Improving survival of micro & small firms in Latin America during COVID-19 via SRM and CRM strategies

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ABSTRACT

Apart from health impacts, the coronavirus pandemic brought many economic challenges for micro and small enterprises (MSEs), especially in Latin America, where they account for most of the firms. For these cash-constrained companies, the combination of lower sales, higher costs of supplies, and advanced payment consumes cash and diminishes their chances of businesses continuity. We approached the problem of how to increase MSEs' chances of survival from a supplier relationship management and customer relationship management standpoint. Our goal was to determine the most effective time to pay suppliers and collect from customers, and what types of relationships could achieve those times. We modeled the cash flow between supply chain echelons to evaluate different payment-term configurations and identify trade-offs and optimization opportunities. We found that via collaboration with vendors and customers the times to collect cash can be modified in MSEs' favor. Increased time to pay suppliers frees up cash, which MSEs can reinvest to purchase more materials and grow sales. When accompanied by an increase in sales beyond a breakeven point, the payment time increase supports a win-win situation: suppliers see a net-zero or net-positive impact, and MSEs can expect value creation of up to 17% from working capital reduction and profit growth. Therefore, the adoption of collaborative relationships with suppliers and customers may increase the likelihood of business continuity—not only during times of crisis but also in periods of relative normality.

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1. Introduction

1.1. Motivation

2020 has been a year of several challenges. More than 100 years since the Spanish Flu Pandemic of 1918, COVID-19 made a dilemma buried in the 20th century resurface: to save lives or to save the economy? Apart from defying health systems, the COVID-19 pandemic has also shaken economies across the globe.

The economic challenges brought by the COVID-19 pandemic have the potential to raze micro and small businesses, leaving millions without a source of income. OECD, p (2020) gathers evidence on the COVID-19 impacts on micro and small firms from various sources: "The survey shows that 43% of responding businesses are already temporarily closed. On average, businesses reduced their employees by 40%. Three-quarters of respondents indicate they have two months or less in cash in reserve."

According to Buffington et al. (2020), in the United States in June 2020, nearly 90% of small businesses experienced a strong (51%) or moderate (38%) negative impact from the pandemic while 45% of businesses experienced disruptions in supply chains. Yet, Buffington et al. (2020) points to an even more unsettling fact: for 25% of those companies, cash reserves were capable of enduring less than 1 to 2 months with no income.

In Latin America, the situation is even more alarming. As of July 2020, the Economic Commission for Latin America and the Caribbean (ECLAC) estimated that the COVID-19 pandemic would result in the worst recession in the region in a century, causing a 9.1% contraction in regional GDP in 2020 (ECLAC, 2020).

Micro and small firms, as defined by Nichter and Goldmark (2009), encounter an arduous situation in Latin America, since countries have fewer resources to face economic strains. Pototschnik, et al. (2020) suggests that traditional small stores have a 20% to 25% risk of closing permanently, while on-premises food service are at an even higher risk: 75% to 80% . This, according to Pototschnik, et al. (2020), means that more than 3 million jobs are in danger. (Pototschnik, et al., 2020) states that "Restaurants and traditional-trade stores have an estimated two to three weeks of cash on hand, but many have much less than that and quickly become unprofitable when faced with declining demand." The situation becomes even more worrying when we realize these businesses' profits are the livelihood of their owners, and with little to no cash reserves, not only the staff employed is at risk, but the managers as well. It is not low profitability that put companies out of business, it is the lack of cash. In times of crisis, "cash becomes king" for large firms, we found in the literature that this is also true for micro and small firms.

1.2. Problem Statement and Contextualization

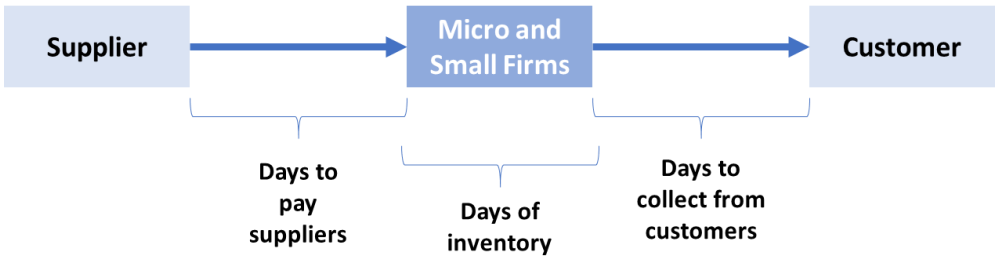
Small firms account for 99% of all businesses in the area (OECD, 2019), which includes Latin American countries. Micro and small enterprises (MSEs) are the most numerous set of companies. The group is also responsible for employing most of the workforce (60%) and adds up to between 50% and 60% of total value added in the OECD area. Despite their importance, small business owners struggle to provide a livelihood for their families. In regular times, these companies already face numerous difficulties: according to (Martinez, 2016), most of the micro and small firms in Latin America survive for less than a year. MSEs are subjected to extremely limited resources, as shown by Thakkar et al. (2009), and strong cash constraints according to Boulaksil and van Wijk (2017).

These ongoing challenges have been greatly exacerbated by the economic impact of the pandemic. Now it is more urgent than ever to find ways to help small and micro businesses become profitable and stable. But before it is necessary to secure cash availability (Gracía-Teruel and Martínez-Solano, 2007).

Cash availability can be measured using the cash conversion cycle (CCC) as a proxy variable. In Section 2.2 we detail the concept of cash conversion cycle and why it is important for firms where cash is a constraint to manage it closely. The CCC has three components: the time to pay suppliers, the time an item spends as inventory, and the time to collect cash from customers, as shown in Figure 1.

Figure 1

Conceptual view of an MSEs supply chain and the components of the cash conversion cycle



The time to pay suppliers and collect from customers can be influenced by the type of relationships the company has with its vendors and clients. On the one hand, collaborative relationships can allow for longer times to pay suppliers and collect from customers. On the other hand, adversarial relationships will likely tilt in favor of the strongest link in the supply chain. This is where the concepts of supplier relationship management (SRM) and customer relationship management (CRM) — described in Sections 2.3 and 2.4, respectively — get intertwined with cash management.

When analyzing the data described in section 3.2 we identified that our sample of Latin American micro and small firms pay their suppliers in advance, suggesting that they do not engage in collaborative relationships. As a result, the cash constraints indicated by Boulaksil and van Wijk (2017) will reduce the companies' chances of survival.

1.3. Research Objective

The key question this project aims to answer is: What are the SRM and CRM strategies that will increase the rate of survival for micro and small firms and allow them to withstand the effects of the COVID-19 pandemic? To answer that, our guiding questions were the following:

- What is the impact of a longer payment term on the supply chain, on the supplier, and on the MSE?
- What is the most convenient time to pay each supplier that increases cash availability for the MSE and creates value for the supply chain?
- What type of relationship (collaborative or adversarial) must the MSE establish with each supplier and customer to allow for a longer time to pay?

In this capstone, first, we present a review of the literature in Chapter 2. Next, we present our methodology for data gathering and modelling in Chapter 3. Thereafter, we demonstrate and analyze our results, in Chapter 4. And finally, in Chapter 5, we state our conclusions and suggestions for future research in the field.

2. Literature Review

This literature review is intended to formalize the concepts of Cash Conversion Cycle, Customer Relationship Management and Supplier Relationship Management, by outlining their history and development. To determine their relevance to the overall business world and especially their relevance to micro and small firms in developing nations, such as those in Latin America.

2.1. Micro and Small Enterprises (MSE)

Most studies and statistical institutes define Micro and Small Enterprises by the number of employees (Nichter & Goldmark, 2009) and (OECD, 2012). According to Nichter & Goldmark (2009), MSEs are firms that commercialize at least 50% of their output and have no more than 50 employees. In most cases they are small vendors, and the owner is the single employee, however, there is a significant number of companies focused on manufacturing goods to be sold that employ paid workers (Mead & Liedholm, 1998).

2.2. Micro and Small Enterprises (MSE) in Latin America

MSEs in Latin America usually operate in low-income regions, low-profit markets, and in activities with minimum entry barriers (Mead & Liedholm, 1998). Several studies have shown the MSEs' importance for the generation of employment and income in Latin America (Mead & Liedholm, 1998). In the region more than 90% of firms are MSEs, and they are responsible for employing most of the population (OECD, 2012). Despite that the majority of the Gross Domestic Product (GDP) is not generated by MSEs, a fact that reflects the low levels of productiveness by smaller firms (OECD, 2012).

Recent research on micro and small business by Nunes and Paulino (2018) focused on establishing a framework of priorities that small businesses should adapt to grow. Through the interview of Mexican

MSEs the study found that quality, service, and cash generation practices were first in order of priority to nurture MSEs' survival and growth. Cash generation practices "are essential to support sustainable growth and operations of the company" (Nunes & Paulino, 2018). Hernández and Thompson (2020) tackled the cash availability problem for MSEs from an inventory perspective and found that inventory management are a key part in managing cash for MSEs. The objective of this project is to explore the cash availability problem, exacerbated by COVID-19, in Latin American MSEs from a different perspective: the company's relationships with upstream and downstream members of the supply chain.

