The Real Effects of Fintech: Instant Digital Payments and Entrepreneurship *

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Abstract

This paper examines the impact of instant digital payment technology on entrepreneurship by analyzing the introduction of PIX, Brazil's nationwide digital instant payment system. Using municipal-level data on firm creation, banking infrastructure, and PIX transaction volumes, we estimate the effect of PIX adoption on business dynamics. Our findings indicate that the introduction of PIX led to a 14% increase in the total number of firms in the average municipality. Moreover, PIX adoption by both firms and individuals is strongly correlated with increased entrepreneurial activity at the local level, for both small and large businesses. The effects were particularly pronounced in municipalities with limited access to traditional banking services, highlighting the role of digital payment systems in reducing financial frictions and fostering business creation. This paper contributes to the literature on fintech innovations by demonstrating that digital payment systems can have significant real effects on economic activity and firm dynamics. Our findings have important policy implications for financial inclusion and the promotion of entrepreneurship in emerging markets.

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1 Introduction

The rapid evolution of financial technology (fintech) has transformed how individuals and businesses interact with financial services. Among the most significant innovations in this space are fast payment systems (Shen et al., 2024), which provide instantaneous, low-cost transactions, enhancing financial inclusion and reducing frictions associated with traditional banking. In recent years, central banks across the globe have introduced digital payment infrastructures to improve efficiency and accessibility. One of the most successful implementations of such a system is PIX, a nationwide instant payment platform launched by the Brazilian Central Bank in 2020.

This paper examines the impact of PIX, a low-cost instant digital payment system created by the Brazilian Central Bank, on entrepreneurship in Brazil. While prior research has extensively documented the role of financial development in fostering firm creation and economic growth (King and Levine, 1993; Rajan and Zingales, 1998; Cumming et al., 2019; Shen et al., 2024), less is known about how digital payment technologies influence entrepreneurial activity. By reducing transaction costs and improving cash flow management, instant digital payments could lower barriers to firm entry and expansion, particularly for small businesses and startups that operate with limited working capital. Additionally, the increased efficiency of payments may enhance consumer spending (Prelec and Simester, 2001), thereby stimulating local demand and incentivizing new business formation.

Our study provides empirical evidence on these dynamics by leveraging municipal-level data on firm creation, banking infrastructure, and PIX transaction volumes. We employ an empirical framework that exploits the nationwide rollout of PIX as an exogenous shock to payment efficiency. Additionally, we assess the robustness of our finding by using granular data on PIX adoption by firms and individuals as additional independent variables. Furthermore, we complement our analysis by incorporating data on the number of physical bank branches per municipality and well as population size, allowing us to disentangle the distinct mechanisms through which digital payments influence entrepreneurship.

Our findings indicate that the introduction of PIX led to a 14% increase in the total number of firms in the average municipality. Furthermore, we find that PIX adoption by both firms and individuals is strongly correlated with higher levels of entrepreneurial activity at the municipal level. Our analysis also reveals that PIX usage was associated with growth in both small and large businesses, with firm size proxied by the number of employees. Finally, we observe that the effects of PIX adoption are most pronounced in municipalities with fewer physical bank branches, underscoring the critical role of digital payment systems in fostering economic activity in areas underserved by traditional financial services.

Our findings contribute to the growing literature on the real effects of fintech innovations. While existing research has primarily focused on the role of digital payments in financial inclusion, consumption patterns, and monetary policy (Jack and Suri, 2014; Rogoff, 2017; Auer et al., 2022), our study highlights their implications for business formation and economic dynamism. Understanding these effects is particularly relevant for policymakers seeking to promote entrepreneurship and financial inclusion in emerging markets.

The remainder of the paper is structured as follows. Section 2 reviews the relevant literature on banking frictions, digital payments, and entrepreneurship. Section 3 outlines our empirical strategy, data sources, and methodological approach. Section 4 presents our main results, including robustness tests and heterogeneity analyses. Section 5 discusses additional implications, and Section 6 concludes with policy recommendations and future research directions.

2 Literature Review

In this section, we present a literature review on the role of bank frictions on entrepreneurial activity, how digital payment systems may increase demand for goods and services, and how the Brazilian PIX system was developed and introduced.

