between significant changes in the capital structure of a firm, within a given time series. We adopt the same approach as Leary & Roberts (2005), Hovakimian (2006) and Korajczyk & Levy (2003) to characterize a significant change in leverage as an upward or downward net variation of 5% between two consecutive periods.

In order to properly capture the effects of the independent variables, we follow Machado (2009) and perform two independent duration analyses: the first, henceforth named upward duration analysis, estimates the factors that govern the duration of periods of relative inactivity preceding positive net variations greater than 5%; the second analysis, henceforth named downward duration analysis, does the same considering negative net variations greater than 5%. We estimated all regressors lagged by one period since current information is not likely to be available at the occasion of adjustment.

Given that durations are measured within finite windows of time, it may happen that the last observation in a time series occurs before an adjustment. In such situations, henceforth named “right censoring”, the hazard function does not apply and equation (2) has to be implemented allowing the survivor function to be the single contributor to the estimation (Cottrell & Lucchetti, 2008). Censoring

dummies (i.e. Censup and Censdown) are included in order to handle right censoring. "Left censoring" (e.g. the first observation in a time series occurring before a change of state) is resolved by forcing the measurement of each time series to necessarily start in a given change of state.

The selected variables and their respective expected impacts over the duration of inactivity periods are shown in Table 2.

Table 2
Parameters employed in the duration model

Parameter	Alias	Upward duration	Downward duration	Rationale
Number of consecutive quarters of leverage inactivity	DUR	not applicable	not applicable	Leary & Roberts (2005)
Ratio of cash and near cash to total assets	CASH	Neutral	neutral	Leary & Roberts (2005)
Basic interest rate in each country	INTEREST	+	–	Rochman *et al.* (2009)
Ratio of market value to book value	MKT2BOOK	+	–	Flannery & Rangan (2006), Lemmon *et al.* (2008), Leary & Roberts (2005)
Ratio of the 1-period difference of operational income to total assets	OINCVOL	+	–	Leary & Roberts (2005)
Ratio of operational income to total assets	PROFIT	–	+	Flannery & Rangan (2006), Lemmon *et al.* (2008), Leary & Roberts (2005)
Log of total assets	SIZE	–	+	Flannery & Rangan (2006), Lemmon *et al.* (2008), Leary & Roberts (2005)
Ratio of fixed assets to total assets	TANG	–	+	Flannery & Rangan (2006), Lemmon *et al.* (2008), Leary & Roberts (2005)
Ratio of total debt to the sum of market value of equity and total debt	LEV	+	–	Flannery & Rangan (2006), Lemmon *et al.* (2008), Leary & Roberts (2005)
1-period difference of leverage level	DLEV	+	–	Leary & Roberts (2005)
Dummy equal to 1 if previous period's variation of leverage is positive	LUP	+	–	Leary & Roberts (2005)

3.5 Data and sample selection

The dataset is composed of firm-quarter observations of publicly-traded Brazilian, Chilean and Mexican companies obtained from the Bloomberg Professional service database, between the 4th quarter of 1996 and the 2nd quarter of 2010. Interest rates were obtained from daily time series available at Banco Central do Brasil, Banco Central de Chile and Banco de México, matched to the dates of each respective firm-quarter observation. All variables were built according to the definitions of Tables 1 and 2.

We focus on Brazilian, Chilean and Mexican firms not only because of the significant size of their combined stock exchanges compared to those of the remaining countries', but also due to practical issues in building the panel dataset for all parameters of the other countries' firms. This issue arises from the limited

access to valid entries in the data source, which also required us to trim the sample to a smaller set of observations and limit the timeframe.

Panel data for the partial adjustment model

Firm-quarters containing missing data were removed from the original sample, as well as all observations related to financial companies since they are subject to particular accounting considerations.

In order to minimize the impact of outliers to the analyses, we follow Flannery & Rangan (2006), Lemmon *et al.* (2008) and Dang *et al.* (2009) and exclude observations at the upper and lower one-percentiles for all firm-specific Parameters (except for leverage level and variation). At last, only firm-quarters pertaining to time series exhibiting at least 12 contiguous quarters have been maintained in the database in order to allow the use of dynamic estimators that require lagged instruments. The final panel consists of 4403 firm-quarter observations of 139 firms. Table 3 summarizes its statistics.

