

The Impact of COVID-19 on Small and Medium-sized Enterprises: Evidence from Two-wave Phone Surveys in China

Ruochen Dai, Hao Feng, Junpeng Hu, Quan Jin, Huiwen Li, Ranran Wang, Ruixin Wang, Lihe Xu, and Xiaobo Zhang

Abstract

This paper examines both the short-term and mid-term impact of COVID-19 restrictions on small and medium-sized enterprises (SMEs), based on two waves of phone interviews with a previously surveyed large SME sample in China. The outbreak of COVID-19 and resultant lockdowns cast a heavy toll on SMEs. Affected by problems of logistics blocks, labor shortages, and drops in demand, 80 percent of SMEs temporarily closed at the time of the first wave of interviews in February 2020. After reining in COVID-19, authorities largely eased lockdown restrictions in April. Consequently, most SMEs had reopened by the time of the second round of surveys in May. However, many firms, particularly export firms, ran at partial capacity, primarily due to inadequate demand. Moreover, around 18 percent of SMEs closed for good between the two waves of surveys from February to May, shedding 14 percent of total jobs.

Keywords: COVID-19; SMEs; Chinese economy; lockdown; reopening

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1. Introduction

Business activity in China, the world's second-largest economy, ground to a halt for a few months after the outbreak of COVID-19 in China in January 2020. Tens of millions of small and medium-sized enterprises (SMEs) were shut down. Given that SMEs generate 80 percent of employment, it is important to understand the toll the novel coronavirus is taking on SMEs, in order to ensure that policy measures are appropriately designed to meet their needs. However, gauging the impact of COVID-19 on SMEs is particularly challenging because these enterprises are plentiful in number but small in size. Unlike publicly listed firms, information on SMEs is scarce.

The spread of the virus has made it impossible to physically survey the SMEs. One way to circumvent this challenge is to conduct online surveys. Right after the outbreak of COVID-19 in China, a few online surveys (Zhu, Liu, and Wei, 2020) were conducted to measure the impact of the novel coronavirus on Chinese firms. Online surveys possess a key advantage in quickly gathering data. However, these surveys are subject to two selection problems (Wang et al., 2020). The first is that the representativeness of the sample is largely unknown and sometimes skewed. It is common for researchers, for instance, to spread the word about online surveys through their own networks, such as university alumni associations. In this case, the respondents were naturally more educated than a typical owner of a SME. The second selection problem with online surveys is that they tend to appeal to certain sectors. In this case, that sector included those entrepreneurs who really suffered from the negative shock of COVID-19 and hence were more likely to spend time answering the online survey questionnaires than those who fared better. Therefore, online surveys tend to report more pessimistic views.

To better measure the short-term and mid-term impact of COVID-19 on SMEs, the Enterprise Survey for Innovation and Entrepreneurship in China (ESIEC) team, led by Peking University, conducted two rounds of follow-up phone interviews in February and May 2020 with previously sampled SMEs in seven provinces, which are largely representative at the provincial level and the major industrial level for China as a whole. The phone interviews asked entrepreneurs about the operational status, major challenges, and business outlook of their businesses as well as their feelings about COVID-19. The rapid telephone interviews, in combination with the baseline survey, provide us with rich and timely information to study the impact of COVID-19 on SMEs.

Our survey shows that COVID-19 cast a heavy toll on SMEs. At the time of the first wave of phone interviews in February 2020, although most provincial governments allowed businesses to reopen, often with stringent conditions, only about 20 percent of SMEs resumed production. Fourteen percent of surveyed firms would be unable to last beyond a month with their current cash flow, while 50 percent would not survive beyond three months. Nearly half of SMEs did not expect their businesses to reopen within a month or were uncertain about the timing of reopening. From the findings of our survey, it is expected that 16 percent of SMEs would run out of cash before their expected business reopening date.

SMEs were struggling with many challenges, such as disruptions in logistics, restrictions on labor mobility, and declines in market order. The major challenges varied by industry. For example, export firms suffered more than others, due to a decline in external demand and a lack of key parts that kept them afloat. SMEs in the residential service sector were hit particularly hard because of shrinking demand. Agricultural enterprises reported more problems with logistical disruptions.

After reining in COVID-19, authorities largely eased lockdown restrictions in April. As a result, most SMEs had reopened by the time of our second round of surveys in May. While the supply-side challenges faded away, lack of demand emerged as the dominant challenge. Many SMEs, particularly export firms, ran at partial capacity, primarily due to inadequate demand. Moreover, our *ex post* analysis reveals that around 18 percent of SMEs closed for good between the two waves of surveys in February and May.

COVID-19 has unfortunately spread to almost all countries worldwide. Many countries have adopted lockdown policies similar to China's, shutting down millions of SMEs. The governments in these countries desperately want to know what impact COVID-19 is having on SMEs as these businesses struggle with reopening. Thus, the study on the impact on SMEs in China may shed light on other countries as well. It is likely that a second wave of COVID-19 will strike again this fall or next year. In the absence of a vaccine, more lockdowns are expected. The evidence generated from this paper offers a useful roadmap for the challenges ahead facing many countries in the course of reopening.

Our study contributes to the emerging body of literature on the effect of COVID-19 on firms (Bartik et al., 2020; Hassan et al., 2020) and on the Chinese economy (Fang, Wang, and Yang, 2020; Wang et al., 2020; Zhang et al., 2020). To our knowledge, our study was among the first to conduct longitudinal phone surveys on the impact of COVID-19 on SMEs in developing countries.

The paper is arranged as follows. The next section briefly discusses the ESIEC baseline survey and follow-up phone surveys. Section 3 presents the reopening status of SMEs. Section 4 reports the major challenges. Section 5 estimates the SME bankruptcy rate between February and May. Section 6 concludes.

2. Survey Description

ESIEC is a field survey of Chinese private enterprises led by the Center for Enterprise Research of Peking University over three consecutive years (2017, 2018, and 2019). Over these three years, ESIEC successfully interviewed nearly 10,000 self-employed entrepreneurs running businesses and private enterprises, collecting information related to start-up history, performance, innovation activities, and overall business environment. The survey sample from 2017 includes only information collected from SMEs in Henan Province. The survey in 2018 was expanded to five more provinces—Guangdong, Zhejiang, Shanghai, Gansu, and Liaoning. We used a stratified sampling strategy in these six provinces. We first randomly sampled 16–25 counties in each province. In total, 117 counties were selected. In each county, we randomly selected private enterprises and self-owned businesses established in the period of 2010–2017 and listed in the China National Business Registration Database.¹ The sampling probability for the retail and wholesale sector was set to a quarter of actual probability, considering the high degree of homogeneity within the sector and the sheer size of the sector. In the same vein, we reduced the number of self-employed businesses in our sample by setting the sampling ratio of self-employed businesses to incorporated enterprises at one to four.

We found that in the 2018 survey, the response rate in a few big cities, such as Shanghai and Shenzhen, was low because enumerators were not allowed to get into some office buildings and high-end apartment complexes. In order to remedy the problem, in the

¹ The China National Business Registration Database is from the State Administration of Industry and Commerce (SAIC), and includes the registration information for all the firms and self-employed businesses, such as registration dates, locations, contact information, business operation scope, and type of industry.

summer of 2019 the ESIEC Project Alliance (formed by Peking University, Central University of Finance and Economics, Harbin Institute of Technology at Shenzhen, Guangdong University of Foreign Studies, and Shanghai University of International Business and Economics) followed up with the sample firms in Shanghai and Shenzhen that were not surveyed in 2018. In addition to the follow-up survey, we also conducted a specialized survey on high-tech firms in Shanghai, Shenzhen, and Beijing in 2019.²

Following the novel coronavirus outbreak, the ESIEC Project Alliance quickly recruited more than one hundred enumerators to conduct phone interviews on incorporated enterprises and self-employed businesses in our ESIEC sample, which were successfully interviewed between 2017 and 2019. All the enumerators had experience in participating in previous waves of the ESIEC field survey. Being at home due to college closures, they were eager to sign up for the survey work.