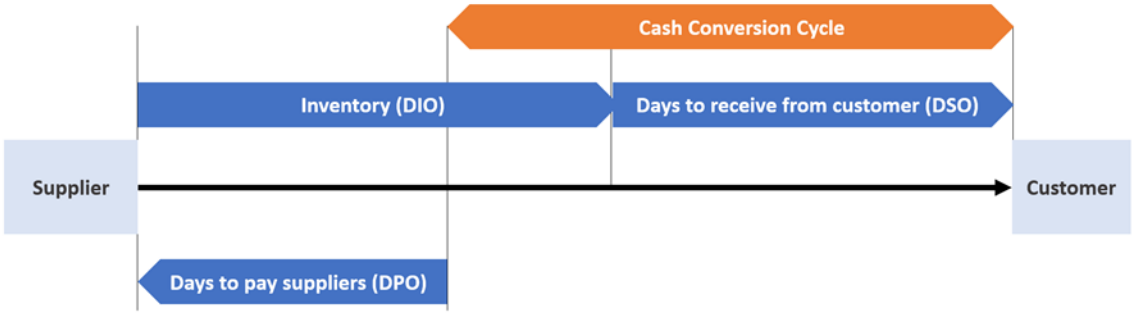
2.3. Cash Conversion Cycle and Company Performance

Cash Conversion Cycle, Cash to Cash Cycle, or simply CCC or C2C (Hofmann & Kotzab, 2010) is a financial indicator of ongoing liquidity (Jose et al., 1996), that was introduced in the 1970's by Gitman (1974). The CCC combines different financial reports (the income statement and the balance sheet) to produce a time measure, usually in days, between cash disbursement and cash revenues (Jose et al. 1996).

The CCC calculation yields the time difference between cash outflow and inflow, therefore it is a time measure of the necessary working capital to finance the company's operations. A high CCC means that there is a significant difference between when the company invests money and when that investment is returned in the form of sales revenue, as shown in Figure 2. Therefore, the company must have enough cash on hand to pay for acquired goods and services while the investment has not yet yielded returns. In contrast, a low or negative CCC indicates that the time between paying suppliers, holding inventory, and receiving payments is low. In this situation, the company is said to be cash efficient.

Figure 2

Perspective on the cash conversion cycle



Note: The figure shows the time difference between inflow and outflow of cash. DPO is amount of time to pay suppliers, DIO is the amount of time the inventory lasts on average and DSO is the amount. From Hofmann, E., & Kotzab, H. (2010). A supply chain-oriented approach of working capital management. Journal of business Logistics, 31(2), 305-330.

As indicated by Hofmann and Kotzab (2010), companies rely on the CCC to evaluate changes in their operation's efficiency from a cash point of view. Therefore, the cash cycle is relevant not only from an accounting perspective of cash availability but also from an operations perspective.

Work from Jose et al. (1996), Wang (2002) and Nazir and Afza (2009) establish a positive correlation between corporate returns and the company's policy regarding the Cash Conversion Cycle. Their findings mean that a conservative behavior towards the CCC can add shareholder value.

Hofmann and Kotzab (2010) reinforce that the lower the CCC the better, in ideal cases, it can even be negative. However, Hofmann & Kotzab (2010) suggests this conclusion has a potential weakness: it assumes that CCC's components can be reduced without any impacts on acquisition costs or revenue from sales. In other words, the premise does not include the influence that credit terms have on the purchase

decision from customers, or the potential price increase by suppliers to cover for the cost of capital caused by a stretched payment cycle.

2.3.1. The Cash Problem for the Micro and Small Enterprises

While large firms are in a position of power to negotiate credit terms with suppliers and customers, micro and small companies rarely face the same situation (Boulaksil et al., 2014). As a result, it is expected that these businesses present a higher CCC when compared to larger firms, which is in fact confirmed by Moss and Stine (1993). In an environment where cash is scarce, cash generation is the key to supporting growth for micro and small companies in emerging markets (Nunes & Paulino, 2018). Similarly, Gracía-Teruel and Martínez-Solano (2007) explored the relationship between the CCC and corporate profitability for small enterprises in Spain, their findings suggested that companies can create value by reducing time between cash outflow for suppliers and cash inflow from customers. Comparable results were also achieved by Ebben and Johnson (2011) with a sample of small US-based retail and manufacturing companies. Their study determined that the firms with lower cash conversion cycles were not only more liquid but also presented higher returns to shareholders.

Therefore, setting the CCC reduction as a goal is key for every micro and small business owner. With COVID-19 the importance of managing the CCC for micro and small firms has become even higher, since cash availability is crucial for small businesses survival (JPMorgan Chase & Co Institute, 2016).

This, however, creates a challenge to MSEs given their potential lack of power towards suppliers and customers. Opportunely, Hofmann and Kotzab, (2010) propose that companies should seek to maximize the supply chain's total shareholder value added, instead of optimizing CCC for each individual entity in the supply chain.

One of the three possible outcomes for the model proposed by Hofmann and Kotzab, (2010) is where companies in the supply chain have different Weighted Average Cost of Capital (WACC). This configuration causes the optimization of the CCC to be a situation where companies with higher WACC should be financed by those with lower WACC. In other words, the payment and receipt terms should be used as levers to reduce the working capital required by the firms with high WACC. Cost of capital increases proportionally with risk perceived by creditors and equity holders. Hence, companies with lower credit scores and operating in emerging markets will naturally present high WACC (Damodaran, 2014). From that collaborative approach it can be theorized that Latin American MSEs should receive some sort of financing support from suppliers and customers. Such assistance is not only in the best interest of the MSE but is also in the best interest of the supply chain.

The cash conversion cycle and the cash problem for MSEs are both central to this project. The cash conversion cycle helps understand the impact that the DSO and DPO have on capital requirements to finance operations. The cash problem for MSEs reinforces the relevance of cash management not only to avoid economic failure but also to generate growth.

2.4. Supplier Relationship Management Strategy

Despite all advancements made in the field, the management of suppliers is still carried out in the category level, meaning that procurement specialists manage clusters of suppliers instead of individual suppliers (Schuh et al., 2014, p.3). This is where Supplier Relationship Management (SRM) emerges as an evolution of strategic sourcing practices made popular in the past (Lambert & Schwieterman, 2012; Schuh et al., 2014). Integration of different entities in the supply chain can lead to improved firm performance (Swink et al., 2007; Enz & Lambert, 2012), with specific regard to supplier collaboration.

The definition of SRM of Schuh et al. (2014) and Lambert & Schwieterman (2012) are extremely similar in the sense that both works portray SRM as a strategic process that aims to create value through leveraging relationships with suppliers that contribute disproportionately to the firm's success.

Supplier Relationship Management can be interpreted as a mirror image of CRM, as shown in Figure 3. Both Lambert & Schwieterman (2012) and Moeller et al. (2006) adapt many insights from the management of customers into the management of suppliers.

Despite its origin, SRM is not to a topic that belongs only to the procurement area. Instead, companies should seek engagement across the organization to achieve a successful SRM implementation (Schuh et al., 2014). The work of Lambert and Schwieterman (2012) suggests a methodology to guide managers through the SRM process. The methodology was built from meetings with executives representing various industries and levels in the supply chain that were almost entirely US-based. The roadmap to a successful SRM implementation comprises five strategic sub-processes connected to seven operational sub-processes, as is the CRM roadmap proposed by Lambert (2010). However, Lambert and Schwieterman (2012) replace the customer focus by the supplier focus.

Lambert and Schwieterman (2012) define the relevant strategic processes to implement SRM as being the review of corporate and marketing strategy followed by the identification of categorization criteria for suppliers, the guidelines for the degrees of differentiation in service agreements, the development of metrics, and the development of guidelines for sharing the benefits of improvements made to processes with suppliers.

From the operational point of view Lambert and Schwieterman (2012) includes: the supplier segmentation, the preparation of the supplier management team, the supplier review, the opportunity identification within each supplier, the actual development of the differentiation in service agreements, the implementation of service agreements, and, finally, the measurement of supplier's operational and cost

performance. Finally, Lambert and Schwieterman (2012) connects the two groups through process interfaces to translate strategic guidelines into operational practices in a similar manner to what was done by Lambert (2010).

Supplier Relationship Management is based on an alignment of company strategy, business processes, workforce, and technology (Lambert and Schwieterman, 2012). However, because SRM is a B2B relationship, it depends highly on relative power to succeed (Schuh et al., 2014).

2.4.1. Supplier Relationship Management Strategy for MSEs

Despite the rising relevance that procurement has gained in large corporations, Quayle (2000) reveals that many small-sized businesses tend to look away from the importance of strategic procurement. Relationships between suppliers and SMEs tend to be adversarial instead of collaborative (Quayle, 2001). To transition into a collaborative environment with suppliers, as suggested by Lambert & Schwieterman (2012), data sharing is of utmost importance. However, Thakkar et al. (2010) discusses that small businesses might evade from sharing information for commercial reasons, since they fear that their suppliers, which usually are large companies, will use it to bend negotiations in their favor.

This situation unveils a common misperception that academia and business practitioners undergo when assuming that relationships between buyer and supplier in large and small businesses can be analyzed equally (Gibb, 2000). In small firms the supplier relationship is marked by a strong power imbalance (Morrisey & Pittaway, 2006). Mudambi et al. (2004) reveals that power asymmetry is indeed an important component to explain how cooperative purchasing relationships in small firms are. The work revealed that it was the supplier who determined how closely relationships would be conducted.