Table 3
Descriptive statistics of the dependent and independent Parameters used in the estimation of the partial adjustment model

Parameter	Mean	Median	Std. Dev.	Min	Max
Leverage Level	0.31	0.28	0.21	0.00	0.96
Size	7.75	7.70	1.35	2.16	11.76
Tangibility	0.48	0.50	0.20	0.00	0.94
Profitability	0.03	0.02	0.02	-0.15	0.13
Market to Book Ratio	1.68	1.21	5.45	0.28	201.09
Cash and Near Cash	0.10	0.07	0.09	0.00	0.87
Income Volatility	0.15	0.01	7.56	-274.20	266.22
Interest Rate	12.19	11.25	6.95	0.50	42.00

Source: developed by the author.
Notes: The first column identifies the Parameters constructed from financial time series obtained through the Bloomberg Professional service database and the websites of each respective country's central bank; each of the remaining five columns exhibit a given statistic associated to the Parameter, respectively mean value, median value, standard deviation, minimum value and maximum value.

Cross-section data for the duration model

The cross-sectional datasets were built from the available panel data. Duration and Leverage Increase were calculated and registered at the final observation of each available time series ending by either a significant variation of leverage or closure of time window. Only the final observations were kept in the final cross-sectional datasets. Two individual datasets were produced, one for upward leverage adjustments and other for downward leverage adjustment, in order to isolate the effects of cost proxies and leverage history over the two different movements. The final datasets consist of 569 observations for upward adjustments and 599 observations for downward adjustments. Tables 4 and 5 summarize the statistics of the Upward Adjustment and Downward Adjustment models, respectively.

Table 4
Descriptive statistics of the dependent and independent Parameters used in the estimation of the upward adjustment duration model

Parameter	Mean	Median	Std. Dev.	Min	Max
Duration	5.35	3.00	6.48	1.00	42.00
Leverage Level	0.35	0.33	0.19	0.00	0.93
Size	7.87	7.81	1.39	3.14	11.40
Tangibility	0.45	0.47	0.21	0.00	0.89
Profitability	0.02	0.02	0.02	-0.06	0.12
Market to Book Ratio	1.34	1.18	0.61	0.49	7.15
Cash and Near Cash	0.10	0.07	0.09	0.00	0.47
Income Volatility	-0.04	0.00	5.56	-125.87	15.69
Interest Rate	11.38	11.25	5.86	0.50	33.14
Leverage Variation	0.01	0.00	0.08	-0.37	0.63

Source: developed by the author.
Notes: The table exhibits statistics of the Parameters used in the upward adjustments model. The first column identifies the Parameters constructed from financial time series obtained through the Bloomberg Professional service database and the websites of each respective country's central bank; each of the remaining five columns exhibit a given statistic associated to the Parameter, respectively mean value, median value, standard deviation, minimum value and maximum value.

Table 5
Descriptive statistics of the dependent and independent Parameters used in the estimation of the downward adjustment duration model

Parameter	Mean	Median	Std. Dev.	Min	Max
Duration	4.90	3.00	5.35	1.00	35.00
Leverage Level	0.43	0.41	0.20	0.00	0.96
Size	7.82	7.72	1.34	3.13	11.38
Tangibility	0.45	0.46	0.19	0.00	0.88
Profitability	0.02	0.02	0.02	-0.15	0.12
Market to Book Ratio	1.19	1.08	0.46	0.48	4.82
Cash and Near Cash	0.10	0.08	0.09	0.00	0.50
Income Volatility	0.38	0.04	4.97	-13.44	98.89
Interest Rate	11.74	11.25	6.86	0.50	42.00
Leverage Variation	0.00	-0.01	0.09	-0.28	0.91

Source: developed by the author.
Notes: The table exhibits statistics related to the downward adjustments model. The first column identifies the Parameters constructed from financial time series obtained through the Bloomberg Professional service database and the websites of each respective country's central bank; each of the remaining five columns exhibit a given statistic associated to the Parameter, respectively mean value, median value, standard deviation, minimum value and maximum value.

4. Empirical Results

4.1 Partial Adjustment Model

Estimation results indicate that capital structure behavior is to a certain extent explained by firms' country of origin, as well as by firm-specific factors.

