

Efficiency Gains from the Securitization of Small & Medium Business Card Payment Receivables in Brazil

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Abstract

This paper investigates the impact of the Central Bank of Brazil's regulatory changes, specifically the 2018-19 securitization of credit card receivables, on the efficiency of the market for advancing card payment receivables. We examine how these changes influenced market thickness, trust and safety, congestion, and contractual terms. Our findings indicate an increase in market thickness and trust, as well as a reduction in congestion, evidenced by a difference-in-difference increase in newly issued loans and decrease in interest rates post-2019 for the regulated credit product versus an untreated comparable. The study provides evidence that these market design changes foster innovation and efficiency improvements, facilitated by central standardized databases in registration entities.

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1 Introduction

Over the past decade, the Central Bank of Brazil (BCB) transformed the payment processing and small business financing landscape in Brazil through innovative regulatory changes. Previously, merchants had to contract with VisaNet (now, Cielo) to accept Visa, and RedeCard (now, Rede) to accept Mastercard due to exclusivity agreements signed between the payment acquirers and the two major card networks, essentially creating a duopoly. The BCB's agenda of reforms to this sector started by mandating interoperability, putting an end to exclusivities and opening the market to new acquirers. In 2018, in line with the Central Bank's agenda of modernizing the Brazilian financial system, a mandate required credit card receivables to be securitized.

The securitization of card receivables is important in Brazil due to one distinguishing factor of the local card payments market: payments are settled in a T+30 regime, meaning businesses get paid for their transactions by acquirers only 30 days after they happen, a legacy of lack of competition in the acquiring space, bundled with a historical culture of consumers paying in instalments. The T+30 settlement cycle opens up a market for small- and medium-sized businesses, who may need working capital now, to advance some or all of their receivables, subject to a discount rate. Previously, that service could only be offered by merchant acquirers (the entities who process merchant card payments), since they controlled and had information on the merchant's future transaction receivables. The securitization mandate however established information standards and created registration entities: a systematic consolidation of card receivables into central databases that allowed merchants to take their receivables and get discount rate bids from any other acquirer or credit provider. It also opened up new markets, such as merchants using their now-traceable receivables as collateral for other credit products.

As in other market design settings, the creation of registration entities have the potential to significantly improve the experience for buyers and sellers interacting in a market. They work as a marketplace, reducing information asymmetry and enabling more players to enter the market, thereby increasing competition and market thickness and improving the contract terms for buyers and sellers. Our paper analyzes, through a difference-in-difference regression, how key indicators of contract terms improved within the credit card cash advance market after the regulation, compared to the same indicators in similar business credit products that were not affected by the regulatory change. Other than raw data reports from the BCB and news articles, little has been written about this regulation, and no academic literature analyzes its efficiency gains.

2 Background & Literature Review

2.1 Brazilian Payments System

For decades, Brazilians were early to the Buy-Now-Pay-Later scene, embracing the practice of paying for purchases in instalments, initially through checkbooks known as *crediários* and later by splitting a card transaction into "interest-free" monthly instalments. The instalments are interest-free to

cardholders because they are financed by the cash advance market between merchants and acquirers. According to data from the Brazilian Association of Credit Card Companies and Services (ABECS), the total value of card payments in Brazil grew by 24.6% in 2022, reaching a total of R\$ 3.31 trillion in transaction volume. Out of these transactions, R\$ 2.1 trillion were processed through credit cards, and the remaining trillion in debit and pre-paid cards.

A pain that small- and medium-sized businesses face is having working capital to run their business only when they get settled in T+30 days for the majority of their transactions, and in T+30/60/90... for payments in instalments. This is why their card acquirer offers them a cash advance on their receivables and charge them a discount rate on that. Acquirers may also choose to offer merchants additional credit in this cash advance repayable by deducting the principal and interest from future transaction receivables. According to Brazil's Support Service for Micro and Small Enterprises (SEBRAE) 2021 report, 45% of entrepreneurs in micro and small businesses in Brazil regularly advance their card sales receivables, while an additional 18% utilize this financial instrument sporadically. In summary, the two ways credit took place between merchants and their payment acquirer prior to 2018 was:

- **Advance Receivables:** acquirer pays the transaction receivable to the retailer before the original due date (i.e., advances), charging a discount rate.
- **Cash Advance:** merchant takes a small working capital loan from acquirer, repaid through their future transaction cashflow with the acquirer. In this case, future receivables work as an imperfect form of collateral: if the merchant changes acquirer, it is hard to recover any pending repayments.

2.2 Registration Entities as a Market Design Intervention

In 2018, the National Monetary Council (CMN) and the BCB introduced Resolution CMN 4.707 and Regulatory Circular 3.924/2018 on credit operations backed by receivables from the national payment system (more relevantly, from credit cards). Following a "Regulatory Transition Window" from December 2018 to June 2019, Resolution CMN 4.734 and Regulatory Circular 3.952/2019 established the definitive receivables registration system ("New Regulatory Framework"), offering greater control and visibility over credit and debit card receivables. This initiative aimed to enhance merchant autonomy over their receivables, increase access to credit, reduce interest rate spreads, and democratize the use of card receivables by stimulating credit provision, minimizing recovery costs, and strengthening legal security.

