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Global Financial Stability Notes

Digital Banking Support to Small Businesses amid COVID-19: Evidence from China

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This note analyzes the economic impact of digital lending to micro and small sized enterprises (MSEs) in China during the coronavirus disease (COVID-19) pandemic. A preliminary analysis of a large pool of MSEs served by a digital bank indicates that digital banks were able to remotely evaluate borrowers and sustain lending during the pandemic, thereby facilitating the business continuity, sales growth, and financial inclusiveness of MSEs. In the global context, a policy framework—leveraging the advantages of digital banks and empowering digital banks, while guarding against possible financial stability risks—would further support small businesses during and after the COVID-19 pandemic.

INTRODUCTION: SMALL BUSINESS FINANCING NEEDS AN INNOVATIVE APPROACH

Small businesses have historically faced important challenges in accessing bank financing. The main barriers include high cost, physical distance, and lack of proper documentation (Agarwal and Hauswald 2010; Demirgüç-Kunt and Klapper 2013), which limit banks capacity to assess and manage the credit risks of small businesses. In particular, the lack of proper documentation—financial history and soft information (such as information on ownership and the local community)—has led to information asymmetry and made it difficult for small businesses to access the traditional banking system. The International Finance Corporation (International Finance Corporation 2020) estimated that 40 percent of small businesses had an unmet financing need of US\$5.2 trillion every year. As a result, many small businesses are operating below their growth potential.

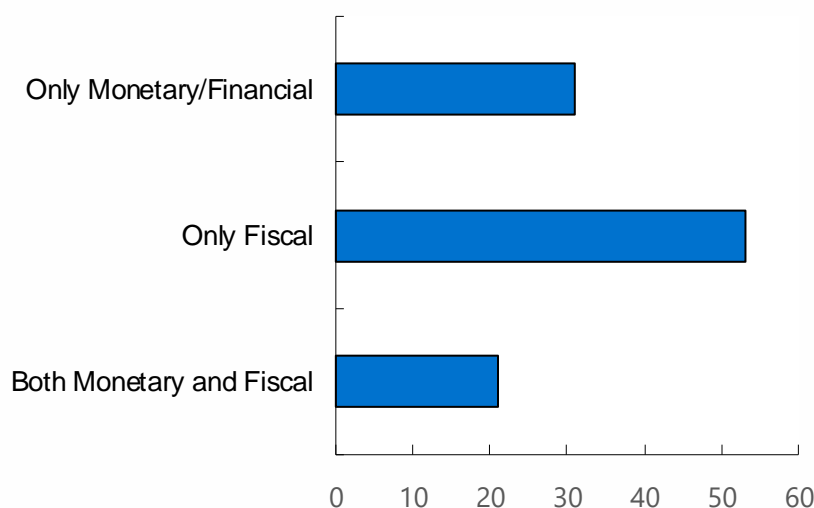
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The COVID-19 pandemic has added to the challenges that small businesses worldwide were facing in accessing bank financing. The sectors in which small businesses are concentrated, such as the service sector, are also the ones that are the most exposed and vulnerable to measures to contain the pandemic, particularly the lockdown policies, thereby heightening the risk of widespread bankruptcies in this sector given that small businesses typically have limited cash buffers (Vardoulakis 2020). The economic uncertainty caused by the pandemic has increased the perceived credit risk for the sector, and information asymmetries have accentuated the difficulties for these firms to access financing. However, technology has made digital financial services possible, which can accelerate and enhance financial inclusion amid social distancing and other containment measures (Eriksson von Allmen et al. 2020).

Global efforts have been made to support small business financing after the onset of the pandemic. Recognizing the vulnerability of small businesses in accessing bank financing during the pandemic, many IMF member countries have announced or introduced fiscal, monetary, and financial policies to support small businesses. Measures to facilitate access to financing include: extending credit lines, allowing for delays of loan repayments, moratoriums on principal for affected small businesses, and providing guarantees for uncollateralized small business loans, among other policies such as reduction of fees and taxes and direct fiscal subsidies and grants (Figure 1). In addition, some member countries have employed digital technology to help small businesses adapt to the pandemic shock and keep employees safe. For instance, Greece, Italy, and others set up digital platforms to connect small businesses with free services, training, and vendors; Germany provided grants for digital consulting services for small businesses; Malaysia and Spain set up credit facilities for small businesses to buy or lease digital equipment or services (Metrick 2020).

The crisis demands innovative digital approaches to small business financing. Traditional banking business models face intrinsic challenges in providing remote and quick financing to small businesses during a pandemic. Many have had to close branches or limit operating hours due to requirements related to facilities management, health, and safety planning (Leonovich 2020). Moreover, many traditional banks have legacy infrastructures that constrain their ability to shift to online business models while the absence of various electronic data trails limit the use of movable collateral for lending.

