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Has COVID-19 hindered small business activities? The role of Fintech

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1. Introduction

Small businesses are a key part of most developing economies and contribute to the stability of economic growth and employment (Thurik and Wennekers, 2004; Dobbs and Hamilton, 2007). In China, the total number of registered small and medium-sized enterprises (SMEs) has increased to more than 42 million, according to statistical data from the State Administration for Market Regulation (SAMR) and the Annual Book of the Development of Small and Medium Firms (2020). However, the risk of failure is high for SMEs, especially within the first five years. In China, about 98% of SMEs fail within the first five years (Zhang et al., 2018). Thus, a study into the responses of small businesses to the uncertainty of a pandemic is urgent at this time and can help to reform policy guidelines.

COVID-19 is now a key risk factor to the global economy, and the rapid spread of the pandemic has made most governments adopt a lockdown policy to prevent increases in the number of cases (Gupta et al., 2020). In 2020, most countries experienced negative economic growth, but growth was positive in several nations, and China maintained a 2.5% annual growth rate. The pandemic destroyed the normal economic order and the forced lockdown policies enhanced the negative shocks to economic growth. In such circumstances, SMEs can face multilevel restrictions and survival risks (Bartik et al., 2020). On the one hand, the economic shutdown caused the cessation of business activities for maintaining operation costs, rent and wage payments reduced cash flow, and operational difficulties worsened as the pandemic increased in length (Liguori and Pittz, 2020). On the other hand, SMEs usually have limited access to finance because of the low coverage of collateral assets. During the pandemic, banks decreased loan opportunities to reduce bank risk (Falagiarda et al., 2020; Acharya et al., 2021) Thus, the survival risk for SMEs was worse than in normal times. Naturally, Fintech...
could meet this demand requirement due to technical advances and cost reduction. In recent years, Fintech has shown a remarkable promotion effect in inspiring entrepreneurs (Haddad and Hornuf, 2019).

The findings of this study make threefold contributions. First, we provide new evidence on the business creation effect of pandemics in China, with a focus on Hubei Province, the worst-hit province from the Covid-19 pandemic from the beginning of 2020, and the support of registration-level micro data. However, the effects of a pandemic on economies have been investigated from different perspectives, such as the stock market (Baker et al., 2020), economic growth (Maliszewska et al., 2020), and international trade (Baldwin and Tomiura, 2020), among others. The economic influence is far from clear because of limited data in time, with most conclusions gained from macro-level data or those of listed firms, but without a credible representative.

In addition, we provide a new picture of the creation of SMEs in the manufacturing sector under the destruction of the Covid-19 pandemic, which has rarely been investigated due to data limitations. Several studies have provided statistical evidence on the impact of a pandemic on small businesses, but most have not provided reliable causal estimations. Bartik et al. (2020) showed the survey results of pandemic effects based on a survey of more than 5,000 firms. Fairlie (2020) referred to the short-term effect of social distancing induced by the pandemic on the owners of small businesses. Fairlie and Fossen (2021) focused on the sale response to pandemics. Graeber et al. (2021) also investigated the asymmetric effect of pandemics, finding that females suffered from a higher risk of income loss than males in the self-employed group. Based on these studies, Dorr et al. (2022) went further with the policy strategy during the pandemic and suggested that an anti-crisis support policy should put more emphasis on a specific group of small businesses to bring about the best policy response.

We also contribute new insights about the role of Fintech in boosting economic growth at the macro level or in small businesses at the micro-level, as most previous studies have focused on the role of Fintech in financial development or the structural change in financial systems from the perspective of lending cost (Jagtiani and Lemieux, 2018; Gopal and Schnabl, 2020). The main characteristics of Fintech are lower costs than traditional banks and less information asymmetry for those targets with insufficient collateral fixed assets (Vives, 2017), but the role of Fintech in business activity has received less attention. Most have focused on the revolution of production, poverty reduction, and entrepreneurship (e.g., Luo and Zeng, 2020; Wang and He, 2020; Zhang et al., 2020). However, unlike traditional financial instruments, Fintech is more inclusive and provides additional opportunities for overcoming the financial constraints of SMEs. To fill this gap, this study provided new evidence of the interactive role of Fintech on the effect of the Covid-19 pandemic.