Importantly, the resolution led to the creation of registration entities. All transactions captured by acquirers and sub-acquirers, whether through point-of-sale devices or online, must be registered within this system. Registration entities function as financial market infrastructures (FMIs) and operate similarly to property registration offices. Each receivable is assigned a unique registration number known as a "Unit of Receivable" (UR). Acquirers and sub-acquirers are responsible for registering the receivables in the name of the holder, providing essential information such as the owner of the receivable, the capturing acquirer, and the terms of the operation.

These changes enabled receivables to be used as collateral in credit operations and transferred to third parties. The practical implications for the two forms of credit described above were:

- **Advance Receivables:** receivables are registered, meaning merchant acquirers lose the information exclusivity they had to offer them an advance. Merchants can advance receivables with any player.
- **Cash Advance:** as above, merchants can take working capital loans from any entity, but perhaps more importantly: receivables become a more secure form of collateral. If a merchant changes acquirers and has an overdue balance with their previous one, that acquirer may pull the collateralized receivables from the registration system until the credit obligations are repaid.

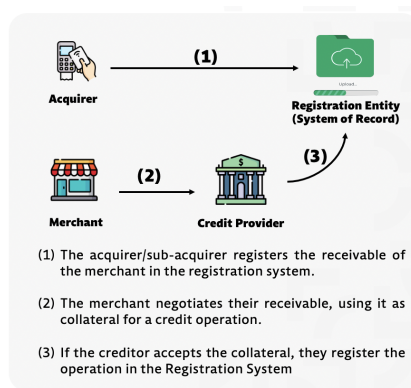


Figure 1: Payment System in Brazil after the Introduction of Registration Entities (Stone Co, 2023)

The process of receivables registration is now carried out electronically, marking a significant shift in the way the industry operates. This helps to prevent fraud by ensuring that the receivable is not falsely used as collateral for more than its actual value. Additionally, it prevents double spending of the same asset by ensuring that an asset-backed security or receivable is only sold or pledged as collateral once. This directly ties in with the **safety component of efficient markets**: by maintaining the ownership of the receivable and facilitating its transfer to a new holder, registration entities establish trust, decrease information asymmetry, and safeguard sensitive information. Providing safety and comfort for participants through securitization provides incentives for them to reveal their true preferences and engage in transactions with confidence (Roth, 2007).

Registration entities enable merchants to discount receivables through any acquirer, allowing the retailer to choose the company offering the best interest rate, regardless of which card terminal processed the sale. This has significantly increased **market thickness** by bringing together numerous potential buyers (merchants) and sellers (acquirers and other credit providers) to facilitate mutually beneficial transactions. By establishing a marketplace and ending the previous implicit "credit upsell" monopolies, registration entities enable credit providers to efficiently offer their services to potential registrants. This encourages competition, provides greater choice, and has the potential to promote favorable outcomes to all market participants.

The Circular also increased market thickness through two additional changes. First, with the merchant’s consent, UR data can be shared with acquirers and other institutions interested in offering credit, facilitating go-to-market - specially outbound - strategies. Second, entrepreneurs can now use their securitized receivables as collateral on other financial institutions, putting an end to previous "lock" of receivables. Previously, a merchant’s flow of receivables was locked to a specific bank account. For example, if a merchant had receivables totaling R\$ 20, 000 but only had an outstanding credit balance of R\$ 4, 000, the entire receivables schedule was pledged to that single creditor. However, under the new system, the merchant’s cash flow and schedule can be pledged to the creditor based on the outstanding balance. This allows the merchant to secure loans with credit card receivables as collateral from multiple financial or payment institutions. From the example above, this would mean unlocking R\$ 16, 000 from the receivables schedule for other credit undertakings. This means that not only can more merchants access credit, but the potential credit pool per merchant is also larger through provider diversification.

Registration entities give credit providers greater visibility and control over receivables by offering information about their existence, ownership, and any liabilities. This enhanced transparency enables credit providers to better understand the reasons for delinquency and make informed credit issuance decisions. As a result, the lower risk associated with improved visibility and control encourages credit providers to offer more credit, contributing to market thickness.

2.3 Evidence of Structural Changes in the Payments Market

The payments industry in Brazil has been opening up since the initial changes that ended the VisaNet (now Cielo) and RedeCard (now Rede) duopoly in 2010, but we observe a continued reduction in market concentration through recent years. Table 1 below shows the evolution of market share for the key merchant acquirers in Brazil, in terms of Total Payment Value (TPV) (JP Morgan, 2023). We also compute the Herfindahl-Hirschman Index (HHI) ¹. While the HHI pertains to the TPV and may not solely reflect the state of the merchant credit market, it is a strong indicator of the higher competition and the ability of merchants to diversify their acquirers without compromising access to credit.