Figure 1. Number of IMF Member Countries That Announced or Implemented Policies to Support Small Businesses in Response to the COVID-19 Crisis (As of December 17, 2020)



Source : IMF 2020. <https://www.imf.org/en/Topics/imf-and-covid19/Policy-Responses-to-COVID-19>.

The experiences of countries where the uptake of digital financial services is high underscore the increasing significance of digital banks.¹ Technology firms benefit from large network effects and have the ability to leverage e-commerce platforms and social networks to their advantage. Some big tech companies, such as Mercado Credito in Argentina, Paytm in India, and Amazon Lending in the United States, have already extended loans to millions of small borrowers (Frost et al. 2019; Agarwal et al. 2019; Huang et al 2020). In China, major technology companies, such as Ant Group, Baidu, Tencent, and JD.com, are making inroads in offering digital banking services—and some have obtained banking licenses.²

Before the COVID-19 crisis, digital banks had demonstrated their capabilities to support small businesses. For instance, borrowers using MYbank in China are typically much smaller firms, with about 80 percent having less than 10 employees. Most of its borrowers also do not have established relationships with traditional banks, with more than 70 percent having difficulties accessing loans previously from any financial institutions. Its loans are generally in smaller amounts, shorter in duration, and used primarily for operational purposes. MYbank's average nonperforming loan (NPL) ratios so far have been lower than those of traditional banks and although there was an uptick in NPL ratios after the onset of the COVID-19 pandemic, the digital bank's average NPL ratio remained below 2 percent. By the end of 2020, MYbank had served more than 35 million MSEs, providing them with ¥31,000 (US\$4,500) in loans on average (Huang et al. 2020; MYbank 2020). The operating costs of MYbank loans are lower than the industry average (only ¥2.3 or US\$0.4 per loan according to MYbank 2018).

During the COVID-19 pandemic, digital banks in China were able to leverage their capabilities in supporting small businesses by:

- Gathering information, including tracking customers' business activities using various electronic data trails, enabled digital banks to have a more accurate understanding of their customers' business continuity. By taking advantage of mobile phone-based applications, digital banks were able to continue lending.
- Providing remote lending quickly. Digital banks have harnessed both proprietary data, such as transaction data in e-commerce markets, and traditional data, such as bank credit and tax histories, to provide remote lending and determine or adjust loan terms and conditions quickly. XWBank, for instance, approved as many as 330,000 loan applications a day with only 270 lending officers during the crisis (China Finance 40 Forum 2020).
- Leveraging data analytics and machine learning techniques to manage risks. Based on the well-established intelligence tracking system established before the pandemic, digital banks have been able to accurately predict the cash-flow needs and default rates of different customer groups—in location, sector, activity, and business relationship—thus allowing them to better manage risks (Huang et al. 2020).

¹ Digital banks are banks that do not have a physical interface and conduct all businesses virtually.

² During 2014–2016, China's banking regulator, the China Banking Regulatory Commission, issued 11 new privately-owned banking licenses, of which three were digital banks, that is, banks that do not have a physical interface with customers, with all services provided over the internet, particularly through mobile devices. These three digital banks are: MYbank of Ant Group, WeBank of Tencent Group, and XWBank of Xiaomi Group.

WeBank, for example, launched new products in 10 days during the crisis, setting a record speed for its product launch (China Finance 40 Forum 2020).

Two pressing questions arise. How has the COVID-19 pandemic and lockdown affected the business performance and financing needs of small businesses? What is the impact of digital banking support to small businesses? The following sections narrowly focus on these two questions by taking MYbank as an example.

