Cash conversion cycle and corporate performance: Evidence from Latin America

Abstract

The study aimed to investigate the relationship between the cash conversion cycle (CCC) and the financial and market performance of firms located in six Latin America (LA) countries: Argentina, Brazil, Colombia, Mexico, and Peru. The analysis period corresponds from 2000 to 2018. The results obtained indicate that the increases in the CCC negatively impact the generation of operating cash flows and long-term investments, and increase financial risk. Other findings suggest that the mechanisms with which the CCC affects the firm's financial performance can provide a satisfactory explanation for its market performance. Thus, the evidence is consistent with the hypothesis that the CCC is a relevant driver of value for the management of working capital in the case of undeveloped or emerging economies.

Keywords: Cash conversion cycle, Working capital, Operating cash flows, Financial risk, Latin America

JEL Classification: G15, G30, G32, G33, G34

1. Introduction

The cash conversion cycle (CCC) is an essential indicator of the efficiency of working capital management since it integrates into a single measure the standard terms of the firm's operating activities (from cash disbursement for the purchase of raw materials to receipt of sales) (Kroes and Manikas, 2014). Chang (2018) and Wang (2019) indicate that the CCC reflects characteristics of the productive and technological process used in the manufacture of products as well as the policies for granting credit to customers and those related to payment by suppliers.

However, the Finance literature does not present a general and unrestricted CCC optimization model in which to maximize the firm's financial performance and, therefore, its market value (Zeidan and Shapir, 2017). Empirical studies on the topic also show quite different results: i) increase in the value of the firm by reducing the CCC- Deloof (2003), Baños-Cabalerro et al. (2012), Altaf (2018); ii) increase in the firm's value by increasing the CCC in some situations: Ng et al. (1999), Wilner

(2000), Afza and Nazir (2008) and; iii) irrelevance of working capital management to the firm's value: Chauhan (2019).

Another relevant issue related to the CCC concerns its use as a component of the operational strategies of firms located in undeveloped or emerging countries. In regions with less economic development, CCC management tends to focus on financial constraints faced by firms (Belghitar and Khan, 2013; Zeidan and Shapir, 2017). Under these conditions, additional investments in working capital and fixed capital compete with each other for a limited amount of financing (Fazzari and Petersen, 1993).

As it is not clear how the CCC can influence the financial performance and market value of firms, especially in the case of less developed markets, the present study investigates this issue from the Latin American (LA) scenario. LA is a region that has historically had low levels of investment productivity; however, a substantial number of LA countries have recently adopted laws and regulations as a way to improve levels of corporate governance, notably concerning property rights of investors (Gaitán et al., 2018). This improvement in the business environment verified in LA has resulted in higher levels of investments in working capital, and that precedes investments in fixed capital (Herrera, 2015).

For the operationalization of the study, the final sample consists of 3,311 data from non-financial companies located in six Latin American countries: Argentina, Brazil, Chile, Colombia, Mexico, and Peru. The analysis period corresponds from 2000 to 2018.

The results obtained employing regressions in dynamic panel data, and the estimates made using the System Generalized Method of Moments (SGMM) indicated an inverse association between the CCC and operating cash flow (OCF[1]). There is evidence that increasing revenues from increments in the CCC causes reductions in the OCF. This revenue growth mechanism, via the CCC, becomes

[1] OCF corresponds to the sum of Net Operating Profit After Taxes (NOPAT) and the depreciation for the period.

quite questionable given that firms in conditions of financial constraints, as seen in LA, substantially depend on resources generated internally to make new investments (Moshirian et al. , 2017; Larkin et al., 2018). The results achieved also suggest that increases in the CCC reduce investments in fixed capital, which tends to reduce growth rates and future economic performance.

Regarding financial risk, the results show a trend of financial imbalance from increases in the CCC. The observed effect is that with the increase in the CCC, investments with permanent characteristics, for example, investments in fixed capital and the working capital requirement, are now financed by a higher amount of short-term liabilities, which can generate lower liquidity levels or even the firm's insolvency. According to Kumar (2004), less developed markets have restrictions on the availability of long-term financing for firms, and the agreed interest rates are out of market equilibrium, that is, investment growth rates are supported, in this case, high-interest rates with short-term maturity. Thus, the elevation of the CCC tends to cause imbalances in the firm's financial structure (Soenen, 1993; Zeidan and Shapir, 2017).

Another critical investigation employed the Path Analysis. This data analysis technique showed that the CCC simultaneously impacts both the operational risk (OCF) and the financial risk of the firm. In turn, there was an indirect effect between CCC and Tobin's Q. It is noteworthy that studies such as the one by Baños-Caballero et al. (2014) and Dary and James Jr. (2019) used Tobin's Q metric to investigate issues related to working capital management and the performance of shares traded on stock exchanges. Also, recent studies have shown that market participants, such as investors, creditors, and investment analysts, pay close attention to OCF (Firth et al., 2016; Barth et al., 2018; Cheng et al., 2020) and financial risk (Aktas et al., 2015; Mutlu, 2020) for decision making.

In general, the results obtained offer several contributions to increase understanding regarding the management of working capital through the CCC. The findings complement the work of Wang (2019) to indicate that firms with high levels of CCC have higher levels of operational (OCF) and financial risks, which can be a plausible explanation for the abnormal returns identified for portfolios with high CCC compared to portfolios with low CCC (CCC spread). However, the results differ from

the work of Chang (2018) in evidencing a robust statistical association between the CCC and measures of financial and market performance for firms located in LA. Chang's (2018) results for LA were only marginal from the statistical point of view. The results found also differ from the studies by Dhole et al. (2019) and Lin and Lin (in press) when verifying only an indirect relationship between CCC and the firm's market value, which brings new perspectives for working capital management.

The study also broadens the scope of the results by including in the analyzes the central LA countries in terms of economic development, which allows a higher generalization of the results in comparison with other studies that carried out such analyzes in a single country in LA, as observed in Almeida and Eid Jr. (2014) and Zeidan and Shapir (2017).

Finally, the results obtained suggest that even with the increase in cash levels seen in LA firms in recent years, as pointed out by Artica et al. (2019)[2], the CCC remains a relevant indicator for the valuation of firms. This result confirms the study by Kieschnick et al. (2013) when considering the evidence obtained on the importance of working capital management in the LA scenario.

The study is divided into five sections. Section 1 refers to this introduction. Section 2 presents the theoretical framework and develops hypotheses. Section 3 concerns the methodological aspects, while Section 4 presents and discusses the results. Section 5 brings conclusions.

2. Literature review and hypotheses development

Investments in net working capital (the sum of accounts receivable and inventories less accounts payable) depend on the CCC (Baños-Cabalerro et al., in press). In this way, firms can free up more cash for their operational activities and to make new investments based on CCC management (Zeidan and Shapir, 2017).

The proper management of the CCC goes through quite complex issues. For example, Bougheas et al. (2009) indicate that inventory levels influence the magnitude of credits granted to customers.

[2] According to Artica et al. (2019), the growth of cash levels for LA firms is mainly due to precautionary reasons against financial constraints, exchange rate risks, and volatility of the macroeconomic indicators.

However, there was no evidence of an effect between inventories and accounts payable to suppliers. The high costs of inventories (maintenance costs, ordering costs, financial costs, and operating costs) would create incentives for increases in accounts receivable from customers.

Other issues are also directly or indirectly related to CCC management: suppliers capture information on firms' cash gaps (hypothesis of informational advantage) in a more timely manner compared to financial institutions, which implies that the granting of credits by suppliers reveals essential information about the firm's financial and economic position (Giannetti et al., 2011); firms with restrictions on raising external resources demand higher levels of credit with suppliers (Biais and Gollier, 1997); managers can increase firms' profitability by reducing the number of days of accounts receivable and inventories to a reasonable minimum. The negative association verified between suppliers' credits and profitability measures indicates that less profitable firms postpone the payment of suppliers (Deloof, 2003).

Specifically for undeveloped or emerging economies, as in the case of LA, the CCC management brings relevant information about the firm's operational strategies (Zeidan and Shapir, 2017), since the firms are inserted in an environment with severe restrictions access to external resources (Moshirian et al., 2017; Larkin et al., 2018). Also, working capital in such economies translates into a kind of substitute for cash, due to the low levels of protection of investors' property rights (Opler et al., 1999). For example, managers or controllers can extract wealth from the firm by improperly converting working capital into cash; however, the rights of other stakeholders are not fully guaranteed by specific laws or regulations (Pinkowitz et al., 2006; Dittmar and Marth- Smith, 2007).

Therefore, if investments in working capital for firms located in less developed economies are systematically out of a precise balance (under or overinvestment), as a way of circumventing external financing restrictions and concerning issues related to a low level of corporate governance, greater efficiency in working capital management and, in turn, the CCC would have economic consequences

for OCF levels and the firm's capital structure (financial risk). For the case of the relationship between the CCC and the OCF, the following hypotheses were established in its alternative form:

$H_{1,1}$: the increase in CCC reduces the firm's OCF (negative association).

$H_{1,2}$: sales growth through higher levels of CCC reduces the firm's OCF.