The remainder of this paper is organized as follows. In Section 2, we briefly review the related literature and Section 3 presents stylized facts. Section 4 introduces the identification strategy, describes our data, and provides descriptive statistics. Section 5 presents the main empirical results and the robustness tests. Section 6 concludes the paper.

2. Literature review

This study is closely related to two strands of literature:

First, it is closely related to studies into the effects of a pandemic on business activities and economic development. Most studies have shed light on the business activities of listed firms, due to data frequency. Yoshino et al. (2021) discussed the investment portfolio response to the Covid-19 shock, while Goel et al. (2021) examined supply chain stability when facing the shock of a pandemic.

Second, the study is also linked to literature on the determinants of small businesses. In contrast to mature firms, small businesses face several disadvantages during their early periods of development (Berger and Black, 2011). One of the major challenges they face is limited access to finance. For example, Yoshino and Taghizadeh-Hesary (2019) discussed the role of credit guarantees in the financing promotion of SMEs.

In contrast to traditional finance, digital finance can offer a new channel for the nexus between finance suppliers and borrowers, mainly because of lower financial costs and less information asymmetry, and it can even improve the match efficiency by lowering entry cost (Gomber et al., 2018; Awan et al., 2021). Cao et al. (2021) provided a case analysis of the role of digital finance in improving energy-environmental performance.

Otherwise, most of the literature has shed light on the effects of trade and investment. Global lockdown policies broke the global value chain, destroyed the operational order of ports, and hindered the expectations for investment returns (Kejzar and Velic, 2020).

3. Stylized facts

In this section, we present statistical evidence on the general effects of pandemics on small businesses in China.

Hubei Province had the highest coverage from the Covid-19 pandemic in China, accounting for 55.2% and 79.32% of pandemic cases and deaths, respectively, up to September 2021. In addition, the pandemic was distributed unequally among cities in Hubei Province, with Wuhan accounting for the largest volume of pandemic cases, with a share of 73.84% (see Fig. 1). As for economic recovery, we can easily observe that most prefectures experienced a quick economic recovery in the second and third quarters of 2020, after a sharp drop in the first quarter of 2020. In the first half of 2021, the economic scale was larger than at the same time in 2019 (see Fig. 2). From those figures, we can say that the economic recovery in Hubei has been strong over the short run, so this study mainly focused on the short-term effects of the pandemic. These factors make Hubei a good fit for this study.
Fig. 1. Covid-19 pandemics distribution in Hubei Province.
*Data source: National Health Commission of the PRC. The data is updated to 13th, September of 2021.*

Fig. 2. Quarterly Economic Growth at Prefectural level in Hubei Province during the COVID-19 pandemics.
*Data source: Bureau of Statistics of each Prefecture in Hubei province. The unit is a million RMB.*

Regarding Fintech distribution, we found it to be unequally distributed among prefectures in Hubei Province (Fig. 3). Wuhan, the capital of the province, is a pioneer in Fintech development in Hubei, with an overall index of over 300, compared to the provincial average of 227. In addition, the distribution of Fintech is not geographically concentrated; there are two peak areas of Fintech in the southeast and northwest of Hubei.

In addition, we presented the main characteristics of business creation in Hubei. Focusing on the manufacturing sector, we can easily observe a sloping drop in business creation from February to April 2020. In the last quarter of 2020, business creation returned to the normal pattern observed in 2018 and 2019 (Fig. 4).