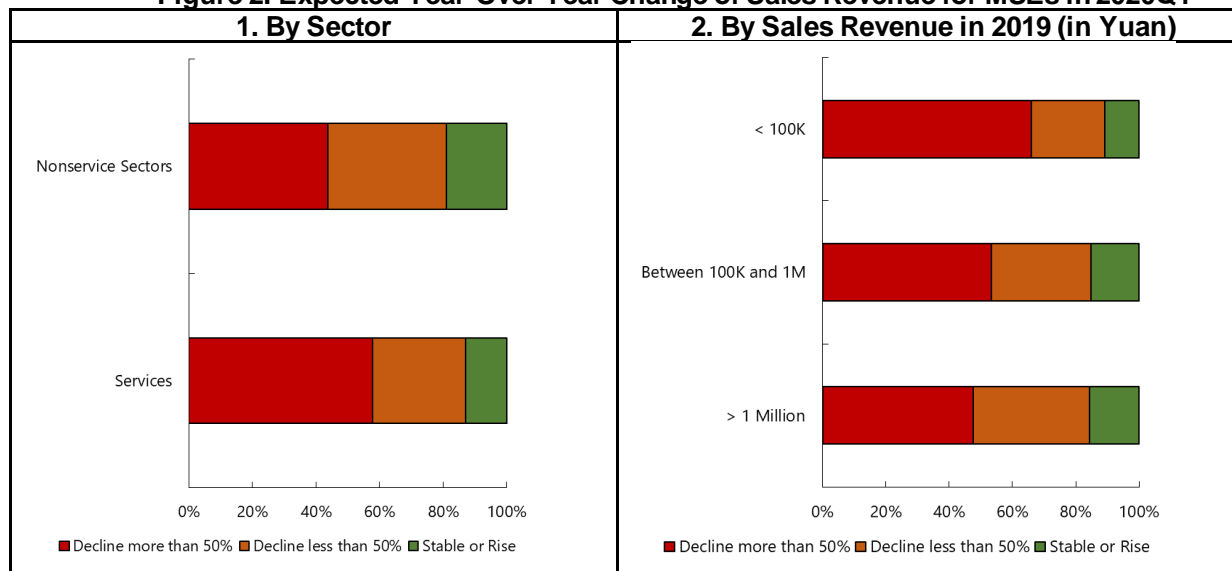
SMALL BUSINESS FINANCING: ADVERSE IMPACT OF THE PANDEMIC

Small businesses in China were highly vulnerable to the pandemic shock. According to a survey, many of the offline merchants served by MYbank are self-employed businesses in urban or rural areas of China. Among these enterprises, about 30 percent are restaurants, 20 percent are local convenience stores, 10 percent are fresh food sellers, and most others are local retailers and service providers, all highly exposed and vulnerable to the pandemic shock and lockdown policies. The financial needs of these firms are vastly different from other firms served by traditional banks, and as a result, many of them could not access financing provided by traditional banks. The average loan amount needed by these micro firms is ¥25,000 (about US\$3,500), far less than an average commercial loan size of ¥1 million (US\$150,000) from traditional banks.

MSEs experienced or expected a sharp decline in sales because of the pandemic. Another survey in February/March 2020 showed that most MSEs experienced or expected a significant drop in sales revenue during the pandemic, which made external financing critical. More than half of the surveyed MSEs in China expected a 50 percent or larger year-over-year decline in their sales revenue in the first quarter of 2020 due to the pandemic. The expected decline in sales was especially severe for MSEs that were in the service sector (Figure 2, panel 1), and that had smaller sizes (Figure 2, panel 2). More than two-thirds of the MSEs expected financing gaps of between ¥10,000 (US\$1,500) and ¥500,000 (US\$70,000), and more than two-thirds of the MSEs expected loans with durations of between six months and a year.³

³ The short duration of MYbank loans is in sharp contrast with traditional banks. Nearly 57 percent of traditional bank loans for MSEs being longer than one year. Reflecting the short duration, these loans are often used as working capital for operational purposes rather than longer-term investment. In addition, using big data and machine learning models, MYbank dynamically provides pre-approved credit lines to a large pool of MSEs. These MSEs with credit lines then can borrow on the so-called 3-1-0 model, which promises user registration and application within 3 minutes, money transferred to an Alipay account within 1 second, and 0 human intervention (Huang et al. 2020).

Figure 2. Expected Year-Over-Year Change of Sales Revenue for MSEs in 2020Q1



Sources: MYbank; authors' estimates.

Note: The survey data was based on 20,165 valid questionnaires. A total of 38.2 percent of the respondents were in Eastern China, followed by Southern China (17.8 percent), Western China (17.1 percent), Central China (16.7 percent), and Northern China (10.2 percent). Among all surveyed MSEs, 72.9 percent had sales revenue of less than ¥1 million in 2019, and 76.8 percent employed fewer than 10 employees. MSEs = micro and small sized enterprises.

ECONOMIC IMPACT OF ACCESS TO FINANCE: EMPIRICAL METHODOLOGY

Based on micro-level data from a large pool of MSEs, an empirical analysis to investigate the impact of lending provided to MSEs during the pandemic was conducted. This section summarizes methodology and is followed by another section on results.

The empirical analysis investigates the correlation between digital bank lending at the onset of the pandemic (February 2020) and firm performance during the pandemic as well as the causal link. Since most of these MSEs did not have access to traditional banks,⁴ measurement of the economic impact of digital lending intends to capture to what extent digital bank lending helped build financial resilience for these MSEs, which are at higher risk of incurring severe layoffs or bankruptcy during crisis times.⁵

⁴ This note does not compare digital banks with traditional banks for two main reasons: (1) most of digital banks' borrowers have never obtained loans from traditional banks, so no comparable data are available; (2) digital bank borrowers that have obtained loans from traditional banks might experience difficulties in borrowing from traditional banks during the COVID-19 lockdown. Therefore, to ensure comparable samples, this note only compare MSEs that borrowed with those that did not borrow.