Hypothesis $H_{1,1}$ assumes that the reduction of the CCC frees working capital resources for use in other types of investments that will provide higher levels of profitability, as proposed by Ek and Guerin (2011), Zeidan and Shapir (2017), Wang (2019), and Baños-Cabalerro et al. (in press). The innovation brought by Hypothesis $H_{1,1}$ in comparison with other studies is that it considers a measure of the firm's potential to generate cash flows (OCF), instead of intrinsically accounting measures such as Return on Assets (ROA) or Return on Equity (ROE). The metrics associated with the generation of cash flows tend to have higher informational value compared to the metrics of profits when considering countries with low levels of protection to the property rights of investors (Hung, 2001; Miranda-Lopez and Nichols, 2012).

Sales growth is another relevant factor in the decisions for additional working capital investments (Hill et al., 2010). For example, minimizing CCC without decreasing the potential for sales growth increases the profitability of working capital investments and also tends to affect the firm's total profitability (Zeidan and Shapir, 2017). Following this same line of argument, Hypothesis $H_{1,2}$ considers that one of the possible strategies for the growth of the firm's revenues is due to the increase in the CCC, mainly through the greater granting of credits or longer payment terms; however, such a strategy would result in lower levels of OCF.

A possible implication of the reduction in OCF due to increases in the CCC (Hypotheses $H_{1,1}$ and $H_{1,2}$) is related to investments in fixed capital (CAPEX). In non-developed or emerging countries, there is a significant dependence on the internal generation of cash flows for the achievement of long-term investments (Moshirian et al., 2017; Larkin et al., 2018). Chowdhury et al. (2016) point out that market imperfections (informational asymmetries and agency costs) tend to increase external financing costs compared to the costs of internal resource generation, which partially explains the

relationship between cash flows and long-term investments, since was assumed that firms face, to a greater or lesser extent, budget constraints. Based on these considerations, Hypothesis $H_{1,3}$ was established, defined below in its alternative form.

$H_{1,3}$**:** the increase in the CCC reduces the firm's OCF, which implies lower levels of long-term investments (CAPEX).

To examine the relationship between the CCC and the firm's capital structure, the following hypothesis was established in its alternative form:

$H_{2,1}$: the increase in CCC results in higher financial risk.

The Hypothesis $H_{2,1}$ tests whether the increase in CCC is associated with higher levels of financing through short-term debt, which increases financial risk. The use of short-term debt in the firm's capital structure intensively increases the risk of refinancing as well as the risk of the agreed interest rate. Under these conditions, only firms with greater flexibility and better financial position can finance their activities with short-term debt (Jun and Jen, 2003).

However, unlike Chang (2018) and Wang (2019)[3], the investigation of hypothesis $H_{2,1}$ took into account that the firm's investments (working capital and fixed capital) are affected by increases in the CCC. This effect occurs basically for two reasons: i) investment in working capital and fixed capital compete with each other for a limited amount of resources (Fazzari and Petersen, 1993); and ii) in LA there is a critical constraint about the availability of long-term financing lines to achieve investments of the same maturity (long term). The scarcity of long-term resources in LA countries derives mainly from the low levels of capital market development (Chong and Lopez-De-Silanes, 2007).

Finally, it was tested whether CCC affects the market value of LA firms. This hypothesis is presented below in its alternative form.

[3] Chang (2018) and Wang (2019) did not consider a possible effect of the CCC on the capital structure from the firm's total investment (working capital and fixed capital).

$H_{3,1}$: The increase in the CCC indirectly impacts the firm's market value through OCF and financial risk.

The Hypothesis $H_{3,1}$ brings important innovations in comparison with other studies, such as the one by Baños-Caballero et al. (in press), Chang (2018), Wang (2019), Zeidan and Shapir (2017), concerning how the CCC is related to the firms' market value. Hypothesis $H_{3,1}$ assumes that, to a greater or lesser degree, CCC implies changes in the market value of firms because it affects cash flow generation (Hypotheses $H_{1,1}$, $H_{1,2}$, and $H_{1,3}$) and financial risk (Hypothesis $H_{2,1}$). Thus, the indirect mechanism with which the CCC influences the market value of firms is related to the primary inputs within an evaluation process (cash flows and cost of capital) (Damodaran, 2001).

3. Methodological aspects

3.1. Data collection and sample

The data used in the study were collected from annual bases of the Thomson Reuters™ information system. All data collected is in nominal US dollars. The data were also adjusted for earnings of any nature as a way to avoid the discontinuity of the financial series.

The analysis period covers from 2000 to 2018, which corresponds to 19 years. Company data and market information are quite limited when considering periods before 2000 in the LA scenario. However, empirical studies such as that of Chang (2018) and Herrera (2015) suggest that a period of 19 years is quite adequate in investigating issues related to working capital management in LA.

For the formation of the sample, information was selected from companies located in six LA countries: Argentina, Brazil, Chile, Colombia, Mexico, and Peru. According to Sensoy (2016), Brazil, Chile, and Mexico can be classified as "Advanced Emerging Countries" (AEC). The other countries in the sample, Argentina, Colombia, and Peru, show less economic development. Furthermore, data from the International Monetary Fund (IMF) attest that only the six countries that make up the sample

were responsible for almost 90% of all the Gross Domestic Product (GDP)[4] generated in LA in 2018, which reflects a greater dynamism of the firm's investments for that particular region.

Procedures were adopted to exclude data from the sample: i) exclusion of data from the financial sector; ii) exclusion of data referring to periods with missing data for carrying out econometric and statistical tests; iii) exclusion of data from companies that presented negative equity for a given period (the results are based on the assumption of business continuity - going concern); iv) procedure of winsorization of variables (1st and 99th percentiles) as a form of treatment extreme observations.

After the procedures adopted for data exclusion, the sample size is quite comparable with other studies. For example, Nam and Uchida (2019) used data from forty countries to form the sample. For the specific case of LA, information about Chile, Mexico, and Peru was used. The total number of observations was 892, 684, and 504, respectively. Another comparable study regarding the sample size for LA countries can be seen in Baños-Caballero et al. (in press). As a result, it is expected that the final sample will bring relevant information on working capital management in the LA scenario and from there on that the results obtained can also be compared with other studies. Table 1 shows the sample composition.

Table 1

Sample composition. This table provides information on the total number of firms, observations, and frequencies in relation to the countries that integrate the sample.

Countries	Number of Firms	Valid Observations	Frequency
Argentina	43	391	11.81%
Brazil	141	966	29.18%

[4] The information available at: https://www.imf.org/en/News/Articles/2018/05/10/NA051118-Latin-America-and-Caribbean-Seizing-the-Momentum

Chile	98	718	21.69%
Colombia	25	88	2.66%
Mexico	84	595	17.97%
Peru	76	553	16.70%
Total	467	3,311	100.00%

The sample is mainly composed of information from Brazil, Chile, and Mexico (AEC), totaling 68.84% of the observations. Peru and Argentina account for 28.51% of the observations. Colombia was the country with the smallest number of data in the sample, totaling only 2.66% of the observations.

3.2. Econometric models

3.2.1. Measurement of CCC and regression models

Following Chang (2018) and Wang (2019), CCC[5] is calculated as follows:

$$CCC_{it} = 365 * \left(\frac{Avg.Inventories_{it}}{COGS_{it}} + \frac{Avg.Accounts\ Receivables_{it}}{Sales_{it}} - \frac{Avg.Accounts\ Payables_{it}}{COGS_{it}}\right) \quad (1)$$

Where inventories, accounts receivables, and accounts payables were calculated from their average values for firm i in period t. $COGS_{it}$ refers to the cost of goods sold to firm i in period t. $Sales_{it}$ represents the net sales for firm i in period t. Subsequently, the CCC variable was scaled by a factor equal to 1000. This procedure enabled the scale of the CCC variable to be comparable with the other variables[6].

For conducting the regression analysis, a dynamic panel model was used with the estimates made from the System Generalized Method of Moments (SGMM) (Blundell and Bond, 1998). Two-step estimation was also used, which tends to be more efficient for the System GMM approach (Newey and Smith, 2004). To check the adequacy of these types of econometric models, the Hansen

[5] Appendix A presents the description and theoretical basis for the variables.

[6] This procedure of transforming the scale of the CCC variable did not affect the results qualitatively. Furthermore, the same procedure can be seen in Boisjoly et al. (2020).

test and the AR (2) test were performed as a way to identify the exogeneity of the instruments (overidentifying restrictions) and the autocorrelation of residues, respectively (Wooldridge, 2010).

The use of SGMM was intended to mitigate possible problems of endogeny, which can bias the inference process (Arellano and Bond, 1991; Arellano and Bover, 1995; Blundell and Bond, 1998). Endogeneity problems can be verified when a given independent variable (x) is correlated with the error term (ε). The causes of this non-exogeneity between x and ε can be explained by the omission of relevant variables in econometric modeling, in the measurement errors of the regressors and the simultaneous determination of the variables. The most effective way to get around this issue of endogeneity is the development of instrumental variables, that is, variables correlated with the regressor (x), but not correlated with the error term. For the SGMM, instrumental variables refer to lagged independent variables (Roodman, 2009; Wooldridge, 2010).