Columns (i) to (v) in Table 6 display the coefficients and p-values of five estimations of the partial adjustment model, each performed with a different set of parameters. Results in column (i) are outputs of the regression of the full list of parameters identified in Table 1. Column (ii) displays the results of the fitted model, selected through the following process: first, we estimate the model without the non-significant interactions identified in column (i); then, we estimate the model

without the non-significant main effects identified in the last output; finally, we estimate the final model until all remaining parameters are significant. Columns (iii) and (iv) display the results of two new estimations in which M2BOOK and SIZE have been respectively omitted from the fitted model. Column (v) displays the results of a model in which the lagged term of ΔLEV is the sole main effect.

Table 6
Coefficients and p-values of the partial adjustment model

	i	ii	iii	iv	v
Speed of adjustment (	0.239	0.204	0.227	0.107	0.131
LEV	0.761[0.000]	0.796[0.000]	0.773[0.000]	0.893[0.000]	0.869[0.000]
SIZE	-0.143[0.000]	-0.143[0.000]	-0.155[0.000]		
TANG	-0.007[0.953]				
PROFIT	-0.051[0.801]				
M2BOOK	0.004[0.002]	0.004[0.001]		0.005[0.002]	
CASH	-0.070[0.309]				
OINCVOL	0.000[0.972]				
INTEREST	0.001[0.105]				
CL*SIZE	0.113[0.000]	0.133[0.000]	0.146[0.000]		
CL*TANG	-0.130[0.304]				
CL*PROFIT	0.675[0.017]				
CL*M2BOOK	0.055[0.125]				
CL*CASH	-0.233[0.122]				
CL*OINCVOL	0.000[0.996]				
CL*INTEREST	0.001[0.801]				
MX*SIZE	0.136[0.000]	0.133[0.000]	0.149[0.000]		
MX*TANG	0.211[0.238]				
MX*PROFIT	0.061[0.82]				
MX*M2BOOK	0.010[0.553]				
MX*CASH	0.260[0.022]				
MX*OINCVOL	-0.001[0.776]				
MX*INTEREST	-0.002[0.089]				
CL*LEV	-0.387[0.005]	-0.511[0.000]	-0.491[0.000]	-0.604[0.000]	-0.580[0.000]
MX*LEV	-0.451[0.000]	-0.532[0.000]	-0.514[0.000]	-0.619[0.000]	-0.602[0.000]
MX_Crisis	0.112[0.000]	0.108[0.000]	0.108[0.000]	0.109[0.000]	0.109[0.000]
CL_Crisis	0.087[0.000]	0.096[0.000]	0.096[0.000]	0.100[0.000]	0.100[0.000]
BR_Crisis	0.019[0.000]	0.018[0.000]	0.020[0.000]		
CL	-0.010[0.000]	-0.013[0.000]	-0.013[0.000]	-0.014[0.000]	-0.014[0.000]
MX	-0.005[0.000]	-0.006[0.000]	-0.006[0.000]	-0.006[0.000]	-0.006[0.000]

Source: developed by the author.
Notes: Variables were constructed as described in Chart 1. The first column labels the estimated results and each of the remaining five columns exhibits the estimates, statistics and tests obtained for different sets of variables, namely (i) to (v). The value of δ, the speed of adjustment; and the estimated coefficients and their respective p-values are displayed in this table.

We lag the main effects by one period to avoid estimating the model with information not available at the event of adjustment. Results for the Arellano-Bond tests for AR(1) and AR(2), Sargan test and Wald test are also listed in Table 7. The Arellano-Bond test for AR(1) rejects the null hypothesis of no autocorrelation in first differences for all the five sets of variables. However, this is an expected result given the structure of the residuals (Mileva, 2007). The tests for AR(2) do not reject the hypothesis of no autocorrelation in parameter levels. The Sargan test does not reject the hypothesis that all instruments, jointly, are exogenous whereas the Wald test rejects that the coefficients of the exogenous variables are equal to zero.