The first round of telephone interviews lasted from February 11 to 16, 2020. We purposely selected these interview dates because February 10 was the official date of reopening businesses in most provinces outside Hubei province, the epicenter of the COVID-19 outbreak, after a two-week national lockdown.³ Although the number of newly infected cases and daily deaths had begun to decline on February 10, as shown in Figure A.1 in the appendix, many lower-level local governments were still cautious about resuming production. They imposed various measures to control the spread of the virus within their jurisdictions, such as requiring a permit for a firm to reopen business, setting up road barriers to slow down cross-border traffic, and restricting labor flow across regions.⁴

A total of 2,513 valid survey samples were collected. Among those enterprises with valid contact information, 51.3 percent of them accepted our interviews. That response rate is quite high compared to the response rate of other telephone surveys.⁵ Among the 2,513 samples collected, 292 firms were closed before our survey concluded and 57 respondents provided us with information on their newly opened businesses instead. Thus, we gathered 2,278 complete questionnaires, which included 481 self-employed businesses and 1,797 private enterprises. The self-employed businesses were mainly concentrated in the residential service sector. Although our sample was meant to be representative only at the province level, it turns out to be largely representative at the first-digit industry level for China as a whole. Figure 1 plots the share of private firms at the first-digit industry level, drawing from our sample and the China Economic Census 2018. The distribution across industries in our sample largely reflects the universe of Chinese firms.

We further compared the firm size distribution measured in employment and revenues between our sample and the China Economic Census 2018. As shown in Figure 2, both

² Unlike the samples from the other six provinces, the Beijing sample is only representative among firms registered in the high-tech zones established between 2010 and 2017.

³ Twenty-two provinces set February 10 as the official date of resumption of commerce. See https://m.sohu.com/a/370889425_120059183/?pvid=000115_3w_a&scm=1002.580041.1040132.PC_ARTICLE_FOCUS&f=index_pagefocus_3&spm=smpc.content.fspic.1.1581033600023oXoZw5N for more details. Among the seven provinces in our analysis, six marked February 10 as the official date of resuming production except for Gansu province, which set the opening date one week earlier.

⁴ For example, in one region, if a firm wanted to restart its business, it had to complete 15 forms, two letters of commitment, a plan for the resumption of production, a plan for canteen health safety, and a plan for workers' dormitory safety. See http://www.xinhuanet.com/comments/2020-02/17/c_1125584149.htm for the news report.

⁵ The response rate of phone surveys in the U.S. in 2018 averaged only 6 percent (Kennedy and Hartig, 2019).

samples are dominated by small firms—more than 60 percent of enterprises in our sample had fewer than eight workers, while the share of similar small firms was about 70 percent for China as a whole. In both samples, around 60 percent of firms reported annual sales below one million Chinese yuan, while approximately 20 percent fell within the range of one million to five million Chinese yuan, as indicated in Figure 2B. Even though our ESIEC survey was not designed to be nationally representative, our sample ends up closely resembling the industrial distribution and firm size distribution at the national level.

The second-round survey took place from May 18 to 24. In total we successfully surveyed 2,508 SMEs. Among them, 1,408 enterprises accepted interviews in both waves, while 1,100 were only successfully interviewed in the May survey. Out of the 1,408 enterprises interviewed in both waves, 135 respondents reported that they had closed their businesses. Fifty entrepreneurs, who had started a new business, accepted interviews for the new business. In total, the valid sample size for May was 2,423. Detailed information about the two-wave survey is shown in Table A.1. Both the industry and firm size distributions are similar between the two waves.

3. Reopening Status and Prospects for the Remainder of 2020

Table 1 presents a few key variables, the status of reopening (including the expected date of reopening), the expected annual revenue changes, and the anxiety by province and for China as a whole, based on the February survey. As of February 10 (the official reopening date in most provinces and two weeks after the national lockdown), only 20.8 percent of businesses reopened in China.⁶ As of March 10, 30.8 percent of firms expected to resume production within one month. When summing the two columns, that equals 51.6 percent. Still, a large proportion of SMEs (38.0 percent) were not certain about their reopening date.

The survey also asked the respondents to predict their firms' total revenue change in 2020 relative to 2019. More than half of respondents expected a decline in annual revenue in 2020. Comparing 2020 to 2019, 43.1 percent of the enterprises foresaw a reduction in revenue by more than 10 percent. By comparison, the share of respondents expecting an increase in revenues over 10 percent was merely 6.0 percent. A back-of-envelope analysis indicates that the expected drop in revenues could translate into a contraction in China's GDP by 4.1–7.8 percent in 2020.⁷ Of course, this is a rough estimate. Nonetheless, it provides some clues to the magnitude of the impact on China's GDP.

⁶ Based on a large phone survey conducted in 726 villages around the same time, Wang et. al. (2020) reported that 74 percent of China's rural labor force stopped working due to workplace closures. Given that most workers employed by SMEs were from rural areas, the closure rate of SMEs (79.2 percent) matches quite well with the rural unemployment figure.

⁷ In order to impute impact on GDP, we need to make a few assumptions. For those reporting percentage changes of less than 10 percent, we set the value as 5 percent. For categories of more than 10 percent, the most conservative estimate is to assume the value as 10 percent. For the group expecting no changes, we assume the value of change as zero. Under these assumptions, the change in China's GDP in percentage equals $(0.430-0.060)*(-0.1)+(0.100-0.020)*(-0.05) = 4.1$ percent. If we assume the median true answer is 20 percent for those expecting a change of more than 10 percent, then the expected GDP contraction in 2020 would be 7.8 percent. As a comparison, according to the newly released statistics by the China National Bureau of Statistics, China's GDP in the first quarter of 2020 contracted by 6.8 percent. (<https://www.wsj.com/articles/china-set-to-report-plunge-in-first-quarter-gdp-11587086697>).

Given this dire outlook, it is no wonder that entrepreneurs reported high levels of anxiety, as revealed in the second to the last column of Table 1. The average score was 6.01 (with 10 standing for the highest level of anxiety and 0 as the lowest).

The table also exhibits some regional variations. For illustration purposes, Figure 3 plots the reopening rate by province. As of February 10, the reported reopening rate in Zhejiang was only 9.9 percent, and 37.7 percent more firms planned to resume operation within a month. This is likely due to the high infection rate of COVID-19 in some cities in Zhejiang, particularly Wenzhou. About 39.0 percent of enterprises estimated their annualized rate of revenue drop to exceed 10 percent. By comparison, less than 7 percent of SMEs would expect to see an increase in revenues by more than 10 percent. These numbers speak to the daunting challenges facing SMEs in Zhejiang Province.

Because Henan has a large number of returning migrants from Hubei Province,⁸ the local governments in Henan province imposed strict measures to control the spread of the novel coronavirus. As a result, only 11.8 percent of enterprises resumed production as of February 10, and 26.7 percent more expected to reopen within a month. This meant that as of March 10, 61.5 percent of businesses remained closed in Henan Province. More than half of survey respondents (55.5 percent) expected that their revenues in 2020 would drop, far exceeding the proportion holding optimistic outlooks (6.8 percent).

By comparison, Shanghai had a much higher reopening rate of 35.3 percent. If including those businesses expected to reopen within one month, the rate would be close to 70 percent. However, the earnings outlook was grim. About 60 percent of survey respondents expected negative revenue growth, compared to a mere 6.3 percent of SMEs with a positive view on earnings. The disconnect in expected reopening rates and earnings outlooks indicates that businesses would likely run at partial capacity this year, even after resuming production in Shanghai.