The application of SGMM in panel data regressions also involves assumptions about the data-generating process (Roodman, 2009). These assumptions are detailed below and are associated with characteristics of the econometric modeling proposed by the study.

i) the data-generating process is dynamic: Ding et al. (2013), Mun and Jang (2015) and Chang (2018) suggest that the econometric models that investigate issues related to working capital and that employ as a dependent metric variable related to the firm's performance, such as ROA, demonstrate that the current realization of this variable is influenced by its past values. In this sense, it is expected that the data-generating process for the case of the firm's operating cash flows, investments in fixed capital and financial risk will also be dynamic;

ii) some regressors are endogenous: Baños-Caballero et al. (2010) point out that it is crucial to mitigate issues that involve endogeny in the studies that link the CCC with the firm's performance metrics;

iii) instrumental variables are internal to the model: studies in corporate finance hardly find instrumental variables exogenous and different from the endogenous regressor (instrumental variables external to the original model) (Black et al., 2006);

iv) reduced temporal dimension: The study sample has a small temporal dimension (T = 19) compared to the size of the analyzed firms (N = 467).

From the considerations made about the SGMM, model 2 was established, as follows:

$$\frac{OCF_{it}}{Total\_Assets_{it-1}} = \alpha + \beta_1 Lag\left(\frac{OCF_{it}}{Total\_Assets_{it-1}}\right) + \beta_2 OCF\_Loss_{it} + \beta_3 CCC_{it} + \beta_4 G\_Sales_{it} +$$

$$\beta_5 CCC_{it}\ X\ G\_Sales_{it} + \beta_6 Ln\_TotalAssets_{it} + \beta_7 OperatingLeverage_{it} + s_i + c_i + \phi_t + \varepsilon_t \quad (2)$$

Where the variable OCF_{it} was calculated from the sum between the Net Operating Profit After Taxes (NOPAT) and the depreciation of the period for firm i in period t. This variable was staggered by the total assets for firm i in period t-1 (total assets lagged in one period), as suggested by Chauhan and Kumar (2018). What is expected with the modeling of the dependent variable (model 2) is that it will be able to capture the potential of firms to generate operating cash flows, which represents one of the main informational inputs within an assessment process of the firms (Damodaran, 2001).

The lagged value for the dependent variable $Lag\left(\frac{OCF_{it}}{Total\_Assets_{it-1}}\right)$ sought to control the results by the temporal dynamics of realization of the firm's operating cash flows. The importance of this type of control in econometric modeling falls on the cycles of growth and economic stagnation observed in LA since the beginning of the 21st century, which have affected the economic and financial performance of firms (Brenes et al., 2016).

OCF_Loss_{it} represents a dichotomous variable. Assumes a value of 1 under the condition that firm i in period t has a negative OCF. Assumes a value equal to 0 for the other observations (positive OCF). In this sense, the results obtained were controlled to the periods in which the operating cash flow generation for a given firm was not able to support the investment needs (fixed capital and working capital).

The CCC_{it} variable was calculated according to formulation 1. G_Sales_{it} represents the percentage change in sales about period t and t-1. According to the accelerator model of investment, sales growth is an essential driver of corporate investments (Fazzari et al., 1988) and, in this sense, an indicator of the firm's cash flow generation. $Ln\_TotalAssets_{it}$ refers to the Neperian logarithm of

total assets for firm i in period t. $OperatingLeverage_{it}$ represents the operating leverage of firm i in period t. This variable was calculated by the ratio between the percentage change in operating profit (EBIT) and the percentage change in sales, as suggested by Damodaran (2001). s_i, c_i, and ϕ_t refer to the binary variables, respectively, for the sectors of economic activity of the firms, the countries in which the firms are located, and the periods analyzed (2000 to 2018).

For model 2, a negative association between CCC and OCF is expected; that is, the coefficient β_3 presents a negative sign and statistical significance (Hypothesis $H_{1,1}$). For the interaction between CCC and sales growth (coefficient β_3), model 2 is expected to indicate a reduction in OCF levels (Hypothesis $H_{1,2}$).

To investigate the relationship between long-term investments and the CCC, model 3 was developed, described below.

$$\frac{CAPEX_{it}}{Total\_Assets_{it-1}} = \alpha + \beta_1 Lag\left(\frac{CAPEX_{it}}{Total\_Assets_{it-1}}\right) + \beta_2 Q\_Tobin_{it} + \beta_3 \frac{OCF_{it}}{Total\_Assets_{it-1}} + \beta_4 CCC_{it} + \beta_5 CCC_{it}\, X\, \frac{OCF_{it}}{Total\_Assets_{it-1}} + \beta_6 G\_Sales_{it} + \beta_7 Ln\_TotalAssets_{it} + \beta_8 \frac{NWC_{it}}{Total\_Assets_{it-1}} + s_i + c_i + \phi_t + \varepsilon_t \quad (3)$$

Model 3 was also estimated from a dynamic panel data model (SGMM). The dependent variable $CAPEX_{it}$ represents the long-term investments for firm i in period t. This variable was staggered by the total assets for firm i in period t-1 (total assets lagged in one period). In addition, model 3 employs the lag of the dependent variable as a predictor variable $Lag\left(\frac{CAPEX_{it}}{Total\_Assets_{it-1}}\right)$.

The variable Q_Tobin_{it} is a proxy for Tobin's Q for firm i in period t. According to Tobin (1969), the optimization of the value of business investments derives from the ratio between the firm's market value and the replacement value of the assets. Values higher than the unit for the Tobin's Q metric denote a wealth generation process for a given firm. The operationalization of the Q_Tobin_{it} variable followed the recommendations of Larkin et al. (2018) and is described below.

$$Q\_Tobin_{it} = \frac{Total\_Assets_{it} + Market\_Value_{it} - Equity_{it}}{Total\_Assets_{it}} \quad (4)$$

In expression 4, the $Total\_Assets_{it}$ variable refers to the total assets for firm i in period t. $Market\_Value_{it}$ refers to the market value of the equity of firm i in period t. $Equity_{it}$ refers to the book value of the net equity of firm i in period t. For the variable Q_Tobin_{it}, a coefficient with a positive sign and statistical significance is expected. However, studies such as that by Moshirian et al. (2017) and Larkin et al. (2018), suggest that Tobin's Q is only a marginal driver for corporate investments considering less developed economies, that is, in this scenario, the market does not translate into a mechanism for transmitting information relevant to the decision-making process.

The other independent variables in model 3 are: $\frac{OCF_{it}}{Total\_Assets_{it-1}}$: operating cash flow of firm i in period t staggered by the lagged total assets; CCC_{it}: cash conversion cycle for firm i in period t; G_Sales_{it}: sales growth rate for the company i in period t; $Ln\_TotalAssets_{it}$: Neperian logarithm of total assets for firm i in period t; $\frac{NWC_{it}}{Total\_Assets_{it-1}}$: net working capital for firm i in period t. Working capital was calculated as the difference between current assets and current liabilities for firm i in period t. This variable was staggered by the total assets for firm i in period t-1. The inclusion of this variable aimed to control the results by the levels of net investments in working capital since, in environments of financial restrictions, investments in fixed and working capital compete with each other for a limited amount of resources (Fazzari and Petersen, 1993). Finally, the results are controlled by the binary variables s_i, c_i and ϕ_t, which are related, respectively, to the sectors of economic activity of the firms, the countries in which the firms are located, and the periods analyzed (2000 to 2018).

The main result of model 3 concerns the interaction between the variables $\frac{OCF_{it}}{Total\_Assets_{it-1}}$ and CCC_{it}. Thus, it is expected that the coefficient β_5 presents a negative sign and statistical significance. Such a result would indicate that the cash cycle impacts the levels of corporate investments through a lower generation of the firm's cash flows (Hypothesis $H_{1,3}$).

For the case of investigating the levels of financial risk concerning the CCC, a dynamic liquidity indicator was calculated using the Fleuriet model (Fleuriet et al., 1978; Fleuriet and Zeidan, 2015).

This financial analysis model adjusts the balance sheet accounts, which allows the derivation of three indicators:

i) Working Capital Requirement (WCR): comprises the net balance between short-term operating investments and short-term operating sources. The main operational applications refer to the values of customer accounts and inventories. The main operating sources, on the other hand, refer to the values of the supplier accounts, salaries, and social charges and operating taxes (on sales). A positive value for the WCR can be interpreted as a net demand for the investment of resources from the firm's operating activities. A negative value for the WCR represents a source of funds from its operations;

ii) Working Capital (WC): represents the net balance between long-term sources (non-current liabilities and shareholders' equity) and long-term investments (non-current assets). The positive WC can be interpreted as a source of long-term funding for WCR. Conversely, when the WC is negative, the firm needs short-term sources to finance its long-term investments partly;

iii) Cash Balance (CB): comprises the net balance between short-term financial investments and short-term financial sources. The primary financial investments refer to the values of cash and cash equivalents. The main financial sources refer to the values of the loans and financing accounts. Another way to analyze the CB is by the difference between the WC and the WCR. When WC <WCR, the firm finances part of the WCR with short-term financial resources. When WC> WCR, the firm can finance the WCR with long-term resources as well as having short-term financial surpluses.

With the description of the indicators proposed by the Fleuriet model (WCR, WC, and CB), the dynamic liquidity indicator (Liquidity Thermometer) is calculated as follows:

$$LT_{it} = \frac{CB_{it}}{Abs(WCR_{it}+LTA_{it})} \quad (5)$$

Where LT_{it} is the liquidity thermometer for the company i in period t. CB_{it} is the cash balance for the company i in period t. WCR_{it} refers to the working capital requirement for company i in period t. LTA_{it} represents the long-term investments of the company i in period t. Abs refers to absolute value.

