COST STICKINESS IN LATIN AMERICAN OPEN COMPANIES FROM 1997 TO 2012

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Abstract

This study aims to analyze whether open company costs in Latin America countries do vary asymmetrically. We used a 669 open companies sample in nine countries of that region from 1995 to 2012. We applied log linear regressions estimated by Ordinary Least Squares (OLS) for panel data, assembling time series to transversal data (cross-section). The results suggest that the behavior of selling, general and administrative (SGA) expenses is asymmetric with respect to changes in sales revenue (SR). This research shows that on average, when sales revenue increases by 1%, SGA 0.56% increase, but when the SR decreases by 1%, SGA decrease only 0.45%. The study confirmed the hypothesis of a possible reversal of the asymmetry when considering lags. However, this asymmetry seems to decrease when considering longer than one year. The results partially corroborate the results of the research of Anderson et al. (2003) performed with U.S. companies; He, Teruya and Shimizu (2010) who analyzed Japanese companies, and Costa, Medeiros and Silva (2005) that investigated Brazilian companies.

Keywords: Sticky costs, Latin America, panel data

Introduction

Three characteristics define traditionally cost behavior: they are proportional to the activity level; they can be fixed or variable concerning activity volume; it is asymmetrical the relationship between cost and activity volume (Noreen & Soderstrom, 1994). However, empiric studies on cost behavior (Brasch, 1927, Anderson, Banker, & Janakiraman, 2003, Costa, Medeiros & Silva, 2005, Balakrishnan & Gruca, 2008, He, Teruya, & Shimizu, 2010, Banker, Byzalov & Chen, 2013) suggest an asymmetrical variation on costs related to activity volume. In other words, the magnitude of in the cost increase changes is greater than the magnitude of this variation equivalent to a reduction of revenue. A company with sticky costs shows a greater drop in income when their activity level drops when compared with companies with less sticky costs (Weiss, 2010, Guenther, Riehe, & Röbler, 2013).

Cost asymmetrical behavior is consistent to the argument that managers tend to adjust deliberately their resources as an answer to activity volume changes (Anderson et al., 2003). These authors identified that with selling reduction, managers tend to purposely delay the decision to reduce costs and expenses until they have greater certainty about the permanence of the decline in demand, keeping unused resources to avoid personal consequences when the retrenchment. Moreover, there may be a time gap between the cost reduction decision and achieving reduction.

Asymmetry hypothesis was confirmed for samples formed by companies in the United States (Anderson et al., 2003), in Brazil (Costa et al., 2005); in the United States, England,

France and Germany (Calleja, Steliaros, & Thomas, 2006), in Japan (He et al., 2010), in Germany, Australia, Austria, Belgium, Canada, Denmark, Finland, France, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States of America (Banker et al., 2013), among some others. The legal system of the origin countries of these open companies can influence the magnitude of this asymmetry. For example, Calleja et al. (2006) and Steliaros and Thomas (2006) found that the variation in costs in France and Germany (country code-law regime) is more asymmetric than the variation in costs in England and the United States (countries of common arrangements law).

This cost variation is defined not only in function of the selling volume, because some other factors are determinant in its formation, such as: the location and size of the company, management incentives, corporate governance level, timing, macroeconomic factors, institutional factors, the legal system of the country of origin of the company, among others (Calleja et al., 2006, Banker & Chen, 2006, Baumgarten, Bonenkamp, & Homburg, 2010, Weiss, 2010; Chen, Lu, & Sougiannis 2012).

Via Dalla and Perego (2012) analyzed Italian companies not listed in micro and macro level including specific business characteristics, magnitude of activity, performance sector. They Adapted to both the base model to analyze the asymmetric behavior of the proposed by Anderson et al. (2003) costs. The survey results suggest the absence of sticky costs in the Italian context behavior, corroborating the traditional literature that defines the behavior of costs as symmetric.

Thus, the research problem arises as follows: do the Latin America company costs vary asymmetrically? This study aims to analyze whether the costs of Latin America open companies do vary asymmetrically. We used the methodology proposed by Anderson et al. (2003) in order to verify cost stickiness in panel data and log linear regressions estimated by OLS (Ordinary Least Squares). The sample consists of 669 public companies from nine countries in Latin America, from 1995 to 2012

This research aims to analyze the asymmetry of costs, but will only examine the variation in selling, general and administrative (SGA) expenses in relation to the sale level. According to Chen et al. (2012), these expenses represent a significant portion of the cost of business operations and they are aligned with management interests and are susceptible to manipulations from corporate governance.

Knowing cost behavior is essential for an efficient management in a company (Anderson et al., 2003). This is because many management decisions are based on knowledge of cost behavior in relation to the activity level in the company (Costa et al., 2005). Thus, the results of this research can be useful for practicing managers, shareholders, investors, analysts and especially for allowing the reduction of agency conflicts. Furthermore, this research can contribute to the overall literature on standard costs. Costa et al. (2006) argue that researches that contributes to understand the economic environment of the jurisdictions are required, as they bring out the similarities and differences between these countries, assisting in understanding this new globalized reality

These surveys become important also in Latin America countries, because they have many common characteristics: the legal framework of the countries based on the code-law legal system, strong regulatory accounting exerted by governments, ownership structure based on stakeholder's system, without accounting profession prestige, strong impact of tax laws on accounting, funding provided mainly by financial institutions (Costa et al., 2006). Among studies on symmetric costs we did not identify any comparative study on this behavior in Latin America countries, which have besides those characteristic have several blocks of economic integration, such as Latin America Integration Association (LAIA), Mercosul – South Common Market and Andean Community.