⁵ Lending during periods of financial constraint can boost sales and reduce layoffs—this has been documented in the literature (Chodorow-Reich 2014). For firms that received new opportunities during the pandemic (for example, online food

Sampling method and model specification. Samples are constructed from the total customer pool of MYbank and are not restricted to only firms with certain credit line levels.⁶ The empirical analysis uses the propensity score matching (PSM) approach to address potential selection bias concerns. The PSM method involves a statistical comparison of borrowers (that is, treatment group) versus nonborrowers (that is, control group) in two steps:

- First, the probability of borrowing is estimated conditional on key observable firm characteristics prior to the pandemic. Specifically, cross-sectional probit regressions on 2019 data are used when the dependent variable is whether a firm had borrowed from MYbank in 2019:Q4 and independent variables include the sector, region, average monthly sales and loan balance, and the standard deviation of the last two variables during 2019:Q1–Q3.⁷ Sales and loan balance are in absolute Yuan. The sector classification is based on the Chinese Merchant Category Code (MCC) and the region classification is based on the provinces.
- Second, these probabilities, or propensity scores, are used to match borrowers to nonborrowers. The matching methodology of k nearest neighbor (k-NN) is used, which is a nonparametric machine learning method that is often used for classification. Therefore, the treatment group is constructed by randomly selecting 20,000 MSEs that borrowed from MYbank in February 2020 and the control group is constructed by randomly selecting 20,000 MSEs that did not borrow from MYbank in February 2020. The matching ensures the similarity of firm characteristics and business conditions between the two groups prior to the pandemic. The mean difference of sales growth between these two groups measures the average treatment effect, that is, the economic effect of borrowing from the digital bank.⁸

Addressing potential endogeneity concerns. The sector, region, prior sales, and borrowing of a firm could all affect both the borrowing decisions and firm performance during the pandemic. The PSM sampling procedure controls for all these potential confounding factors. Therefore, the result is not biased by the sample selection procedure along these dimensions of firm characteristics prior to the pandemic.⁹ However, endogeneity concerns could still arise if the PSM method is not adequate because of the possible difference in the way the pandemic affected the two groups. To formally address this

delivery), greater lending support can help expand their business operations to meet the demand, thus increasing sales. For firms that lost opportunities during the pandemic (for example, offline barber shops), lending support can avoid closure of the business, massive layoffs, and suspension of regular equipment purchases and maintenance, all useful to sustain the scale of operations and sales both during the pandemic and when lockdown policies are relaxed.

⁶ MSEs that acquire credit access at the beginning of the month may drop out of pre-approved credit lines at the end of the month, given the daily reconsiderations of any MSEs for credit approval by MYbank (Hau et al. 2018). This feature makes it difficult to select both treatment and control groups from firms with pre-approved credit lines. Therefore, the selected sample of MSEs that did not borrow during the pandemic could include those either in the pool with pre-approved credit lines or those not in the pool. However, this is unlikely to be a concern that could systematically bias the results as MSEs' prior borrowing and sales activities were controlled for, as well as the sector and region.

⁷ This step is estimated using a probit model $\Phi^{-1}(Y_i) = \beta_0 + \beta_1 \text{sector}_i + \beta_2 \text{region}_i + \beta_3 \text{FirmChar}_i$ where Y is the dummy for the firm having borrowed in 2019:Q4, Φ is the probit function and FirmChar includes past (during 2019:Q1–Q3) monthly average sales, loan balance, and the standard deviations of these variables.

⁸ The PSM estimation does not aim at finding the best statistical model for explaining the probability of borrowing, but to control, to the extent possible, for variables that could influence both borrowing and the outcome variable (sales growth).

⁹ This is also called the conditional independence condition of these firm characteristics for the probability of borrowing.

concern and establish the causal relationship, a proxy variable was chosen—firms’ pre-shock loan balance as of 2019:Q4 (zero or positive balance) from MYbank— thus separating the treatment group from the control group. This proxy variable preceded the pandemic, so it is uncorrelated with the impact from the pandemic. The economic impact can be studied by comparing the sales differences between the two groups Holding all other firm characteristics the same, firms with positive 2019:Q4 loan balance can be assumed to have had a higher likelihood to continue to borrow and receive loans from MYbank, including during the pandemic.¹⁰ This empirical exercise on the causal relationship would address the endogeneity concern about the pandemic’s impact and would confirm that the difference in firm performance was not driven by the pandemic’s impact but by borrowing from the digital bank.

Robustness check. The simple correlation analysis and the causality analysis is by itself evidence that results are generally robust. To further ensure that the results are not driven by extreme outliers or data irregularities, firms in the offline service sector (for example, offline restaurants and barbershops)— which was among the most heavily hit sectors by the pandemic and where liquidity support was needed across the entire sector—were studied to determine whether similar findings exist for this specific sector as well. Moreover, gender and regional differences were checked between the treatment and control groups. These subsample results are similar to the results in the whole sample.