The shock stemming from the pandemic was not only felt in manufacturing, due to the disconnection in the production value chain. Lockdown policies under a pandemic may directly wipe out demand for some service industries. To check the influence of a pandemic on business creation, we provided additional evidence in the hotel and restaurant industries. Remarkably, we observed a sharp reduction in business creation in the lockdown months in Hubei Province. In particular, the recovery of the restaurant industry was stronger and at a higher speed than the hotel industry (Figs. 5 and 6).

Furthermore, the geographic structure of the manufacturing sector may also have altered the influence of the pandemic. We show the manufacturing creation in Hubei Province for the years 2019 and 2020 in Figs. 7 and 8. The new
manufacturing firms are heavily located in Wuhan and Xiangyang. The creation in Xiaogan experienced a significant reduction in 2020, while the number increased in Enshi and Xiantao. Thus, we believe that the pandemic may have had an unequal influence among these prefectures.

4. Empirical methodology and data

4.1. Identification

For the research target, in the baseline model, we estimated the causal effect of a pandemic on SME activities. The two-way fixed-effect model is ideal in the traditional view because it controls unobservables. Considering the reality of dynamic policies in cities, we used the lockdown policies to act as a pandemic shock, while the quasi-natural design brought a pure estimation of the pandemic effect and eliminated the reverse effect of small businesses on lockdown policy design.

In the context of this study, business activity was recorded as new registrations and, because of the limitation on firm-level characteristics, we used the count model to estimate the effect of the Covid-19 pandemic on the creation of small businesses. Taking this into consideration, we designed the identification strategy as follows:

\[
SME_{kt} = \alpha + \beta \cdot \text{lockdown}_{kt} + \mu_k + \mu_y + \mu_m + \epsilon_{kt}
\]
Fig. 5. New registration of Restaurants in Hubei Province during the COVID-19 pandemics.

Fig. 6. New registration of Hotels in Hubei Province during the COVID-19 pandemics.

Fig. 7. Manufacturing Registration in Hubei Province (2019).
where SME represents manufacturing registration activities, which are measured by the registration numbers in baseline regressions, and the subscripts $k$ and $t$ indicate the city and year-month pairs, respectively. Lockdown is the key independent variable, which measures exposure to the Covid-19 pandemic and the negative shock to economic activities. We defined the period between February 2020 and April 2020 as the lockdown period with a value of 1; otherwise, it was 0. To some extent, the variable lockdown presented a dynamic difference-in-differences setting, owing to the data structure and the various durations of lockdown policies.

In this study, the key variable frequency was monthly, while the ordinary controls were either quarterly or annually. The frequency mismatch could have induced an estimation bias when the controls were included directly. Taking this into account, we also controlled for the prefecture, yearly, and monthly fixed effects, $\mu_k$, $\mu_y$, and $\mu_m$, respectively. Thus, the potential estimation bias stemming from omitted variables could be addressed properly. The error term $\varepsilon_{kt}$ followed a randomly normal distribution.

Based on knowledge of the entrepreneurship effect of lockdown policies or the shock from the Covid-19 pandemic in Eq. (1), we still had an incentive to understand the role of Fintech in the nexus between lockdown policies and small business creation, so we incorporated an interaction in the regression to estimate the additional role of Fintech.

$$SME_{kt} = \alpha + \beta \times \text{lockdown}_{kt} + \gamma \times \text{lockdown}_{kt} \times \text{fintech}_{kt} + \mu_k + \mu_t + \varepsilon_{kt}$$

where parameter $\gamma$ is the main focus of our study. The variable $\text{fintech}_{kt}$ is the development of inclusive financial development in prefecture $k$ in year $t$.

### 4.2. Data

The main data sources of this study were twofold. First, we obtained China’s new firm registration data from SAMR, which is a unique, comprehensive, and largely unexplored database. The main duty of SAMR is to be responsible for the unified registration of various market participants, including enterprises, farmer specialized cooperatives, individual industrial, and commercial households. Thus, we were able to obtain detailed information on firms’ registered addresses, registration times, current states of existence, and industries via SAMR.