Table 2 repeats the summary statistics of Table 1, except that it replaces provinces with industries. Even at the one-digit SIC code level, there are 19 different industries listed in official records. To simplify presentation, we grouped them into five broad sectors, as shown in Table 2—agriculture, manufacturing, business service, residential service, and others. As shown in Table 2, as of 10 February 2020, the level of work resumption in the agricultural industry and in business services was higher than the level of work resumption in the manufacturing and residential service sectors. The rather high reopening rate of business services is likely due to two factors. First, many of this sector's operations can be conducted online. Second, some essential sectors, such as IT, logistics, and scientific research, remained open to provide key services for people's daily lives following the outbreak, as shown in Figure 3.

Only 12.0 percent of manufacturing firms had resumed production at the time of our survey, while 32.4 percent more expected to open their doors in a month. About half of them predicted that their revenues would decline in 2020, which was much higher than the proportion of firms with an optimistic outlook on earnings growth (6.9 percent). Entrepreneurs in this subsector reported an anxiety level of 6.20, higher than the average (6.0).

⁸ Henan province shares a border with Hubei province to the south. Based on the 2010 population census, Henan migrants accounted for 15.1 percent of total migrant workers in Hubei province in 2010. According to Baidu Qianxi Data (Fang et.al., 2020), Henan province received the largest exodus of migrants from Wuhan city right before the Chinese New Year and lockdown, equivalent to 6 percent of the total outflow of the province's population (Qianxi.baidu.com. 2020).

Scientific research services, business services, and information technology reported rather high reopening rates, at 36.5 percent, 23.3 percent, and 22.1 percent, respectively. In the following month, an additional 37.3 percent, 34.0 percent, and 40.9 percent of enterprises in the three industries planned to reopen. The percentage of entrepreneurs in these three industries expecting negative revenue growth was 45.7 percent, 55.7 percent, and 48.7 percent, respectively, overwhelming those optimistic about revenue growth (17.8 percent, 8.4 percent, and 13.6 percent). Despite the rather high actual and expected reopening rates, enterprises in the three industries revealed bleak prospects for earnings in 2020.

The reopening rate in the residential service sector was as low as 19.0 percent. A few subsectors (leisure and entertainment, hospitality, and residential service) in the residential service sector scored reopening rates in the lower teens: 17.1 percent, 8.0 percent, and 9.5 percent, respectively; while 22.3 percent, 22.9 percent, and 27.9 percent more expected to reopen within a month. Putting them together, the expected reopening rates by mid-March would have been 39.4 percent, 30.9 percent, and 37.4 percent. Not surprisingly, entrepreneurs in these subsectors were pessimistic about their earnings prospects in 2020. Specifically, 30.3 percent, 53.2 percent, and 44.3 percent of respondents in the three industries expected the annualized rate of decline in revenues to be more than 10 percent. The average anxiety level in the three sectors was as high as 5.8, 6.1, and 6.3, worse than that in most industries. As seen in Figure A.2, across industries the mean measurement of anxiety appears to be positively associated with the share of businesses that did not expect to reopen within a month or were not sure about their reopening time frame. The uncertainty about reopening correlates to anxiety.

By May, situations had greatly improved. Across provinces, most businesses had resumed production, as shown in Figure 3. Accordingly, entrepreneurs felt much less anxious, scared, and worried in May than they had in February (see Figure 4). They were significantly more optimistic in May.

4. Evolving Major Challenges

Having examined the reopening status of SMEs in the previous section, we will now discuss evolving major challenges facing SMEs across sectors and regions in February and May. We also pay particular attention in this section to export firms.

Major Challenges in February

An important reason that enterprises could not resume work in February is that employees were unable to return to work in a timely manner. As shown in Panel A of Figure 5, the percentage of employees unable to return to work in manufacturing firms was the highest, at about 47.6 percent, because manufacturing firms tend to be labor intensive. As indicated in the ESIEC baseline survey, manufacturing firms employed 46.1 percent of migrant workers from outside the province. Not surprisingly, manufacturing firms were more likely to report labor shortages as their most severe concern, more than other sectors. Although the residential services sector was directly hit by the novel coronavirus outbreak, only about 30 percent of entrepreneurs in this sector saw labor shortage as an issue, primarily because they were usually small or self-employed enterprises and more employees were local.

Logistics was another major problem that prevented firms from reopening. After the outbreak of the novel coronavirus, many areas in China were locked down to contain the spread of the disease. At the time of the survey in mid-February, as the pandemic passed from its peak, China began to lift some restrictions. However, there were still significant logistics problems. As shown in Panel A of Figure 5, agricultural and manufacturing

industries reported more problems with raw material shortages and with logistics disruptions than did the business and residential service sectors. Manufacturing production involves many intermediate goods. Any missing parts or raw materials would put a drag on the whole production process (Kremer, 1993).

While about 50 percent of the agricultural enterprises surveyed encountered raw material shortages, they were most severe in the livestock farming sector. The agricultural industry reported the highest percentage of logistics disruptions (35.3 percent), much higher than the manufacturing enterprises (25.7 percent) and the two service sectors (16.6 percent and 20.0 percent). Notably, 41.5 percent of livestock farms listed “logistics disruption” as a major challenge. This is likely due to the nature of livestock production. Animals need to eat every day, and production cycles are short—daily for dairy, six weeks for chickens, and three months for pigs. Feed shortages mean that animals and poultry may starve to death.

The pandemic depressed demand for most goods and services. Panel A of Figure 5 also lists the percentage of firms, by industry, that reported a shortage of market orders as a major challenge. As shown in Panel A, the residential service sector suffered the most in declining demand, with 56 percent of enterprises in that sector pointing to this problem. By comparison, among agricultural enterprises, less than 30 percent faced similar shortages. In summary, SMEs faced both supply and demand shocks in February.

Major Challenge in May: Lack of Demand

As shown in Figure 3, most businesses had reopened by May. On average, among those firms that had reopened, employment reached 86.4 percent of the pre-shock level. However, production capacity ran at only 62.9 percent of the prior year’s level. The low utilization of production capacity was largely due to lack of demand, rather than to supply-side factors. As shown in Panel B of Figure 6, lack of demand was listed as the top challenge, while other supply-side challenges, such as raw material shortages and labor shortages, had faded away. Manufacturing, business service, and residential service sectors encountered more serious demand problems than agricultural enterprises.

Challenges Facing Export Firms

Export has been a key engine of economic growth in China, accounting for 18 percent of China’s GDP in 2019. The questionnaire in February and May included a question on export status prior to the pandemic. Among our sample, 19.0 percent of Chinese businesses were engaged in export activities in 2019.

In February, export firms suffered more than non-export firms because they tended to employ more migrant workers and their suppliers were highly concentrated. By linking the follow-up phone survey with the ESIEC baseline survey, we grasped information about employment and share of workers from outside the province. Our survey found that export firms were generally larger than non-export firms. On average, an export firm employed 22.4 workers, while non-export firms averaged 17.4 workers. Moreover, export firms relied more heavily on migrant workers from outside the home province than did non-export firms. Migrant workers accounted for 53.7 percent of total employees in export firms, compared to 34.8 percent of employees in non-export firms. Thus, the restrictions on labor mobility imposed by local governments after the outbreak of COVID-19 hit export firms much harder than non-export firms in February. According to our February survey, 58.7 percent of export firms faced labor shortages, 25.5 percentage points higher than non-export firms.

Beside labor shortages, export firms also encountered other challenges. Panel A of Figure 6 compares the five major types of challenges facing export and non-export firms in February 2020—contract breach risk, decline in external demand, raw material shortages, supply chain disruptions, and logistics disruptions. Several findings are apparent from Panel A. First, export firms were more likely to report problems associated with raw material shortages, supply chain disruptions, and logistics blocks. More than 60 percent of export firms suffered shortages in raw materials, while only 35.7 percent of non-export firms experienced such a problem. According to our ESEIC 2018 baseline, export firms tended to rely only on a few stable suppliers. In normal times, export firms may enjoy a cost advantage in doing so. However, in the event of a large shock like COVID-19, export firms struggled with finding alternative suppliers when previous key suppliers failed to deliver the necessary parts or raw materials on time.