The more negative the value presented by the LT_{it} variable, the worse the company's financial situation tends to be since this result indicates more significant use of short-term financial resources, such as short-term loans, financing permanent investments (long-term investments and the WCR). Thus, the mismatch between the maturity of applications and the sources of funds implies higher financial risk, as advocated by Fleuriet et al. (1978) and Fleuriet and Zeidan (2015). The econometric modeling developed from the LT_{it} variable is presented below.

$$LT_{it} = \alpha + \beta_1 Lag\_LT_{it} + \beta_2 \frac{OCF_{it}}{Total\_Assets_{it-1}} + \beta_3 CCC_{it} + \beta_4 G\_Sales_{it} + \beta_5 CCC_{it}\, X\, G\_Sales_{it} +$$

$$\beta_6 \frac{Cash_{it}}{Total\_Assets_{it-1}} + \beta_7 \frac{CAPEX_{it}}{Total\_Assets_{it-1}} + \beta_8 \frac{Total\_Debt_{it}}{Total\_Assets_{it-1}} + \beta_9 Ln\_TotalAssets_{it} + s_i + c_i + \phi_t + \varepsilon_t \quad (6)$$

LT_{it} represents the liquidity thermometer for the company i in period t. Lag_LT_{it} represents the lagged dependent. $\frac{OCF_{it}}{Total\_Assets_{it-1}}$ is the operating cash flow of firm i in period t staggered by the lagged total assets. CCC_{it} represents the cash conversion cycle for firm i in period t. G_Sales_{it} refers to the growth rate of sales for company i in period t. $\frac{Cash_{it}}{Total\_Assets_{it-1}}$ represents cash and cash equivalents for the company i in period t staggered by the lagged total assets. $\frac{CAPEX_{it}}{Total\_Assets_{it-1}}$ represents investments in fixed capital for the company i in period t staggered by the lagged total assets. $\frac{Total\_Debt_{it}}{Total\_Assets_{it-1}}$ refers to the total debt (short and long term) for the company i in period t staggered by the lagged total assets. $Ln\_TotalAssets_{it}$ is the Neperian logarithm of total assets for firm i in period t. The variables s_i, c_i, and ϕ_t are related, respectively, to the sectors of economic activity of the firms, the countries in which the firms are located, and the periods analyzed (2000 to 2018).

For model 6[7], the coefficient of the variable CCC_{it} (coefficient β_3) is expected to show a negative sign and statistical significance, indicating that increases in the cash conversion cycle will attempt to increase the firm's financial risk (Hypothesis $H_{2,1}$). For the variable $\frac{CAPEX_{it}}{Total\_Assets_{it-1}}$ and

[7] Model 6 comprises a dynamic model in panel data estimated from the SGMM.

$\frac{Total\_Debt_{it}}{Total\_Assets_{it-1}}$ the coefficients are expected to show a negative sign. For the other variables in the model 6, coefficients with positive signs are expected.

Another strategy for the investigation between the CCC and financial risk employed the differentiation of each variable for the period t and t-1 in a panel data regression model based on fixed effects. This econometric modeling allows greater control of unobserved sources of heterogeneity in firms, mitigating issues related to the omission of relevant variables (Wooldridge, 2010). An example of an application of this type of analysis is observed in the study by Aggarwal et al. (2011). Model 7 is presented below.

$$\Delta LT_i = \alpha + \beta_1 \text{Lag\_CCC}_{it} + \beta_2 \Delta\text{CCC}_i + \beta_3 \Delta\text{OCF}_i + \beta_4 \Delta\text{Cash}_i + \beta_5 \Delta\text{CAPEX}_i + \beta_6 \Delta\text{Total\_Debit}_i + \beta_7 \text{G\_Sales}_{it} + \beta_8 \text{Ln\_TotalAssets}_{it} + \beta_9 \Delta Accounts\_Receivables_i + \beta_{10} \Delta Accounts\_Payable_i + \beta_{11} \Delta Inventories_i + \beta_{12} \Delta CCC_i X\ \Delta OCF_i + \beta_{13} \Delta CCC_i X\ \Delta Cash_i + \beta_{14} \Delta CCC_i X\ \Delta CAPEX_i + \beta_{15} \Delta CCC_i X\ \Delta Total\_Debit_i + \beta_{16} \Delta CCC_i X\ G\_Sales_{it} + \phi_t + \varepsilon_t \quad (7)$$

Model 7 employs the lagged CCC in one period (Lag_CCC_{it}) as well as its variation (ΔCCC_i). For these two variables, coefficients with a negative sign and statistical significance are expected. The other control variables are translated by the differentiation of the variables already used in model 6, except for the variables $\Delta Accounts\_Receivables_i$, $\Delta Accounts\_Payable_i$, and $\Delta Inventories_i$, which represent, respectively, the variation of the accounts receivable, variation in accounts payable with suppliers, and variation in inventories. These last variables were staggered by the total assets lagged in one period (t-1) before going through the differentiation process. Also, the inclusion of the variables $\Delta Accounts\_Receivables_i$, $\Delta Accounts\_Payable_i$, and $\Delta Inventories_i$ in model 7 aims to control the results by variations in the main CCC components, as recommended by Wang (2019).

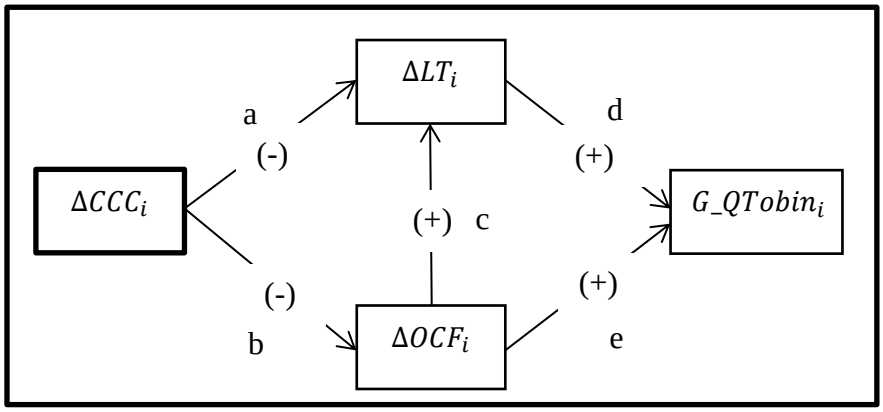
An important investigation also addressed in model 7 is the interaction between the variable related to the variation of the CCC (ΔCCC_i) with the variables ΔOCF_i, $\Delta Cash_i$, $\Delta CAPEX_i$, and G_Sales_{it}. For these interactions, coefficients with negative signs and statistical significance are expected. Such a result would indicate the possible interactions in which the CCC impacts the financial risk of firms.

3.2.2. CCC and market performance: Path Analysis

For the Hypothesis $H_{3,1}$ test, the Path Analysis technique was used. This econometric technique can be defined as the structural component of the structural equation model (SEM). Furthermore, this technique allows the identification and decomposition of the central relationships established in a given causal model based on the estimation of the direct, indirect, and total effects for these relationships (Bhattacharya et al., 2012).

Preliminary tests indicated the CCC investigation regarding the firm's market performance based on model 8[8].

Figure 1
Path Analysis. Model 8



In model 8 (Figure 1), the variables ΔCCC_i, ΔLT_i, and ΔOCF_i correspond, respectively, to the differentiation of the variables CCC_{it}, LT_{it}, and OCF_{it}. The use of differentiation of variables in the Path Analysis can be seen in Tang and Moro (2020). The variable G_QTobin_i corresponds to the growth rate for the variable Q_Tobin_{it}, and was used as an approximation for the market performance of the firms that compose the sample.

The signs in parentheses correspond to the expected signs of the coefficients for the relationships established in Model 8. For example, the variable ΔCCC_i is expected to impact the firm's

[8] Preliminary tests indicated that the insertion of other control variables in model 8 did not change the results qualitatively. Therefore, the study presents the results from a simpler model in Path Analysis.

cash flow generation negatively (OCF_i) and increase the level of financial risk (ΔLT_i)[9]. In turn, it is expected that the coefficient of the relationship between the variables OCF_i and ΔLT_i will show a positive sign, indicating that the internal generation of resources tends to decrease financial risk. Finally, a positive signal is expected for the coefficient of the relationship between the variables OCF_i and G_QTobin_i and between the variables ΔLT_i and G_QTobin_i[10].

Each relationship proposed in model 8 is indicated by a letter. Thus, Hypothesis $H_{3,1}$ will be tested from the indirect and total effects of the variable ΔCCC_i on the variable G_QTobin_i from the following relationships (paths): (path a + d) and (path b + e).

Model 8 was also tested considering that the CCC can be both negative (WCR <0: a source of resources) and positive (WCR> 0: an application of resources). According to Fleuriet and Zeidan (2015), the financial cycle is inherently related to the firm's business model. For example, in the food sector, which has historically had low margins of return, a negative financial cycle is desirable, since, in this situation, the firm finances part of its long-term investments with resources from its operations (operating liabilities). However, changes in supplier credit policies can cause substantial imbalances in this financial structure.