Cooperation is seen with skepticism among small-firm owners due to behaviors from large suppliers that in many cases can be classified as opportunistic (Quayle, 2000). These suppliers seek to take

advantage of the situation by choosing only the parts of the relationship that benefit themselves and have little regard to the effect their decisions might have on smaller customers. Such practice is doomed to failure even in the perspective of the supplier, as highlighted by (Schuh et al. (2014); Lambert & Schwieterman (2012); Lambert (2010)).

However, suppliers are not the only responsible for a failure to collaborate. Results from Morrisey & Pittaway (2006) reveal that a micro firm operating with a single employee will have a different behavior from a small firm with an employee dedicated to managing supplier relationships. Instead of prioritizing a partner type of relationship, price was found to be the most important decision driver for owner-managers of small firms, as shown by Morrisey & Pittaway (2006). The authors point out that among many reasons, the financial exposure of owner-managers could explain the drive for price. Morrisey & Pittaway (2006) also reveal that the level of formality in supplier relationships of SMEs tends to be lower than what is found in large firms. Instead, small firms heavily rely on personal and casual interactions with suppliers.

Even though they recognize that cooperation may be hard to achieve, Morrisey & Pittaway (2006) suggest that small firms should seek that kind of relationship among peers to gain more negotiating power with suppliers. Tristão et al. (2016) reinforces the importance of relationships among peer small businesses in his study about the success of Brazilian small shoe manufacturers.

As the literature shows, SRM depends significantly on collaboration between suppliers and MSEs. Those relationships, however, tend to be adversarial instead of collaborative. This literature review found that a successful SRM implementation is as a powerful tool for value creation for the firms engaged in commercial activities. SRM is relevant for this project as we explore potential changes in the time to pay the MSEs suppliers to generate value for the MSE and the supply chain. We envision that different SRM strategies will need to be implemented so that changes to payment terms can be made.

2.5. Customer Relationship Management Strategy

According to Heskett et al. (1997), profit growth can be driven by customer loyalty, customer satisfaction and the value of goods delivered to customers. As a result, managing relationships with customers has become increasingly relevant (Lambert, 2010). The criticality of managing relationships with customers is a fundamental result of ongoing changes in customers' demographics and behaviors; changes in the marketplace's level of competition; and changes in marketing functions (Kumar & Reinartz, 2018)

Customer Relationship Management (CRM) and customer value are intertwined terms. While customer value "refers to the economic value of the customer relationship to the firms, expressed as a contribution margin or net profit" (Kumar & Reinartz, 2018, p.5), CRM has a broad array of definitions and can be seen from three different perspectives (Kumar & Reinartz, 2018, p.5):

- Functional level: At this level, CRM is limited to automation of daily sales and marketing activities
- Customer-facing front-end level: At this level, CRM is defined as the means by which the company can build a profile of the client to be shared across all channels based on data
- Strategic level: This is a holistic perspective. It tries to untangle CRM from technicalities, raising the term from operational and tactical levels to the strategic. This view defines CRM as the process of optimizing the company's portfolio of clients to maximize total value of customers

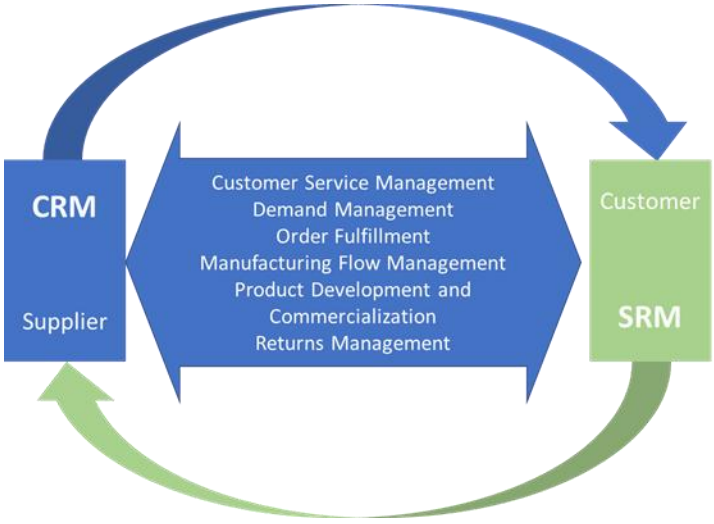
In this capstone project, one of the focuses is on the strategic level of Customer Relationship Management. The strategic CRM is not limited to automating sales processes and building databases of clients' preferences and habits. Strategic CRM directions a wide range of activities towards the customer and seeks to increase customer satisfaction. Similar definitions can be found in works from Lambert (2010), Chen and Popovich (2003) and Nadeem (2012). CRM, when successfully implemented generates a "hard to imitate competitive advantage: the customer-centric organization." (Kumar & Reinartz, 2018, p.5).

Still, implementing a successful Customer Relationship Management was found to be a large-scale effort with which organizations struggled to put into practice. Lambert (2010) proposes an approach to implementation comprising five strategic sub-processes that connect to operational sub-processes.

The five strategic sub-processes to achieve a successful implementation will include: from the strategic side, the review of corporate and marketing strategy, followed by the identification of categorization criteria for customers, the guidelines for the degrees of differentiation in service agreements, the development of metrics and the development of guidelines for sharing the benefits of improvements made to processes with customers (Lambert, 2010)

Figure 3

Interfaces between CRM and SRM



Note: From (Lambert & Schwieterman, 2012). The CRM activities of a company are areas of interface with its customer SRM activities.

The operational sub-processes will include: the customer segmentation, the preparation of the account management team, the account review, the opportunity identification within each account, the actual development of the differentiation in service agreements, the implementation of service

agreements, and, finally, the measurement of operational and profit performance. There are process interfaces connecting the two groups to translate strategic guidelines into operational practices (Lambert, 2010).

2.5.1. Customer Relationship Management Strategy for MSEs

The investments made by large enterprises to personalize the interface between customer and the company has produced great competitive advantages (Lambert, 2010) and (Kumar & Reinartz, 2018, p.5). This forces MSEs into a challenging situation; either they invest in similar strategies to equate to their competitors, or they are likely to go out of business (Cappuccio et al., 2012).

Yet CRM seems to be off-limits for micro and small firms: most MSEs are unaware of CRM's importance or existence, while some small companies, even though they recognize the relevance of CRM to business, are not capable of investing financial and time resources into the development of a CRM strategy and implementation (Cappuccio et al., 2012; Wynn et al., 2016; Pohludka & Štverková, 2019). The lack of financial resources, reliable data sources, technology, competent staff, and well stablished business processes are challenges for the implementation of CRM in small firms. Companies with strategies that are unclear or infeasible are also likely to fail when implementing a customer relationship management strategy (Wynn et al., 2016).

According to Wynn et al. (2016) a mismatch between small firm's strategy and adopted technology will most certainly result in a failure. It can be said that similarly to large firms, MSEs should seek an alignment of strategy, processes, data, and systems to achieve a successful CRM. However, it is most important that the company recognizes its size and relative power to develop the strategy and procure technology systems.

Despite the existing limitations for MSEs, Berry (2003) indicates that the adoption of CRM strategies might be, in some cases, easier in smaller firms. Pedron et al. (2011) suggests that different approaches to CRM that respect constraints by MSEs have allowed an increase in investment of micro, small and medium firms on managing customers.

To succeed, Berry (2003) indicates that MSEs should invest time to lay out a robust company strategy that will allow for an effective CRM implementation. The strategy should be combined with the systematization of business processes, and the search for technologies and systems specifically crafted for their size, which are available today. A similar view is shared by Cappuccio et al. (2012), focused specifically on the implementation of Social CRM (SCRM), the evolution of traditional CRM as portrayed by Kumar and Reinartz, (2018).

Works such as Cappuccio et al. (2012), Yawised et al. (2017), Marolt et al. (2020) and Ahani et al. (2017) advocate for the implementation of SCRM as a powerful tool to connect yet another point of contact between customer and MSE. Social CRM emerges as a relevant topic for MSEs with the rise and popularization of social media, customers and companies can now interact through Facebook, Instagram, WhatsApp, Twitter, Google Maps, Yelp, etc. (Marolt et al. 2020). Small businesses can take advantage of customer profiles to direct advertisements using Google Ads or Facebook Ads, but also to gather instant feedback from visiting clients through Google Maps or Yelp. Even more relevant during COVID-19, reviews on delivery apps such as Uber Eats, Rappi, iFood and others can yield, if positive, more sales, or changes inside the company to cope with customers complaints.

The literature suggests that CRM is a challenging topic for micro and small firms, even though it can be a powerful driver of competitive advantage. This project focuses on finding customer relationship management strategies that will allow for value increase within micro and small firms via adjusting the times to collect cash from customers.

2.6. Concept Interfaces

The literature shows the importance of cash on hand to increase the rate of survival of micro and small enterprises (JPMorgan Chase & Co Institute, 2016), even more so during COVID-19 (Pototschnik, L. et al., 2020). As past research show, the cash conversion cycle is a useful measure for evaluating cash efficiency (Jose et al. 1996). In other words, a lower CCC means a higher probability of survival for the MSE. To change the CCC, recovering the definition by Hofmann and Kotzab (2010), a company can modify the DSO, the DPO and the DIO.