2.1 Banking Frictions and Entrepreneurial Activity

Entrepreneurial activity is a key driver of economic growth, job creation, and innovation (King and Levine, 1993; Malchow-Møller et al., 2011; Audretsch, 2018; Shen et al., 2024). However, its development is often hindered by market frictions such as financial constraints (Garmaise, 2008; Paulson and Townsend, 2004), information asymmetry (Leland and Pyle, 1977; Cumming et al., 2019), and high transaction costs (Wu and Wu, 2023). Reducing these frictions, particularly those related to financing, remains a critical policy objective worldwide (Jensen et al., 2022).

Traditional payment infrastructures, including bank transfers and card networks, impose significant fees that disproportionately affect businesses operating on thin margins. Beyond cost-related barriers, delays in payment processing introduce liquidity constraints, which can be particularly detrimental to firms with limited working capital (Rajan and Zingales, 1998). Entrepreneurs require fast and reliable access to their revenue streams to cover operational expenses, maintain competitiveness, and sustain growth.

To address these challenges, governments have prioritized the development of fast and reliable payment systems. As highlighted by World Bank (2021a), the global payments industry is undergoing a paradigm shift driven by technological innovation. Consumers increasingly demand faster, cheaper, and more convenient payment methods, prompting governments to invest in Fast Payment Systems to reduce reliance on cash while promoting financial inclusion (World Bank, 2021b).

These digital payment systems enable the real-time processing of retail transactions, ensuring immediate fund availability for recipients. They provide a comprehensive framework that includes the underlying infrastructure, participating payment service providers, consumer-facing platforms, and regulatory mechanisms governing execution and settlement. By enhancing transactional efficiency and reducing settlement delays, these systems contribute to the modernization of financial ecosystems (Frost et al., 2024).

In this context, we argue that the implementation of digital payment systems plays an important role in reducing financial frictions that may constrain the entry of new firms. By eliminating, or significantly lowering, transaction fees, these systems reduce the fixed costs associated with accepting electronic payments, making it more feasible for small businesses and startups to operate in the formal financial system. Moreover, by increasing the efficiency and accessibility of financial transactions, digital payment systems enhance market participation, enabling entrepreneurs to reach a broader customer base and integrate more seamlessly into supply chains. As a result, these systems may foster a more dynamic business environment, ultimately stimulating entrepreneurship and economic activity (Hasan et al., 2012).

However, reducing frictions is only one potential mechanism through which fast payment systems may increase firm entry. In the following subsection, we explore an additional channel: the impact of enhanced payment efficiency on consumer demand.

2.2 Digital Payment Systems and Consumption

Recent empirical evidence shows that the adoption of digital payment systems can have significant effects on individual consumption behavior. Agarwal et al. (2024) show, using data from India, that individuals tend to increase their consumption levels when they gain access to digital payment methods. This finding aligns with broader discussions in behavioral finance, where the literature long documented that the mode of payment influences consumers' behavior (Choi and Loh, 2024). Specifically, digital transactions, such as credit card and mobile payments, reduce the psychological friction associated with parting with money, leading individuals to spend more than they would if they were using cash (Prelec and Simester, 2001).

This well-documented tendency for digital payments to encourage higher spending has important implications beyond individual consumption decisions. In particular, the aggregate effects of increased consumer spending can translate into higher demand for goods and services within a given locality. As more consumers shift toward digital payment systems, their increased expenditure can create positive demand shocks for local businesses, thereby stimulating overall economic activity (Fisman and Love, 2007). This mechanism suggests that digital payment systems may not only reshape individual spending habits but also contribute to broader market dynamics.

Building on this intuition, we posit that the introduction of digital payment systems may lead to an expansion in the number of firms operating within a municipality. As consumer demand rises due to higher spending facilitated by digital transactions, new business opportunities emerge, attracting entrepreneurs and encouraging market entry. This effect can be particularly pronounced in regions where access to traditional banking services is limited, as digital payment systems can reduce transactional inefficiencies and enhance the overall ease of doing business.

It is important to highlight that this mechanism is distinct from the firm-entry effect discussed in the previous section. While our earlier discussion focused on how the reduction of barriers to entry (such as lower financial frictions or regulatory constraints) can directly increase the number of firms, the mechanism described here operates through a different channel. In this case, the primary driver of firm entry is not the removal of constraints on the supply side but rather an increase in consumer-side demand, which makes market entry more attractive to potential entrepreneurs.