This paper has six sections. After this introduction we present the literature review on cost behavior, Third section shows the search hypothesis; the fourth one describes the study methodology; the fifth one present the results the last one the conclusions.

Cost Behavior

Studies on cost behavior are relevant to scholars, academicals and every professional involved in management activities (Oliveira, Lustosa, & Sales, 2007). These professionals make decisions which require knowing cost behavior related to the activity level. (Costa et al., 2005). Garrison and Noreen (2001) state that management decisions made without knowing cost and their behavior can lead the company to insolvency.

Cost behavior is used to describe how this resource responds to changes in activity level (Garrison & Noreen, 2001). According to Anderson et al. (2003), managers handle the increasing volume of expenses in that increased sales. However, when the volume of sales decreases, managers assess the possibility of such sales decline is temporary, opting to keep costs rather than incur adjustment costs.

These managers decisions to maintain the same level of costs can also be caused by personal interests, resulting in a form of agency costs (Anderson et al., 2003). Jensen and Meckling (2008) define agency costs as the expenses incurred by the company caused by decisions of calculating managers who seek to maximize their personal utility, without taking into account the interests of shareholders. These administrators can keep unnecessary expenses to avoid personal consequences of containment, such as loss of status when the company is lowered, or the anguish of firing employees, contributing to the asymmetric cost behavior.

The cost stickiness occurs when managers decide to keep idle rather than adjusting the cost resources when there is a decrease in sales volume (Anderson et al., 2003). The reasons that lead managers to incur stickiness of costs are listed by Anderson et al. (2003): the agency costs that occur when the manager makes decisions according to their personal well-being, psychological adjustment costs that occur with layoffs, causing negative impact on the image of the administrator, and the need of time to confirm the reduction in market demand and, consequently, the volume of business activity.

Anderson et al. (2003) analyzed industrial firms in the United States, where the main variables used were: selling expenses, general and administrative (SGA) and net sales. The authors found the prevalence of sticky costs for SGA behavior, showing the importance of managers in adapting resources in response to changes in market demand, while reducing the level of activities that utilize these resources

The results of the research developed by Costa et al. (2005) corroborate partially the findings of Anderson et al. (2003). The Brazilian open companies that comprised the sample of this study showed an asymmetric elasticity of costs in relation to revenue and this asymmetry is partially reversed over time, corroborating the hypothesis of cost stickiness. However, these authors did not confirm the hypothesis that the asymmetry observed reduced over the years, justifying this as being possibly caused by more rigid labor laws applied to Brazilian companies. Countries with a more rigid (code-law) legislation may have a degree of asymmetry of the steeper costs (Banker et al., 2013).

In Japan, public companies also showed an asymmetrical relationship of costs (He et al., 2010). Despite the Japanese labor laws do not be as rigid as the layoffs, the decision to fire the employees takes time, since managers tend to wait for confirmation of permanent demand reduction to reduce costs (He et al., 2010). To these authors, the asymmetrical behavior may be justified for two main facts: 1) managers believe that the market reacts negatively to a reduction of costs, 2) the image of managers may be compromised in the face of reduced expenses with hand labor. This attitude can be characterized with a conflict of agency, since the manager favors personal interest. Nonetheless, not only would the agency theory a

possible explanation for this fact. To Banker et al. (2013), a possible explanation for the asymmetrical behavior of costs in relation to revenue would be the economic theory of optimizing the decision, stating the search managers for a great decision on the adjustment costs. Managers can also have great conviction future demands, and the decision not to "cut" the excess costs in preparation for these future increases in activity level (He et al., 2010).

Kama and Weiss (2013) show that agency theory can be adjusted by smoothing cost stickiness. Encouraging managers to align their personal goals with the institution can be considered a technical maneuver in designing Kama and Weiss (2013), since the incentives for optimization of results, as subsidies, driving managers to achieve the goals and defined objectives. Thus, the company can minimize the agency conflict, providing also the reduction of the asymmetry between the costs.

We emphasize that manager influence is related to expectations on future demands for their products (Anderson et al., 2003, He et al., 2010, Kama & Weiss, 2013). This is due to the decision makers in maintaining or not the surplus spent, material, labor, and other elements of the production process, the time of these decisions reduction may be related. For Kama and Weiss (2013) the results show that when future sales expectations are perceived by managers as more "pessimistic" a reduction is observed in the asymmetry of costs, since there is a more immediate reduction in production costs to reduced revenues. In the opposite situation, managers are "optimistic" about the future market behavior and even with the drop in revenue, they tend to keep the costs of production for a longer period, thus boosting the asymmetry of costs.