There are records of research that explored the improvement of cash efficiency by using the DIO as variable to cause a reduction on the cash conversion cycle, one example is the study of Hernández and Thompson (2020). It explored different inventory policies for a number of MSEs that aimed to reduce DIO and improve cash availability. However, there is a gap on how MSEs can modify the DSO and DPO to also increase cash on hand. For that reason, we argue that micro and small firms can make use of SRM and CRM to leverage DPO and DSO in their favor. Therefore, CRM and SRM strategies are vital to MSEs.

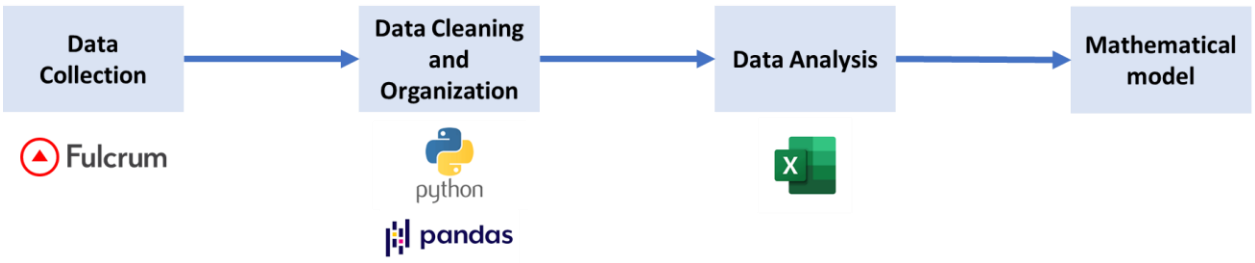
Our goal is to use the DPO and DSO to alter the CCC in a way that increases the Latin American MSEs rate of survival during and post COVID-19. To do so it analyzed data gathered from a variety of MSEs in Latin America and propose adequate CRM and SRM strategies that allow for a change in the days to pay key suppliers and to receive cash from key customers. Despite our focus on Latin America, we argue that the conclusions yield from this study may also be applicable to MSEs in other developing regions.

3. Methodology

To identify what are the SRM and CRM strategies that will increase the rate of survival for micro and small firms and allow them to withstand the effects of COVID-19, we collected data from 99 companies from 7 different countries, as described in detail in 3.1.1. After receiving the data, we proceeded to an intense data validation and data cleaning process to remove all outliers that could cause misleading conclusions. Subsequently, we performed descriptive statistical analyses on the dataset to understand the companies' profile and to observe patterns. Finally, we built a model to evaluate which are the optimal times to pay suppliers and collect from customers. In the sections to follow, more details will be provided on the methodology. Figure 4 illustrates the adopted methodology.

Figure 4

Methodology for obtaining results



3.1. Data

Our sources of information come from seven different countries in Latin America — Argentina, Brazil, Colombia, Ecuador, Mexico, Peru, and Uruguay. The data collection was done in partnership with the following local Universities: Tecnológico Monterrey, Universidad EAFIT, Instituto Tecnológico de Aguascalientes, Universidad de Piura, Pontificia Universidad Católica del Peru, Universidad de La Sabana, Universidade Federal de Santa Catarina, Universidad Pontificia Bolivariana, Universidad San Francisco,

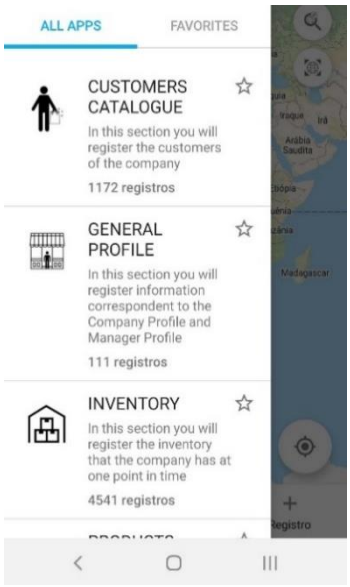
Universidad Panamericana, Universidad del Pacífico, Universidad de Montevideo, PUC Rio, and Universidad Mayor de San Andrés.

3.1.1. Data Collection

The data gathering process lasted three months, during which students from partner Universities communicated with companies via digital communication tools like WhatsApp, Zoom, Microsoft Teams or regular phone calls to collect data. The tool used to record data was a platform built by the MIT GeneSys team with the Fulcrum App. Figure 8 illustrates the app's layout.

Figure 5

Layout of the Data Collection App



Note: The Fulcrum App is a SaaS (Software as a Service) tool designed to make data gathering easier and digital, by allowing users to capture data with customized, no-code apps.

The data gathered from the companies contains the following sections:

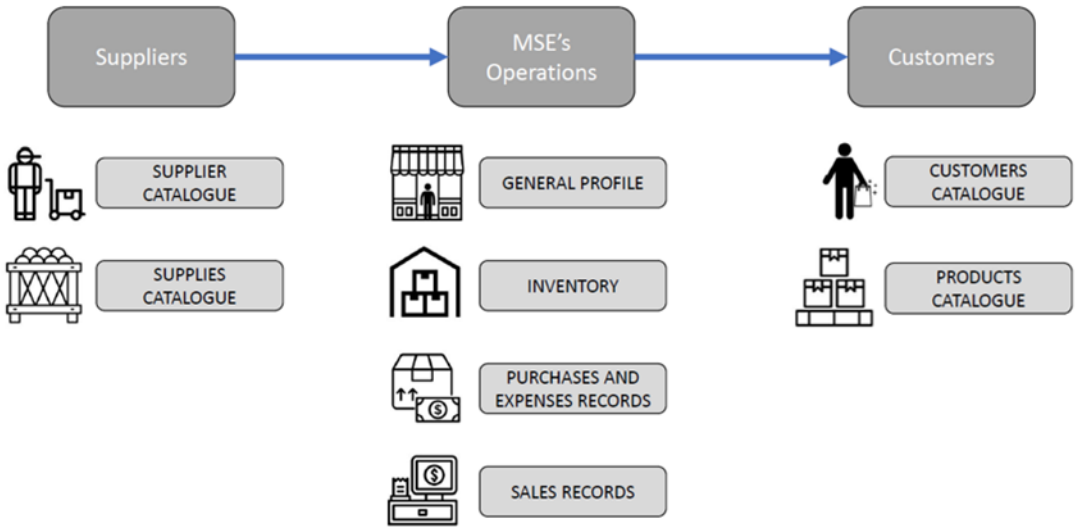
- **General Profile:** Information about the company profile and manager profile, such as company name, address, time in business, sector, subsector, managerial profile, impact on sales and staff from the new coronavirus pandemic.
- **Supplies Catalogue:** Information about the supplies the company uses, namely supply id, supply name, unit of measure, for example units, kilograms, liters, gallons, and cups.
- **Supplier Catalogue:** Information about all the suppliers of the company, namely supplier id, supplier name, supplier address, how the order is placed, how the order is delivered, and payment methods.
- **Products Catalogue:** Table containing all stock keeping units sold by the company, namely product id, product name, unity of measure (units, kg, l, gallons, cups), bill of materials and production time.
- **Customers Catalogue:** Table containing the company's customers, namely customer ID, customer name, customer address, payment methods, payment conditions, and delivery format.
- **Purchase and Expenses Records:** Table containing the purchases and expenses of the company, namely order ID, supply ID, supplier ID, company ID, date of expenditure, date of reception of order, cost of order, quantity ordered, cost of goods ordered.
- **Inventory:** Table containing the amount of inventory for each product or supply at a point in time, namely date of recording, type of SKU (supply or product), SKU ID, SKU unit of measure (units, kg, l, gallons, cups), SKU quantity.
- **Sales Records:** Table containing daily sales for each SKU and company with quantity, price, and other relevant information, namely sale ID, product ID, company ID, customer ID, date

of sale, payment method, payment condition (upfront, credit), percentage of upfront payment, time to collect from customers.

In Figure 9, we show how each data table is correlated with a link in the supply chain. Upstream in the supply chain there are information from suppliers and supplies. From the micro and small firms standpoint, the data contains a general profile section, inventory information, records for purchases and sales. Downstream in the supply chain there are information from customers and the products they purchase.

Figure 6

Categories of collected data, shown in relation to a supply chain flow



3.1.2. Data Analysis

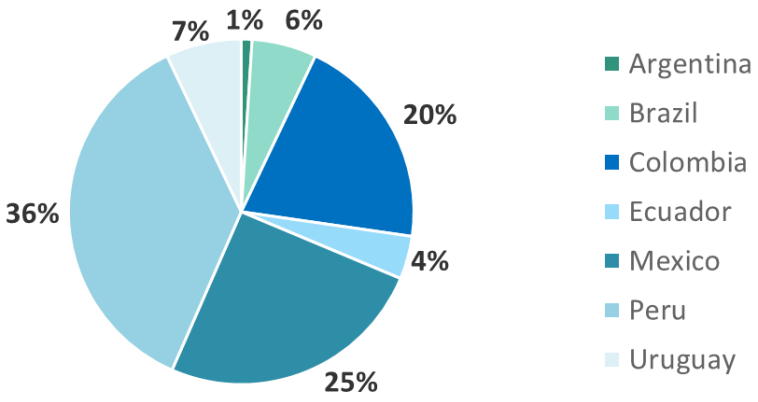
We performed all data consolidation and cleaning. After selecting the relevant columns, standardizing names, removing outliers, and joining tables. Finally, we performed the data screening about the companies' profile, purchasing, and sales patterns.