In addition, we obtained Fintech development information from the Institute of Digital Finance at Peking University, and the details of the index construction can be seen in Guo et al. (2020). This indicator contains seven sub-indexes: coverage, depth, payment, insurance, investment, credit, and digitization. In this study, we used the total average index of the financial inclusive index as a measure of Fintech development.

### 5. Empirical evidence

#### 5.1. Baseline results

Table 1 presents the estimation results of Equation 2 and the test statistics. It presents the effect of pandemic-induced lockdown policies on firm creation using two-way fixed effects. In columns (1)–(3), the regressions are without fixed effects, with only fixed effects at the prefecture-level, and with all kinds of fixed effects. We can consistently observe that the lockdown policy hurts manufacturing firm creation, and the impact was significant, even with various fixed
Table 1
The effect of overall Fintech index on the activity of manufacturing registration.

|                | (1)       | (2)       | (3)       | (4)       | (5)       |
|----------------|-----------|-----------|-----------|-----------|-----------|
| Dependent variable | Registration number of manufacturing firms |
| lockdown        | $-0.6144^{**}$ | $-0.6921^{***}$ | $-1.3164^{***}$ | $-1.0761$ | $0.3062$ |
|                | ($-2.53$) | ($-3.01$) | ($-5.98$) | ($-1.19$) | ($0.81$)  |
| fintech*lockdown| $0.1387$  | $-0.6277^{***}$ |           |           |           |
|                | ($0.36$)  | ($-3.80$) |           |           |           |
| Constant       | $4.0271^{***}$ | $0.6931$  | $0.3556^{**}$ | $4.1643^{***}$ | $0.4068^{**}$ |
|                | ($71.00$) | ($)       | ($1.99$)  | ($69.19$) | ($3.20$)  |
| FEs            | no        | yes       | yes       | no        | yes       |
| Observations   | 510       | 506       | 495       | 402       | 391       |
| R-squared      | 0.0179    | 0.6931    | 0.3556**  | 4.1643*** | 0.4068*** |

Note: Robust t-statistics in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1.

Table 2
The effect of the sub-Fintech index on the activity of manufacturing registration.

| Variables          | (1)       | (2)       | (3)       | (4)       | (5)       | (6)       | (7)       |
|--------------------|-----------|-----------|-----------|-----------|-----------|-----------|-----------|
|                    | coverage  | usage depth | payment   | insurance | investment | credit    | digitization |
| lockdown            | 0.1062    | 1.0468*   | 0.0464    | $-0.2144$ | 0.7251    | $-4.1784^{***}$ | 0.0568    |
|                    | ($0.32$)  | ($1.83$)  | ($0.15$)  | ($-0.84$) | ($1.08$)  | ($-3.81$) | ($0.18$)  |
| coverage*lockdown  | $-0.5694^{***}$ |           |           |           |           |           |           |
|                    | ($-3.75$) |           |           |           |           |           |           |
| usage depth*lockdown| $-0.9267^{***}$ |           |           |           |           |           |           |
|                    | ($-3.78$) |           |           |           |           |           |           |
| payment*lockdown   |           | $-0.4817^{***}$ |           |           |           |           |           |
|                    |           | ($-3.85$) |           |           |           |           |           |
| insurance*lockdown | $-0.2361^{***}$ |           |           |           |           |           |           |
|                    | ($-3.83$) |           |           |           |           |           |           |
| investment*lockdown|           |           | $-0.7639^{***}$ |           |           |           |           |
|                    |           |           | ($-2.86$) |           |           |           |           |
| credit*lockdown    | $0.4087^{***}$ | $0.4031^{***}$ | $0.4039^{***}$ | $0.4080^{***}$ | $0.4120^{***}$ | $0.4268^{***}$ | $0.4088^{***}$ |
|                    | ($3.23$)  | ($3.16$)  | ($3.17$)  | ($3.22$)  | ($3.26$)  | ($3.40$)  | ($3.22$)  |
| digitization*lockdown| $1.6716^{***}$ |           |           |           |           |           |           |
|                    | ($2.82$)  |           |           |           |           |           |           |
| Constant            | $0.4087^{***}$ | $0.4031^{***}$ | $0.4039^{***}$ | $0.4080^{***}$ | $0.4120^{***}$ | $0.4268^{***}$ | $0.4088^{***}$ |
|                    | ($3.23$)  | ($3.16$)  | ($3.17$)  | ($3.22$)  | ($3.26$)  | ($3.40$)  | ($3.22$)  |
| FEs                 | yes       | yes       | yes       | yes       | yes       | yes       | yes       |
| Observations        | 391       | 391       | 391       | 391       | 391       | 391       | 391       |
| R-squared           | 0.8654    | 0.8657    | 0.8651    | 0.8648    | 0.8641    | 0.8610    | 0.8640    |