Hypothesis

Following the model proposed by Anderson et al. (2003), which was adapted by Costa et al. (2005) for the investigation of sticky costs, four hypotheses will be tested in this research. The first one is that cost behavior is asymmetric in relation to revenue. This may be caused by the fact that changes in the volume of sales are not accompanied by the managers' decision making, suggesting that weak demand variation does not lead to a decision to reduce or increase the immediate costs by managers (Costa et al., 2005). Thus, our first hypothesis is that:

H1: The magnitude of the increase in SGA expenses due to increased sales in publicly held companies in Latin America in the period 1997 to 2012 was greater than the magnitude of its reduction in case of falling sales in the same period

The considered divergence between the reduction or increase of costs against the behavior of increase or decrease in income, may also be linked to other reasons such as agency conflict, which may be indicated in this case because the managers have a concern about your image social, in order that a wrong decision may over time prove the most appropriate, impairing its performance. As shown by Anderson et al. (2003) and Costa et al. (2005), changes in demand can be something momentary. In this case, a wrong decision could incur higher costs, since the reversal of the situation may or may not occur quickly.

The temporal question then is another item that should be checked when it is expected to make the analysis of a single period alone does not take into account the adjustment costs in relation to the variation of the amount of revenues that are more permanently, thus these conditions the asymmetry tends to be more conspicuous. In order to evaluate this presupposition, we formulate the second hypothesis:

H2: The level of asymmetry of SGA expenses in publicly held companies in Latin America in the period 1997-2012 is mitigated with the aggregation of periods

The equalization of costs to fluctuations in sales volume cannot be limited to the contemporary environment, but still lagged way, i.e., the expectation is that cost stickiness is reduced when it is observed in lag of one period. With the intention to test this has been the third hypothesis:

H3: The investigated Public companies in Latin America underwent adjustment of expenditure SGA regarding changes of sales.

When managers note the occurrence of a variation in sale volume they tend to wait for a final decision regarding cost variation. Labor laws rigidity can also hamper efforts to minimize costs given the decline in the level of activities, resulting in cost stickiness. Considering the possible delay in decision making cost reduction on the reduction in the volume of activities, the stickiness observed in one period may be reversed in subsequent periods. Thus we formulate the fourth hypothesis to be checked for this search:

H4: Public companies from Latin America revert the cost stickiness in subsequent periods.

Methods

This is a descriptive quantitative research using the methodology developed by Anderson et al. (2003) to measure cost stickiness. This methodology involves log-linear regressions estimated by Ordinary Least Squares (OLS) for panel data, assembling temporal series to transversal data (cross-section). To ensure the robustness of this research results were tested three types of models for panel data: the constant coefficient (pooled), the fixed effects) and random effects (random effects). As the sample involves a variety of different industries and sizes of companies, the log-linear specification improves the comparability of variables between firms and reduces the potential for heteroskedasticity (Anderson et al., 2003).

Anderson et al.'s methodology (2003), used in this study, was effective in identifying cost stickiness to revenue for U.S. companies. The work carried out by Costa et al. (2005) with Brazilian companies also demonstrated that the model is effective to measure the sticky costs. Later, other authors have also confirmed the effectiveness of this methodology for the measurement of sticky costs (Calleja et al., 2006, He et al., 2010, Kama & Weiss, 2013).

Models I and II, developed by Anderson et al. (2003) to assess asymmetry costs are shown in Equations 1 and 2, respectively.

$$log\left[\frac{VGA_{i,t}}{VGA_{i,t-1}}\right] = \beta_0 + \beta_1 \, log\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] + \beta_2 Dummy_{t-1} * log\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] + \varepsilon_{it} \quad \text{(Eq.1)}$$

$$log\left[\frac{VGA_{i,t}}{VGA_{i,t-1}}\right] = \beta_0 + \beta_1 \, log\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] + \beta_2 Dummy_{t-1} * log\left[\frac{RLV_{i,t}}{RLV_{i,t-1}}\right] +$$
$$\beta_3 \, log\left[\frac{RLV_{i,t-1}}{RLV_{i,t-2}}\right] + \beta_4 Dummy_{i,t-1} * log\left[\frac{RLV_{i,t-1}}{RLV_{i,t-2}}\right] + \varepsilon_{i,t} \quad \text{(Eq.2)}$$

Dummy variable assumes value 1 when the sale liquid revenue (SLR) decreases between t and t-1 periods, and zero when the contrary happens. β1 coefficient measures the percent change, sale, general and administrative expenses (SGA) with an increase of 1% in SLR. The sum of β1 and β2 coefficients results in percentage change in VGA with a 1% reduction in RLV. For the first research hypothesis (H1) is not rejected, the coefficient β1 must be greater than zero and the coefficient β2 should be significantly less than zero.

To test the second research hypothesis (H2), that stickiness cost of public companies from Latin America decline with the aggregation of periods, the model I regressions were estimated for aggregate periods of 1, 2, 3 and 4 years.

Model II (Equation 2) is used to test the third and the fourth hypotheses. The coefficient β3 indicates the lagged effect of the variation in costs of revenues (H3). It is expected that this coefficient is significant and positive. The coefficient β4 measures the reversal of asymmetric costs in subsequent periods (H4).