3.1.2.1. General Profile

The company profile in this research includes data from 99 companies from 7 different countries (detailed in Figure 10), of which 76% were family businesses.

Figure 7

Breakdown of companies per country



Of the 99 companies, 49% had five or fewer employees, 29% had between 6 and 10 employees and 22% had more than 10. Therefore, we conclude 49 of the companies in our data set are micro firms. As a result of the COVID-19 pandemic, 40% of companies reported a reduction in staff, while 49% reported a reduction in sales in the last 6 months and 36% reported an increase in costs. At the same time, 52% of companies, reported a reduction in sales, and 40% of them reported an increase in costs. However, only 27% of these firms reported a reduction of staff.

3.1.2.2. Purchases

From the purchases point of view, there were records available for 31 companies from Brazil, Colombia, and Mexico. Two companies from Colombia accounted for nearly 60% of all recorded purchases.

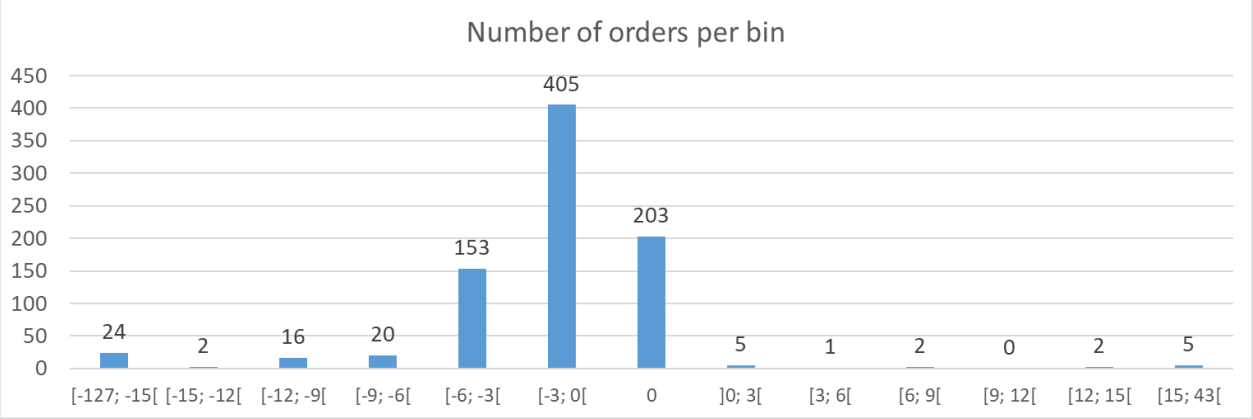
We define the time to pay suppliers as the difference between the date of receipt of the order and the date of expenditure. Therefore, negative values indicate payments made in advance to the suppliers.

Literature suggests that potential benefits to the supply chain could be derived from favoring weaker links, as shown by Hofmann & Kotzab (2010) and Lambert & Schwieterman (2012). We hypothesized that the weaker links of the MSEs' supply chain would be our sample of MSEs. However, the results shown by the data were counterintuitive: the existing relationships between our sample of MSEs and their suppliers seems to favor suppliers.

An analysis of the time to pay suppliers revealed that in 75% of orders companies were paying their suppliers in advance, averaging 1.7 days in advance, as illustrate by Figure 11.

Figure 8

Distribution of time to pay orders



An analysis per country revealed that in Brazil, companies were paying their suppliers, on average, 2 days in advance, and in Colombia the number rose to 4 days in advance, while in Mexico, it dropped to only 1 day in advance.

3.1.2.3. Sales

From the sales point of view, data was available for 28 companies from Brazil, Colombia, and Mexico. Two companies from Colombia accounted for nearly 48% of all recorded sales, and a single company from Brazil accounted for all recorded orders in the country, representing 13% of total recorded orders.

We define the time to collect money from customers as weighted average of the percentage of payment required in advance by the MSE. However, 94% of recorded sales did not have the information necessary to calculate the time to collect from customer, which limits any conclusion resulting from the sample. The analysis of the available data on the time to collect from customers shows that for 61% of recorded sales the money is collected from customers with no delay, for 15% the money is collected within 5 days and for 23% the money is collected within 15 days or more.

3.2. Mathematical model

The model adopted to explore different configurations of payment terms between companies in the supply chain where MSEs operate is described in Equations 1 through 4.

$$SVA_{SC} = SVA_S + SVA_{MSE} + SVA_C \quad (1)$$

$$SVA_S = \overbrace{\sum(-x_{ij} * P_{ij} * w_i)}^{Financing\ Term} + \overbrace{\sum P_{ij} * mg_i}^{Profit\ Term} \quad (2)$$

$$SVA_{MSE} = \overbrace{\sum[(x_{ij} * P_{ij} - y_{jk} * S_{jk}) * w_j]}^{Financing\ Term} + \overbrace{\sum P_{ij} * \frac{mg_j}{c_j}}^{Profit\ Term} \quad (3)$$

$$SVA_C = \overbrace{\sum(y_{jk} * S_{jk} * w_k)}^{Financing\ Term} + \overbrace{\sum S_{jk} * \frac{mg_k}{c_k}}^{Profit\ Term} \quad (4)$$

Where:

- SVA_S, SVA_{MSE}, and SVA_C are the shareholder value added for the supplier, the micro and small enterprise, and the customer, respectively.
- x_{ij} is the time it takes the MSE j to pay back supplier i in days.
- y_{jk} is the time it takes the MSE j to receive money from customer k in days.

- P_{ij} is the average payment balance between the MSE j and supplier i.
- S_{jk} is the average payment balance between the MSE j and customer k.
- w_i, w_j, and w_k are the costs of capital for the supplier, the micro and small enterprise, and the customer, respectively.
- mg_i, mg_j, and mg_k are the net profit margins as percent of the revenue for the supplier, the micro and small enterprise, and the customer, respectively.
- c_j and c_k are the cost of goods sold as percent of revenue for the MSE j and customer k.

We can assume that P and S hold linear relationships with x and y, respectively:

$$\begin{cases} P = P_0 + a * (x - x_0) \\ S = S_0 + b * (y - y_0) \end{cases}, for\ each\ index\ i, j\ and\ k \quad (5)$$

We interpret the relationship from three different perspectives. First, the supplier can increase the unit price of the products when it allows for a longer payment term, resulting in a higher P. The second perspective is derived from the heavy cash constraints that MSEs are subjected to: the argument is that MSEs purchase less products than their potential demand due to shortage of cash. Therefore, if MSEs could pay suppliers later, they would increase their purchases. The third perspective is a combination of the first two.

For this model we will assume the increase in P or S due to an increase in x and y is caused exclusively by an increase in the purchased quantity, with no changes to the unitary price. Given that, this model must have a demand constraint to avoid results where companies would buy more products than their customers' demand.

Following what Hofmann & Kotzab (2010) highlighted, we also assumed the weighted average cost of capital (w) is constant for each firm. However, this assumption is not true for all possible values of x and y. Since the weighted average cost of capital (w) is defined as the weighted average between cost of

debt and cost of equity (Frank & Shen, 2016), w can only be a constant for intervals of x and y that do not endanger the companies' liquidity. If x or y are high enough to impact the liquidity, then w can no longer be assumed constant; it becomes a function of x and y. Therefore, we need to impose two constraints for the values of x and y:

$$\begin{aligned} x &\leq x_{max} \\ y &\leq y_{max} \end{aligned} \tag{6}$$

Where x_{max} and y_{max} denote the maximum values of x and y that do not impact the liquidity of the companies in the supply chain.