Second, export firms faced greater contract breach risk. According to the data from ESIEC 2018, the majority of export firms (71 percent) signed formal contracts with the largest buyer, compared with 55 percent for non-export firms. Due to the emerging problems of labor shortages and supply chain disruptions, export firms ran into greater difficulty in fully resuming production and fulfilling orders than did non-export firms. As a result, they were subject to a higher risk of breaking contracts.

Third, export firms and non-export firms faced similar challenges in declining market demands. At the time of the first-round survey in February, when businesses in many countries were still operating as usual, the backlog of demand from overseas buyers was still on the table.

However, since March the pandemic has spread all over the world. Many countries have imposed lockdown policies. Both consumer demand and production in these countries have stalled, canceling many international orders, including a significant number from China. With the recent collapse of international orders, lack of external demand has become the gravest challenge for export firms, as shown in Panel B of Figure 6. More than 80 percent of export firms reported lack of demand as the leading challenge, in comparison with about 70 percent among non-export firms.

5. Financial Challenges and Bankruptcy

The COVID-19 restrictions put a strain on the financial situations of SMEs. Table 3 lists the major financial challenges facing SMEs, by province, in February. Rent was a major expense for 62.3 percent of firms, while wages were listed as a major expense among 42.5 percent of the respondents. Survey responses also revealed that 14.6 percent of firms could not survive beyond one month, given their current cash flow. Additionally, 35.5 percent of firms reported that their cash flow could only last between one and three months. Putting this together, if lockdown measures closed businesses for three months, during which they had no cash flow, only half of those businesses could survive.

The average numbers mask vast regional differences. As shown in Table 3, in the four richer provinces—Beijing, Shanghai, Guangdong, and Zhejiang—the two cost items of rent and wages were particularly critical for entrepreneurs, because of higher wages and land values. By comparison, in Gansu, one of the poorest provinces in China, only 27.0 percent of respondents regarded wages as the major cost item for their businesses. Yet, debt was a more burning problem for SMEs in Gansu, where 35.1 percent of them listed debt repayment as their main cost pressure—far higher than in other provinces. Among the entrepreneurs interviewed in Gansu province, 56.4 percent revealed that their cash flow could not sustain their business for more than three months. More than a quarter

(27.7 percent) of SMEs would likely run out of cash before reopening. Henan province was also subject to a similar high risk of SME bankruptcies (23.2 percent).

Table 4 (below) reports financial challenges by industry. Wage expenses imposed a greater cost challenge on the business service sector than on the other three sectors. For the residential service sector, rent expenses were the biggest burden. Some of the subsectors in the residential service industries, such as hospitality and residential service, suffered serious cash flow problems, with 31.5 percent and 33.3 percent of them unlikely to survive to the date of reopening.

Using the reported reopening status in Table 1 and cash flow information in Table 3, we could compute the percentage of enterprises that would run out of money before their expected date of reopening. The percentage can be regarded as an expected SME bankruptcy rate due to liquidity problems induced by COVID-19. For China as a whole, the rate was 16.4 percent. Given that SMEs generate 80 percent of employment in China, a 16.4 percent failure rate of SMEs would send a shockwave through the labor market, chopping the national employment rate by about 13 percent.

Based on businesses' operational status observed in the second wave of interviews and on information from other sources, we could infer the actual bankruptcy rate of surviving firms in February at the time of the second-wave survey in May. As the first step to doing so, we needed to comprehend the number of surviving firms as of February 10. For those firms successfully interviewed, we could easily label their operational status. A big challenge was to figure out the operational status of those unsuccessfully interviewed in February. We used the following procedures to identify firm status. First, if a firm that failed to be interviewed in February was later successfully interviewed in May and still alive, then the firm presumably was in business in February. Second, those enterprises that could not be reached for interviews in both waves were assumed to be out of business as of February. Third, firms that did not file 2019 annual inspection reports with the State Administration of Industry and Commerce were defined as exit firms.

Having figured out the number of surviving firms in February, we next counted the number of newly closed firms since February. The May survey included valuable information about firms' operational status. From those firms successfully interviewed in May, we could clearly identify the firms that had exited between February and May. Firms that we successfully interviewed in February but omitted from our second-round interview in May got treated as surviving firms. This likely underestimates the death rate of firms, as some entrepreneurs might have been reluctant to participate in the second interview because their business just failed. Some respondents interviewed in February could not be reached anymore, due to invalid contact information. They are classified in our survey as new exit firms. Based on the imputed number of surviving firms and exit firms, we estimated the bankruptcy rate as a result of COVID-19 from February to May as 17.9 percent. It is close to the expected death rate of 16.4 percent inferred from the February survey.

Figure 7 compares, by sector, the estimated death rate drawn from the February survey with the estimated death rate drawn from updated information from the May survey. The two rates match closely, with a correlation coefficient as high as 0.448.

Notably, the estimated death rate for self-employed businesses is 20.6 percent, more than three percentage points higher than that for privately incorporated enterprises. Based on the newly estimated death rate by sector and employment in each sector drawn from the China Economic Census 2018, we estimated that job loss as a result of bankruptcy of SMEs between February and May is equal to 13.6 percent of China's total employment. Our estimate is broadly consistent with the *ex-ante* and *ex-post* evaluations

on the impact of COVID-19 on rural employment by Zhang et al. (2020) and Wang et al. (2020).

6. Conclusions

Based on the recent two waves of phone interviews with entrepreneurs from previously surveyed SMEs that reflect China's general employment framework, the paper provides first-hand information about the impact of COVID-19 on SMEs and their related challenges of reopening. We found that COVID-19 has landed a heavy blow on Chinese SMEs, with huge differential effects across sectors and regions.

As COVID-19 is largely under control in China, resuming production has become high on the country's policy agenda. Understanding the challenges of reopening is essential for designing appropriate policies to help SMEs find solutions to the issues that hamper them and navigate this tough time. From February to May, major challenges facing firms had shifted from the supply side to the demand side. Lack of demand has become the most critical challenge, in particular for export firms. Thus, supporting policies that target consumers, particularly low-income and vulnerable consumers, would indirectly benefit SMEs through the channel of rising domestic demand.

In response to the spread of COVID-19, many countries have adopted lockdown policies, thereby halting production activities. China is facing a decline in external demand. Although COVID-19 is temporally under control in China, export SMEs still face headwinds.

China now accounts for 17 percent of the world's economy, compared with 4.3 percent in 2003, when the SARS epidemic was unfolding. China drives 30 percent of the world's GDP growth and is a trade partner to more than 100 countries. The negative effect of COVID-19 on Chinese SMEs may spill over to other countries, given the fact that the world has become much more interconnected than it was at the time of the SARS epidemic in 2003.

Because COVID-19 struck China earlier than other countries, the findings on its impact on SMEs in China may also provide clues to what would happen in other countries after lockdowns. SMEs underpin massive employment in every country, and in particular in developing countries. Therefore, finding solutions to the issues facing SMEs in developing countries amid COVID-19 is imperative. Based on the experiences seen in China, the negative impact of lockdowns on SMEs in developing countries is likely to be pronounced. In developing countries, disruptions in logistics associated with lockdowns may hit agricultural enterprises, such as livestock farms, particularly hard, as observed in China. Of course, these conjectures are speculative and subject to more rigorous examinations based on data from more countries.