2.3 PIX

On August 12, 2020, the Brazilian Central Bank introduced PIX (Resolution BCB No. 1/2020), marking a significant milestone in the country's payment system. PIX established a national instant payment network, enabling seamless transactions between bank accounts. While individuals can use PIX free of charge, businesses—both small and large—may incur relatively small fees. Moreover, adherence to PIX is mandatory for all financial institutions and payment service providers in Brazil, requiring them to offer the system to customers.

As discussed by Sampaio and Ornelas (2024), prior to PIX, Brazilian firms primarily relied on three main payment methods: cash, credit cards, and debit cards. Credit card transactions imposed fixed costs on businesses and often created liquidity constraints, as funds were typically transferred after 30 days unless firms paid an additional fee for early disbursement. Debit card transactions, in contrast, offered lower fees and faster fund availability, although both still substantial when compared to PIX. On the consumer side, credit card usage was limited to individuals with access to a credit line, often requiring annual fees. Additionally, traditional bank transfers could take hours or even days to process, depending on various factors.

These inefficiencies led many small businesses in Brazil to accept only cash, a common practice in developing economies (Aggarwal et al., 2023). However, reliance on cash restricted the customer base and exposed businesses to risks such as theft (Economides and Jeziorski, 2017). Consequently, the prevalence of cash transactions among small and medium-sized enterprises (SMEs) and the limited adoption of credit cards created significant financial frictions and entry barriers for new firms.

Since its launch, PIX has become the dominant payment system in Brazil, facilitating transactions worth 26 trillion BRL (approximately 4.5 trillion USD) in 2024 and surpassing 500 million registered accounts. According to the Brazilian Central Bank (Banco Central do Brasil, 2023), PIX generated an estimated 5.7 billion USD in cost savings for businesses and consumers in 2021, contributing to an additional economic output of 5.5 billion USD—equivalent to 0.34% of Brazil's GDP. Projections indicate that by 2026, these figures will reach 37.9 billion USD and 37.6 billion USD, representing 2.08% of GDP.

Research on fintech innovations has primarily examined their effects on financial inclusion, transaction costs, and consumer behavior, particularly in emerging markets (Jack and Suri, 2014; Aron and Muellbauer, 2019; Auer et al., 2022; Agarwal et al., 2024; Shen et al., 2024). Digital payment systems, in particular, can reduce reliance on cash transactions while fostering the adoption of digital financial services (Rogoff, 2017; Aggarwal et al., 2023).

Recent studies suggest that PIX has played a crucial role in financial resilience, enabling communities to receive and process payments following natural disasters (Barros Jr et al., 2025). Furthermore, evidence from Sampaio and Ornelas (2024) indicates that PIX complements, rather than replaces, traditional payment methods such as card transactions, ultimately increasing their usage among individuals. Despite the growing literature on digital payments, to the best of our knowledge, no study has examined the impact of PIX—or digital payment systems more broadly—on entrepreneurship. This paper addresses this gap by exploring the relationship between digital payments and firm dynamics.

3 Methods and Data

3.1 Sample

We compile data on the number of firms per municipality from RAIS (Annual Social Information Report), provided by the Ministry of Labor and Employment, covering the period from 2010 to 2021. To analyze PIX transactions, we use the Central Bank's dataset, which tracks all PIX transfers—both incoming and outgoing—at the municipal and monthly levels. Given the annual frequency of RAIS data, we aggregate the monthly PIX transaction data to construct annual figures for each municipality. Additionally, we obtain data on the number of bank branches per municipality from the Monthly Banking Statistics of the Brazilian Central Bank and population data from the Brazilian Institute of Geography and Statistics.

Our final dataset comprises 5,570 municipalities, with 5,565 municipalities covered from 2010 to 2012 and 5,570 from 2013 to 2021, yielding a total of 66,825 observations. Detailed descriptive statistics are presented in Section 3.3.