The conditions for the research hypotheses are not rejected are summarized in Table 1

Table 1: Conditions for not rejecting hypothesis

Hipothesis	Expected effect
H_1	$\beta_1 > 0, \beta_2 < 0, \beta_1 + \beta_2 < 1$
H_2	β_2 decreases in absolute value with the aggregation of years per
H_3	$\beta_3 > 0$
H_4	$\beta_4 > 0, \beta_4 < |\beta_2|$

Source: Costa et al. (2005)

To test the research hypotheses we used a set of unbalanced panel data of listed companies in nine countries in Latin America (Argentina, Brazil, Chile, Colombia, Costa Rica, Jamaica, Mexico, Peru, Venezuela) with available data on the basis of Thompson Reuters data for the period 1995-2012 (Table 2).

Table 2: Countries, company and observation amount

Country	Acronym	Company	Observation
Argentina	ARG	56	896
Brazil	BRA	225	3.600
Chile	CHL	130	2.080
Colombia	COL	45	720
Costa	CRI	3	48
Jamaica	JAM	17	272
Mexico	MEX	81	1.296
Peru	PER	92	1.472
Venezuela	VEM	20	320
Amount		669	10.704

Source: Elaborated by the searchers

Initially, this database had 1,364 listed companies located in Latin America, and only 868 had data for net sales and selling, general and administrative disclosed for the period of study. We excluded companies that did not have data in at least eight years of the time horizon of the study, resulting in a sample of 669 companies and 12,042 data. We also excluded the observations in 1995 and 1996, because they were used only for calculating lagged variables, resulting in a final sample of 10,704 observations and 669 public companies. Due to the different currencies of each country in the sample, data were collected in U.S. dollars. Thus, the research sample consists of listed companies of Latin America accounting information disclosed in that currency.

Results and Discussions

Table 3 presents the descriptive statistics segregated by country component of the sample.

Table 3: Descriptive statistics per country

Country	Variable	Quant.	Average	%	Pattern	Minimum	Median	Maximum
ARG	RLV	731	0,043		0,216	-2,142	0,046	3,113
	VGA	724	0,029	67%	0,198	-1,131	0,038	1,788
BRA	RLV	3.068	0,031		0,189	-2,229	0,040	1,790
	VGA	3.037	0,022	70%	0,186	-1,360	0,029	2,056
CHL	RLV	1.697	0,037		0,219	-2,911	0,042	2,619
	VGA	1.669	0,029		0,223	-2,538	0,033	2,219
COL	RLV	585	0,049		0,208	-0,630	0,041	3,817
	VGA	582	0,031	64%	0,165	-0,820	0,038	1,478
CRI	RLV	32	0,063		0,153	-0,356	0,075	0,317
	VGA	32	0,061		0,163	-0,441	0,041	0,408
JAM	RLV	219	0,017		0,156	-0,923	0,030	0,425
	VGA	218	0,016	93%	0,169	-0,741	0,025	0,569
MEX	RLV	999	0,036		0,285	-3,726	0,044	3,074
	VGA	991	0,027		0,223	-2,438	0,033	2,278
PER	RLV	1.209	0,031		0,190	-1,183	0,035	1,442
	VGA	1.204	0,024	79%	0,186	-1,340	0,028	2,172
VEM	RLV	305	0,033		0,119	-0,379	0,034	0,691
	VGA	305	0,026	77%	0,136	-0,448	0,036	0,544
América	RLV	8.845	0,035		0,209	-3,726	0,040	3,817

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Latina	VGA	8.762	0,025	73%	0,196		-2,538	0,031	2,278

Source: Elaborated by the searchers

   The total valid for the variable 'net sales' (SRV) observations is 8,845, whereas the Latin American region, and 8,762 for the variable 'selling, general and administrative' (SGA). Brazil is the country with the largest number of observations in the sample (3,068 to 3,037 for SRV and SGA). On the opposite side is Costa Rica with 32 observations for SRV variation of listed companies in Latin America averaged 0.035, i.e. the SRV increased on average 3.5% from 1995 to 2012. This variable has a median of 0.040, close to the average value of 0.035, which suggests that the average is not affected by extremely high or low values of SRV (Table 3). The mean change from SGA was 0.025, suggesting that the costs of sales, general and administrative of public companies in Latin America increased by 2.5% on average over the time horizon of the study. The variation of the SGA of the listed companies in Latin America represents 73% of the variation of the SRV. The lowest average SRV was the listed companies of Jamaica (0.017), but the SGA expenses represent 93% of RLV.

Descriptive statistics of the SRV and SGA, segregated by sampling period are presented in Tables 4 and 5, respectively.