4. Presentation and analysis of the results

4.1. Descriptive statistics

Descriptive statistics are shown in Table 2.

Tabela 2

[9] From the operationalization of the variable ΔLT_i, the more negative it presents its value, the higher the financial risk of the firm tends to be. Thus, a negative sign coefficient is expected for the relationship between ΔCCC_i and ΔLT_i (model 8- path a).

[10] A positive signal is expected for the relationship between the variables ΔLT_i and G_QTobin_i, assuming that a lower financial risk (higher values for the variable ΔLT_i) tends to increase the firm's market performance (G_QTobin_i).

Descriptive statistics. CV represents the coefficient of variation. The variables OCF_{it}, NWC_{it}, $CAPEX_{it}$, $Cash_{it}$, $Total\_Debt_{it}$, $Accounts\_Receivables_{it}$, $Accounts\_Payable_{it,}$ and $Inventories_{it}$ were staggered with respect to the lagged total assets in a period (t-1).

Variables	Mean	Median	Standard Deviation	CV	Mínimum	Maximum	Asymmetry	Kurtosis
CCC_{it}	0.0902	0.0694	0.1220	1.3525	-0.172	0.7472	2.4117	13.3137
OCF_{it}	0.0896	0.0844	0.0671	0.7489	-0.1200	0.3384	0.5128	5.5640
LT_{it}	-0.0236	-0.0272	0.2318	9.8220	-0.7053	0.8055	0.4723	5.2901
G_Sales_{it}	0.0942	0.0594	0.2901	3.0796	-0.5238	1.3915	1.4893	7.7424
$LN\_TotalAssets_{it}$	20.2352	20.229	1.8477	0.0913	16.2134	24.4368	0.0580	2.5464
NWC_{it}	0.1351	0.1244	0.1682	1.2450	-0.2857	0.6333	0.1975	4.6338
$OperatingLeverage_{it}$	0.0038	0.0012	0.0432	11.3684	-0.1523	0.3186	4.2319	36.1778
$CAPEX_{it}$	0.0490	0.0382	0.0400	0.8163	0.0011	0.2042	1.5494	5.7015
Q_Tobin_{it}	0.9896	0.7904	0.7255	0.7331	0.1160	4.1819	2.1037	8.3762
G_QTobin_{it}	0.0485	-0.0094	0.3945	8.1340	-0.6990	2.0090	2.0057	10.0813
$Cash_{it}$	0.0559	0.0316	0.0646	1.1556	0.0001	0.3182	1.8782	6.6050
$Total\_Debt_{it}$	0.2533	0.2438	0.1582	0.6246	0.0005	0.7143	0.4735	2.8444
$Accounts\_Receivables_{it}$	0.1198	0.0976	0.0966	0.8063	0.0031	0.4450	1.9391	10.2998
$Accounts\_Payable_{it}$	0.0891	0.0679	0.0784	0.8799	0.0051	0.3692	2.5075	13.7188
$Inventories_{it}$	0.1241	0.0981	0.1057	0.8517	0.0016	0.4419	1.5556	7.4938

The average value obtained for the CCC_{it} variable is 0.0902 (90.2 days). This value is relatively close to the average CCC value found by Chang (2018)[11], considering the data from firms located in LA.

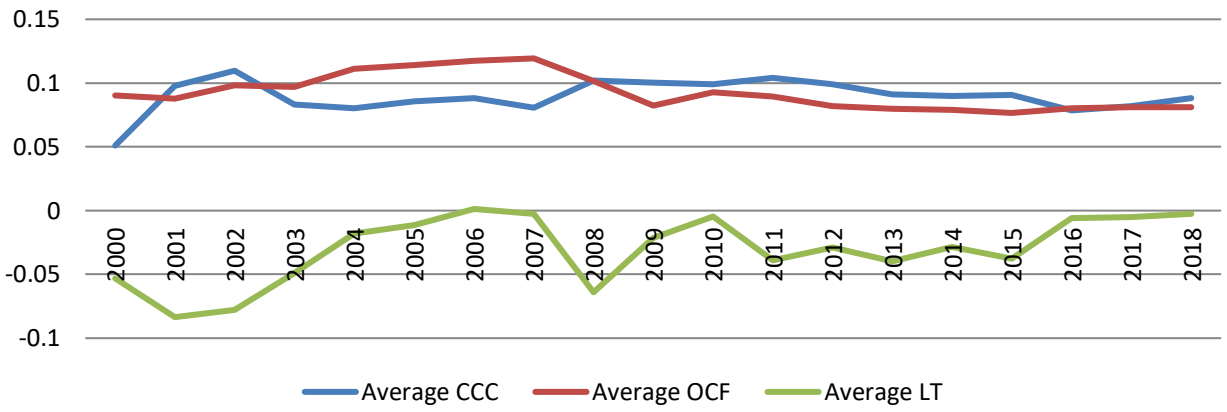
For the case of the OCF_{it} variable, the results suggest that the analyzed firms generated, in the analyzed period, an average of 8.96% of operating cash flow in relation to total assets. The LT_{it} variable had a CV of approximately 9.8, which denotes a high dispersion for financial risk. Average sales growth (G_Sales_{it}) was 9.42%. The variable related to company size ($Ln\_TotalAssets_{it}$) had the lowest CV (0.0913), while the variable associated with operational leverage had the highest CV (11.3684). The levels of CAPEX, cash and cash equivalents, and net working capital represent an average of 4.9%, 5.59%, and 13.51% in relation to total assets, respectively. The Q_Tobin_{it} variable showed a result close to 1, while the average growth rate for this variable was 4.85%. Accounts

[11] Chang (2018) used data from companies located in 46 countries. For the case of LA, information was collected from companies located in five countries: Argentina, Brazil, Chile, Mexico, and Peru.

receivable from customers, suppliers, and inventories average 11.98%, 8.91%, and 12.41%, respectively, in relation to total assets.

Additionally, the temporal evolution for the mean values of the variables CCC_{it}, OCF_{it}, and LT_{it} was investigated to identify the behavior of these variables concerning the economic cycles verified in the LA during the analysis period (2000 to 2018). This information is shown in Figure 2.

Figure 2
Temporal evolution for the mean values of CCC, OCF, and LT



In the period from 2000 to 2007, there is a growing trend for the average OCF values. This period is characterized by marked economic growth in LA, in which many sectors have benefited, directly or indirectly, from the high prices of commodities traded in international markets ("supercycle commodities") and the higher level of foreign direct investments (Manuelito and Jiménez, 2015; Aguilera et al., 2017). After 2007, a decline in OCF is identified until 2009 and relative stabilization of the values in this series for the other years.

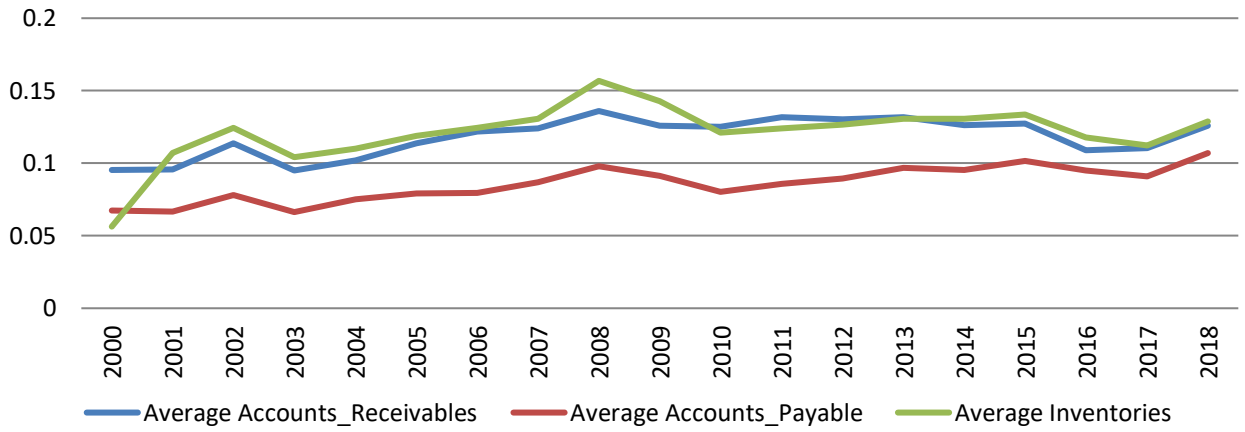
The average financial risk (Average TL) was more pronounced in 2001, a period corresponding to the severe political and economic crisis faced by Argentina (Thomas and Cachanosky, 2016), and in 2008 with the subprime financial crisis in the North American scenario but which also affected the economies of undeveloped and emerging countries (Mensi et al., 2014). There is a lower average financial risk for the periods from 2006 to 2007 and from 2016 to 2018.

The average CCC was higher for the years 2001 and 2002 and with a relative stabilization for the years 2003 to 2007. In 2008 there is an increase in the average CCC and practically its stabilization until the year 2011 when there is a slight decline in its values. The behavior of the CCC was also

investigated from the time evolution of the average values of the variables $Accounts\_Receivables_{it}$, $Accounts\_Payables_{it}$, and $Inventories_{it}$. This information is shown in Figure 3.