3.2.1. Model for a Two-Echelon Supply Chain

We can simplify the model described by Equations 1 through 4 and analyze its behavior between only two companies in a supply chain: a MSE and its supplier. After an algebraic manipulation of the original model, we derived equation 8, which illustrates such situation. All terms are as described before.

$$\begin{aligned} SVA = \; & -x\big(P_0 + a(x - x_0)\big)w_i + (P_0 + a(x - x_0))mg_i \\ & + x\big(P_0 + a(x - x_0)\big)w_j + (P_0 + a(x - x_0))\frac{mg_j}{c_j} \end{aligned} \tag{7}$$

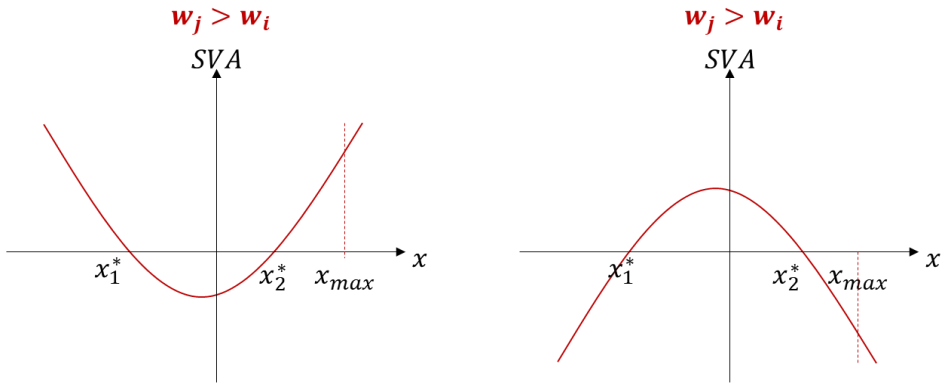
$$\begin{aligned} SVA = a\big(w_j - w_i\big)x^2 + & \left((P_o - ax_0)\big(w_j - w_i\big) + a\left(mg_i - \frac{mg_j}{c_j}\right)\right)x \\ & + (P_0 - ax_0)\left(mg_i - \frac{mg_j}{c_j}\right) \end{aligned} \tag{8}$$

Since SVA is a quadratic function, we can affirm that it has a concave up form if $a\big(w_j - w_i\big) > 0$ and a concave down form if $a\big(w_j - w_i\big) > 0$. Since a is always positive, we have:

$$\begin{cases} w_j > w_i \ \rightarrow concave\ up\ format \\ w_j < w_i \ \rightarrow concave\ down\ format \end{cases}$$

Figure 9

Illustration of the SVA's behavior



The concavity of the function shown in Figure 5 shows if an increase in x will enhance the SVA or reduce it. In other words, if the cost of capital for the MSE is higher than the cost of capital of the supplier, it makes sense, from the supply chain perspective, to increase the time to pay the supplier up to the limit x_{max}, where it starts to affect the supplier's liquidity and, by extension, impacts the cost of capital for the supplier.

If $w_j = w_i$, we eliminate the financing term from the model and are left with a linear relationship, as shown in equation 9.

$$SVA = a\left(mg_i - \frac{mg_j}{c_j}\right)x + (P_0 - ax_0)\left(mg_i - \frac{mg_j}{c_j}\right) \quad (9)$$

This relationship describes the SVA variation only depending on the company's margins and the variation in P caused by a variation in x, as seen in equation 5.

3.2.2. Potential Impacts for Suppliers

Even though we are increasing the supply chain's SVA, in some situations, we can observe a negative impact to the supplier's SVA when increasing the time MSEs must pay them back. It is important to be aware of that risk, even more so when designing supplier relationship management strategies.

It should be easier to negotiate an increase in the time to pay suppliers if the impact to its shareholder value is zero or positive. To study the possible outcomes, we imagined two different scenarios:

Table 1

Scenarios with different SVA for each time to pay

Scenario 1		**Scenario 2**	
Time to pay suppliers	x_1	Time to pay suppliers	x_2
Shareholder Value Added for the supplier	SVA_1	Shareholder Value Added for the supplier	SVA_2

If $x_2 > x_1$ and $SVA_1 = SVA_2$ we find an optimal point where there is no negative impact for the supplier, the MSEs SVA is increased and the supply chain's SVA is also increased. This situation is given by equations 10 through 13.

$$SVA_1 = -x_1 P_1 w_i + P_1 m g_i \quad (10)$$

$$SVA_2 = -x_2 P_2 w_i + P_2 m g_i \quad (11)$$

$$\Delta SVA = SVA_2 - SVA_1 = 0 \quad (12)$$

$$P_2 = P_1 + a * (x_2 - x_1) \quad (13)$$

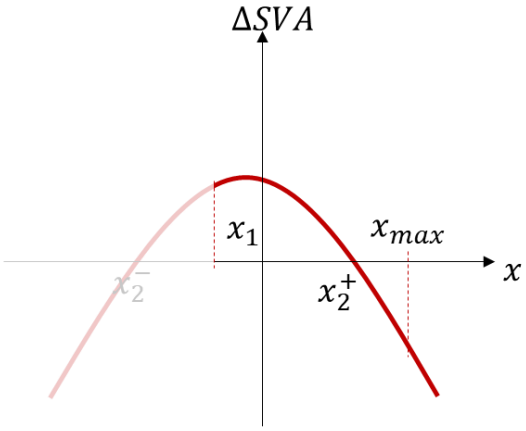
Solving for x_2 we get equation 14.

$$\Delta SVA = -aw_i * x_2^2 - [(ax_1 + P_1)w_i - amg_i] * x_2 - ax_1 mg_i = 0 \quad (14)$$

Since $\Delta SVA = 0$ is a simple quadratic equation, the solution is trivial. Letting the roots for that equation be x_2^- and x_2^+. Figure 6 illustrates the behavior of ΔSVA. The interpretation of Figure 6 must consider the time the MSE had to pay the supplier in scenario 1 (x_1). Since we assume $x_2 > x_1$, the interval of analysis for ΔSVA should only consider values of x_2 that comply with that. In case $x_2^- < x_1$ we must discard x_2^-, as shown in Figure 6. For values of $x > x_2^+$ shareholder value is destroyed for the supplier. In this region it may be significantly difficult to negotiate an extended payment term with suppliers.

Figure 10

Behavior of ΔSVA for the supplier depending on x_2^+, x_1 and x_{max}



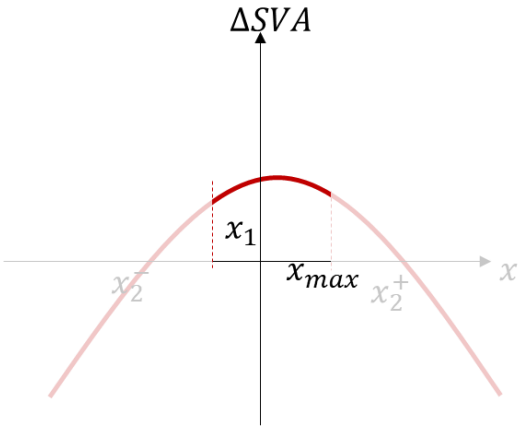
Note: For values $x > x_2^+$ we end up destroying value for the supplier and negotiations may hit a gridlock

We can observe that for values of x between $x_1$and x_2^+, we are not only creating value for the MSE, but also creating value for the supplier. Therefore, this is the range within which we should negotiate with the supplier.

However, in cases where $x_2^+ \geq x_{max}$, the negotiation interval should be restricted to $[x_1, x_{max}]$. Figure 7 shows that situation:

Figure 11

Behavior of ΔSVA if $x_2^+ \geq x_{max}$



Note: If $x_2^+ \geq x_{max}$ the interval of value creation for the supplier is more limited.

It is most relevant to determine the condition for the supplier from a breakeven standpoint. We sought to comprehend what must be achieved both in terms of increased sales and relationship to guarantee a win-win relationship between suppliers and the micro and small firms.

When seeking to guarantee a constant positive impact for the supplier, we solve equation 15 to find the breakeven increment in sales from the increased cash availability for the small firm. The result shown in equation 16 reveals that as long as the percent increase in sales is superior to $\frac{w_i}{mg_i - x_2 w_i}$, the supplier will always benefit from stretching the time to collect money from the MSE.

$$\Delta SVA = SVA_2 - SVA_1 \geq 0 \tag{15}$$

$$\frac{a}{P_1} \geq \frac{w_i}{mg_i - x_2 w_i} \tag{16}$$

Therefore, to comprehend how generalizable this result is for all small firms, we must understand three factors: the cost of capital for their suppliers, the margins for their suppliers, and the marketplace the MSE is operating in. The first two factors point to the direction of a cooperative relationship between the firms, since suppliers would not reveal their financial information, nor their margins to a customer. The third will reveal if the increase in sales yielded from equation 16 is achievable given the demand and other constraints. Even though the request for extended payment terms may come from the customer, the supplier must work together with the customer to evaluate whether the necessary increase in sales is realistic. The consequences of equation 16 are analyzed in Section 4.1.2 and 4.1.3.

4. Results and Analysis

4.1. Model Behavior

4.1.1. Analysis of a Case Study

The approach to comprehend the model behavior was to simulate scenarios with real data. The inputs were as shown in Figure 12.