Table 4: Descriptive statistics per year SRV

Year	SRV					
	Quant.	Averag	Pattern	Minimum	Median	Maximum
1997	266	0,034	0,176	-1,486	0,027	1,137
1998	337	-0,003	0,168	-1,121	-0,005	1,062
1999	406	-0,038	0,271	-1,345	-0,034	3,817
2000	450	0,041	0,253	-1,169	0,028	3,113
2001	475	-0,015	0,170	-1,778	-0,010	1,089
2002	512	-0,087	0,193	-1,504	-0,052	0,613
2003	550	0,069	0,175	-1,104	0,078	1,196
2004	590	0,090	0,140	-1,372	0,084	1,442
2005	636	0,084	0,186	-2,229	0,082	1,613
2006	648	0,069	0,157	-1,366	0,058	1,146
2007	657	0,088	0,298	-3,726	0,090	3,074
2008	662	0,008	0,155	-0,957	-0,002	1,153
2009	663	0,052	0,189	-0,659	0,051	1,788
2010	665	0,081	0,213	-1,182	0,069	2,619
2011	664	-0,006	0,258	-3,078	0,018	0,899
2012	664	0,016	0,163	-1,094	0,028	1,324
Total	8.845	0,035	0,209	-3,726	0,040	3,817

Source: Elaborated by the searchers

   We noticed that the number of observations for SRV (Table 4) and SGA (Table 5) variables increased over the time horizon of the study. In addition, the mean change in net income and the change in selling, general and administrative expenses are negative for the years 1998, 1999, 2001, 2002, 2011 (2012 only for VGA).

Table 5: Descriptive statistics per year SGA

Year	sGA					
	Quant.	Averag	Pattern	Minimum	Median	Maximum
1997	258	0,036	0,176	-0,814	0,023	1,646
1998	326	-0,002	0,151	-1,128	0,000	0,821
1999	400	-0,041	0,179	-0,869	-0,041	1,478
2000	442	0,016	0,186	-1,001	0,011	1,788
2001	469	-0,003	0,158	-0,905	-0,007	0,949
2002	506	-0,091	0,191	-1,340	-0,068	1,640
2003	541	0,046	0,191	-2,538	0,047	1,150
2004	585	0,070	0,175	-0,536	0,064	2,278
2005	633	0,083	0,163	-1,131	0,072	2,056
2006	647	0,084	0,160	-0,688	0,059	1,690
2007	652	0,087	0,217	-1,186	0,074	1,624
2008	661	0,004	0,178	-1,017	-0,006	2,149
2009	661	0,065	0,160	-1,096	0,063	0,839
2010	659	0,051	0,187	-0,910	0,052	2,219

2011	660	-0,047	0,225	-2,438	-0,007	1,045
2012	662	-0,010	0,254	-1,920	0,020	0,984
Total	8.762	0,025	0,196	-2,538	0,031	2,278

Source: Elaborated by the searchers

Table 6 presents the results of Chow, Lagrange Multiplier (ML) of Brusch and Pagan and Hausman tests for the Latin American sample. The Brusch and Pagan and Chow test suggest that pooled ist he most appropriate model. The Hausman test indicates the model as fixed as appropriate. Thus, the test results show that the model common intercept (pooled) is the most suitable for both the Model I (Equation 1), and for Model II (Equation 2).

Table 6: *Chow*, LM and *Hausman tests*– América Latina

Model	Breusch	and	Hausman		Chow		Suiktable
	Chi2	Prob	Chi2	Prob	Chi2	Prob	specification
I	0,00	1,00	22,90	0,00	0,61	1,00	Pool
II	0,00	1,00	22,81	0,00	0,64	1,00	Pool

Source: Elaborated by the searchers

From the results of Table 6 data, we present the regression results for the three panel data models (pooled, fixed and random), but we will comment only the results of the more suitable, model, pooled. Besides the coefficients and the statistics t, we will present R2, F statistics and the observation number.

The results of estimation of model I (Equation 1), using the constant coefficient (pooled regression) are shown in Table 7. For the Latin America country sample, the significant value of the coefficient $\beta1$ (0.560) indicates that the cost of sales, general and administrative (SGA) increased 0.56% for a 1% increase in sales (SRV). The negative and significant sign of the coefficient $\beta2$ (-0.107) shows that, in a similar way to the United States (Anderson et al., 2003), to Japan (He et al., 2010) and Brazil (Costa et al., 2005), SGA OF Latin America present sticky behavior. The combination of the $\beta1$ and $\beta2$ values (0.560 to 0.107 = 0.453) shows that the SGA decrease only 0.45% for a 1% reduction in SRV. The fact that $\beta1$ and $\beta1$ and $\beta2$ sum to be significantly smaller than 1 shows that the SGA are not proportional to the variations of the recipe. With this result, considering the sample of listed companies in Latin America, the H1 hypothesis SGA asymmetry with respect to variations of the SRV is also not rejected in this study.