Note: Robust t-statistics in parentheses. ***p < 0.01, **p < 0.05, *p < 0.1. FEs contain prefecture-level, yearly and monthly fixed effects.

effects. In addition, we examined the role of Fintech in the nexus between lockdown and firm creation. The result was unexpected, as the lockdown policy effects became insignificant, while the comparative advantage of Fintech did not bring a lower reduction in registrations, but rather enhanced the negative shock of the pandemic. This finding is contrary to previous studies supporting the view that Fintech brings new opportunities for SMEs and encourages the cultivation of more entrants. The main reason is that Fintech can minimize the mismatch between the lender and borrower and reduce loan costs for SMEs. However, the Fintech industry may be more sensitive to economic uncertainty when, in the situation of a pandemic, it has the incentive to allocate to industries with quicker rapid recovery and higher profitability rates.

Due to the negative effect of Fintech, we turned to the sub-index in seven aspects to examine which sub-index was the main driver of the negative impact. It can be easily observed that in Table 2, first, the credit index is the only aspect that can alleviate the negative impact of lockdown policies, which means that if SMEs enjoyed a better credit access environment, the creation of SMEs would be higher than those areas with a lower credit environment index. Second, the main motivating factor of the negative role stemmed from usage depth and investment, which means that the reliance on Fintech could induce investment in industries with lower entrance requirements and more easily connect to Fintech. The manufacturing sector is closely related to traditional bank financing. In the development of Fintech, a higher index means more resource reallocation to the service industry.

5.2. Robustness tests

In this section, we subject our findings to additional tests to ensure robustness. Additional checks in this section are needed to support the estimation of firm registrations, and the employment dynamics may serve as a role related to
entrepreneurship. As previously inferred, SMEs are the major contributors to employment growth. Several studies have proven that employment is sensitive to the shock induced by Covid-19 or other pandemics (Forsythe et al., 2020).

In this study, we collected job posting data for all firms within Hubei Province between January 2018 and June 2021, which accounted for a total volume of 2,200,503. For all ranges of job postings, we found that job postings reduced rapidly from February to March 2020 (Fig. 9). This pattern means that the labor market faced a more rapid recovery than the creation of small businesses in China, which is different from findings based on the U.S. or Europe (Hensvik et al., 2021; Chetty et al., 2020).

For this purpose, we replaced firm creation as a job vacancy. Table 3 presents the estimates of using employment postings as the impacts of a pandemic and Fintech, with the support of job vacancies for most industries. This is contrary to the results of firm creation, the job vacancies increased during the time of lockdown, and the development of Fintech weakened the demand for employees. In addition, the negative role of Fintech was mostly supported by the development of coverage, payment, insurance, and digitization. However, the development of investment and credit had no remarkable effect on job vacancies. The demand for vacancies in the manufacturing sector is structurally different from service industries, and we limited the job vacancies to those within the manufacturing sector. We then found that the development of Fintech had no significant effect on labor demand, which means that Fintech may not match well with the development of the manufacturing sector in China (Table 4).