	2014	2015	2016	2017	2018	2019	2020	2021	2022	1Q23
Cielo	53.7%	51.5%	48.5%	46.1%	40.3%	37.1%	31.5%	26.8%	26.3%	24.0%
Rede	37.1%	36.0%	32.1%	28.9%	28.1%	26.5%	24.9%	23.3%	22.1%	23.3%
Getnet	6.3%	7.8%	9.0%	10.5%	12.1%	11.3%	13.4%	15.4%	14.5%	15.1%
Stone	0.0%	0.0%	2.3%	3.6%	5.4%	7.0%	10.3%	10.4%	11.1%	11.1%
PagSeguro	0.4%	0.7%	1.2%	2.8%	4.9%	6.2%	7.9%	9.5%	10.7%	10.5%
Banrisul	1.6%	2.0%	2.1%	1.8%	1.7%	1.6%	1.5%	1.4%	1.3%	1.3%
Other	0.9%	2.1%	4.7%	6.4%	7.5%	10.3%	10.6%	13.3%	14.1%	14.7%
HHI	4,381	4,179	3,834	3,525	3,058	2,854	2,450	2,255	2,204	2,174

Table 1: Market Share Evolution for Acquirers

¹HHI was calculated recomputing the equivalent market share of each firm out of the total sum of market shares disregarding "Other" firms

Finally, registration entities have significantly reduced barriers to entry in the credit market by making data more accessible and facilitating an "unbundling" of certain layers of the payments stack. This allows more players to offer credit to merchants using receivables as collateral, even if they are not traditional acquirers. As a result, several startups have emerged to address the working capital gap and enhance access to credit for retailers in Brazil. These startups offer innovative solutions that streamline commercial relationships, provide liquidity, and facilitate transactions between retailers and suppliers. Table 2 below lists a few examples.

Startup	Business Model
Tino (previously called TruePay)	Buy-Now-Pay-Later startup building a B2B network allowing sellers to grant credit without being exposed to default risk and buyers to access credit for purchasing inventory from suppliers seamlessly and costlessly.
Marvin	Enables businesses to use card receivables to pay suppliers, reducing credit risk. Their platform connects industries and retailers, providing more credit access and favorable payment terms for retailers. No fees are charged to small retailers, and payments are made at the time of purchase, eliminating credit risk.
Credit2B	Platform that connects retailers and suppliers, enabling retailers to use their card receivables as a form of payment for purchasing raw materials from suppliers. It provides liquidity to suppliers and guarantees payment, even in the case of charge-backs.
PayHop	Platform that brings together suppliers and small to medium-sized retailers, allowing retailers to leverage their card receivables to access credit and improve their cash flow. It enables suppliers to sell more with reduced credit risk.

Table 2: Startups with business models built on top of new regulatory framework

Registration entities serve as efficient marketplaces, enhancing market thickness by attracting a multitude of participants to a centralized platform. The presence of centralized services enables seamless information exchange and facilitates transactions that would be otherwise difficult without a clearinghouse-like intermediary (Roth, 2007).

It is important to note that registration entities in Brazil are privately owned. This ensures a lack of monopoly in the intermediation process itself. While certain registration entities existed prior to regulatory changes with a focus on specific receivables, new institutions have emerged with the new regulatory framework, fostering competition. Currently, Brazil has five registration entities, listed in chronological order of their establishment below:

Registration Entity	Established	Major Clients
Câmara Interbancária de Pagamentos (CIP)	2001	Cielo, Rede, Getnet, SafraPay
Central de Registro de Direitos Creditórios (CERC)	2015	PagSeguro, Mercado Pago (Mercado Livre), MagaluPay (Magalu), B2W, iFood, Iugu, Vindi
Central de Registro de Direitos Creditórios (CRDC)	2015	Banks, FIDCs, factoring companies, fintechs, securitization companies, ESCs, and entrepreneurs seeking credit based on their receivables
TAG Infraestrutura (TAG IMF)	2020	Stone Co., PagarMe, Yapay, Rappi
Registradora B3 (operated by the controlling company of Brazilian Stock Exchange)	2022	Still in the early stages of operation and does not have direct clients yet

Table 3: Key registration entities in Brazil and their respective major clients

The preference for a registration player may stem from institutional trust, existing partnerships, or historical associations. For instance, we observe from Table 3 large banks and their affiliated acquirers collaborating with CIP, while smaller banks and newer acquirers tend to centralize their registrations with CERC.

Depending on how the dynamics between registration entities evolve, we will see the new regulatory framework transforming the discount receivables from a one-sided market into a two-side market by establishing (i) limitations on the ability to set prices bilaterally between buyers and sellers, (ii) constraints on pricing between end-users, and (iii) membership costs/fees to operate a transaction via the registration entities (Rochet & Tirole, 2006).

In any case, the regulatory framework established by the BCB mandates interoperability among the registration entities, regardless of their choice. This requirement ensures seamless communication and information sharing between different entities, promoting efficiency and harmonization. The availability of multiple registration entities, each with its own strengths and market positioning, fosters healthy competition and innovation, allowing financial institutions to select the entity that best suits their specific needs.