Table 7: Model I - Estimate Coeficients (T statistics) – Pooled Regression

	Lat Am	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	0,001	-0,012	0,004	0,002	0,016	-0,010	-0,005	0,005	-0,004	0,003
	(0,59)	(-2,07)	(1,15)	(0,47)	(2,81)	(-0,43)	(-0,39)	(0,83)	(-0,75)	(0,31)
β_1	0,560	0,701	0,427	0,591	0,499	1,016	0,736	0,521	0,709	0,750
	(44,61)	(23,82)	(16,01)	(19,84)	(18,88)	(6,36)	(5,78)	(15,98)	(20,90)	(10,41)
β_2	-0,107	-0,224	-0,091	-0,102	0,291	-0,211	-0,200	-0,494	-0,152	0,065
	(-5,6)	(-4,24)	(-2,28)	(-2,21)	(3,82)	(-0,70)	(-1,15)	(-1,16)	(-2,87)	(0,42)
F	1.926	402,87	268,92	359,45	297,56	46,02	51,00	368,55	437,86	124,91
R	0,307	0,528	0,152	0,303	0,508	0,760	0,322	0,431	0,422	0,453
N	8.701	719	3.013	.655	580	32	218	978	1.201	305

Source: Elaborated by the searchers

Although the results of Chow, Lagrange Multiplier (LM) of Brusch and Pagan and Hausman tests suggest that common intercept model (pooled) is the most suitable for the research sample (Table 6), the results of the estimation of Model I (equation 1), using the fixed effects model, a random effects and are shown in Tables 8 and 9, respectively, for comparison purposes.

Tabela 8: Modelo I - Coeficientes Estimados (estatística t) – *Fixed Efects*

	ALATINA	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	0,001	-0,010	0,004	0,002	0,018	-0,005	-0,002	0,005	-0,006	0,002
	(0,50)	(-1,95)	(0,88)	(0,43)	(3,05)	(-0,20)	(0,11)	(0,81)	(-1,05)	(0,21)
β_1	0,551	0,694	0,420	0,590	0,481	1,053	0,703	0,500	0,725	0,749
	(39,78)	(22,80)	(13,82)	(17,60)	(17,21)	(6,12)	(5,15)	(14,12)	(19,21)	(9,59)
β_2	-0,118	-0,212	-0,115	-0,105	0,318	0,018	-0,127	-0,628	-0,184	0,038
	(-5,36)	(-3,83)	(-2,34)	(-1,95)	(3,95)	(0,05)	(-0,67)	(-1,33)	(-3,06)	(0,22)
F	1.619	377,79	220,12	314,85	259,87	41,24	44,23	285,67	386,71	108,91
R	0,287	0,533	0,137	0,293	0,494	0,753	0,308	0,389	0,411	0,435
N	8.701	719	3.013	1.655	580	32	218	978	1.201	305

Source: Elaborated by the searchers

We noticed that SGA H1 sticky hypothesis regarding variations of the SRV is not rejected using the three models for panel data: pooled (Table 7), fixed (Table 8) and random (Table 9).

SGA H1 stickiness neither is rejected to open companies in Argentina, Brazil, Chile and Peru (Table 7). This is due to the fact that besides the coefficient β1 being positive and significant, the coefficient β2 is negative and significant for these countries. It is noteworthy that the coefficient β1 is positive and significant for all countries in the sample, suggesting that variations in costs are not proportional to revenue changes.

Table 9: Model I – t statistics Estimated Coefficients– *Random Efects*

	ALATINA	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	0,001	-0,011	0,004	0,002	0,016	-0,010	-0,005	0,005	-0,004	0,003
	(0,59)	(-1,37)	(1,15)	(0,47)	(2,78)	(-0,43)	(-0,39)	(0,83)	(-0,75)	(0,31)
β_1	0,560	0,698	0,4273	0,591	0,498	1,016	0,736	0,521	0,709	0,750
	(44,61)	(23,73)	(16,01)	(19,84)	(18,81)	(6,36)	(5,78)	(15,98)	(20,90)	(10,41)
β_2	-0,107	-0,224	-0,091	-0,102	0,292	-0,211	-0,200	-0,049	-0,152	0,065
	(-5,60)	(-4,23)	(-2,28)	(-2,21)	(3,83)	(-0,70)	(-1,15)	(-1,16)	(-2,87)	(0,42)
Wald chi2(2)	3.851	805,8	537,85	718,91	592,65	92,04	102,01	737,09	875,72	249,82
R	0,287	0,533	0,136	0,293	0,494	0,749	0,307	0,389	0,411	0,435
N	8.701	719	3.013	1.655	580	32	218	978	1.201	305

Source: Elaborated by the searchers

H2 Hyphothesis that cost stickiness decreases with period aggregation is rejected according to the results of Model I estimative for multiple periods (Table 10). The signs and significance of the β1 and β2 coefficients estimated for periods of 2, 3 and 4 are similar to those estimated for Model I (one year - Equation 1).

The value of the coefficients β1 and β2 decreases with the aggregation of periods. The combination of these coefficients (β1 + β2) results in an asymmetric variation of 0.45%, 0.42%, 0.42% and 0.39% for periods of 1 year, 2 years, 3 years and 4 years respectively. These results suggest an increase in the SGA stickiness with the aggregation of periods.