Figure 12

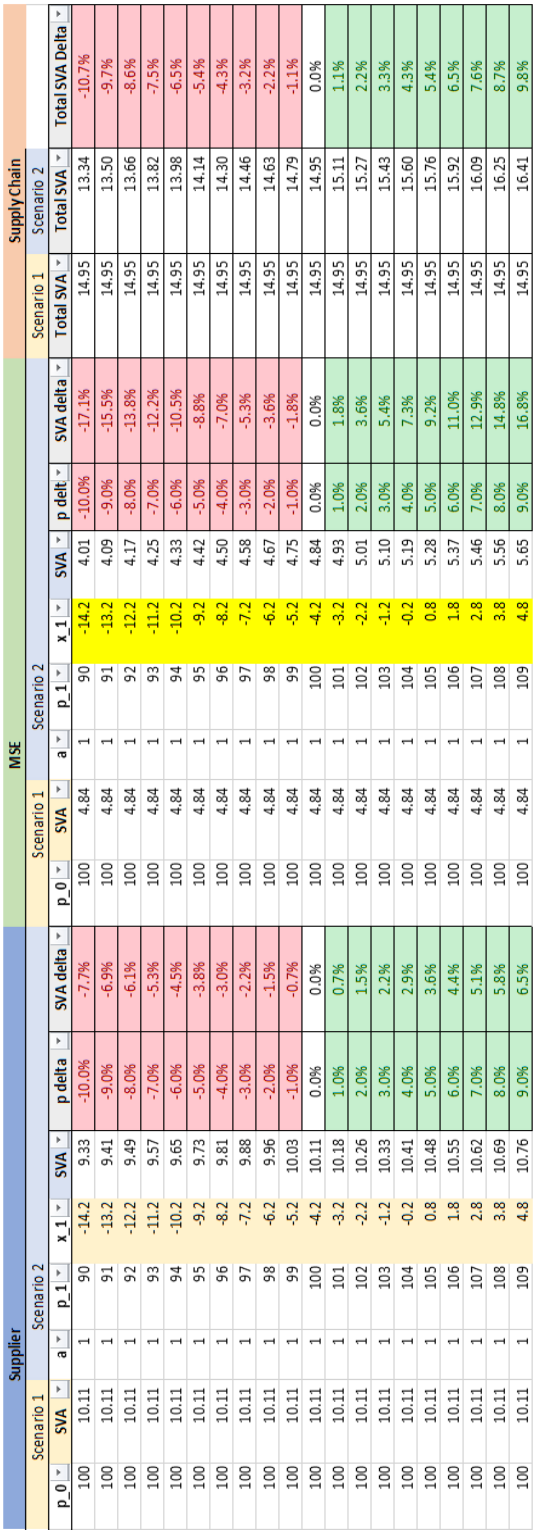
Model inputs for case study

p_0	100
x_0	-4.2
w_i	0.026%
mg_i	10%
a	1.00
w_j	0.038%
mg_j	5%
c_j	80%

The simulation compares two scenarios: an initial situation, with an initial time to pay the supplier (x_0) and an initial payment balance (P_0); and a potential situation, with a new time to pay the supplier (x_1) and a new payment balance (P_1) calculated according to equation 5. The different possible values of $x_1$yield different calculated shareholder value added for the supplier, the MSE and the supply chain, as illustrated in Figure 13.

Figure 13

Illustration of the model's output



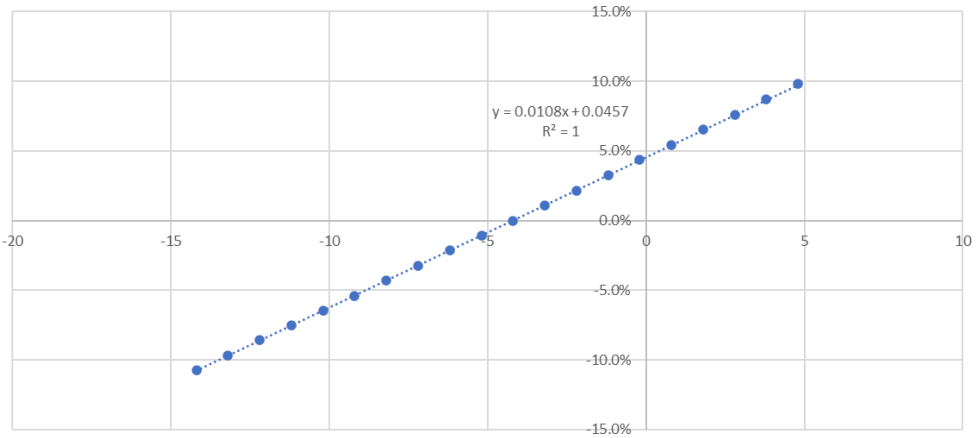
Supplier							MSE								SupplyChain			
Scenario 1		Scenario 2					Scenario 1		Scenario 2						Scenario 1		Scenario 2	
p_0	SVA	a	p_1	x_1	SVA	p delta	SVA delta	p_0	SVA	a	p_1	x_1	SVA	p delt	SVA delta	Total SVA	Total SVA	Total SVA Delta
100	10.11	1	90	-14.2	9.33	-10.0%	-7.7%	100	4.84	1	90	-14.2	4.01	-10.0%	-17.1%	14.95	13.34	-10.7%
100	10.11	1	91	-13.2	9.41	-9.0%	-6.9%	100	4.84	1	91	-13.2	4.09	-9.0%	-15.5%	14.95	13.50	-9.7%
100	10.11	1	92	-12.2	9.49	-8.0%	-6.1%	100	4.84	1	92	-12.2	4.17	-8.0%	-13.8%	14.95	13.66	-8.6%
100	10.11	1	93	-11.2	9.57	-7.0%	-5.3%	100	4.84	1	93	-11.2	4.25	-7.0%	-12.2%	14.95	13.82	-7.5%
100	10.11	1	94	-10.2	9.65	-6.0%	-4.5%	100	4.84	1	94	-10.2	4.33	-6.0%	-10.5%	14.95	13.98	-6.5%
100	10.11	1	95	-9.2	9.73	-5.0%	-3.8%	100	4.84	1	95	-9.2	4.42	-5.0%	-8.8%	14.95	14.14	-5.4%
100	10.11	1	96	-8.2	9.81	-4.0%	-3.0%	100	4.84	1	96	-8.2	4.50	-4.0%	-7.0%	14.95	14.30	-4.3%
100	10.11	1	97	-7.2	9.88	-3.0%	-2.2%	100	4.84	1	97	-7.2	4.58	-3.0%	-5.3%	14.95	14.46	-3.2%
100	10.11	1	98	-6.2	9.96	-2.0%	-1.5%	100	4.84	1	98	-6.2	4.67	-2.0%	-3.6%	14.95	14.63	-2.2%
100	10.11	1	99	-5.2	10.03	-1.0%	-0.7%	100	4.84	1	99	-5.2	4.75	-1.0%	-1.8%	14.95	14.79	-1.1%
100	10.11	1	100	-4.2	10.11	0.0%	0.0%	100	4.84	1	100	-4.2	4.84	0.0%	0.0%	14.95	14.95	0.0%
100	10.11	1	101	-3.2	10.18	1.0%	0.7%	100	4.84	1	101	-3.2	4.93	1.0%	1.8%	14.95	15.11	1.1%
100	10.11	1	102	-2.2	10.26	2.0%	1.5%	100	4.84	1	102	-2.2	5.01	2.0%	3.6%	14.95	15.27	2.2%
100	10.11	1	103	-1.2	10.33	3.0%	2.2%	100	4.84	1	103	-1.2	5.10	3.0%	5.4%	14.95	15.43	3.3%
100	10.11	1	104	-0.2	10.41	4.0%	2.9%	100	4.84	1	104	-0.2	5.19	4.0%	7.3%	14.95	15.60	4.3%
100	10.11	1	105	0.8	10.48	5.0%	3.6%	100	4.84	1	105	0.8	5.28	5.0%	9.2%	14.95	15.76	5.4%
100	10.11	1	106	1.8	10.55	6.0%	4.4%	100	4.84	1	106	1.8	5.37	6.0%	11.0%	14.95	15.92	6.5%
100	10.11	1	107	2.8	10.62	7.0%	5.1%	100	4.84	1	107	2.8	5.46	7.0%	12.9%	14.95	16.09	7.6%
100	10.11	1	108	3.8	10.69	8.0%	5.8%	100	4.84	1	108	3.8	5.56	8.0%	14.8%	14.95	16.25	8.7%
100	10.11	1	109	4.8	10.76	9.0%	6.5%	100	4.84	1	109	4.8	5.65	9.0%	16.8%	14.95	16.41	9.8%

Note: The green cells indicate increase in SVA, while the red color denotes a decrease.

For this case study, we varied the time to pay the suppliers between [-10,+10] off of the initial time to pay. We plotted the percentage difference between the initially calculated values of SVA and the values calculated after modifying x as shown in Figure 14. We observed that, even though the model suggests a quadratic behavior for the SVA Figure 14 shows that the behavior for this interval of variation and inputted values is essentially linear, as suggested by the R^2value.

Figure 14

Behavior for the ΔSVA for the supply chain



Note: is essentially linear for this interval and inputted values

As shown by table 2, the increase in the shareholder value added for micro and small firms is substantial. This effect is due to the increase in the time to pay suppliers. The increased time to pay affects both the financing term and the profit term in equation 3.