Figure 3

Time structure of average values for CCC components: Accounts_Receivables, Accounts Payable and Inventories



The levels of Inventories and Accounts_Receivables were higher in 2008. The growth in the levels of short-term operational applications (Inventories and Accounts_Receivables), in periods of crisis, can be explained by the abrupt reduction in the firm's sales level, which makes the levels of inventories quite excessive, besides, in these periods of greater economic instability, customers also face financial difficulties, which increases the probability of late payment related to the acquisition of the firm's products or services (Tsuruta, 2019).

For the Accounts_Payable case, a higher value was found for the year 2008, considering the period from 2000 to 2008. Bastos and Pindado (2013) suggest a substitution effect of bank credits for commercial credits in periods of crisis, which would explain the values found for the Accounts_Payable in 2008; however, increases in the average values for this variable were identified for the period from 2010 to 2018.

Table 3

Correlation coefficients. This table shows Spearman's correlation coefficients on the upper diagonal, while Pearson's correlation coefficients are shown on the lower diagonal. Each variable is represented by a number, being: CCC_{it} = 1; OCF_{it} = 2; LT_{it} = 3; G_Sales_{it} = 4; $Ln\_TotalAssets_{it}$ = 5; NWC_{it} = 6; $OperatingLeverage_{it}$ = 7; $CAPEX_{it}$ = 8; Q_Tobin_{it} = 9; G_QTobin_{i} = 10; $Cash_{it}$ = 11; $Total\_Debt_{it}$ = 12. The significance levels for the results are presented the following way: *** significance at 1%, ** sigificance at 5%, * significance at 1%.

	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
1	1	-0.205***	-0.406***	-0.126***	-0.220***	0.491***	0.022	-0.261***	-0.098***	-0.011	-0.054***	-0.007
2	-0.216***	1	0.128***	0.235***	0.090***	0.096***	0.037**	0.454***	0.418***	0.094***	0.171***	-0.128***
3	-0.316***	0.127***	1	0.117***	0.305***	0.310***	0.0005	0.128***	0.204***	0.010	0.315***	-0.187***
4	-0.115***	0.191***	0,125***	1	0.009	0.030*	-0.109***	0.137***	0.152***	0.109***	0.027	-0.057***
5	-0.160***	0.083***	0.239***	0.022	1	-0.057***	-0.021	0.153***	0.294***	-0.022	0.223***	0.281***
6	0.387***	0.102***	0.386***	0.034**	-0.054***	1	0.018	-0.066***	0.144***	0.017	0.311***	-0.196***
7	-0.007	-0.020	0.025	-0.025	-0.031**	-0.012	1	-0.004	-0.021	0.012	0.010	-0.031**
8	-0.266***	0.377***	0.090***	0.091***	0.115***	-0.116***	-0.024	1	0.305***	0.007	0.093***	-0.014
9	-0.100***	0.396***	0.147***	0.119***	0.168***	0.136***	-0.010	0.220***	1	0.236***	0.193***	0.101***
10	-0.023	0.090***	0.035**	0.097***	-0.064***	0.022	-0.003	0.002	0.262***	1	0.044***	0.025
11	-0.050***	0.153***	0.355***	0.024	0.176***	0.325***	0.010	0.053***	0.207***	0.017	1	0.018
12	-0.010	-0.174***	-0.195***	-0.056***	0.259***	-0.230***	-0.011	-0.025	-0.025	-0.033**	0.030*	1

The subsequent analysis focused on the results found for the correlation coefficients. These results are shown in Table 3.

The results reported in Table 3 indicate an inverse association between the CCC_{it} variable and the OCF_{it} and LT_{it} variables, which suggests that increases in the CCC imply less generation of operating cash flows and higher financial risk. The variables G_Sales_{it}, $Ln\_TotalAssets_{it}$, $CAPEX_{it}$, and $Cash_{it}$ also showed negative correlations about the CCC_{it} variable. The firm's market performance, measured by the variable Q_Tobin_{it}, was inversely related to the variable CCC_{it}. For the $OperatingLeverage_{it}$, G_QTobin_{i}, and $Total\_Debt_{it}$ variables, no statistically significant results were found regarding the CCC levels. For the relationship between the NWC_{it} and CCC_{it} variables, positive and statistically significant correlation coefficients were obtained, indicating that the increase in CCC levels increases net short-term investments. Other results found do not indicate a high correlation between the control variables, which tends to mitigate multicollinearity problems in econometric modeling (Wooldridge, 2010).

4.2. Results of regression models

Table 4 presents the results related to the effects of the CCC on the generation of operating cash flows of the firm.

There is evidence that model 2 (Table 4) is suitable for the inference process since the F statistic was significant at the 1% level, the Hansen test points to the exogeneity of instrumental variables and the AR(2) test indicates the absence of autocorrelation of residues. Thus, there is no indication that the results achieved are biased due to issues of endogeneity of the proposed econometric modeling.

The variables $\frac{OCF_{it}}{Total\_Assets_{it-1}}$ and OCF_Loss_{it} presented statistically significant coefficients with positive and negative signs, respectively. For the $Ln\_TotalAssets_{it}$ and $OperatingLeverage_{it}$ variables, no significant results were found.

The CCC_{it} variable showed a coefficient with a negative sign and statistical significance at the level of 1%. This result suggests that increases in the CCC reduce the firm's internal generation of resources, measured, in this case, by the operational generation of cash flows (Hypothesis $H_{1,1}$). The

results were controlled by the variable G_Sales_{it} (sales growth rate), which showed a positive and statistically significant coefficient. However, the interaction between the variables CCC_{it} and G_Sales_{it} showed a negative coefficient and statistical significance at the level of 1%, suggesting that the growth in sales through the CCC enhances an effect that translates into a more significant reduction in operating cash flows (Hypothesis $H_{1,2}$)

Table 4

Results of model 2: CCC and operating cash flows. The results presented in Table 4 were estimated through regression in panel data from the SGMM.The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Variables	Coefficients
Constant	0.0687*
$\mathbf{Lag}\left(\frac{\mathbf{OCF_{it}}}{\mathbf{Total\_Assets_{it-1}}}\right)$	0.4458***
OCF_Loss_{it}	-0.0968***
CCC_{it}	-0.0340***
G_Sales_{it}	0.0323***
CCC_{it} X G_Sales_{it}	-0.1438***
$Ln\_TotalAssets_{it}$	-0.0009
$OperatingLeverage_{it}$	-0.0001
Industry dummies	Yes
Country dummies	Yes
Year dummies	Yes
Observations	3,311
Statistic F	26.94***
Hansen test- Prob. Chi2 (273.20)	0.320
AR(2) test - Prob. Z	0.597

The next analysis refers to the results obtained from the relationship between the firm's long-term investments (CAPEX) and the CCC. Such results are reported in Table 5.

The results obtained from model 3 (Table 5) indicate the adequacy of the proposed econometric modeling. The F test is statistically significant, while the Hansen test and the AR(2) test were not significant for all tested versions of model 3 (versions 1 to 4).

For model 3, the lagged variable related to the firm's fixed investments (CAPEX) was statistically significant. The variable associated with the generation of operating cash flows (OCF) presented a positive and statistically significant coefficient at the level of 1%, and, still, it is shown as the primary explanatory variable of the firm's investments. For the variable Q_tobin_{it}, a coefficient with a positive sign and statistical significance at the level of 1% was identified; however, the

magnitude verified for its coefficient suggests that this variable only impacts the levels of fixed investments marginally. The variable G_Sales_{it} is significant in versions 1 and 3 of model 3, while the variable Ln_TotalAssets was significant only in version 4. For the NWC_{it} variable, no significant results were found.

Table 5

Relationship between CAPEX and CCC (model 3). Table 5 tested four different versions of model 3 (versions 1 to 4). Versions 1 to 3 correspond to a system generalized method of moments (SGMM). Version 4 was tested based on the differentiation of variables, which eliminated the fixed effects (for this model, dummy variables for industries and countries are not used). This differentiation procedure in version 4 aimed to maintain the number of groups higher than the number of instruments. Another characteristic of version 4 is that it does not have the term constant and, yet, there is a reduction in the number of observations (2,769). The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Variables	(1)	(2)	(3)	(4)
Constant	0.0250	0.0253	0.0268	-
$Lag\left(\frac{CAPEX_{it}}{Total\_Assets_{it-1}}\right)$	0.4478***	0.4516***	0.4497***	0.2984***
Q_Tobin_{it}	0.0057**	0.0047**	0.0058**	0.0082**
$\left(\frac{OCF_{it}}{Total\_Assets_{it-1}}\right)$	0.1436***	0.1778***	0.1337***	0.1424***
CCC_{it}	-0.0270**	-0.0667	-0.0288**	0.0483
CCC_{it} X $\left(\frac{OCF_{it}}{Total\_Assets_{it-1}}\right)$	-	-0.3706***	-	-0.8049***
G_Sales_{it}	-0.0098**	-0.0064	-0.0098**	-0.0033
$Ln\_TotalAssets_{it}$	-0.0004	-0.0004	-0.0005	-0.0179**
NWC_{it}	-	-	0.0080	0.0120
Industry dummies	Yes	Yes	Yes	No
Country dummies	Yes	Yes	Yes	No
Year dummies	Yes	Yes	Yes	Yes
Observations	3,311	3,311	3,311	2,769
Statistic F	31.35***	32.87***	31.26***	9.26***
Hansen test- Prob. Chi2	0,610	0.382	0.606	0.561
AR(2) test - Prob. Z	0.303	0.271	0.302	0.710

The CCC_{it} variable showed a negative coefficient and statistical significance at the level of 1% in versions 1 and 3 of model 3. However, the CCC_{it} variable did not present, in isolation, statistical significance when considering the CCC_{it} X OCF_{it} interaction (versions 2 and 4 of model 3). This result indicates that the mechanism with which the CCC impacts the firm's fixed investments is related to the lower operating generation of cash flows from increments in the CCC (Hypothesis $H_{1,3}$).