Table 10: Model I – Period aggregation

t statistic estimated coefficients			
Pooled			
1 year period	**2 years period**	**3 years period**	**4 years period**
β_0			
(0,59)	(1,02)	(0,62)	(1,48)
β_1			
(44,61)	(26,72)	(23,66)	(20,09)
β_2 -0,107	-0,084	-0,088	-0,079
(-5,60)	(-2,74)	(-2,64)	(-2,20)
F			
N			

Source: Elaborated by the searchers

The rejection of the hypothesis of decreasing asymmetry of VGA open Latin American companies investigated, for 1995-2002 period with period aggregation confirms Costa et al.'s findings (2005) concerning to Brazil. However, it does not confirm those from Anderson et al. (2003) regarding the United States neither those from He et al. (2010) related

to Japan. Costa et al. (2005) suggest greater rigidity of the Brazilian labor legislation as justification for H2 rejection. This justification was also presented by Calleja et al. (2006). For these authors, countries legal system code law (such as Brazil) may have a more pronounced cost stickiness and can take longer to make the decision to reduce costs in the face of reduced revenues. This fact can be explained by these countries present a weak corporate governance system, and a least developed market, which can cause greater agency costs.

Table 11 illustrates the results of estimation of model II (Equation 2) using the pooled regression model (as results of Table 6). The values and significance of the coefficients $\beta 1$ (0.573) and $\beta 2$ (-0.107), for Latin America, are similar to those found in Model I (Table 6). The $\beta 3$ (0.026), positive and significant coefficient suggests an outdated SGA in for a change in the sales effect, corroborating the hypothesis H3. This hypothesis is confirmed in studies carried out by Anderson et al. (2003), concerning to the United States, and that one done by He et al. (2010), in relation to Japan, however, this hypothesis is rejected in Costa et al.'s study (2005), for Brazil. These authors suggest a rigid labor laws in Brazil as justification for this result.

The $\beta 4$ (0.065) coefficient is positive, significant and smaller than the $\beta 2$ coefficient leading to non-rejection of the hypothesis H4 that sticky SGA in Latin American open companies are reversed in subsequent periods (Table 11). This hypothesis is neither rejected by Anderson et al. (2003), He et al. (2010) and Costa et al. (2005).

Table 11: Model II – t statistic estimated coefficients - *Pooled*

	ALATINA	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	-0,001	-0,011	0,002	0,004	-0,013	0,017	-0,012	0,009	-0,009	-0,002
	(-0,54)	(-1,81)	(0,41)	(0,66)	(-1,86)	(0,90)	(-0,81)	(1,28)	(-1,64)	(-0,17)
β_1	0,573	0,676	0,437	0,546	0,840	1,020	0,772	0,456	0,748	0,761
	(39,23)	(21,66)	(14,97)	(17,12)	(16,35)	(8,52)	(5,80)	(9,48)	(20,85)	(10,32)
β_2	-0,107	-0,276	-0,058	0,006	-0,182	0,138	-0,391	0,020	-0,227	0,037
	(-4,97)	(-4,78)	(-1,32)	(0,12)	(-1,86)	(0,58)	(-2,01)	(0,35)	(-3,99)	(0,23)
β_3	0,026	- 0,055	0,104	0,003	0,030	- 0,111	0,050	0,003	0,009	0,582
	(2,58)	(-1,95)	(4,56)	(0,11)	(1,27)	(-1,20)	(0,70)	(0,15)	(0,34)	(0,92)
β_4	0,065	0,061	0,032	0,054	0,060	-0,542	0,090	0,095	0,067	-0,031
	(3,62)	(1,37)	(0,90)	(1,14)	(1,00)	(-2,93)	(0,62)	(2,24)	(1,45)	(-0,30)
F	839	158	141,11	160,67	133,3	48,3	17,65	142,82	201,22	60,4
R	0,293	0,488	0,166	0,297	0,500	0,885	0,262	0,388	0,421	0,456
N	8.096	668	2.818	1.525	539	30	204	907	1.112	293

Source: Elaborated by the searchers

For comparison, Tables 12 and 13 present the results of the estimation of Model II (Eq. 2) using the fixed effects model and random effects respectively.

Table 12 – Modelo II - t statistic estimated coefficients - *Fixed*

	ALATINA	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	-0,001	-0,009	0,001	0,005	-0,010	0,033	-0,008	0,011	-0,012	-0,004
	(-0,54)	(-1,44)	(0,27)	(0,89)	(-1,37)	(1,69)	(-0,51)	(1,62)	(-2,10)	(-0,41)
β_1	0,569	0,665	0,437	0,535	0,814	0,926	0,745	0,409	0,778	0,779
	(35,31)	(20,52)	(13,39)	(14,78)	(14,80)	(7,66)	(5,20)	(7,84)	(19,40)	(9,61)
β_2	-0,121	-0,230	-0,079	0,028	-0,143	0,562	-0,297	0,036	-0,284	-0,027
	(-4,94)	(-3,75)	(-1,52)	(0,50)	(-1,36)	(2,06)	(-1,37)	(0,56)	(-4,38)	(-0,15)
β_3	0,008	- 0,048	0,081	- 0,010	0,029	- 0,028	0,042	- 0,028	0,002	0,054
	(0,77)	(-1,62)	(3,29)	(-0,38)	(1,17)	(-0,26)	(0,54)	(-1,24)	(0,08)	(0,81)
β_4	0,087	0,034	0,063	0,068	0,025	-0,592	0,206	0,129	0,089	-0,012
	(4,53)	(0,74)	(1,65)	(1,34)	(0,39)	(-3,47)	(1,25)	(2,91)	(1,84)	(-0,12)
F	699	151	114	140	114,03	46,95	15,56	105,08	178,9	52,17
R	0,274	0,499	0,150	0,286	0,482	0,891	0,254	0,338	0,413	0,437
N	8.096	668	2.818	1.525	539	30	204	907	1.112	293