ECONOMIC IMPACT OF ACCESS TO FINANCE: EMPIRICAL RESULTS

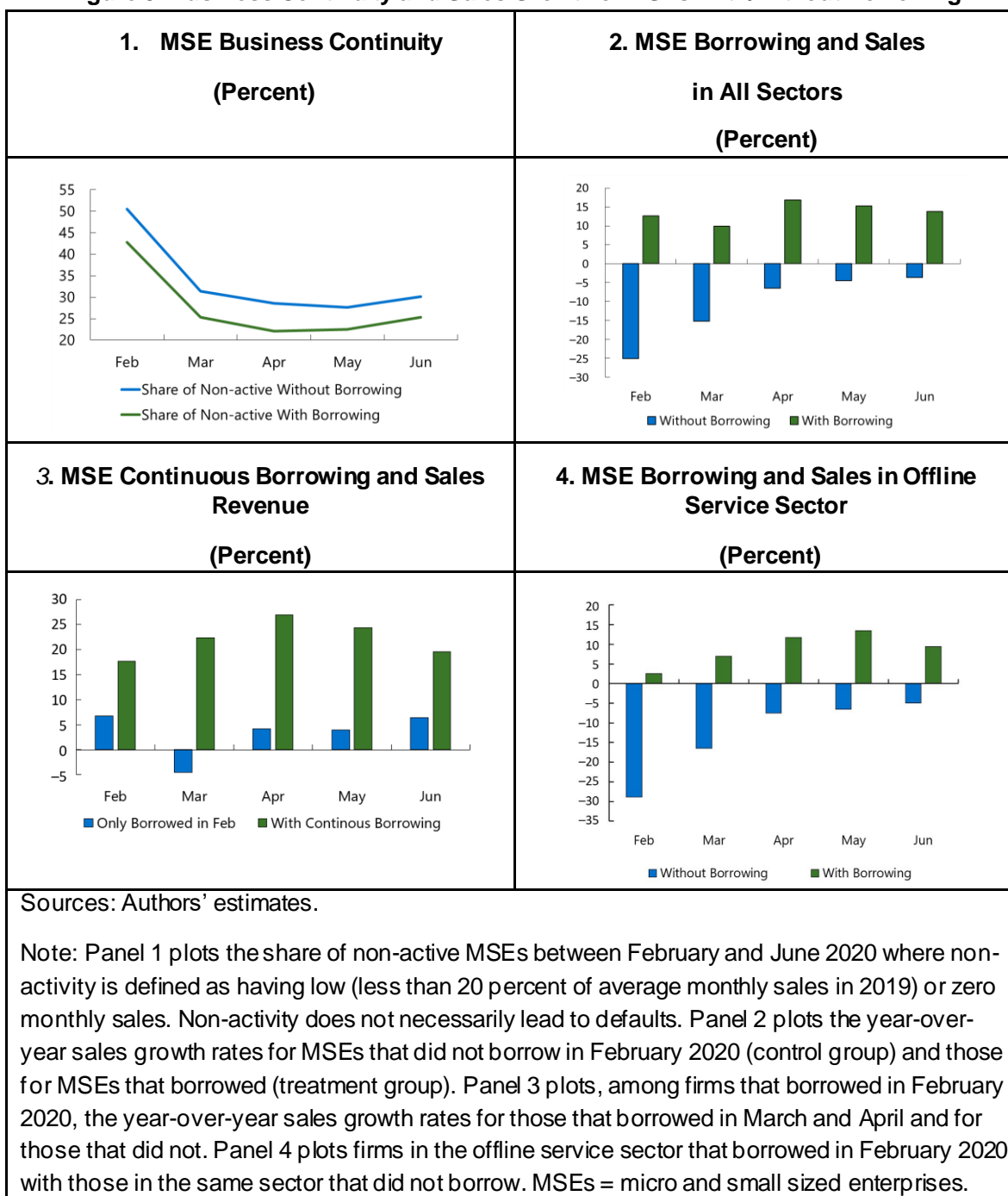
First, a random sample of 40,000 MSEs shows that lending to small businesses by the digital bank was positively associated with sales growth. MSEs that borrowed in February 2020 appeared to be more active, on average, than those that did not borrow (Figure 3, panel 1). Moreover, firms that borrowed registered positive year-over-year sales growth rates while those that did not borrow had much lower and even negative year-over-year sales growth rates (Figure 3, panel 2).¹¹ More importantly, within the firms that borrowed in February 2020, those that continued to borrow in March and April also appeared to have significantly higher sales growth (Figure 3, panel 3). Results also show that offline service sector firms that received loans at the beginning of the pandemic in 2020 significantly outperformed those that did not, whereas the two groups had similar past performance in 2019 (Figure 3, panel 4). The results lend support to the hypothesis that the ability of digital banking to leverage digital data and platforms to lend remotely played a positive role in supporting small businesses amid the pandemic and that digital banking credit complemented that of traditional banks.¹²

¹⁰ This assumption is verified by looking at firms’ actual borrowing activities during the pandemic. We find that, holding all other firm characteristics the same, firms with positive 2019:Q4 loan balances indeed had higher actual borrowing from MYbank during the pandemic.