The next analysis refers to the relationship between the CCC and the firm's financial risk. The results are shown in Table 6.

Table 6

CCC and financial risk (model 6). Table 6 presents the results for the regression analysis in dynamic panel data from the SGMM approach. OCF_{it}, $Cash_{it}$, $CAPEX_{it,}$ and $Total\_Debt_{it}$ are staggered by the total assets for firm i in period t-1. The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Variables	Coefficients
Constant	-0.2325
Lag_LT_{it}	0.4546***
OCF_{it}	0.0681
CCC_{it}	-0.314***
G_Sales_{it}	0.0124
CCC_{it} X G_Sales_{it}	0.1659
$Cash_{it}$	0.8319***
$CAPEX_{it}$	-0.4732*
$Total\_Debt_{it}$	-0.1716***
$Ln\_TotalAssets_{it}$	0.0129**
Industry dummies	Yes
Country dummies	Yes
Year dummies	Yes
Observations	3,311
Statistic F	31.55***
Hansen test- Prob. Chi2	0.464
AR(2) test - Prob. Z	0.166

The results reported in Table 6 indicate the adequacy of model 6. The F statistic is statistically significant, while the Hansen test and the AR(2) test were not significant.

The Lag_LT_{it} variable showed statistical significance. The variables $Cash_{it}$ and $Ln\_TotalAssets_{it}$ showed coefficients with a positive sign and statistical significance, suggesting that companies with a higher level of cash, and also larger companies tend to have a lower level of financial risk. The $CAPEX_{it}$ and $Total\_Debt_{it}$ variables, on the other hand, presented coefficients with a negative sign, indicating a higher level of financial risk from the achievement of fixed investments and a more considerable amount of debt. For the OCF_{it} and G_Sales_{it} variables and the CCC_{it} X G_Sales_{it} interaction, no significant results were found.

The CCC_{it} variable showed a coefficient with a negative sign and statistical significance at the level of 1%, which suggests that increases in the CCC tend to increase the firm's financial risk (Hypothesis $H_{2,1}$). Thus, there is evidence that increases in the CCC cause financial imbalances, in the sense that the firm's permanent investment needs (WCR and Non-Current Assets) are now

financed by a higher amount of onerous short-term debts. The relationship between CCC and the financial risk was also investigated using model 7. These results are shown in Table 7.

Table 7
CCC and financial risk (model 7). Model 7 was tested using panel data regressions using fixed effects. Three versions were tested for model 7 (versions 1 to 3). The symbol Δ denotes variation between periods t and t-1. The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Variables	(1)	(2)	(3)
Constant	-0.2779*	-0.3101**	-0.0394
Lag_CCC_{it}	-0.1085*	-0.1236**	-0.1001*
ΔCCC_i	-0.6530***	-0.7147***	-0.1763**
ΔOCF_i	0.2901**	0.3177**	0.4162***
$\Delta Cash_i$	0.9162***	0.9232***	0.8636***
$\Delta CAPEX_i$	-0.4601***	-0.4619***	-0.4538***
$\Delta Total\_Debit_i$	-0.1922***	-0.1855***	-0.1875***
G_Sales_{it}	-0.0030	-0.0066	-0.0003
$Ln\_TotalAssets_{it}$	0.0133*	0.0150**	0.0022
$\Delta Accounts\_Receivables_i$			-1.0378***
$\Delta Accounts\_Payable_i$			0.7948**
$\Delta Inventories_i$			-0.9121***
ΔCCC_i X ΔOCF_i		-3.3814**	-2.4513**
ΔCCC_i X $\Delta Cash_i$		-0.3702	0.0109
ΔCCC_i X $\Delta CAPEX_i$		-3.430	1.6101
ΔCCC_i X $\Delta Total\_Debit_i$		-0.3086	-1.9920
ΔCCC_i X G_Sales_{it}		0.0417	-0.0572
Year dummies	Yes	Yes	Yes
Observations	3,311	3,311	3,311
Statistic F	14.45***	13.93***	20.88***
R^2 Overall	15.27%	15.10%	23.60%

The results achieved by model 7 (Table 7) show that the variables related to the CCC (Lag_CCC_{it} and ΔCCC_i) presented coefficients with a negative sign and statistical significance (versions 2 and 3 of model 7). These results indicate a direct effect of the CCC on the firm's financial risk. Also, it was identified that the ΔCCC_i X ΔOCF_i interaction showed a negative coefficient and statistical significance at the level of 5%. This result proved to be robust even when considering variations in accounts receivable, accounts payable from suppliers, and inventories. Thus, there is evidence of a direct effect of the CCC on financial risk and an indirect effect through the levels of the generation of operating cash flows.

4.3. Path Analysis results

The results derived from Path Analysis are shown in Table 8.

Table 8

Path Analysis. Table 8 segregates the results in two panels. Panel A refers to the results obtained without any sample segregation. Panel B presents the results for positive CCC (value equal to 0 in parentheses) and negative CCC (value equal to 1 in parentheses). SRMR: standardized root mean squared residual. The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Panel A	Direct Effects	Indirect Effects	Total Effects
Outcome			
ΔOCF_i			
$\Delta CCC_i \rightarrow \Delta OCF_i$	-0.0670***	No Path	-0.0670***
ΔLT_i			
$\Delta CCC_i \rightarrow \Delta LT_i$	-0.7026***	-0.0291***	-0.7317***
$\Delta OCF_i \rightarrow \Delta LT_i$	0.4341***	No Path	0.4341***
G_QTobin_i			
$\Delta CCC_i \rightarrow GTobin_i$	No Path	-0.1242***	-0.1242***
$\Delta OCF_i \rightarrow GTobin_i$	1.0399***	0.0324*	1.0723***
$\Delta LT_i \rightarrow GTobin_i$	0.0745*	No Path	0.0745*
Observations: 3,311. Chi2 statistic: 0.110. SRMR: 0.002			
Panel B	Direct Effects	Indirect Effects	Total Effects
Outcome			
ΔOCF_i			
$\Delta CCC_i \rightarrow \Delta OCF_i$ (0)	-0.0546***	No Path	-0.0546***
$\Delta CCC_i \rightarrow \Delta OCF_i$ (1)	-0.1355***	No Path	-0.1355***
ΔLT_i			
$\Delta CCC_i \rightarrow \Delta LT_i$ (0)	-0.6316***	-0.0234***	-0.6550***
$\Delta CCC_i \rightarrow \Delta LT_i$ (1)	-1.0851***	-0.0580*	-1.1431***
$\Delta OCF_i \rightarrow \Delta LT_i$ (0)	0.4286***	No Path	0.4286***
$\Delta OCF_i \rightarrow \Delta LT_i$ (1)	0.4281**	No Path	0.4281**
G_Tobin_i			
$\Delta CCC_i \rightarrow GTobin_i$ (0)	No Path	-0.0903***	-0.0903***
$\Delta CCC_i \rightarrow GTobin_i$ (1)	No Path	-0.4573***	-0.4573***
$\Delta OCF_i \rightarrow GTobin_i$ (0)	0.9778***	0.0241	1.0020***
$\Delta OCF_i \rightarrow GTobin_i$ (1)	1.6828***	0.0859	1.7686***
$\Delta LT_i \rightarrow GTobin_i$ (0)	0.0563	No Path	0.0563
$\Delta LT_i \rightarrow GTobin_i$ (1)	0.2006*	No Path	0.2006*
Observations:: 3,311. Chi2 statistic: 0.799. SRMR: 0.008			

The results reported in Table 8 show the direct, indirect, and total effects related to the relationships established in Path Analysis. Panel A shows a negative association between the variables ΔCCC_i and ΔOCF_i and between the variables ΔCCC_i and ΔLT_i. These results corroborate the idea that higher levels of CCC are associated with the lower generation of operating cash flows and higher financial risk. Another significant result was the identification of an indirect relationship between the variables ΔCCC_i and G_QTobin_i. This relationship showed a negative coefficient and

statistical significance at the level of 1%, which indicates that higher levels of CCC impact, even if indirectly, the firm's market performance (Hypothesis $H_{3,1}$).

Panel B (Table 8) segregates the results taking into account whether the firm has a positive (WCR> 0) or negative (WCR <0) financial cycle. The results obtained also showed a negative association between the variables ΔCCC_i and ΔOCF_i and between the variables ΔCCC_i and ΔLT_i. However, the indirect relationship between the variables ΔCCC_i and G_QTobin_i is more prominent for firms with a negative financial cycle compared to those with a positive financial cycle[12]. A plausible explanation for this result is that firms with a negative financial cycle depend quite substantially on the generation of resources from their operations to finance their permanent investments (Fleuriet and Zeidan, 2015).