3.2 Empirical Strategy

3.2.1 Using the PIX introduction as an exogenous shock

We estimate a baseline model of the impact of the PIX instant digital payment technology on entrepreneurship using its introduction as an exogenous shock. Therefore, we create a variable called *Post*, which assumes a value of 0 between 2011 and 2019 and 1 in 2020 and 2021. The OLS model is estimated as follows:

$$ln(Number\ of\ Firms)_{m,t} = \beta \cdot Post_{t>t'} + \theta_m + \epsilon_{m,t}$$

In the above model β captures the impact of the PIX introduction on the number of firms in a municipality, with θ_m being the municipality fixed effects. These fixed effects should capture latent municipality-level differences, such as structural economic conditions, historical business activity, local infrastructure quality, population demographics, and regulatory environment that are stable over time.

3.2.2 Using the PIX payments received by firms as an additional independent variable

An important hurdle to causal estimations of the impact of the introduction of PIX in entrepreneurialism is the fact that PIX was introduced in 2020, in the middle of the COVID pandemic. Hence, the *Post* variable is mechanically correlated with the COVID outbreak (observations with *Post=0* do not suffer effects from the pandemic, while observations with *Post=1* do suffer these effects).

We disentangle the impact of digital payment technologies in entrepreneurship by estimating a new OLS model taking into consideration the total amount of PIX payments received by firms in a municipality in a given year. Since now there is heterogeneity between municipalities and the model is estimated only in a sample comprised from observations in 2020 and 2021 (after the PIX introduction), this new coefficient should not suffer from the mechanic correlation with the COVID pandemic.

Thus, we calculate a new independent variable which we call *PIXpay* as the natural logarithm of the total amount of PIX payments received by firms in the municipality (in Brazilian reais), using both municipality and firm fixed effects as follows:

$$ln(Number\ of\ Firms)_{m,t} = \beta \cdot PIXpay_{m,t} + \theta_m + \tau_t + \epsilon_{m,t}$$

3.2.3 Using the PIX payments received by individuals as an unrelated independent variable

In the previous model, we estimated the effect of the introduction of the PIX payment technology on the number of firms in a municipality as a function of the total amount paid to firms using the PIX technology. Nevertheless, one may argue that this metric could suffer from reverse causality issues.

For example, it could be the case that an increase in the number of firms leads to an uptick in the total amount of PIX payments, since more firms in the municipality would induce more transactions to firms. In order to address such issue, we calculate the variable *PIXuse* which is the ratio of the number of PIX payments received by people in that municipality in a given year scaled by the total population of that municipality in that given year. We then take the natural logarithm of this variable in order to control for possible outilers.

This new variable is not affected by the opening of new firms in the municipality, since it captures payments to individuals, and not firms. Furthermore, monthly salaries paid by firms to individuals cannot be paid by PIX, but rather as a "salary deposit" ("*depósito em conta salário*"). Therefore, because individuals must opt into the PIX system (by having a bank account and setting a PIX key), this variable measures the adoption of the PIX technology by the population of a municipality.

Hence, this measure can only affect the number of firms in a municipality in two ways. First, because it is easier for individuals to make payments, they consume more, which leads to an increase in demand (Agarwal et al., 2024), and thus to an increase in the number of firms in that municipality. Secondly, individuals running an informal business may now receive instant payments and scale up their business, leading to their formalization, thus increasing the number of firms in that municipality.

Therefore, we estimate the following OLS model using the same fixed effects from the previous model (firm and year fixed effects):

$$ln(\mathit{Number\ of\ Firms})_{m,t} = \beta \cdot PIXuse_{m,t} + \theta_m + \tau_t + \epsilon_{m,t}$$

3.3 Summary Statistics

Table 1 provides the descriptive statistics for our sample (mean, median, and standard deviation), while Table 2 shows the correlation between our main variables.

<Insert Tables 1 & 2 around here.>

We highlight that the median value for the number of bank branches is 1, which means that at least half (in fact, about 62.5%) of the municipality-year observations in our sample either have a single bank branch or none. Since the median municipality in our sample has a population of about 20,000 people, this shows that even municipalities with tens of thousands of inhabitants have very little access to traditional financial services. This demographic setting makes the theoretical real effects of the introduction of instant digital payment systems even more pronounced. With limited access to physical bank branches, residents in these municipalities likely face significant barriers to financial transactions. The adoption of instant digital payment systems can therefore serve as a tool for financial inclusion, reducing transaction costs and improving the efficiency of local economies.