2.4 Technical Challenges and Limitations of the Registration Entities

The implementation of registration entities presented significant challenges, particularly in the technological domain. The BCB acknowledged that existing systems and integrations with financial institutions were not fully prepared to meet the new regulatory requirements for receivables. Achieving interoperability among various payment processors and making the necessary investments for compliance were key challenges faced by acquirers.

Before the new regulatory framework, because of the locked receivables effect described earlier, a financial institution only needed to establish contractual guarantees through the assignment of receivables and verify whether a merchant's cash flows from a specific card network were already secured or not. If the cash flows were not secured, the institution could proceed with extending credit

and securing the receivables. However, if the cash flows were already secured, it indicated that other institutions had already claimed the guarantees, making it impossible for the loan to be backed by those receivables. The status of a merchant's available cash flows was binary: either secured or not, and - despite not efficiency-maximizing - the process was straightforward from a technical standpoint.

Problems arose when the complexity of the criteria met an unprepared technological infrastructure. Consequently, certain card acquirers and sub-acquirers could bypass the proper bank account settlement process, resulting in the circumvention of the associated guarantees and credit locks established in existing loan contracts.

The emblematic credit burst of Stone in 2021 exemplifies the initial fragility of the technology backbone of registration entities in Brazil. Stone, a provider of financial technology solutions empowering merchants and integrated partners for seamless electronic commerce, faced significant challenges in navigating the new scenario due to a lack of real-time communication between central systems. This resulted in higher delinquency rates and poorer recoveries from non-performing clients than expected and observed in previous periods. While the company acknowledged its mistakes in credit execution, it attributed part of the problem to the malfunctioning of the registration system and a lack of real visibility of the receivables data.

Another technical challenge lied in the interoperability between registration entities. With the existence of five registration entities, it is crucial to ensure that their databases are synchronized to guarantee the visibility and reliability of guarantees. This synchronization allows lenders to have a comprehensive view of all receivables from a specific card brand, regardless of the acquirer processing the transactions. However, in the initial months of the new regulatory framework, interoperability was not functioning properly, creating a loophole in the collateralization process.

The new regulatory framework enacted in 2019 somewhat overlooked these technical implementation challenges. Recognizing the limitations, the CMN and the BCB imposed new transaction rules in November 2022 ("Resolução BCB 264/22"). These changes aim to enhance the stability, competitiveness, and integrity of the financial system by creating a governance structure to ensure interoperability and efficiency across different platforms. By fostering cooperation and reducing friction, these changes bolster overall safety and confidence in the market.

Apart from technological gaps, there is a significant challenge in raising awareness and promoting understanding of registration entities among merchants to ensure their effective utilization of the associated benefits. A survey conducted by C2Cards in July 2022 with over 120 retailers revealed that 100% of the respondents were unaware of the new regulatory framework and its associated benefits (Valor Econômico, 2022). The unfamiliarity with the changes leads to missed opportunities and a certain level of mistrust when credit companies approach retailers to offer credit services. As a result, the market potential is hindered as retailers fail to take advantage of the increased flexibility, choice, and competitive rates that the framework can provide.

This relates to **congestion**, which is the third aspect of the design of efficient markets. When participants face numerous alternatives, it becomes challenging to make choices as it might be tempting to just stick with the original credit provider, especially in the busy life of a small business-owner. Over time, registration entities should alleviate congestion, avoiding confusion, delays, and sub-optimal outcomes, ensuring an efficient allocation of resources (Roth, 2007).

Finally, there are conflicting signs of how much the regulatory changes have been impacting major acquiring companies. Receivables advancement has become a significant revenue stream for these companies, offsetting the decline in transaction fees due to intense competition among card payment providers. Companies have claimed they have been able to handle the pressure. For instance, Getnet has seen an increase in the spread for receivables advancement (despite reporting competition from players who were not previously active in the receivables advancement space), and Cielo has improved its profitability.

On the other hand, SEBRAE's 2021 report highlights an increase in the percentage of merchants successfully negotiating favorable terms with acquirers (73% in 2021 vs. 57% in 2016), indicating a stronger bargaining power on the demand side. Additionally, more merchants are opting to use two POS providers (42% in 2021 vs. 28% in 2016), signaling that the regulatory changes have impacted the core business of acquirers as there are now fewer incentives to consolidate the payments flow with a single provider (this aligns with the HHI evolution shown before).

Registration entities are still in their early stages of operation, especially in the credit card receivables market. However, as the market matures and the regulatory framework is refined, we can anticipate the entry of new players and a continued gradual increase in market thickness and safety.

3 Quantitative Analysis

As discussed earlier, the implementation of registration entities is expected to yield increased competition and improved credit availability for businesses. With the ability for merchants to request advanced receivables from any institution and the flexibility of using the same schedule of receivables for multiple credit operations with a wider range of credit providers, it is anticipated that lower, more competitive rates can be offered. This opening of the market to previously uninvolved players allows for more competitive offers and better conditions for merchants seeking credit.