4.4. Additional tests

A concern with the results obtained is to verify whether the proposed econometric modeling is adequate to capture the differences in the operational and financial cycles of the different economic sectors analyzed. Within the same sector, firms have more similar characteristics of CCC compared to firms in other sectors (Ng et al., 1999). To circumvent this issue, the CCC_{it} variable was adjusted for the sector's performance based on the recommendations of Chang (2018). This expression is defined as follows:

$$IndAdjCCC_{itj} = CCC_{it} - MedianCCC_{tj} \quad (8)$$

The variable $IndAdjCCC_{itj}$ represents the cash conversion cycle for the company i in period t and adjusted for the performance of sector j. CCC_{it} is the cash conversion cycle for the company i in period t. $MedianCCC_{tj}$ is the median of the cash conversion cycle for period t and sector j. The variable $IndAdjCCC_{itj}$ was used in the econometric modeling below.

[12] Additional tests (not reported) showed that the coefficient for the indirect relationship between the variables ΔCCC_i and G_QTobin_i is statistically different, at the level of 5%, between firms with negative and positive financial cycles.

$$G\_QTobin_i = \alpha + \beta_1 \frac{OCF_{it}}{Total\_Assets_{it-1}} + \beta_2 LT_{it} + \beta_3 Lag\_IndAdjCCC_{itj} +$$

$$\beta_4 Lag\_IndAdjCCC_{itj}\ X\ \frac{OCF_{it}}{Total\_Assets_{it-1}} + \beta_5 Lag\_IndAdjCCC_{itj}\ X\ LT_i + \beta_6 G\_Sales_{it} + \beta_7 \frac{Cash_{it}}{Total\_Assets_{it-1}} +$$

$$\beta_8 \frac{CAPEX_{it}}{Total\_Assets_{it-1}} + \beta_9 \frac{Total\_Debt_{it}}{Total\_Assets_{it-1}} + \beta_{10} Ln\_TotalAssets_{it} + \ s_i + \ c_i + \ \phi_t + \varepsilon_t$$

(9)

Model 9 employs the lag in one period for the variable IndAdjCCCitj, aiming to mitigate endogeneity problems in econometric modeling. The estimation was performed using panel data regression based on random effects[13]. The results are shown in Table 9.

Table 9

CCC results adjusted to sector performance. The variables OCF_{it}, $CAPEX_{it}$, Cashit, $CAPEX_{it,}$ and $Total\_Debt_{it,}$ are staggered about the lagged total assets in a period. The procedures adopted in this test reduced the valid observations from 3,311 to 3,301. The significance levels for the results are presented the following way: *** significance at 1%, ** significance at 5%, * significance at 1%.

Variables	Coefficients
Constant	0.3789***
OCF_{it}	0.4246***
LT_{it}	0.0164
$Lag\_IndAdjCCC_{itj}$	-0.0319
$Lag\_IndAdjCCC_{itj}$ X OCF_{it}	-2.3391***
$Lag\_IndAdjCCC_{itj}$ X LT_{it}	-0.6398**
G_Sales_{it}	-0.0065
$Cash_{it}$	0.6915
$CAPEX_{it}$	0.0489
$Total\_Debt_{it}$	-0.0011
$Ln\_TotalAssets_{it}$	-0.0205***
Industry dummies	Yes
Country dummies	Yes
Year dummies	Yes
Observations	3,301
Wald Chi2	406.82***
R^2 Overall	15.03%

The results reported in Table 9 show that the variable $Lag\_IndAdjCCC_{itj}$ did not present statistical significance. However, the interaction between the variables $Lag\_IndAdjCCC_{itj}$ and OCF_{it}

[13] The Chow test (not reported) indicated the use of panel data based on random effects instead of fixed effects. POLS estimations and random effects with autoregressive error terms AR (1) were also used; however, there were no qualitative changes in the results obtained.

and between the variables $Lag\_IndAdjCCC_{itj}$ and LT_{it} showed coefficients with a negative sign and statistical significance. This result is in line with the other results obtained in order to show an indirect effect of CCC on the firm's market performance. The mechanism underlying this indirect effect is reflected by the evidence obtained from the reduction in the generation of operating cash flows and increases in financial risk from increases in the CCC.

4.5. Discussion

The study provides evidence of multiple effects that the CCC affects the financial and market performance of firms located in LA. In this sense, the study seeks to contribute to a greater understanding of working capital management in the case of undeveloped or emerging economies.

The results indicate a negative association between the CCC and the generation of operating cash flows. This result complements other studies that used strictly accounting variables to measure the firm's performance, as can be seen in Chang (2018) and Boisjoly et al. (2020). In turn, the lower generation of cash flows due to increases in the CCC results in lower levels of fixed investments by the firm. This result broadens the contributions of the studies by Moshirian et al. (2017), and Larkin et al. (2018) about the sensitivity of the investment-cash flows in the case of less developed economies. Furthermore, the results found suggest that LA companies are inserted in an environment of severe financial restrictions, as proposed by Chong and Lopez-De-Silanes (2007).

Other results obtained show that higher levels of CCC tend to increase the firm's financial risk. Thus, increases in the CCC tend to cause imbalances in the financial structure of the firm (WCR, WC, and CB), which can make a given business model unfeasible. An example of this can be found in Soenen (1993), which suggests that high levels of CCC are one of the determining factors for the bankruptcy of firms.

An indirect mechanism was identified in which the CCC impacts the firm's market performance. This indirect effect, in which the CCC jointly impacts operating cash flow generation and financial risk, would result in changes in the value of the firm's net worth to market value.

Besides, this type of indirect effect is little explored in studies that investigate the formation of stock portfolios from different levels of the CCC, as can be seen in Wang (2019) and Lin and Lin (in press).

The study has important implications for a very diverse range of economic agents. The CCC levels provide essential information to managers regarding the levels of short-term operating investments, payment policies to suppliers, and credits granted to consumers. In addition to these internal working capital management practices, there is evidence that the CCC affects the market value of firms. Investment analysts may gain new perspectives in recommending investments considering, among other things, the relationship between CCC and fixed investments, which may reflect on the firm's long-term performance. Shareholders can also benefit from information from the CCC in order to understand what are the underlying forces of the market value of their investments. Multinational firms can also better understand the role played by the CCC in regions with less economic development.

5. Conclusions

LA presents itself as a very challenging environment for conducting business, given the high economic and political instability and the low levels of legal protection and property rights of investors; however, this region is an essential route for international investments. In this scenario, adequate working capital management is a critical driver of the firm's financial and market performance.

The results obtained from a sample of 467 LA firms suggest that increases in the CCC reduce the generation of operating cash flows and increase financial risk, which, in turn, implies a reduction in the market value of the firm. These results were shown to be robust when considering issues relevant to the endogeneity of econometric modeling and when the CCC was adjusted for the sector's performance.

The generalization of the results should be viewed with caution, especially for regions with very different characteristics from LA in terms of levels of economic development. For future research, studies may investigate in LA the impacts of the CCC on the performance of unlisted

companies and medium and small companies. Another research suggestion is the identification of working capital management practices that can add wealth to firms located in undeveloped or emerging countries. Additionally, it is interesting to investigate whether the CCC translates into a valid predictor of default or bankruptcy of firms.

Appendix A. Description and theoretical background of the variables

Variables	Description	Theoretical Background
CCC_{it}	cash conversion cycle	Chang (2018) and Wang (2019)
$IndAdjCCC_{itj}$	cash conversion cycle adjusted to the sector's performance	Chang (2018)
OCF_{it}	operating cash flow	Baños-Caballero et al. (2010), Chiou et al. (2006), and Damodaran (2001)
LT_{it}	liquidity thermometer	Fleuriet et al. (1978), Fleuriet and Zeidan (2015), and Zeidan and Shapir (2017)
G_Sales_{it}	sales growth rate	Petersen and Rajan (1997)
$Ln\_TotalAssets_{it}$	neperian logarithm of total assets	Baños-Caballero et al. (2010), and Chiou et al. (2006)
NWC_{it}	net working capital	Ng et al. (1999), and Zeidan and Shapir (2017)
$OperatingLeverage_{it}$	operational leverage	Chang (2018), and Core et al. (1999)
$CAPEX_{it}$	fixed capital investment	Kieschnick et al. (2006), and Banos-Caballero et al. (2010)
$Cash_{it}$	cash and cash equivalents	Aktas et al. (2012), Artica et al. (2019), and Petersen and Rajan (1997)
Q_Tobin_{it}	Tobin's Q	Baños-Caballero et al. (2014), and Dary and James Jr. (2019)
G_QTobin_{it}	the growth rate of Tobin's Q	Baños-Caballero et al. (2014), and Dary and James Jr. (2019)
$Total\_Debt_{it}$	financial leverage	Afrifa et al. (2018), and Chang (2018)
$\Delta Accounts\_Receivables_{i}$	variation of accounts receivable	Fleuriet and Zeidan (2015), and Wang (2019)
$\Delta Accounts\_Payable_{i}$	variation in accounts payable with suppliers	Fleuriet and Zeidan (2015), and Wang (2019)
$\Delta Inventories_{i}$	variation in inventories	Fleuriet and Zeidan (2015), and Wang (2019)

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