¹¹ MSEs in the treatment group are not immune to the shock of the pandemic and lockdown. The sales growth rates of the treatment group declined from 38 percent in March 2019 to 10 percent in March 2020.

¹² Sales were not controlled since they are the dependent variable that can be affected by both the pandemic and lending activities (such as business sales during the pandemic). On credit lines, since the average historical monthly borrowing as well as the standard deviation of the borrowings in addition to other firm characteristics were controlled for, it is unlikely that sampling procedures resulted in systematic biases in firms’ credit lines.

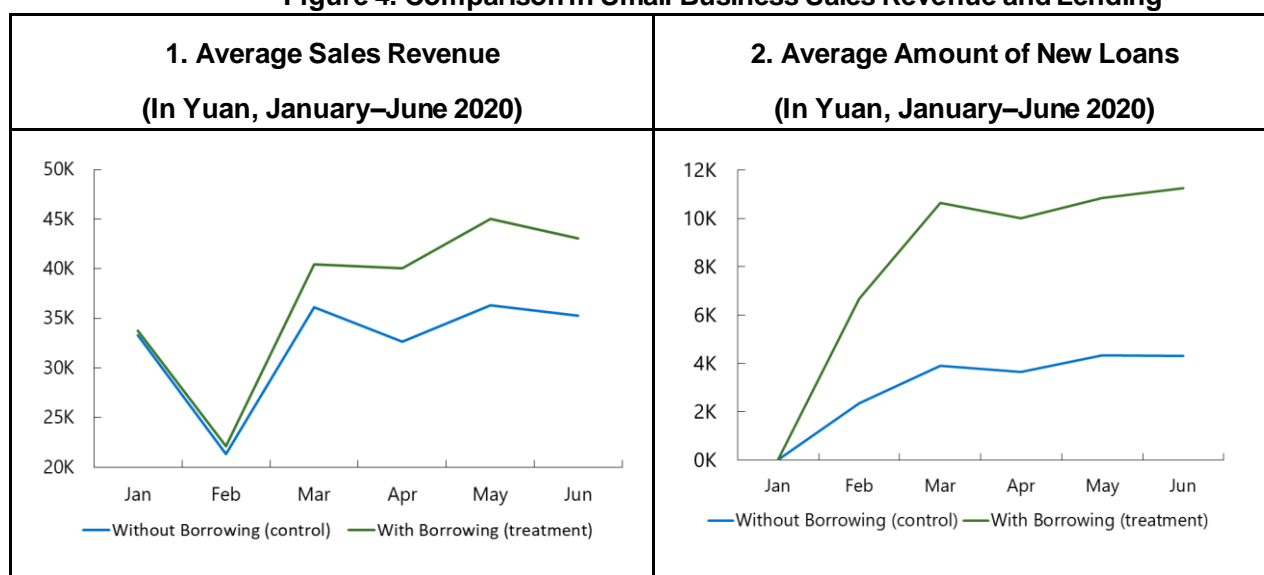
Figure 3. Business Continuity and Sales Growth of MSEs With/Without Borrowing



Second, a random sample of another 40,000 MSEs shows a possible causal relationship between lending by the digital bank and the MSEs' higher sales growth during the pandemic. Firms can borrow because of better sales prospects. Moreover, the pandemic could systematically affect certain firms' borrowing decisions and sales revenues, which could cause endogeneity concerns. To formally address these endogeneity concerns, instead of sampling according to their actual borrowing activities during the pandemic, the treatment group of MSEs was constructed by selecting firms that borrowed in 2019:Q4 and the control group of similar MSEs that did not. The PSM method was used again to ensure that the sector, region, prior sales, and borrowing before 2019:Q4 were similar between the two groups. It was assumed that

MSEs that borrowed in the pre-COVID period 2019:Q4 had a higher likelihood to borrow during the pandemic, while their borrowing in 2019:Q4 was entirely uncorrelated with the exogenous impact from the pandemic.¹³ An additional requirement was added: firms in both the control and treatment groups that had a zero loan balance in Jan 2020. This ensures that all firms had similar credit demand immediately before the pandemic and that those that borrowed during the pandemic were not doing so simply to roll over previous loans. The difference in performance between the two groups was then compared to infer the causal effect of borrowing from the digital bank, which is calculated by the difference of the average sales revenue between the two groups divided by the difference of the average amount of new loans between the two groups. The results confirm the positive role of MYbank lending on MSEs sales (Figure 4). The estimates suggest that every ¥1,000 that MYbank lent to a firm led to an increase in the firm’s sales revenue by ¥1,170, ¥1,340, and ¥1,130 in April, May, and June 2020, respectively. This analysis lends support to the conclusion that the access to credit led to higher sales during the pandemic, made available by the digital bank’s ability to use data and platforms to assess borrowers and extend credit remotely.