3.1 Data

We look at empirical data over the last decade to see how credit terms to businesses evolved. We focus on interest rates, loan volumes and term duration of the loans for two types of products: advancing card receivables and invoice factoring. Both serve a similar purpose of providing working capital to businesses, but the former was affected by the 2018/2019 regulation, while the latter was not

Our data set was sourced from official BCB reporting on the major interest rate products offered by financial institutions, and also utilized by Stone Co's public policy team to monitor the evolution of

the industry. It contains 193 observations, one for every month since March 2011, of the market average discount rates, term duration, outstanding portfolio balance and newly issued loan volume both for factoring and advance card receivables. We use the latter two to compute a newly issued loans ratio as a percentage of the outstanding portfolio, so that the factoring and card receivable markets are comparable in scale. The market average is calculated based on data reported by every licensed financial institution. A potential downside of our data set is the lack of granularity on the rates charged by individual institutions. This did not allow us to exclude possible outliers, but the market average is nonetheless what is needed to show the overall effects of the regulatory change in these variables.

While our data set did contain default and late payment data, we found that the numbers reported for the two types of products we are analyzing (factoring and card receivables) did not move together before or after the regulation, so no meaningful insight could be drawn from them.

Figures 2, 3 and 4 in the next pages are plots of the time series we will analyze next. The regulatory transition window is highlighted in light gray in each of the graphs. The transition window start date is defined as December 2018, when Resolution CMN 4.707 and Circular 3.924/2018 were enacted, enforcing optional adoption of the rules, and ends at the date that the receivables securitization Resolution CMN 4.734 and Circular 3.952/2019 became effective, July 2019. During the optional period, firms already knew they would be mandated to adopt the measures in the near-term, hence we define the period as a transition window.