4 Empirical Results

4.1 Main Results

Table 3 presents the results of our main estimations. From the first column results we find that, after introduction of PIX in Brazil, the number of firms in a municipality increased by about 13 log points (about 14 percentage points) after the introduction of the PIX instant payment system. Additionally, we see that the municipality-level fixed effects are able to capture most of the unexplained variance of the model, thus encompassing the effect of latent variables such as structural economic conditions, historical business activity, local infrastructure quality, population demographics, and regulatory environment that are stable over time.

<Insert Table 3 around here.>

The second column of the aforementioned table shows that an increase of 1 log point in the amount of PIX payments received by firms in a municipality (in Brazilian reais) is correlated with a 0.016 log point increase in the number of firms in that municipality. In percentage points, it means that a 25% increase in the amount of PIX payments received by firms in a given municipality is correlated with a 1.6% increase in the number of firms in that municipality.

Finally, the last column shows that an uptick of 1 log point in the use of PIX among inhabitants of that municipality raises the number of firms in that municipality by 0.102 log point. Again, transforming the log points into percentage terms, we find that a 25% increase results in approximately a 9.9% growth in the number of firms.

Our findings provide robust evidence that the introduction of instant payment technology fosters entrepreneurship, as demonstrated using three distinct proxies. Specifically, we show that the number of firms increased following the implementation of PIX, and that broader adoption of this technology within a municipality is associated with a higher number of new firms. Importantly, our measure of PIX adoption (*PIXuse*) is particularly well-suited for identifying causal effects, as it captures only PIX payments received by individuals (excluding salaries, which are not processed through PIX), thereby mitigating potential endogeneity concerns.

In the next subsection, we extend our analysis by estimating additional models, including a dynamic specification that incorporates lags of the number of firms. We also explore heterogeneity in the effects of PIX adoption on the number of firms by segregating our models by firm size. We also assess if results differ for municipalities with lower access to physical bank branches. Finally, we also estimate the moderating effect of population sizes.

4.2 Additional Estimations

4.2.1 Dynamic Estimations

Although our fixed effects captured most of the unexplained variance in previous estimations, autocorrelation may still introduce concerns of reverse causality. Specifically, municipalities with a higher number of firms may have exhibited greater PIX adoption among both individuals and businesses, potentially leading to further firm growth driven by preexisting entrepreneurial activity, and not by PIX adoption.

Thus, in order to control for serial autocorrelation, we adopt the following dynamic estimation as previously used by Fernandes et al. (2021) (X refers to the main independent variable, either *PIXpay* or *PIXuse*):

$$ln(Number\ of\ Firms)_{m,t} = \beta \cdot X_{m,t} + \lambda \cdot ln(Number\ of\ Firms)_{m,t-1} + \theta_m + \tau_t + \epsilon_{m,t}.$$

Table 4 presents the results incorporating one- and two-year lags as control variables to address potential autocorrelation. The estimates remain consistent with those from the previous subsection, effectively ruling out the alternative explanation that preexisting entrepreneurial activity drove higher PIX adoption and the subsequent growth in the number of firms.

<Insert Table 4 around here.>

4.2.2 Heterogeneity by firm size

We now re-estimate the models from section 3.2, this time segregating the dependent variable by firm size. Instead of using the natural logarithm of the total number of firms in a municipality, we separately consider the natural logarithm of the total number of small and large firms. This approach allows us to assess the impact of PIX adoption on each group independently. We proxy small firms as firms that employ less than 10 people, while large firms are those that have 100 or more employees. The results are presented in Table 5.

<Insert Table 5 around here.>

Our empirical findings indicate that the introduction of PIX payment technology led to an increase in the number of both small and large firms. However, the effect was slightly more pronounced for larger firms. Specifically, the number of small firms grew by approximately 10 log points (around 11%), while the number of large firms increased by roughly 18 log points (about 19%).

These findings indicate that both small and large firms benefited from the introduction of a digital instant payment system. The adoption of PIX may have facilitated the growth of mid-sized firms, enabling them to transition into larger enterprises, or encouraged established firms to expand by opening subsidiaries in smaller municipalities in response to increased demand. Additionally, the PIX system may have incentivized individuals operating informal businesses to formalize their activities, contributing to the rise in the number of small firms.