Table 2

Impact of modifying the time to pay the supplier on shareholder value added for each firm

Time to pay the supplier	SVA variation for the supplier	SVA variation for the MSE	SVA variation for the supply chain
-14.2	-7.7%	-17.1%	-10.7%
-13.2	-6.9%	-15.5%	-9.7%
-12.2	-6.1%	-13.8%	-8.6%
-11.2	-5.3%	-12.2%	-7.5%
-10.2	-4.5%	-10.5%	-6.5%
-9.2	-3.8%	-8.8%	-5.4%
-8.2	-3.0%	-7.0%	-4.3%
-7.2	-2.2%	-5.3%	-3.2%
-6.2	-1.5%	-3.6%	-2.2%
-5.2	-0.7%	-1.8%	-1.1%
-4.2	0.0%	0.0%	0.0%
-3.2	0.7%	1.8%	1.1%
-2.2	1.5%	3.6%	2.2%
-1.2	2.2%	5.4%	3.3%
-0.2	2.9%	7.3%	4.3%
0.8	3.6%	9.2%	5.4%
1.8	4.4%	11.0%	6.5%
2.8	5.1%	12.9%	7.6%

3.8	5.8%	14.8%	8.7%
4.8	6.5%	16.8%	9.8%

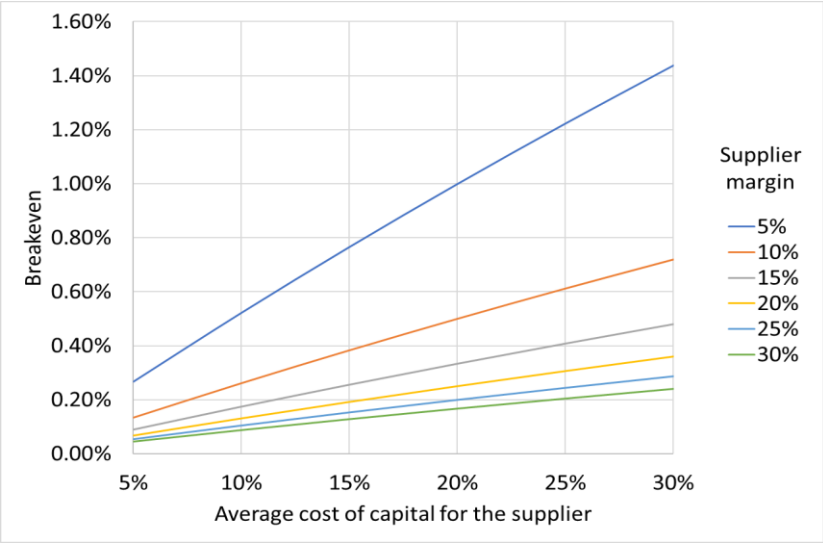
We can observe that value was also generated for the supplier. Even though the increased time to pay harms the financing term in equation 2, the profit term benefits from the demand increase. This result is further explored in sections 4.1.2 and 4.1.3.

4.1.2. Analysis of the Relationship Between Supplier and MSE

To analyze the result from equation 16 we calculated the percent increase in sales necessary to allow for extensions on the time to pay with no impact for the supplier, as shown in Figure 15 and 16. From Figures 15 and 16, allowed us to understand what happens in the worst-case scenario for the supplier, where a high cost of capital is contrasted with a low margin. Even in that situation, we do not need to increase sales by more than 1.4% to achieve breakeven for the supplier.

Figure 15

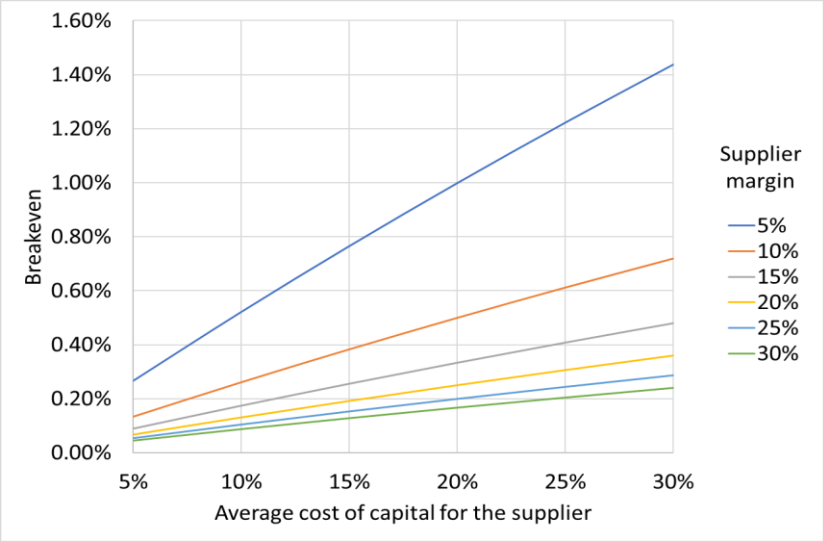
Breakeven point for different values of cost of capital and margin



Note: Breakeven was calculated for an MSE with initial time to pay of 40 days in advance and new payment time of 0 days (payment on delivery). There is net-zero impact for supplier.

Figure 16

Breakeven point for different values of cost of capital and margin



Note: Breakeven was calculated for an MSE with initial time to pay of 2 days in advance and new payment time of 0 days (payment on delivery). There is net-zero impact for supplier.

It is relevant to point out that both graphs shown in Figures 15 and 16 are the same, even though the initial time to pay the supplier is 40 days in advance for Figure 15 and 2 days in advance for Figure 16. This result may seem unintuitive, but it was anticipated by equation 16. Since the equation shows the breakeven point does not depend on the initial time to pay the supplier (x_1).

4.1.3. Analysis of the Relationship Between Customer and MSE

We analyzed the relationship between the micro and small firms and its customers from a perspective similar to the one adopted in Sections 4.1.1 and 4.1.2. Therefore, all equations are analogous.

From this point of view, the supplier is the MSE, and the customer takes on the spot previously held by the MSE.

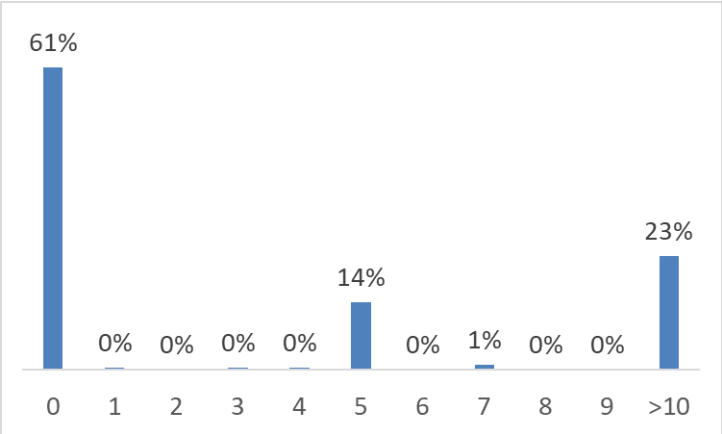
Likewise, we determined the ideal increment in sales such that the net impact on shareholder valued for the MSE is zero, as we did for Section 4.1.2. As expected, we get the same results shown previously in Figures 15 and 16.

The sales increase motivated by a payment term extension for customers is dependent on the type of business of the MSE. Boulaksil et al. (2014) cite the capacity of small traditional retailers to offer informal credits to well-known customers as one of the reasons for their success.

Ideally, if sales are not increased by the minimum required for zero impact in shareholder value for the MSE, it would be better not to change the time to collect cash from customer. Therefore, we would leave it as shown in Figure 17.

Figure 17

Distribution of days to collect cash from customers (% of recorded orders)



5. Conclusions

In Latin America, micro and small firms struggle to survive and are heavily reliant on cash availability to operate. The coronavirus pandemic has significantly impacted the region and their cash inflow. In this situation, business continuity was put at risk due to their low levels of cash on hand. Micro and small companies struggle with implementing SRM and CRM initiatives for the reasons described in sections 2.4.1 and 2.5.1. With this project we intended to show that supplier relationship management and customer relationship management initiatives can allow for collaboration across the supply chain and ensure the survival of micro and small firms in Latin America during COVID-19 via increased cash availability. We gathered sales and purchases records from 99 Latin American MSEs and analyzed potential threats to MSEs' cash conversion cycle, using it as a proxy for cash availability. We found that the time to pay suppliers was harming the micro and small companies' cash position, since most firms were paying their suppliers in advance.

We developed a mathematical model to study the impacts of varying the times to pay and collect cash across the supply chain. The model consists of two terms – a financing term and a profit term. The financing term accounts for the cost of capital when paying later or earlier. The profit term takes into consideration the increase in sales that occurs when a supplier agrees to receive payment later.

Using such model, we found that a collaborative relationship with suppliers and customers can be achieved and can improve the cash position (creating up to 17% in additional value) of micro and small firms while still generating value for other companies in the supply chain (up to 5% increase). We have shown that a win-win-win configuration can be achieved when MSEs delay payment to their suppliers. It is a win for the supply chain, a win for the supplier and a win for the micro and small firms that benefit from value creation. We have also shown that a balance can be achieved in the MSEs customer side. However, the equilibrium for this portion of the supply chain may not be simple to achieve. For this reason, we

recommend that MSEs only grant extended payment terms to customers when a demand increase beyond the breakeven point can be guaranteed.

5.1. Limitations

Our work had data from 99 micro and small firms with a high concentration in Colombia and Mexico. This may limit our capacity to generalize our conclusions to the entirety of Latin America. Also, a key assumption in the model is the fact that there is in fact a correlation between cash availability and the increase in sales for micro and small business. We argue that future research is needed to prove the correlation between the two variables.

5.2. Further Research

We recommend that future researchers try to identify demand elasticity with respect to payment term increases and compare their findings with the values obtained in our work. We also recommend that others reproduce the work we have done with a different sample of companies to identify if the pattern of advanced payment for suppliers appears. There is still opportunity to look at the problem described in this project from an optimization standpoint, but data for cost of capital and margins are required for such approach. Also, connecting this analysis with the inventory problem for micro and small firms can also lead to a broad research avenue.

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