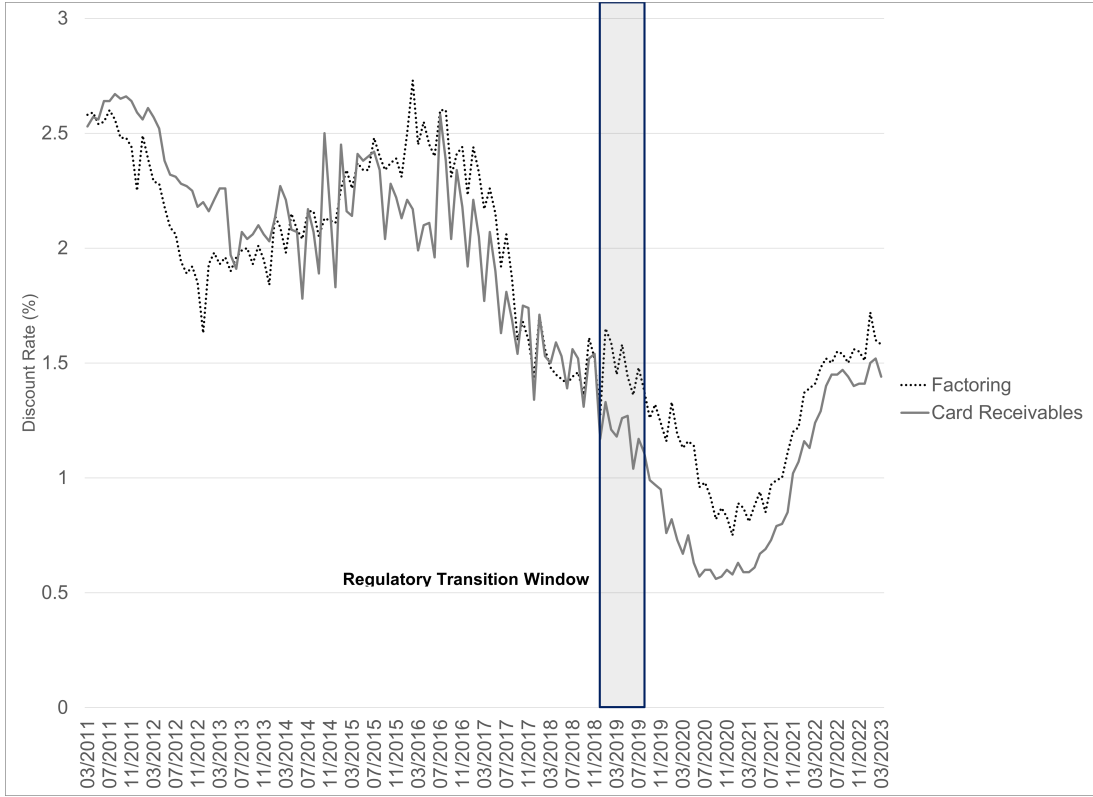


Figure 2: Card Receivables and Factoring Discount Rates from 2011 to 2023

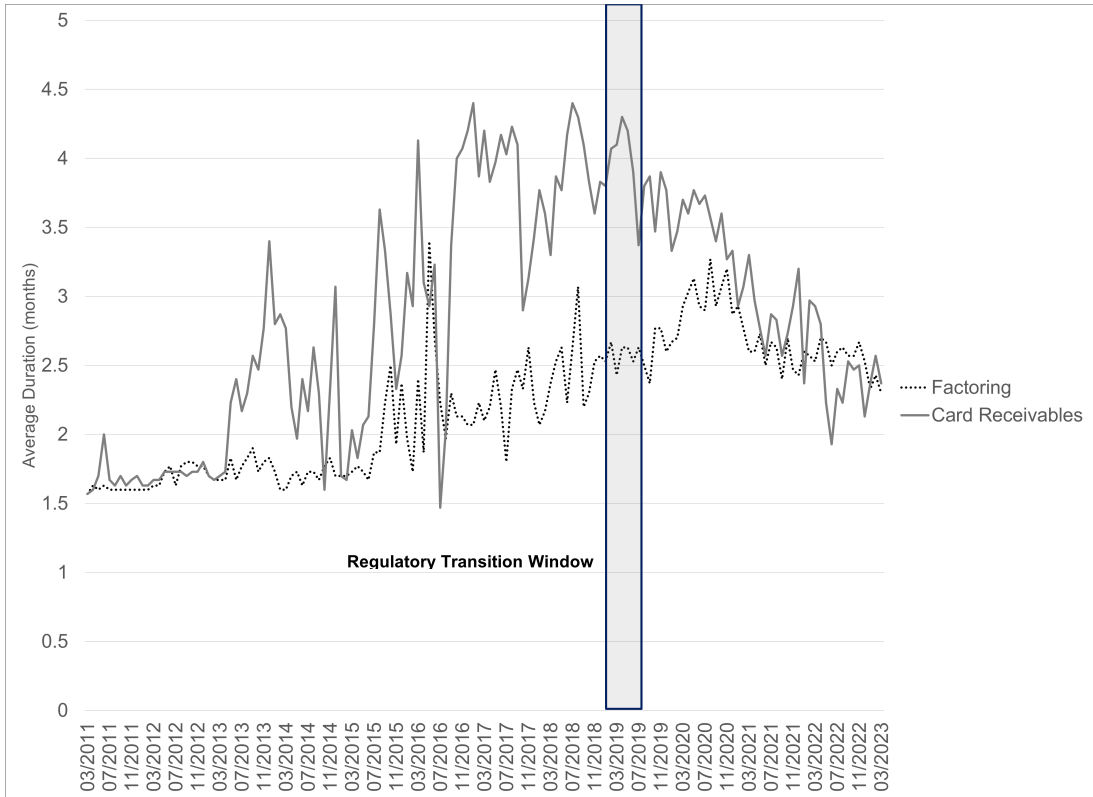


Figure 3: Card Receivables and Factoring Duration in months, from 2011 to 2023

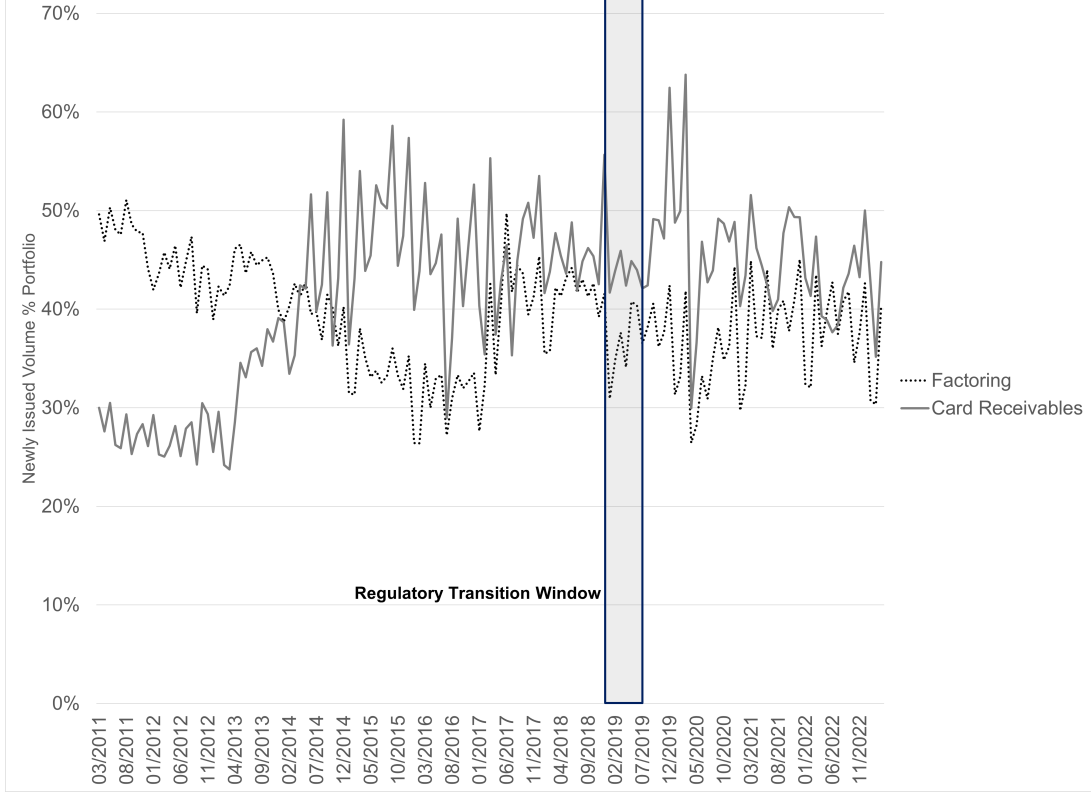


Figure 4: Newly Issued Card Receivables and Factoring Volume as a Percentage of Total Portfolio Value, from 2011 to 2023

3.2 Empirical Strategy

We run three difference-in-difference regressions, one on each of the key variables plotted in the figures above: Discount Rate, Duration, and Newly Issued Loan Volume as a percentage of Outstanding Portfolio. The regressions are specified in equations 1-3 below. We use December 31, 2018 as the cutoff date for our pre- and post-treatment indicator variable I_t^{post} (i.e. we consider the data within the transition window as part of the treatment). This cutoff was chosen after verifying no significant differences existed between this cutoff or the one in the end of the transition window. Our treatment indicator variable I_i^{card} was defined as 1 on the card receivables product (i.e. the credit product that underwent regulation). Additionally, we added the CDI interbank overnight rate r to control for fixed effects in our three regressed variables.

Discount Rate $R_{i,t}$ for product i at time t :

$$R_{i,t} = \beta_0 + \beta_1 I_i^{card} + \beta_2 I_t^{post} + \beta_3 I_i^{card} I_t^{post} + \beta_4 r + \epsilon_{i,t} \quad (1)$$

Average Loan Term Duration $D_{i,t}$ for product i at time t :

$$D_{i,t} = \beta_0 + \beta_1 I_i^{card} + \beta_2 I_t^{post} + \beta_3 I_i^{card} I_t^{post} + \beta_4 r + \epsilon_{i,t} \quad (2)$$

Newly Issued Volume as Percentage of Total Portfolio $Y_{i,t}$ for product i at time t :

$$Y_{i,t} = \beta_0 + \beta_1 I_i^{card} + \beta_2 I_t^{post} + \beta_3 I_i^{card} I_t^{post} + \beta_4 r + \epsilon_{i,t} \quad (3)$$

where:

$$I_i^{card} = \begin{cases} 1, & \text{if } i = \text{card receivable product} \\ 0, & \text{otherwise.} \end{cases}$$

$$I_t^{post} = \begin{cases} 1, & \text{if } t \text{ is after } 12/31/2018 \\ 0, & \text{otherwise.} \end{cases}$$

We are interested in measuring the difference-in-difference of the variables R , D and Y between card receivables and invoice factoring before and after the regulation took place. By expanding the expressions, we know that the coefficient β_3 will give us the difference in average differences in each of the variables R , D , Y :

$$\beta_3 = (\text{Avg. Post} - \text{Avg. Pre})_{\text{card}} - (\text{Avg. Post} - \text{Avg. Pre})_{\text{factoring}}$$

3.3 Regression Results

For each variable, we run two OLS models. Model 1 does not include control variable r , and Model 2 does. We find no significant differences between Models 1 and 2 for each of the three estimated variables. The results are summarized in the tables below:

		Discount Rate	
R		1	2
β_1	Card	-0.001 (0.050)	-0.001 (0.034)
β_2	Post	-0.859*** (0.059)	-0.600*** (0.043)
β_3	Card*Post	-0.250*** (0.083)	-0.250*** (0.057)
β_4	InterestRate		0.947*** (0.053)
β_0	Constant	2.104*** (0.035)	1.329*** (0.050)
Observations		290	290
R^2		0.666	0.842
*p<0.1		**p<0.05	***p<0.01

Table 4: Discount Rate Regression

		Loan Duration	
<i>D</i>		1	2
β_1	Card	0.741*** (0.093)	0.741*** (0.091)
β_2	Post	0.712*** (0.111)	0.569*** (0.116)
β_3	Card*Post	-0.267* (0.158)	-0.267* (0.154)
β_4	InterestRate		-0.523*** (0.142)
β_0	Constant	1.961*** (0.066)	2.389*** (0.133)
Observations		290	290
R^2		0.313	0.344
*p<0.1		**p<0.05	***p<0.01

Table 5: Term Duration Regression

		New Issues % Portfolio	
<i>Y</i>		1	2
β_1	Card	-0.576 (1.044)	-0.576 (1.045)
β_2	Post	-2.921** (1.244)	-3.093** (1.323)
β_3	Card*Post	8.393*** (1.760)	8.393*** (1.760)
β_4	InterestRate		-0.630 (1.627)
β_0	Constant	40.029*** (0.738)	40.545*** (1.523)
Observations		290	290
R^2		0.103	0.103
*p<0.1		**p<0.05	***p<0.01