These results highlight the profound economic impact of digital financial infrastructure on entrepreneurship and business dynamics. By reducing transaction costs, increasing payment efficiency, and expanding financial inclusion, the introduction of PIX stimulated firm creation, thereby showing that fintech can have real effects on the economy. The fact that both small and large firms responded to this technological shift underscores its broad relevance across different segments of the economy. These findings suggest that instant payment systems can serve as powerful tools for fostering economic development. In the next subsection we test if this effect is larger for municipality with limited access to traditional banking services.

4.2.3 Heterogeneity by access to physical bank branches

We now proceed to analyze the heterogeneity of our main results in section 3.2 with respect to access to physical bank branches. Traditional banking infrastructure plays a fundamental role in facilitating business operations by providing access to credit, payment processing, and financial intermediation. However, in municipalities with limited banking services, entrepreneurs and small businesses face higher transaction costs, restricted liquidity, and greater barriers to formalization. The introduction of PIX, by enabling instant, low-cost transactions, effectively reduces these frictions, allowing businesses in underbanked areas to operate more efficiently and expand. Consequently, we should expect the impact of PIX to be more pronounced in these municipalities, as it provides a much-needed alternative to conventional banking services, fostering entrepreneurship and economic activity.

Thus, we create the variable called "Bank Quartiles", which assumes the value of 1 if the municipality was in the top quartile of the number of bank branches distribution in 2020 (the year of the PIX introduction), -1 if the municipality was in the bottom quartile, and 0 otherwise (middle quartiles). We then estimate the following model:

$$ln(Number\ of\ Firms)_{m,t} = \beta \cdot X_{m,t} + \lambda \cdot X_{m,t} \times Bank\ Quartiles_m + \theta_m + \tau_t + \epsilon_{m,t}.$$

The coefficient β represents the effect of the main independent variable (*Post*, *PIXuse* or *PIXpay*) for municipalities in the middle quartiles of the bank branch distribution ($Bank\ Quartiles_m = 0$). The term $\beta - \lambda$ captures the estimated effect for municipalities in the lowest quartile of physical bank branches availability, while $\beta + \lambda$ reflects the corresponding effect for those in the highest quartile. This specification allows us to assess how the impact of PIX adoption varies with access to traditional banking infrastructure, providing a better understanding of the relationship between digital payments and entrepreneurship. Table 6 shows the results for these estimations.

<Insert Table 6 around here.>

As shown in Table 6, the coefficient for λ is negative, indicating that the impact of PIX adoption was more pronounced in municipalities with fewer physical bank branches, as we theorized. While the effect in municipalities with greater banking infrastructure was approximately 6 log points (around 6%), the impact in under-served areas—those with the lowest number of bank branches—was nearly three times larger, at 18 log points (approximately 19%). This finding underscores the role of digital payment systems in mitigating financial frictions, particularly in regions with limited access to traditional banking services. By providing an alternative transaction mechanism, PIX appears to have facilitated entrepreneurial activity and firm creation where financial constraints were most binding, highlighting its potential as a tool for financial inclusion and economic development.

4.2.4 Heterogeneity by population

Finally, we estimate how the impact of PIX adoption on the number of active firms varies with municipality population size. Larger municipalities typically have more developed financial and business infrastructures, which may reduce their dependence on digital payment systems for firm creation. In contrast, smaller municipalities, where financial services are less accessible, may experience a greater impact from PIX adoption as it lowers transaction costs and facilitates economic activity. By examining this heterogeneity, we aim to understand whether the benefits of digital payment systems are more pronounced in less populated areas or whether their effects are uniform across different municipality sizes. The results provide further insights into the role of financial technology in shaping local economic development.

Hence, we create a dummy variable which assumes the value of 1 if the municipality had less than 10,000 inhabitants in 2020. We then interact it with our main independent variables (*Post*, *PIXuse* or *PIXpay*) as follows:

$$ln(Number\ of\ Firms)_{m,t} = \beta \cdot X_{m,t} + \lambda \cdot X_{m,t} \times (\mathbb{1}|Population_{2020} < 10,000)_m + \theta_m + \tau_t + \epsilon_{m,t}.$$

The results, presented in Table 7, suggest that smaller municipalities experienced a greater increase in the number of firms following the introduction of PIX. However, alternative measures yield statistically insignificant estimates. While this provides some indication that the impact of PIX adoption may have been more pronounced in less populated areas, the overall evidence remains inconclusive.