Table 7
Regression statistics and test results of the partial adjustment model

	i	ii	iii	iv	v
Sum of Sq. Errors	19.288	19.749	20.088	21.262	21.736
Std. Error	0.087	0.087	0.088	0.091	0.092
AR(1)	-3.379 [0.000]	-3.361 [0.001]	-3.353 [0.001]	-3.363 [0.001]	-3.350 [0.001]
AR(2)	-0.594 [0.552]	-0.634 [0.526]	-0.679 [0.497]	-0.838 [0.402]	-0.892 [0.373]
Sargan	898.578 [0.000]	902.332 [0.000]	875.158 [0.000]	885.761 [0.000]	867.709 [0.000]
Wald	822.313 [0.000]	536.240 [0.000]	497.859 [0.000]	451.433 [0.000]	473.253 [0.000]

Source: developed by the author.
Notes: Variables were constructed as described in Chart 1. The first column labels the estimated results and each of the remaining five columns exhibits the estimates, statistics and tests obtained for different sets of variables, namely (i) to (v). This table displays the sum of squared errors, standard error, z-statistic and respective p-value (in brackets) of Arellano-Bond tests for autocorrelation AR(1) and AR(2), and the chi-squared and respective p-values (in brackets) of Sargan's and Wald's tests.

The negative coefficients of the country dummies CL and MX point out that, in comparison to Brazilian firms, Chilean and Mexican firms consistently have lower leverage ratios. The absolute value of such coefficients indicate that Mexican firms exhibit leverage ratios intermediate to those of Brazilian and Chilean firms. Given that the findings for CL and MX are consistent across the five specifications, we infer that country idiosyncrasies not captured through firm-specific parameters may account for the different propensity of firms from different countries to increase their leverage. Further research on Brazilian, Chilean and Mexican firms may evidence that legislation and other economic, political and cultural traits have significant influence on the financing decisions of these countries' firms. Rochman *et al.* (2009), referring to previous studies on the financing decisions of Brazilian firms, point out that local legislation makes it less attractive for Brazilian firms to look for external sources of financing when compared to firms from more developed capital markets. Lefort & Walker (2000) show that economic groups are the predominant form of corporate structure in Chile and suggest that the controllers of Chilean conglomerates hold more equity than strictly needed due to cash-flow benefits associated to subsidiaries. The examination of factors such as the aforementioned may enlighten the discussion and provide empirical basis to justify the consistently different financing behavior of these three countries firms.

Additional evidence is provided by the coefficients of the parameters "absolute size" (SIZE) and "market-to-book ratio" (M2BOOK): both parameters are significant regressors, however the signs of their coefficients are opposite to the signs predicted by the trade off theory. According to our results, larger firms are less prone to look for external financing sources (i.e. negative sign of SIZE) while increasing market-to-book ratios slightly enhance firms' propensity to leverage. Furthermore, when summed to the coefficient of SIZE, the positive coefficients of the interactions CL*SIZE and MX*SIZE indicate that the negative impact of the parameter SIZE over leverage ratios is much weaker among Chilean and Mexican firms. Such findings, rather than simply challenging the adherence of Brazilian, Chilean and Mexican publicly traded firms to the trade off theory, suggest that country idiosyncrasies exert influence over the extent to which firm characteristics contribute to the capital structure behavior. Theoretical investigation on the

expected impact of such firm characteristics subject to those countries economic, legal and social environments may provide further insights on the validity of major capital structure theories such as trade off and pecking order theories.

The speeds of adjustment (δ) are obtained by subtracting the coefficient of the lagged leverage ratios (LEV) from 1, as depicted in Equation (1). When summed to the coefficient of LEV, the negative coefficient signs of the interactions CL*LEV and MX*LEV denote a large, positive impact over for Chilean and Mexican firms in comparison to their Brazilian counterparts. Based on this result consistent across the different specifications, we infer that Chilean and Mexican managers are more avid to close the gap between actual and target leverage ratios than their Brazilian equivalents. In fact, this conclusion may be sustained given that Brazil is considered a country with low levels of equity issuance (Rochman *et al.*, 2009) and presents elevated financing costs (Marcon *et al.*, 2007) which would put off firms' attempts to adjust capital structure. Once again, we suggest future comparative studies of those countries economic, legal and social environments to elucidate this observed behavior and provide further evidences on the role of country idiosyncrasies in determining firms' capital structure.

At last, we isolate the effect of major financial crises in each country during the period of analysis. Such crises may account for relevant impacts on firms' leverage ratios and hence distort the observed results. The coefficients of the interactions BR_Crisis, CL_Crisis and MX_Crisis indicate that crisis events increase leverage levels in all countries, although with greater impact over Chilean and Mexican firms.