6. Conclusion and policy recommendations

The exact impact of Covid-19 on small firms has rarely been investigated since the outbreak of Covid-19 at the beginning of 2020, while small firms act as the root of social stability and economic recovery. By using the registration data of novel firms in China, this study exploited the potential effects of the Covid-19 pandemic and the interactive role of Fintech on small businesses. The main findings are as follows: First, pandemics cause a reduction in the registration of new firms in the manufacturing sector. This finding is consistent with several findings on the negative role of macroeconomics (Guerrieri et al., 2020), firm performance either in a specific country or across countries (Cevik and Miryugin, 2021), and even employment (Yoon et al., 2021). Second, Fintech strengthens the negative effect of a pandemic on new firm creation; only the sub-index of the credit environment weakened the pandemic shock. This finding is relatively different from previous studies in supporting the role of inclusive help in the real economy (Liu et al., 2021). In this study, the negative impact could support the reallocation effect of financial resources being larger than the complementary effect of traditional finance with higher information asymmetry. Third, taking the potential bias of firm registrations into account, we turned to the alternative indicator of the job posting to measure entrepreneurship, and the robust check on job posting showed that Fintech is of no or negative significance in labor demand during a pandemic in the manufacturing sector. This result should call for caution from policymakers, with an incentive to promote the distribution of inclusive finance. It plays a limited role in economic recovery in the manufacturing sector. Finally, the longer lockdown policies are sustained, the
Table 3
The effect of Fintech index on the activity of job postings.

| Variables          | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     | (7)     | (8)     |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|
|                    | fintech | coverage | usage depth | payment | insurance | investment | credit | digitalization |
| lockdown           | 0.8116*** | 0.8087*** | 0.7152** | 0.7182*** | 0.6503*** | 0.1739  | -0.5669 | 0.7740*** |
|                    | (4.35)   | (4.83)   | (2.08)   | (4.39)   | (4.53)   | (0.27)  | (-0.76) | (4.58)   |
| fintech*lockdown   | -0.1624** | -0.1692** |           |         |         |         |         |         |
|                    | (-2.08)  | (-2.27)  |          |         |         |         |         |         |
| coverage*lockdown  | -0.1190  |          |         |         |         |         |         |         |
|                    | (-0.92)  |          |         |         |         |         |         |         |
| usage depth*lockdown| -0.1142* |          |         |         |         |         |         |         |
|                    | (-1.91)  |          |         |         |         |         |         |         |
| payment*lockdown   | -0.0544* |          |         |         |         |         |         |         |
|                    | (-1.81)  |          |         |         |         |         |         |         |
| insurance*lockdown | 0.1041   |          |         |         |         |         |         |         |
|                    | (0.44)   |          |         |         |         |         |         |         |
| investment*lockdown| 0.0544*  |          |         |         |         |         |         |         |
|                    | (-1.81)  |          |         |         |         |         |         |         |
| credit*lockdown    | 0.5535   |          |         |         |         |         |         |         |
|                    | (1.46)   |          |         |         |         |         |         |         |
| digitization*lockdown|         | -0.1302* |          |         |         |         |         |         |
|                    |         | (-1.95)  |          |         |         |         |         |         |

Constant: 10.5691*** (86.84)
FEs: yes
Observations: 389
R-squared: 0.9114

Note: Robust t-statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.1
FEs contains prefecture-level, yearly and monthly fixed effects.