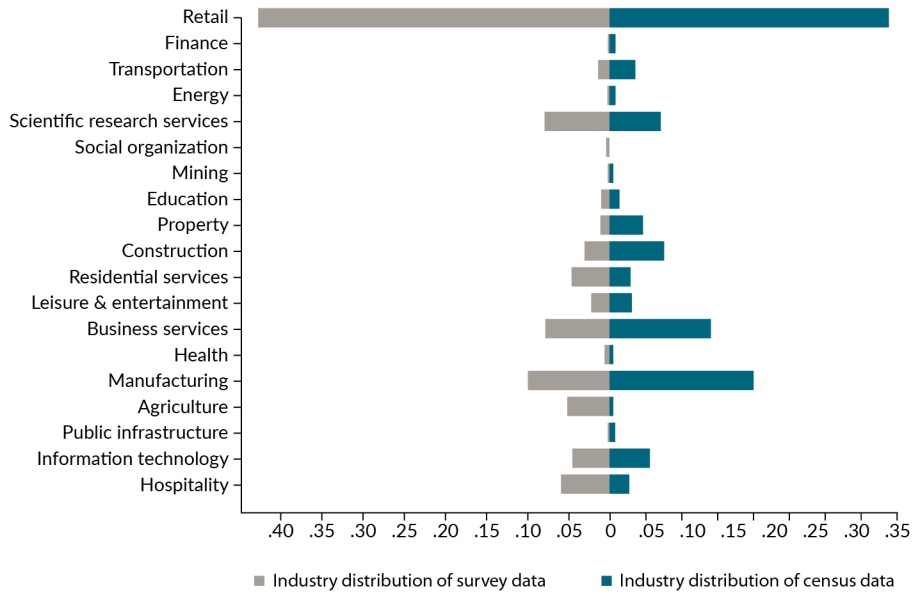
After we posted our survey instrument online in March, more than 20 countries have adopted our questionnaire for conducting similar SME surveys.⁹ It would be an interesting research project to do an international comparison on the impact of COVID-19 on SMEs when the datasets from different countries become available in the future. Our work serves as a steppingstone by providing descriptive survey evidence from China.

⁹ The survey instrument in Chinese, English, and Spanish can be found by going to <https://www.cgdev.org/blog/measuring-impact-coronavirus-global-smes-survey-instrument-chinese-english-and-spanish>.

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Figure 1. Industry Distribution of the ESIEC Sample and the China Economic Census in 2018



Note: This figure plots the distribution of our survey respondents by industry, in comparison with population data. On the vertical axis we list the 19 one-digit industries. The horizontal axis shows the fraction of firms from these industries in our survey dataset and in the whole economy. The survey dataset comes from our COVID-19 survey in February, excluding those responses without industrial information. The firm population data comes from the China Economic Census 2018. The probability of the retail industry was designed to be a quarter of the real fraction of the sample, since firms are more homogenous in the retail industry. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this figure.

Figure 2. Size Distribution between the ESIEC Sample and the China Economic Census in 2018

Figure 2A. Employment

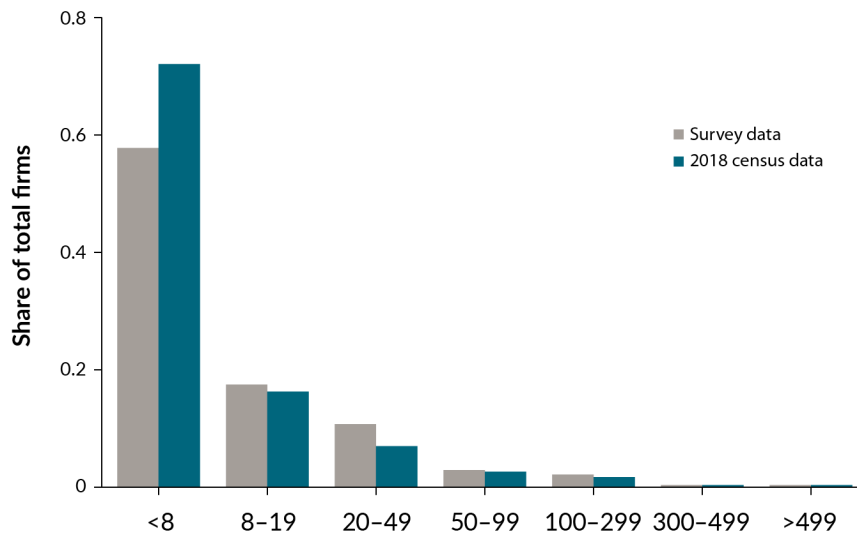
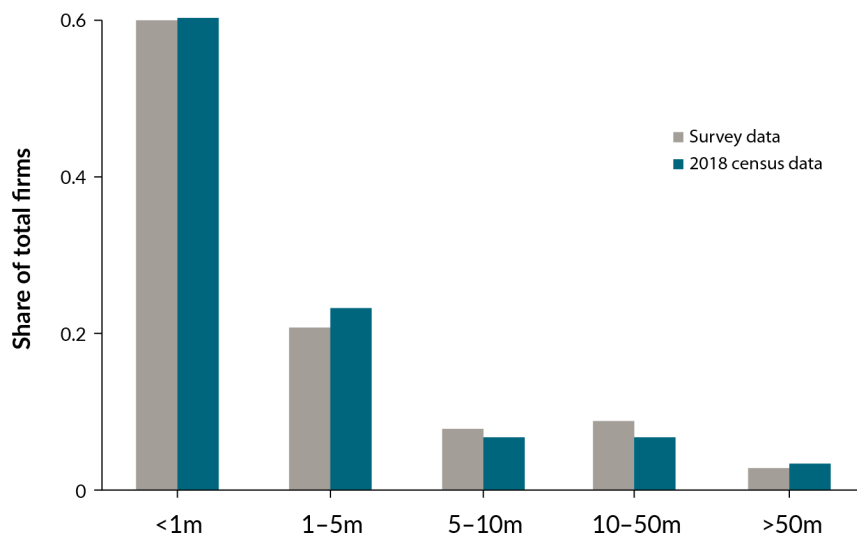
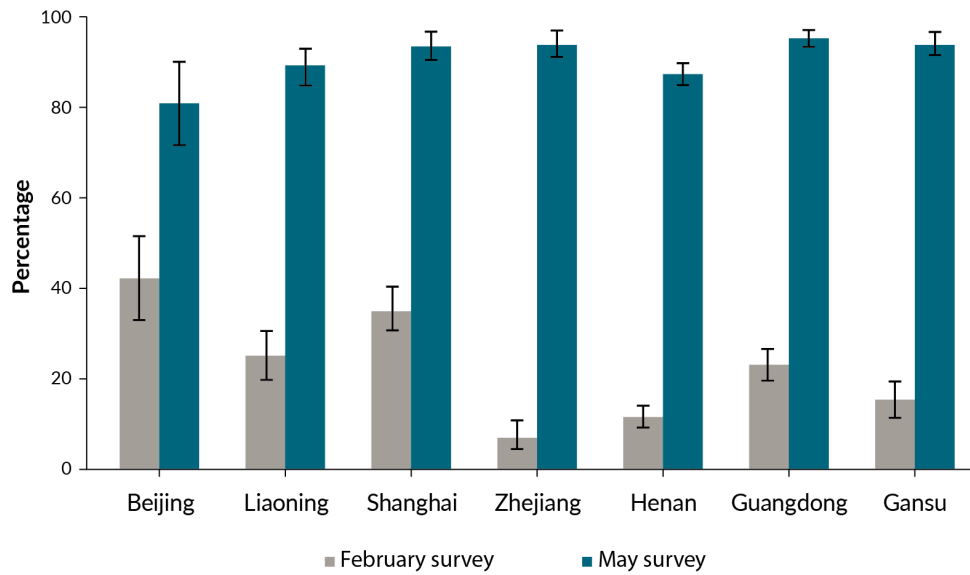