Figure 4. Comparison in Small Business Sales Revenue and Lending



Sources: Authors’ estimates.

Note: The treatment group and the control group are expected to have similar distributions of firms’ credit demand, yet firms in the treatment group are more likely to tap MYbank’s financing. The identification assumption is that the difference in their borrowing from MYbank in the pre-COVID-19 period 2019:Q4 serves as a proxy for the two groups’ different propensities to borrow from MYbank (after controlling for sector, region, and other characteristics) but is uncorrelated with the exogenous impact from the pandemic.

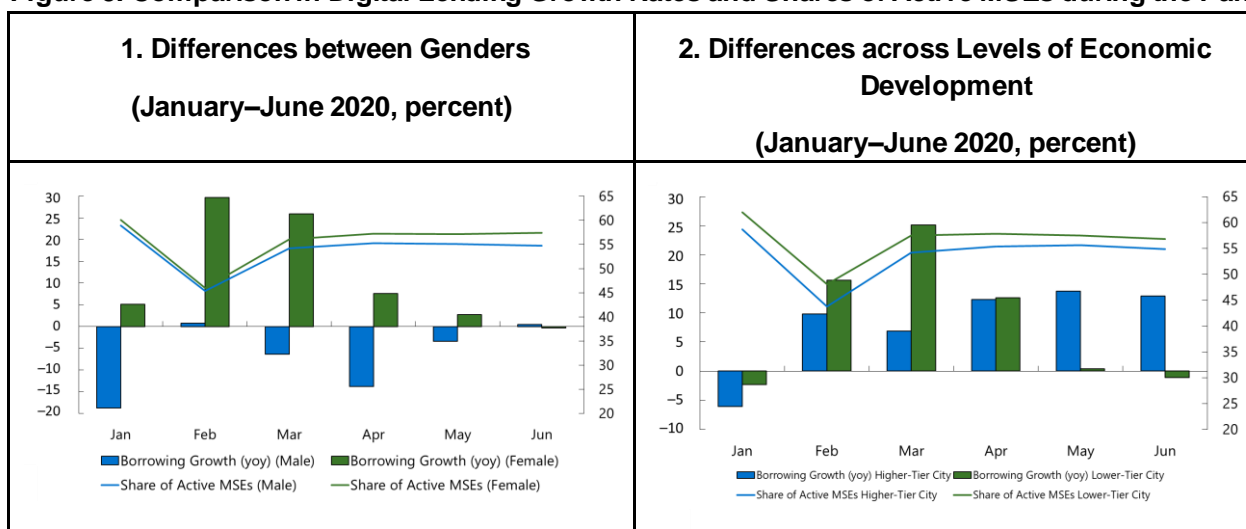
The analysis also suggests that digital lending was gender inclusive. The growth rate of lending to female-owned MSEs was higher than to male-owned MSEs during the pandemic, although the relationship slightly reversed in June 2020 (Figure 5, panel 1). The year-over-year growth rates of digital lending to female-owned MSEs were positive between January and May and were 15 to 25 percentage points higher than that of male-owned MSEs. For both groups, the share of active MSEs with positive monthly sales were negatively affected by the pandemic in February and bounced back starting in March. In addition, even when

¹³ It is not assumed that firms that did not borrow in 2019:Q4 did not have access to credit. Instead, 2019:Q4 is only used to represent the different propensities to access digital lending.

the lending growth rates to female-owned MSEs turned to be slightly lower than that of male-owned MSEs in June 2020, the share of active female-owned MSEs was still higher than that of male-owned MSEs, partially reflecting female-owned MSEs' better business continuity even with potentially lower loan demand. These observations together suggest that digital lending might have played a positive role in providing liquidity to help female-owned MSEs to survive the adverse economic impact during the pandemic.

An assessment of the geographic distribution of digital lending also shows support to MSEs in less developed regions of China. The lending growth rates to MSEs in less developed regions (third-, fourth-, and fifth-tier cities) outpaced that of MSEs in developed regions (first- and second-tier cities) during the pandemic, although the relationship reversed again a few months later starting in May (Figure 5, panel 2). In both regions, the share of active MSEs with positive sales declined sharply in February and bounced back afterward. Even when the lending growth rates to MSEs in less developed regions turned out to be lower than that of developed regions in May and June 2020, the share of active MSEs in less developed regions was higher than that of more developed regions, partially reflecting better business continuity of MSEs in less developed regions. This evidence is consistent with the hypothesis that digital lending played a positive role in helping MSEs survive the economic downturn in an inclusive manner.¹⁴

Figure 5. Comparison in Digital Lending Growth Rates and Shares of Active MSEs during the Pandemic



Sources: Authors' estimates.