<Insert Table 7 around here.>

5 Conclusion

This paper provides empirical evidence on the real effects of digital payment systems on entrepreneurship, using the introduction of PIX in Brazil as an exogenous shock. By leveraging municipal-level data from different sources, we document that the implementation of PIX was associated with a significant increase in the number of firms, particularly in municipalities with limited access to traditional banking services. Our results suggest that digital payment technologies can reduce financial frictions, enhance market participation, and facilitate business creation. Overall, our study underscores the transformative potential of fintech innovations in reshaping economic landscapes. By reducing transaction costs and increasing accessibility, digital payment systems can play a crucial role in fostering a more dynamic and inclusive business environment.

Our findings contribute to the literature on fintech and economic development by highlighting the role of instant payment systems in fostering entrepreneurship. While previous research has primarily focused on the implications of digital payments for enonomic growth (Shen et al., 2024), our study demonstrates that these technologies also have meaningful real effects by promoting entrepreneurship. Moreover, our heterogeneity analyses reveal that these benefits are particularly pronounced in underbanked areas, where financial constraints are most binding.

From a policy perspective, our results suggest that governments and central banks in emerging markets should consider expanding and optimizing digital payment infrastructures as a means of promoting entrepreneurship and economic dynamism. The case of PIX illustrates how low-cost, real-time payments can enhance financial inclusion, stimulate business activity, and contribute to local economic development. Future research could explore the long-term impacts of digital payment systems on firm survival and growth, as well as their interaction with broader financial and regulatory policies.

While our study provides robust evidence on the relationship between PIX adoption and firm creation, it has certain limitations. First, our analysis focuses on short-term effects, and further research is needed to assess the long-term sustainability of these newly created businesses. Second, our study uses data from one country, and evidence from other countries may reveal heterogeneity in the impact of instant digital payments on entrepreneurial activity. Third, our study primarily relies on aggregate municipal-level data. Future research could use micro-level data to examine the effects of digital payment adoption on firm performance, profitability, and survival rates. Additionally, exploring the role of complementary fintech services, such as digital lending and automated accounting solutions, could provide a more comprehensive understanding of how financial technologies shape entrepreneurial ecosystems.

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A Figures and Tables

Table 1: Summary statistics

We provide summary statistics of the 66,825 municipality-year observations from 2011 to 2021 which comprise our sample. The first column shows the average, the second column provides the median, and last column presents the median. Third and fourth columns show the 5th and 95th percentile of the distribution, respectively. Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality.

Variable	Obs	Mean	Median	Std. Dev.
ln(Number of Firms)	66,785	6.561	6.469	1.950
Post	66,825	0.167	0	0.373
PIXpay	11,138	14.977	15.255	3.060
PIXuse	11,136	0.639	0.381	2.119
Number of Bank Branches	66,825	3.516	1	36.881
ln(Population)	66,813	9.459	9.945	1.169

Table 2: Cross-correlation table

We provide correlation statistics of the 66,825 municipality-year observations from 2011 to 2021 which comprise our sample. Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. The correlations between PIXpay and PIXuse with Post cannot be estimated, since they are only observed when Post = 1 (i.e., after PIX introduction).

Variables	ln(Number of Firms)	Post	PIXpay	PIXuse	No. of Bank Branches	ln(Population)
ln(Number of Firms)	1.000					
Post	0.025	1.000				
PIXpay	0.665	.	1.000			
PIXuse	0.169	.	0.770	1.000		
Number of Bank Branches	0.210	-0.022	0.065	-0.041	1.000	
ln(Population)	0.760	0.008	0.548	0.115	0.249	1.000

Table 3: Results of main estimations

We report OLS regression results using the natural logarithm of total number of firms in a municipality as dependent variable with three different independent variables that capture the effect of the introduction of the PIX payment technology: Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. Year and Municipality fixed effects are used when noted. Standard errors are provided in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

DV:	ln(Number of Firms)		
Post	0.131***		
	(0.003)		
PIXpay		0.016***	
		(0.004)	
PIXuse			0.102***
			(0.013)
Observations	66,773	11,133	11,133
R^2	0.98	0.99	0.99
Municipality FE	Yes	Yes	Yes
Year FE	No	Yes	Yes