Figure 2B. Revenue



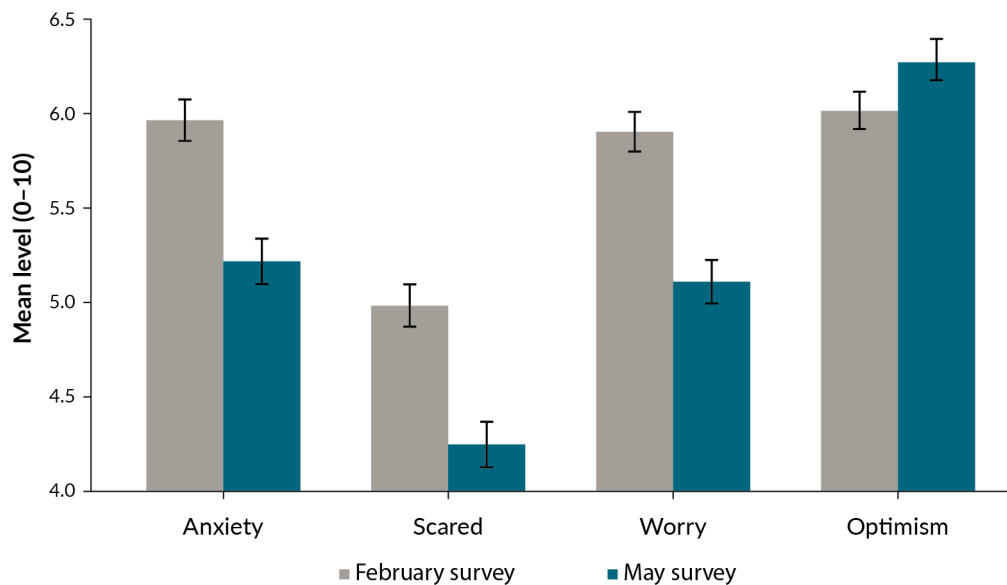
Note: This figure compares firm size distribution in employment and revenue between our survey sample in February and the China Economic Census 2018. The employment (annual sales) information of the survey data is for 2018, 2017, or 2016, drawing from ESIEC baseline surveys in 2019, 2018, and 2017, respectively. The census data reports the employment (annual sales) in 2018. Firms in survey data with missing information on employment (annual sales) are excluded. The probability of the retail industry was designed to be a quarter of the real fraction of the sample, since firms are more homogenous in the retail industry. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this figure.

Figure 3. Reopening Rate in February and May 2020, by Province



Note: Authors' calculations based on ESIEC survey data at both February and May. Vertical lines in the bar chart represent 95 percent confidence intervals. The horizontal axis reports the fraction of interviewed firms that claimed to have been back to work at the time of survey. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this figure.

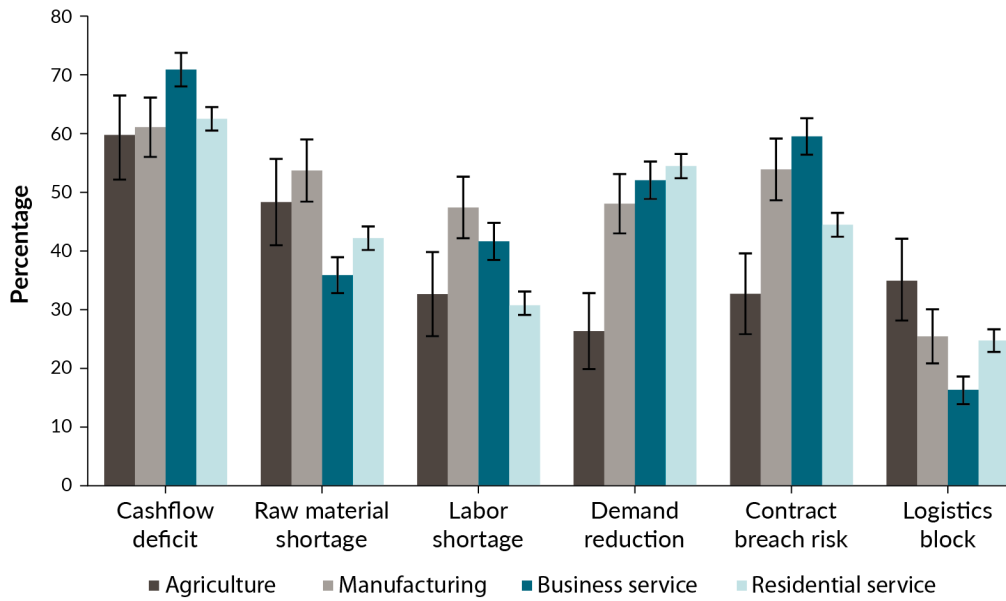
Figure 4. Feelings about COVID-19



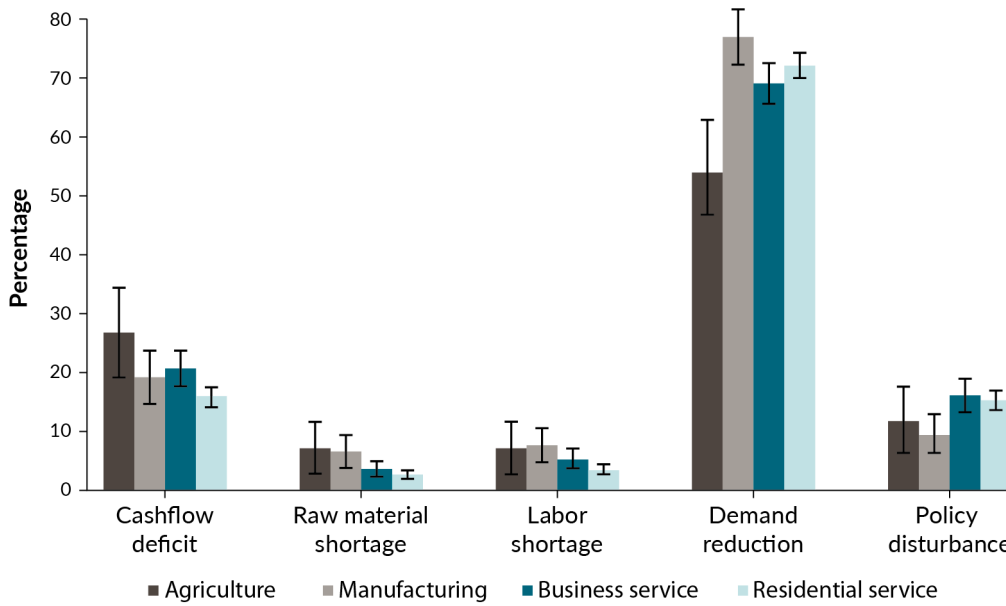
Note: Authors' calculations based on ESIEC survey data at both February and May. Vertical lines in the bar chart represent 95 percent confidence intervals. The horizontal axis reports the average scores of each feeling type, which ranges from 0 to 10. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this figure.