Source: Elaborated by the searchers

Table 13: Modelo II - t statistic estimated coefficients - *Random*

	ALATINA	ARG	BRA	CHL	COL	CRI	JAM	MEX	PER	VEM
β_0	-0,001	-0,010	0,002	0,004	-0,012	0,017	-0,012	0,009	-0,009	-0,002
	(-0,54)	(-1,47)	(0,41)	(0,66)	(-1,80)	(0,90)	(-0,81)	(1,28)	(-1,64)	(-0,17)
β_1	0,573	0,673	0,437	0,546	0,839	1,021	0,772	0,456	0,748	0,761
	(39,23)	(21,51)	(14,97)	(17,12)	(16,30)	(8,52)	(5,80)	(9,48)	(20,85)	(10,32)
β_2	-0,107	-0,272	-0,058	0,006	-0,181	0,139	-0,391	0,020	-0,227	0,037
	(-4,97)	(-4,70)	(-1,32)	(0,12)	(-1,85)	(0,58)	(-2,01)	(0,35)	(-3,99)	(0,23)
β_3	0,026	- 0,056	0,104	0,003	0,030	- 0,111	0,050	0,003	0,009	0,058
	(2,58)	(-2,00)	(4,56)	(0,11)	(1,27)	(-1,20)	(0,70)	(0,15)	(0,34)	(0,92)
β_4	0,065	0,057	0,032	0,054	0,059	-0,543	0,090	0,095	0,067	-0,031
	(3,62)	(1,29)	(0,90)	(0,14)	(0,97)	(-2,93)	(0,62)	(2,24)	(1,45)	(-0,30)
Wald chi2(2)	3.356	630	564	643	530,75	193,18	70,61	571,27	804,89	241,58
R	0,273	0,499	0,150	0,286	0,482	0,876	0,251	0,337	0,413	0,437
N	8.096	668	2.818	1.525	539	30	204	907	1.112	293

Source: Elaborated by the searchers

Table 14 shows the results of the hypotheses tested in this study (current column) compared the results found by Anderson et al. (ABJ, 2003), He et al. (HTS 2010) and Costa et al. (CMS, 2005).

Table 14: Result synthesis

	Current	ABJ (2003)	HTS (2010)	CMS (2005)
H1 – SGA stickiness related to SRV	Not	Não é	Não é	Não é
H2 - Cost stickiness decreases with period aggregation	Rejected	Not rejected	Not rejected	Rejected
H3 – SGA lagged setting forth variations of	Not	Not rejected	Not rejected	Rejected
H4 – reversal of SGA stickiness subsequent periods.	Not rejected	Not rejected	Not rejected	Not rejected

Source: Elaborated by the searchers

Conclusion

This research analyzed cost behavior, investigating the existence of cost sticky behavior of listed companies in Latin America. The survey sample consists of 669 public companies from nine countries in the region, from 1995 to 2012.

Our findings highlight the asymmetric cost behavior in relation to changes in sales revenue for the listed countries of Latin America object of study companies. In other words, on average, when the sales revenue (SRV) increases 1%, selling, general and administrative expense (SGA) increased 0.56%, but when the SRV decreases by 1%, SGA decrease only 0.45%. These results are consistent with those found for public companies in the United States, Brazil and Japan found respectively by Anderson et al. (2003), Costa et al. (2005) and He et al. (2010).

Considering specifically the results of the sample of listed companies in Latin America, H1 hypothesis, on cost stickiness in relation to changes in revenue, is confirmed in this study. H2 hypothesis that cost stickiness decreases with addition of periods is rejected since the results show an increase in the asymmetry of the cost of adding periods. A conjecture for the fact that this hypothesis has not been confirmed in this study may be the rigidity of labor laws of code-law countries. H3 hypothesis that there is a lagged adjustment costs in relation to revenue variations, is neither rejected. H4 hypothesis, that stickiness costs are reversed in subsequent years, was confirmed.

The results of this study show the importance of facing the development of new models of analysis of cost behavior scientific research. The inclusion of quantitative methods in cost analysis can assist accountants, shareholders, managers, analysts and other professionals involved in the review process to identify the asymmetric cost behavior, committed to adjusting the level of activities and resources more effectively timing.

Furthermore, monitoring asymmetric costs can reduce agency costs, since the reluctance to adjust resources in response to changes in demand may involve personal considerations.

Latin America currently has about twenty countries, but the sample of this research consists of nine of these countries, which prevents generalization of results. For future research, we suggest to investigate the magnitude of the cost stickiness in relation to contingent factors, such as size, sector, strategy, perceived stage of life cycle and environmental uncertainty as well the intensity level of competition, production technology and technology management. Moreover, it could be relevant to conduct researches to identify factors that could determine the reversion, or not, the asymmetry in lags and also to identify why the asymmetry decreases in costs not exceeding one year.

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