4.2 Duration analysis

Estimation results do not indicate that the duration of the intervals of time without active rebalancing is explained by firms' country of origin, but mainly by cost proxies represented by firm-specific factors.

Table 8 displays the results of the duration model represented by equation (2). Columns (i) of both upward and downward models display the results of the estimation of all the independent variables. Columns (ii) display the results of the fitted models selected through the following process: first, all non-significant interactions were removed and a new estimation performed; then, all non-significant main effects were removed and a new estimation performed; finally, the remaining non-significant variables were removed and the final model estimated. Since OINCVOL exhibited a high Variance Inflation Factor score, it was removed from estimations to avoid multi-colinearity issues.

Table 8
Coefficients and p-values of the duration model

	Upward (i)	Upward (ii)	Downward (i)	Downward (ii)
const	1.967[0.000]	2.327[0.000]	1.640[0.000]	1.930[0.000]
CL	1.728[0.060]		-1.391[0.179]	
MX	1.554[0.093]		0.855[0.409]	
LEV	-1.439[0.000]	-1.687[0.000]	-0.872[0.002]	-0.961[0.000]
SIZE	0.156[0.000]	0.082[0.009]	0.076[0.031]	0.077[0.009]
TANG	0.137[0.656]		0.301[0.303]	
PROFIT	5.562[0.007]	5.285[0.006]	-5.083[0.036]	
M2BOOK	0.070[0.511]		0.357[0.005]	
CASH	-0.797[0.204]		-0.622[0.219]	
INTEREST	-0.076[0.000]	-0.059[0.000]	-0.026[0.002]	-0.030[0.000]
DLEV	-3.261[0.000]	-3.505[0.000]	7.972[0.000]	6.861[0.000]
LUP	0.013[0.913]		-0.271[0.027]	
CL_LEV	-2.679[0.001]		0.968[0.184]	
CL_SIZE	-0.075[0.430]		0.104[0.252]	
CL_TANG	1.653[0.004]		-0.031[0.962]	
CL_PROFIT	13.475[0.032]		8.525[0.041]	
CL_M2BOOK	-1.016[0.000]		0.170[0.640]	
CL_CASH	1.531[0.406]		1.645[0.262]	
CL_INTEREST	-0.073[0.111]		-0.130[0.011]	
CL_DLEV	0.020[0.994]		0.850[0.718]	
CL_LUP	0.181[0.513]		0.393[0.136]	
MX_LEV	-0.897[0.179]		-0.778[0.271]	
MX_SIZE	-0.184[0.053]		0.031[0.731]	
MX_TANG	0.286[0.668]		-0.182[0.816]	
MX_PROFIT	19.367[0.015]		8.088[0.586]	
MX_M2BOOK	-0.680[0.000]		-2.103[0.000]	
MX_CASH	-1.266[0.510]		8.822[0.007]	
MX_INTEREST	0.016[0.447]		0.008[0.705]	
MX_DLEV	-3.922[0.069]		-4.713[0.021]	
MX_LUP	0.476[0.081]		1.134[0.000]	
BR_CRISIS	-0.081[0.494]		0.569[0.006]	
CL_CRISIS	-0.187[0.223]		-0.474[0.004]	
MX_CRISIS	-0.419[0.004]		-0.336[0.083]	
sigma	0.822[0.000]	0.881[0.000]	0.800[0.000]	0.853[0.000]

Source: developed by the author.
Notes: Variables were constructed as described in Chart 2. The first column labels the estimated results and each of the remaining five columns exhibits the coefficients and p-values obtained for upward and downward adjustment models (i – full model, ii – fitted model).

Table 9
Statistics and test results of the duration model

	Upward (i)	Upward (ii)	Downward (i)	Downward (ii)
Avg. dep. var.	5.351	5.351	4.903	4.903
Std. Dev. dep. var.	6.476	6.476	5.348	5.348
Chi-sq.	288.622	209.251	229.101	162.336
Log Likeliness	-702.634	-742.320	-735.014	-768.397
p-value	0.000	0.000	0.000	0.000
Akaike	1.473.268	1.498.639	1.538.028	1.548.794
Hannan-Quinn	1.530.898	1.510.504	1.596.206	1.559.060
Schwarz	1.620.960	1.529.046	1.687.467	1.575.165

Source: developed by the author.
Notes: Variables were constructed as described in Chart 2. The first column labels the statistics and test results for upward and downward adjustment models (i – full model, ii – fitted model).