Table 4
The effect of Fintech index on the activity of Manufacturing job postings.

| Variables          | (1)     | (2)     | (3)     | (4)     | (5)     | (6)     | (7)     | (8)     |
|--------------------|---------|---------|---------|---------|---------|---------|---------|---------|
|                    | fintech | coverage | usage depth | payment | insurance | investment | credit | digitalization |
| lockdown           | 0.9642*** | 0.9525*** | 0.8880* | 0.8790*** | 0.7952*** | 0.3512  | -0.3389 | 0.9325*** |
|                    | (3.17)   | (3.59)   | (1.87)   | (3.32)   | (3.63)   | (0.57)  | (-0.40) | (3.93)   |
| fintech*lockdown   | -0.1667  |          |         |         |         |         |         |         |
|                    | (-1.38)  |          |         |         |         |         |         |         |
| coverage*lockdown  | -0.1696  |          |         |         |         |         |         |         |
|                    | (-1.54)  |          |         |         |         |         |         |         |
| usage depth*lockdown| -0.1325  |          |         |         |         |         |         |         |
|                    | (-0.71)  |          |         |         |         |         |         |         |
| payment*lockdown   | -0.0552  |          |         |         |         |         |         |         |
|                    | (-1.19)  |          |         |         |         |         |         |         |
| insurance*lockdown | 0.0875   |          |         |         |         |         |         |         |
|                    | (0.38)   |          |         |         |         |         |         |         |
| investment*lockdown|         |          |         |         |         |         |         |         |
|                    |         |          |         |         |         |         |         |         |
| credit*lockdown    |         |          |         |         |         |         |         |         |
|                    |         |          |         |         |         |         |         |         |
| digitization*lockdown|         | -0.1102  |          |         |         |         |         |         |
|                    |         | (-1.95)  |          |         |         |         |         |         |

Constant: 7.1684*** (37.18)
FEs: yes
Observations: 389
R-squared: 0.8529

Note: Robust t-statistics in parentheses.
*** p<0.01, ** p<0.05, * p<0.01
deeper their destructive effect on firm creation. Moreover, Fintech may accelerate the concentration of financial resources by showing a negative effect on the creation of new manufacturers.

The policy implications of this study can be organized into two aspects. On the one hand, reducing the degree of impact on the manufacturing sector is indeed important for economic recovery in the aftermath of Covid-19. The negative role of lockdown policies is stronger over prolonged periods, especially in the creation of new firms. Different areas of the world may face a trade-off between economic reopening and social distancing, while the essential policies should target the maintenance of the manufacturing sector, which may reduce the negative impact on economic stability.
Table A.1
The scale distribution among registration capital.

| scale                  | Less than 1 million | 1–5 million   | 5–20 million | More than 20 million | foreign currency |
|------------------------|---------------------|---------------|--------------|----------------------|------------------|
| fraction               | 22.39%              | 14.35%        | 7.19%        | 2.57%                | 0.06%            |

On the other hand, they should receive help from financial institutions, but more importantly, Fintech should be in concordance with the financial demand of the manufacturing sector; otherwise, there will be additional financial misallocation, without resolving information asymmetry. In this study, we found an unexpected role of Fintech in the manufacturing sector, compared to a common understanding. To address the concern of limited financial support in manufacturing recovery, we should design structural reform combined with traditional banking finance and Fintech and we should not neglect the vital role of large-scale traditional finance.

Future works should put more effort into the evaluation of the business creation effects of pandemics, which may be limited by external validity; since we restricted our analysis to the sample in Hubei Province. There is a need for future studies on the mechanism of economic policies to prevent economic slumps from unexpected shocks. First, we would examine whether the role of Fintech in the manufacturing sector behaves heterogeneously among areas and industries. This kind of study would provide a richer picture of the comprehensive role of Fintech. Second, we would look at the exact mechanism of Fintech on firms’ creation and development. Creation is one side of the recovery, and the effect of incumbent growth is also vital at the macro level.