Figure 5. Major Challenges of Reopening by Industry

Panel A. February 2020



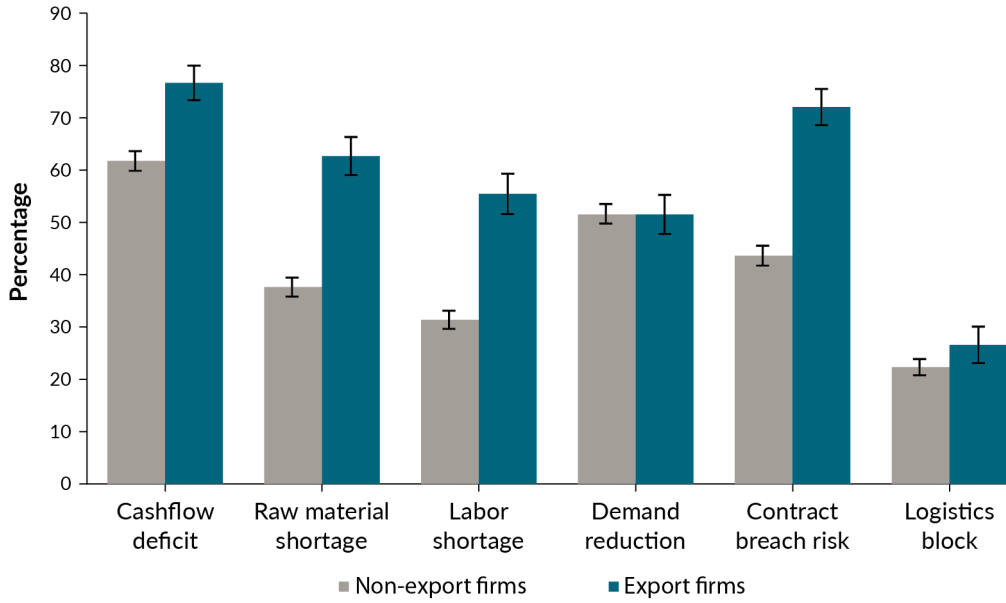
Panel B. May 2020



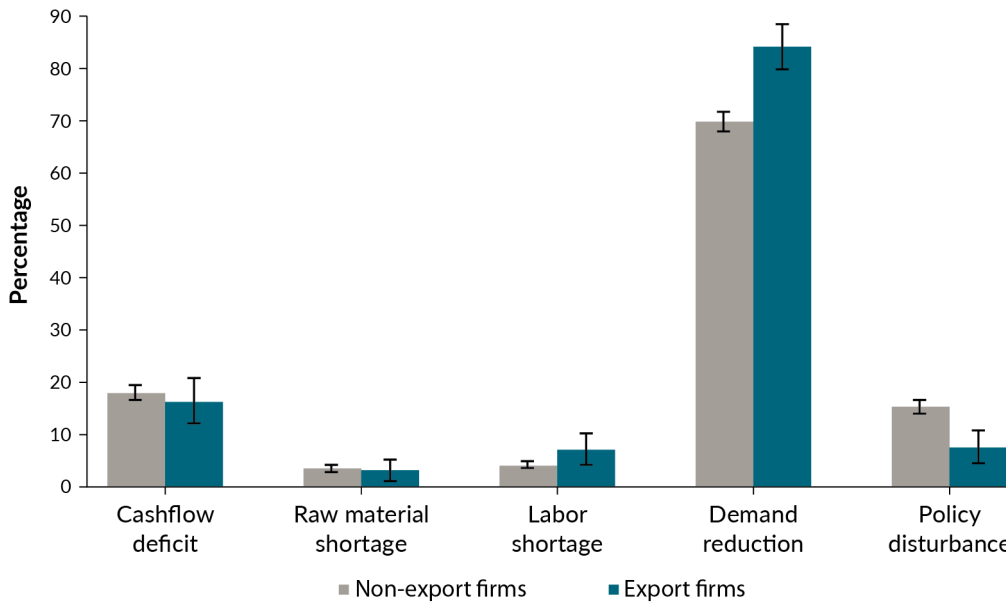
Note: Authors' calculations based on ESIEC survey data at both February and May. Vertical lines in the bar chart represent 95 percent confidence intervals. If vertical lines in a bar chart do not overlap each other, this means that the average values of the two groups differ at the 95 percent significance level. The vertical axis is the percentage of firms indicating they face the corresponding problems listed in the x-axis. Please refer to Table 2 for the definition of the four sectors. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this figure.

Figure 6. Challenges Facing Export and Non-export Firms

Panel A. February 2020

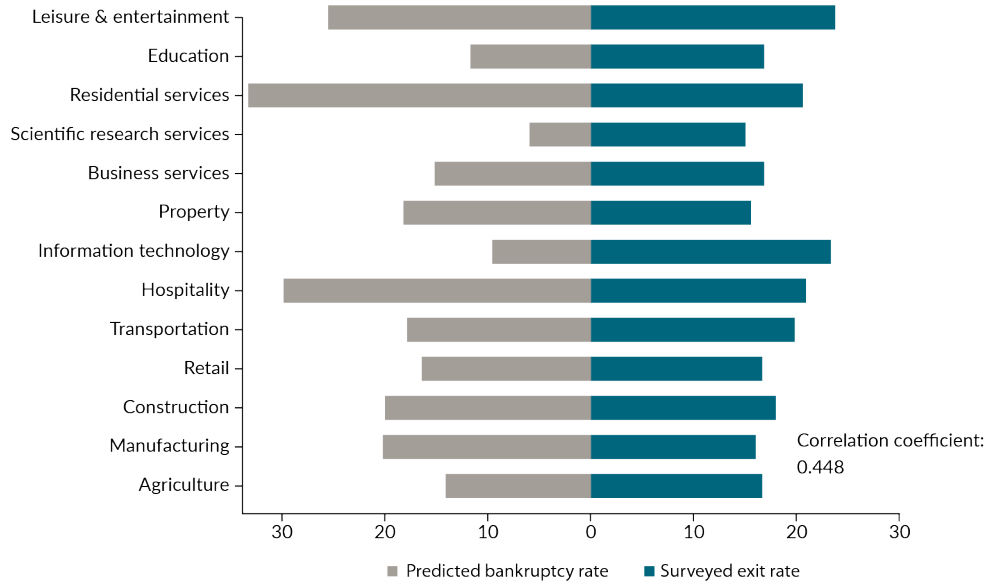


Panel B. May 2020



Note: Authors' calculations based on ESIEC survey data at both February and May. Vertical lines in the bar chart represent 95 percent confidence intervals. If vertical lines in a bar chart do not match one another, this means that the average values of the two groups differ at the 95 percent significance level. The term "export firms" refers to firms that had an exporting business before COVID-19.

Figure 7. Comparison between Predicted Bankruptcy Rate in February and Actual Exit Rate in May, by Industry



Note. Authors' calculations based on ESIEC phone survey data in February and May 2020. Predicted bankruptcy rate is the fraction of firms that would run out of cash before their expected reopening time, based on the survey in February. Surveyed firm exit rate is the fraction of newly closed firms between February and May in total surviving firms in February.

Table 1. Status of Reopening, Prospect for Earnings, and Anxiety in February 2020, by Province

Province	Reopening Rate	Expect to reopen within					Expected annual revenue change						Anxiety	Observations
		2 weeks	1 month	1–3 months	Over 3 months	Cannot expect	Increase over 10%	Increase less than 10%	No change	Decrease less than 10%	Decrease over 10%	Cannot tell		
Liaoning	27.8	12.9	11.0	6.3	1.4	40.5	4.4	2.8	15.4	7.2	39.7	30.6	5.2	225
Shanghai	35.3	17.5	16.9	9.4	1.2	19.8	6.1	0.2	3.9	8.4	52.7	28.6	6.1	345
Zhejiang	9.9	14.7	23.0	3.5	1.6	47.3	6.1	0.6	13.1	16.0	39.0	25.2	6.1	229
Henan	11.8	11.6	15.1	9.1	2.5	49.9	4.5	2.3	10.2	14.0	41.5	27.5	5.4	568
Guangdong	22.0	19.6	16.2	7.9	1.6	32.8	8.2	3.1	9.5	10.5	41.6	27.1	6.8	492
Gansu	17.3	11.0	16.6	11.4	3.7	39.9	4.2	1.0	11.0	7.7	46.2	29.9	6.4	310
Beijing	42.2	17.4	13.8	5.5	3.7	17.4	16.5	7.3	8.3	10.1	29.4	28.4	5.9	109
Unknown	25.0	25.0	16.7	8.3	8.3	16.7	25.0	0.0	8.3	25.0	25.0	16.7	5.8	12
Total	20.8	14.7	16.1	8.3	2.1	38.0	6.0	2.0	10.0	10.8	43.1	28.1	6.0	2,278

Note: The “reopening rate” measures the percentage of firms that resumed production as of February 10. For those SMEs not opening yet by then, the survey asked the respondents to estimate the time of reopening. Each cell represents the percentage of firms of above reopening status in total. The anxiety column measures the anxiety level of respondents with a score ranging from zero (no anxiety at all) to 10 (the highest level of anxiety). All the numbers in the table except for anxiety and observations are in percentages. When making the telephone interviews, if respondents were busy, we gave them an option to fill in the online questionnaire later on. Some of them did not fill in firm names. As a result, they could not be linked to the original ESIEC data that included regional and industry information. They are marked as “unknown” in the table. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this table.