Note: Panel 1 is based on randomly drawing 10,000 female-owned MSEs and another 10,000 male-owned MSEs in the entire universe of MSEs while ensuring that the two groups have similar distributions of city tiers and of sales in 2019. Panel 2 is based on randomly drawing 10,000 MSEs from higher-tier Chinese cities (that is, first- and second-tier cities) and another 10,000 MSEs from lower-tier Chinese cities (that is, third-, fourth-, and fifth-tier cities) while ensuring that the two groups have similar distributions of genders and of sales in 2019. MSEs = micro and small sized enterprises; YOY = year-over-year.

¹⁴ Regression results are available upon request, however, as confidence bands are not available, results should be seen as indicative for now.

CONCLUSIONS

The pandemic presented challenges for businesses worldwide, particularly for small businesses, but the ability of digital banks to lend remotely and manage credit risks using digital technology could play a positive role in facilitating business continuity. Though the resilience of digital bank lending in China may have been helped, in part, by the speed with which the pandemic was contained in the summer, the resumption of business activities and the high level of digitalization in China. The ability of digital banks to remotely assess the creditworthiness of small businesses and lend underscores the importance of digital lending.

Digital banks could facilitate small businesses' access to finance and could have a positive economic impact during future pandemics and economic downturns. In the crises, when the information asymmetry challenge is the most acute, digital banks could leverage their advantageous position in tracking business activities and complementing traditional banks by lending to small businesses. During the COVID-19 lockdown, digital banks in China, such as MYbank, WeBank, and XW Bank, appear to have reduced the financing gap and supported the business continuity of small businesses that had difficulties accessing loans. The empirical analysis in this note tentatively suggests that lending by digital banks to MSEs enabled higher sales growth as well as access to finance by segments of the population that typically had not been served by traditional banks, such as female-owned MSEs and MSEs in less developed regions. This is consistent with other studies showing the complementary role of fintech lending to traditional banks (Cornelli et al. 2020; Barkley and Schweitzer 2020). That said, the long-term impact remains to be seen since the analysis is based on five-month data during the lockdown. In addition, the overall support from digital banks to the real economy is still limited, given their small size in the whole financial system,

Looking forward, policymakers could consider empowering digital banks to support small businesses and achieve more inclusive growth. During pandemic episodes and economic recessions, vulnerable groups are likely to be among the most affected. Digital banks, underpinned by investments in digital technology and digital infrastructure, could be part of the solution to enhance social equity for low-income, low-skilled workers, during and possibly after the pandemic. The COVID-19 pandemic provided an opportunity for digital banks to leverage their advantages in reaching and building resilience for these groups. The pandemic has also sped up the transformation of the financial system, which has become increasingly capital light, flexible and dynamic, and more reliant on the value of intangible assets featured with nonrivalrous data. Therefore, policies to enhance open banking—allowing data to move securely between traditional banks and digital banks in a standardized way—could further support small business financing and financial inclusion.

Countries could strengthen digital banking services based on their specific circumstances. Making information easier to share could boost both the supply of, and demand for, credit, increasing SME lending without increasing risks in the system (Bank of England 2020). Moreover, digital banks' highly automated and data-driven credit underwriting process relies heavily on rich proprietary data available to the lender via its payments and e-commerce platforms. This is a unique feature compared with traditional banks. Countries, depending on their circumstances and institutional settings, could benefit from focusing on digitally enabled short-term liquidity products without collateral, with higher interest rates for appropriate risk compensation and dynamic credit line adjustments. Limitations exist for big data and machine learning on risk management for countries with limited data.

Policymakers will, however, need to also strengthen regulation and ensure financial stability, including issues related to data privacy and security. Countries need to strike a balance between reaping the benefits from financial innovation and guarding against potential risks (Jeffrey 2021). Although digital

banks have demonstrated several advantages during the pandemic in providing financial services to small businesses, it is yet to be seen whether various dimensions of risks are properly and efficiently managed. Countries with different characteristics may also require slightly different forms of digital lending and of market structures. Policymakers need to ensure robust regulatory and supervisory frameworks are in place to address risks specific to digital banks. For instance, the use of massive amounts of data to assess firms' creditworthiness could reduce the need for collateral in solving asymmetric information problems in credit markets (Gambacorta 2020) but can also introduce issues related to data security and privacy.¹⁵ Therefore, regulatory and supervisory frameworks could consider both the likely mitigated risks (for example, the role of machine learning and big data in reducing information asymmetry) and increased risks (for example, cyber security and data security) associated with the wide use of data in small business financing. Digital banks in the world may carry their own risks which need to be carefully understood, monitored, and managed, but that is beyond the scope of this paper and leaves room for future policy and academic research.

¹⁵ Lending to small businesses using collateral is less feasible, especially during a lockdown. A collateralized loan would be expensive, since there could be added costs arising from collateral verification, documentation, registration, and monitoring—to some extent these need a physical presence. In addition, the cost of foreclosing the collateral may be higher than the loan exposure itself. As a result, the income from the loan may not be able to cover these collateral costs. Therefore, the traditional approach to using collateral to reduce information asymmetries is unlikely to be feasible for small business lending.

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