Appendix A. Data process

In this study, we used new firm registration data from SAMR; however, the original structure of this data was not suitable for empirical usage. First, each registration record contained information on the firm’s name, geographic location (such as the province and prefecture to which it belongs, and a detailed registration address), unified registration code, the industry to which it belongs, legal representative, operational status, registration capital, company type, business scope, website, contact email, contact telephone, application date, approved date, and so forth. For the purpose of analysis, focusing on one province can exclude alternatives to business migration or policy spillovers. Among all provinces, the pandemic cases were concentrated in Hubei Province, so the damaging effect of the pandemic on economic activities was more severe. Taking this into account, we limited the data to Hubei Province from January 2019 to June 2021.

First, most firms reported complete information on the province and prefecture; then, we directly added them to the total numbers at the prefecture level. However, about 600 firms reported missing records for location information, so we searched for the location information using Baidu Map to find the city to which they belonged.

Second, even though we focused on the registration activity of small businesses, data limitations may have caused obstacles in identifying them accurately. In most previous studies, the discussion of small businesses was concentrated on identification by registration capital, employment size, or operational sales. However, 53.44% of new registrations had missing information on the exact registration capital. In addition, the unit of registration capital was not unified in its original form, with some accounting in RMB, some in ten thousand RMB, and others in foreign currencies (such as U.S. dollars, yen, Canadian dollars, among others). By comparing different scale category fractions within the subsample with positive registration capital in Table A.1, the number of SMEs accounted for 43.93% of the total sample of registered firms in the years 2019–2021, while the big firms and firms with registration capitals in foreign currencies accounted for only 2.63%. Thus, we can be confident that the conclusion from the results using the whole sample mostly reflects SMEs.

Appendix B. Robustness

As we limited the target to within Hubei Province, variation in the shock induced by COVID-19 among cities could improve the identification quality. According to government policies, the lockdown policies were removed on March 25 for non-Wuhan areas and April 8 for Wuhan. By comparing the registration patterns shown in Fig. B.1, we can infer that, for most months during the sample period, the moving pattern of Wuhan kept pace with other cities in Hubei Province, while the exceptions were the lockdown and post-lockdown periods. Registration recovery in Wuhan was weaker than in other cities from February to May, and then the registration growth pattern tended to converge from June 2020. Taking this into consideration, we designed triple interactions between Fintech, lockdown, and Wuhan to verify whether stricter pandemic regulations caused fewer new firms. To examine the exact effect, we restricted the sample in the year 2020, and we observed that, in the first column in Table B.2, after the fixed effects were included, the interaction between lockdown and Wuhan was insignificant, but the lockdown policies did indeed cause a reduction in new registrations. In the second column, development in Wuhan induced a larger volume of new firms. However, suffering from the pandemic, showed frangibility and did not weaken the negative shock, but rather amplified the negative shock on new registrations.
Fig. B.1. Manufacturing Registration between Wuhan and other cities. 
Note: The right coordinate axes present the registration dynamics of Wuhan. The two vertical lines are the times of pandemic outbreaks and the end of lockdown.

Table B.2
The effect of overall Fintech index on the activity of manufacturing registration: Wuhan vers. Non-Wuhan.

| Dependent variable | (1)          | (2)          |
|--------------------|--------------|--------------|
|                    | Registration number of manufacturing firms |                  |
| lockdown           | −1.7399***   | −2.2871***   |
|                    | (−5.24)      | (−6.53)      |
| fintech*lockdown   | −0.2277**    |              |
|                    | (−2.17)      |              |
| fintech*wuhan      | 0.3167***    |              |
|                    | (16.34)      |              |
| fintech*lockdown*wuhan | −0.3487** |              |
|                    | (−2.25)      |              |
| lockdown*wuhan     | −0.7002      |              |
|                    | (−0.61)      |              |
| Constant           | 3.3950***    | 3.7636***    |
|                    | (13.08)      | (31.58)      |
| FEs                | yes          | yes          |
| Observations       | 295          | 192          |
| R-squared          | 0.6060       | 0.9532       |

Note: Robust t-statistics in parentheses.

*** p<0.01, ** p<0.05, * p<0.1.

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