The coefficients of both country dummies, CL and MX, and of their respective interactions with the remaining parameters are not significant. Such result points

out that Brazilian, Chilean and Mexican firms do not consistently differ in terms of the duration of time intervals in which active capital structure does not take place. In this, we do not find evidence that country idiosyncrasies have considerable influence over managers' pursuit of quasi-optimal leverage ratios within a costly adjustment framework.

Although we are not able to capture country effects through cost proxies, we find evidence that such proxies trigger the rebalancing actions of firms regardless of their countries of origin. The coefficients of LEV, INTEREST and SIZE in the downward adjustment model as well as those of LEV, INTEREST, SIZE and PROFIT in the upward adjustment model are significant within a 95% confidence interval. These results sustain that costly adjustment is able to explain the mechanics of capital structure rebalancing through evidences of critical leverage levels above which increasing debt means a heavier burden than firms are willing to carry.

However, only the signs of the coefficients in the downward adjustment model meet the expected results. Results for the upward adjustment model do not reproduce the predictions of the trade off theory given that the signs of LEV, INTEREST, SIZE and PROFIT are opposite to the expected ones. These findings prompt a review of the model in order to more accurately represent the decision process of managers when faced to costly adjustment. As firms may not follow a strict trade off behavior at all, or at least when their leverage levels are far below the maximum debt capacity, effects predicted by alternative theories should be tested.

Finally, we again isolate the effect of major financial crises through the interactions BR_Crisis, CL_Crisis and MX_Crisis and find that crisis events do not play significant role in the duration of inactive rebalancing periods.

5. Conclusion

Our analyses of firms' leverage ratios detects that Brazilian, Chilean and Mexican firms exhibit dissimilar rebalancing behavior when their countries of origin are controlled. We use two dynamic specifications that model leverage ratio fluctuations under the hypothesis of active capital structure rebalancing: a partial adjustment model and a duration model. In both models we use dummy variables that identify firms' country of origin and their respective interactions with firm-specific determinants.

Results from the partial adjustment model suggest that capital structure is to a certain extent determined by country idiosyncrasies, as well as by firm-specific factors. Sinces leverage ratios are consistently higher for Brazilian firms, followed by Mexican and Chilean firms in this order, we infer that country idiosyncrasies not captured through firm-specific parameters may account for the different behavior. Additionally, analyses of the coefficients of firm-specific factors and their interactions with country dummies suggest that country idiosyncrasies have impact in the way firm characteristics contribute to the capital structure behavior. Evidence supporting the trade off firms in our sample is not found, however further investi-

gation on countries' economic, institutional and social environments may ascertain the validity of trade off or other major capital structure theories such as the pecking order.

Results from the duration model do not provide evidence that country idiosyncrasies have significant impact over firms' active rebalancing toward target leverage ratios, given that Brazilian, Chilean and Mexican firms do not consistently differ in terms of the duration of time intervals without major capital structure changes. Nevertheless, we find evidence that firm-specific cost proxies prompt firms' rebalancing action regardless of their countries of origin. A major setback is that just the downward adjustment model functions according to the predictions as the upward adjustment model provides results opposite to our expectations This leads us to conclude that the specification does not approximate the decision process of managers when faced to costly adjustment and that additional factors may be considered in the model.

In summary, our paper relates findings in favor of the relevance of country idiosyncrasies as determinants of capital structure. Limitations of our work are the probable sample bias due to the fact that our database is composed of publicly listed companies, a restricted number of countries of origin and the limited timeframe of panel observations. We encourage future research to encompass other countries such as Argentina, Colombia and Peru in the analysis, as well as to expand the scope of this work to a greater number of companies in a wider timeframe.

We contributed to the efforts of Joeveer (2006), Cheng & Shiu (2007) and Bastos *et al.* (2009) by further developing the dynamic perspective in the analysis of capital structure divergences and expect future research to develop novel approaches that expound how institutional, macroeconomic and other country specific factors shape the capital structure of Latin American firms.

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