Table 6: New Issues as Percentage of Portfolio Regression

3.4 Discussion of Results

3.4.1 Discount Rates

From from Table 4, β_3 shows discount rates difference-in-difference was -0.25 (25 basis points) with p-value < 0.01. This makes it likely at the 99.99% confidence level that there was indeed a non-zero difference in differences and that discount rates for the regulated card receivables market fell in comparison to invoice factoring, after the regulation cutoff, even when accounting for interest rate fixed effects. Indeed, from Figure 2 we observe how in the early 2010s (close to the duopoly period), advance receivable discount rates were charged at a premium to invoice factoring, then they started to closely track the factoring rate, and from 2019 onwards consistently kept a negative spread from the factoring rate.

3.4.2 Term Duration

Table 5 for average duration in months has a difference-in-difference β_3 of -0.267 months with p-value < 0.1. Out of the three regressions, this was the difference-in-difference result with the lowest confidence level, of 90%. By referring back to the graph in Figure 3, that makes sense as there was a more noise in the pre-period for card receivables duration. The duration of card receivables may also be influenced by omitted variables that we were not able to collect data for control, such as consumer spending habits such as the number of instalment months they choose to pay. Still, it makes sense to see a negative difference-in-difference effect. This could be attributed to two hypotheses: (i) a rise in credit-accessible merchants suggests that businesses with lower "credit scores" (typically newcomers to credit) may have been offered shorter durations, or (ii) enhanced credit conditions may have improved business financial health, reducing the advance duration of receivables.

3.4.3 New Issues as Percentage of Portfolio

Finally, Table 6 shows us the difference-in-difference effects on newly issued loans as a percentage of the outstanding portfolio. In this case, we see an increase in difference-in-difference between the card receivables and invoice factoring with $\beta_3 = 8.393$ percentage point increase in new loans, significant at the 99.99% confidence level. This supports the hypothesis that the market expanded vis-a-vis traditional bank invoice factoring.

3.5 Limitations

While the results here show statistical significance and account for interest rate fixed effects, there are limitations to the regression approach. The main ones are that the invoice factoring product is not a perfect substitute or benchmark for the card receivables product as the businesses who use these two services may not always be the same. We must also acknowledge that even controlling for interest rates, the world that emerged after the COVID-19 pandemic, especially when it comes to small business financing, is very different from the one before the COVID-19 pandemic. There was only one year, 2019, of observed post-treatment data that did not overlap with the effects of the

COVID-19 pandemic such as lockdowns, small business stimulus programs, and changes in monetary policy. Observing whether these effects persist for the next five years as we emerge from the pandemic will be important.

4 Conclusion

The primary objective of this paper was to evaluate the efficiency gains brought about by the regulatory changes in the market for advancing card payment receivables, within the context of the BCB's agenda of increasing inter-operability and decreasing barriers to entry in the Brazilian payments system. From a market design perspective, our analysis focused on how the regulatory changes improved (i) market thickness, (ii) trust and safety, (iii) congestion, and thereby (iv) contractual terms for market participants.

We noted an increase in market thickness, as evidenced by the continuous decrease in HHI for payment acquirers in Brazil. This trend can be attributed to the entry of more players into the market, providing small businesses with a broader array of options. The 2018 regulation further contributed to market thickness, as indicated by the increase in newly issued loans difference-in-difference relative to the benchmark (Table 6), and more competitive discount rates (Table 4).

The regulatory changes also fostered an environment of increased trust and safety. As outlined in the Background section, the introduction of registration entities facilitated information sharing and decoupling, while also paving the way for more secure collateralization of business loans. This environment of safer transactions encouraged more suppliers to extend credit, again boosting market thickness and reducing rates.

Moreover, the regulatory changes were instrumental in reducing congestion. The introduction of standardized rules and the removal of bureaucratic hurdles facilitated smoother transactions and provided market participants with greater flexibility to make optimal decisions. This was evident in the decoupling of receivable schedules from banks and the entry of multiple private registration entities into the market (Table 3).

Our regression analysis demonstrated significant changes in the difference-in-difference of discount rates, newly issued loans, and the duration of credit card receivables versus traditional invoice factoring, following the 2018 regulatory changes. These changes can be interpreted as net improvements in credit terms brought about by the structural changes discussed above.

The BCB has just set the stage. The Bank's commitment to progressive regulatory reform, along with the emergence of new market participants, such as the recent B3 Registry, signal that the payments system is poised for further innovation and efficiency improvements. The success of these regulatory changes thus far provides a promising foundation for the future. The potential for continued efficiency gains extends beyond our current framework. One promising application of market design not yet explored is the implementation of auction-style bidding for credit products, facilitated by the central databases provided by the registration entities.

In conclusion, this study underscores the potential of market design in the financial sector. The continued evolution of the Brazilian payments and fintech landscape stands as a testament to the power of markets, competition and innovation in bringing about better outcomes for all involved.

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