Table 4: Results of dynamic estimations

We report OLS regression results using the natural logarithm of total number of firms in a municipality as dependent variable with three different independent variables that capture the effect of the introduction of the PIX payment technology: Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. Models 1 and 4 are estimated using the $t-1$ lags of the ln(Number of Firms) as a control variable, while models 2 and 4 use the $t-1$ and $t-2$ lags. Year and Municipality fixed effects are used when noted. Standard errors are provided in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

DV:	ln(Number of Firms)			
PIXpay	0.014***	0.013***		
	(0.004)	(0.004)		
PIXuse			0.092***	0.091***
			(0.012)	(0.012)
Observations	11,133	11,133	11,133	11,133
R^2	0.99	0.99	0.99	0.99
Municipality FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Lag year $t-1$	Yes	Yes	Yes	Yes
Lag year $t-2$	No	Yes	No	Yes

Table 5: Results of estimations segregating by firm size

We report OLS regression results using two separate dependent variables: the natural logarithm of total number of small firms (firms with less than 10 employees) in a municipality, and the natural logarithm of total number of large firms in the same municipality (100 or more employees). We use three different independent variables that capture the effect of the introduction of the PIX payment technology: Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. Year and Municipality fixed effects are used when noted. Standard errors are provided in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

DV:	ln(Number of Small Firms)			ln(Number of Large Firms)		
Post	0.102***			0.176***		
	(0.002)			(0.013)		
PIXpay		0.006**			0.039*	
		(0.002)			(0.019)	
PIXuse			0.027***			0.191**
			(0.006)			(0.061)
Observations	66,813	11,136	11,136	66,813	11,136	11,136
R^2	0.99	0.99	0.99	0.87	0.96	0.96
Municipality FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	No	Yes	Yes	No	Yes	Yes

Table 6: Results of estimations accounting for heterogeneity in physical bank access

We report OLS regression results using the natural logarithm of total number of firms in a municipality as dependent variable with three different independent variables that capture the effect of the introduction of the PIX payment technology: Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. We interact these variables with a variable named "Bank Quartiles", which assumes the value of 1 if the municipality was in the top quartile of the number of bank branches distribution in 2020, -1 if the municipality was in the bottom quartile, and 0 otherwise (middle quartiles). Year and Municipality fixed effects are used when noted. Standard errors are provided in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

DV:	ln(Number of Firms)		
Post	0.118***		
	(0.003)		
Post × Bank Quartiles	-0.057***		
	(0.004)		
PIXpay		0.002	
		(0.004)	
PIXpay × Bank Quartiles		-0.010***	
		(0.001)	
PIXuse			0.070***
			(0.014)
PIXuse × Bank Quartiles			-0.008***
			(0.001)
Observations	66,773	11,133	11,133
R^2	0.98	0.99	0.99
Municipality FE	Yes	Yes	Yes
Year FE	No	Yes	Yes

Table 7: Results of estimations accounting for heterogeneity in population

We report OLS regression results using the natural logarithm of total number of firms in a municipality as dependent variable with three different independent variables that capture the effect of the introduction of the PIX payment technology: Post assumes the value of 1 after PIX introduction, 0 otherwise; PIXpay is the natural logarithm of the total amount of PIX payments received by firms in that municipality in that year; and PIXuse measures the rate of adoption of PIX payments by the population by taking the natural logarithm of the ratio between the number of PIX payments received by individuals in a given municipality-year and the population size of the municipality. We interact these variables with a variable named "Population less than 10,000", which assumes the value of 1 if the municipality had less than 10,000 habitants in 2020, and 0 otherwise. Year and Municipality fixed effects are used when noted. Standard errors are provided in parentheses. Significance levels: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

DV:	ln(Number of Firms)		
Post	0.121***		
	(0.004)		
Post × Population less than 10,000	0.023***		
	(0.007)		
PIXpay		0.015***	
		(0.005)	
PIXpay × Population less than 10,000		0.001	
		(0.002)	
PIXuse			0.100***
			(0.013)
PIXuse × Population less than 10,000			0.002
			(0.002)
Observations	66,773	11,133	11,133
R^2	0.98	0.99	0.99
Municipality FE	Yes	Yes	Yes
Year FE	No	Yes	Yes