Table 2. Status of Reopening, Prospect for Earnings, and Anxiety in February 2020, by Industry

Category	Industry	Expect to reopen within					Expected revenue change							Anxiety	Observations
		Reopening rate	2 weeks	1 month	1–3 months	Over 3 months	Cannot expect	Increase over 10%	Increase less than 10%	No change	Decrease less than 10%	Decrease over 10%	Can't tell		
Agriculture	Agriculture	27.7	12.7	12.1	8.7	2.3	36.4	6.4	5.8	11.6	7.5	27.2	41.6	5.4	173
Manufacturin	Manufacturing	12.0	19.2	13.2	8.7	2.4	44.6	5.1	1.8	11.4	9.0	41.6	31.1	6.2	334
Business Service	Scientific research	36.5	21.8	15.5	5.5	1.5	19.2	14.8	3.0	8.5	9.6	35.8	28.4	6.1	271
	Property	28.9	10.5	18.4	5.3	2.6	34.2	0.0	0.0	15.8	13.2	42.1	28.9	6.1	38
	Business services	23.3	19.5	14.5	8.4	2.3	32.1	6.5	1.9	6.9	8.8	46.9	29.0	6.1	262
	Information technology	22.1	19.5	21.4	8.4	1.3	27.3	11.7	1.9	9.7	9.7	39.0	27.9	5.9	154
	Construction	11.7	15.5	20.4	10.7	1.9	39.8	7.8	1.9	9.7	10.7	34.0	35.9	6.0	103
	Transportation	26.0	24.0	16.0	6.0	0.0	28.0	8.0	2.0	8.0	14.0	38.0	30.0	6.0	50
	Finance	0.0	80.0	0.0	0.0	0.0	20.0	20.0	0.0	0.0	0.0	20.0	60.0	7.6	5
	Total	26.0	19.9	16.9	7.5	1.7	28.0	10.0	2.2	8.6	9.9	39.8	29.7	6.0	883
Residential Service	Leisure & entertainment	17.1	10.5	11.8	15.8	5.3	39.5	9.2	1.3	5.3	13.2	30.3	40.8	5.8	76
	Residential service	9.5	10.8	17.1	9.5	0.6	52.5	3.8	1.3	10.1	10.8	44.3	29.7	6.1	158
	Health	15.0	5.0	15.0	10.0	5.0	50.0	5.0	0.0	25.0	15.0	20.0	35.0	4.8	20
	Retail	21.9	11.9	17.5	7.8	2.2	38.8	4.2	1.9	11.1	11.6	47.4	23.8	6.0	361
	Hospitality	8.0	12.9	10.0	11.4	2.0	55.7	3.5	1.0	3.5	10.9	53.2	27.9	6.3	201
	Education	18.2	15.2	21.2	6.1	3.0	36.4	0.0	0.0	18.2	12.1	36.4	33.3	5.9	33
	Total	19.0	11.8	16.6	8.5	2.2	41.8	4.2	1.7	10.2	11.8	46.6	25.5	6.0	861
Others	Resource	57.1	0.0	0.0	28.6	0.0	14.3	14.3	0.0	14.3	14.3	0.0	57.1	5.7	7
	Mining	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	50.0	0.0	50.0	0.0	4.0	2
	Public infrastructure	50.0	0.0	16.7	0.0	0.0	33.3	0.0	0.0	16.7	0.0	16.7	66.7	7.3	6
	Public organization	8.3	0.0	41.7	0.0	0.0	50.0	8.3	0.0	0.0	50.0	41.7	0.0	6.6	12
Export firms		20.6	16.2	22.2	8.4	2.9	29.5	10.6	1.6	8.4	11.2	41.4	26.8	6.6	424
Non-export firms		20.9	14.4	14.7	8.3	1.9	39.9	5.0	2.1	10.3	10.7	43.4	28.4	5.9	1,854

Note: The “reopening rate” measures the percentage of firms that resumed production as of February 10. For those SMEs not opening yet by then, the survey asked the respondents to estimate the time of reopening. The anxiety column measures the anxiety level of respondents with a score ranging from zero (no anxiety at all) to 10 (the highest level of anxiety). All the numbers in the table except for anxiety and observations are in percentages.

Table 3. Financial Challenges Facing SMEs in Relation to Reopening in February 2020, by Province

Province	Major cost items			How long can cash flow sustain your business?					Running out of cash before reopening	Observations
	Wage	Rent	Debt	Within a month	1–3 months	4–5 months	Over 6 months	Can't tell		
Liaoning	36.6	55.6	21.2	11.8	36.4	6.1	20.7	25.1	8.0	225
Shanghai	57.6	74.7	13.7	11.8	46.1	9.0	21.2	12.0	11.1	345
Zhejiang	44.4	65.8	11.2	14.4	31.6	5.8	29.4	18.8	12.5	229
Henan	32.5	48.1	26.8	13.2	25.1	7.6	22.2	31.9	23.2	568
Guangdong	52.9	77.7	12.3	15.6	42.7	9.4	15.7	16.6	15.1	492
Gansu	27.0	56.1	35.1	23.1	33.3	5.0	13.3	25.4	27.7	310
Beijing	67.9	57.8	13.8	4.6	42.2	17.4	25.7	10.1	7.4	109
Total	42.5	62.3	20.5	14.6	35.5	7.8	20.0	22.1	16.4	2,278

Note: The first three columns show the share of enterprises listing wages, rent, or debt as major costs amid the COVID-19 pandemic.

All the figures except for observations are in percentages. We adjusted the fraction of the retail industry in the survey data by multiplying a factor of four in this table.

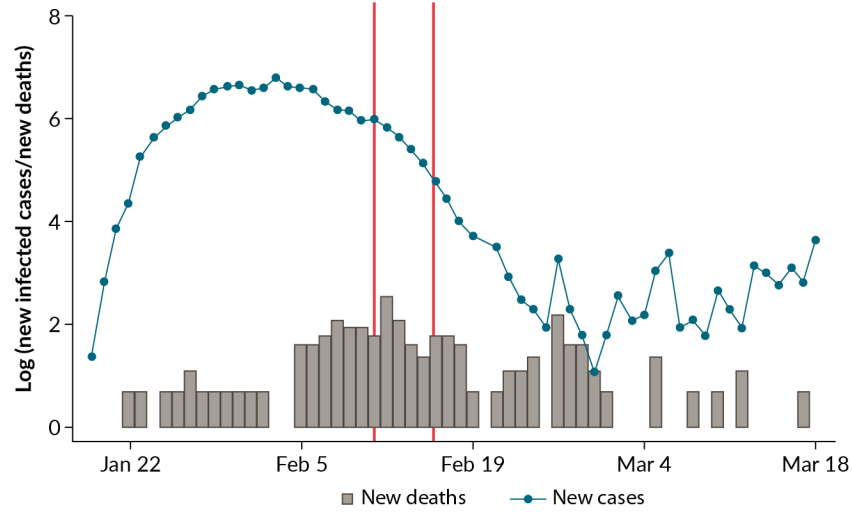
Table 4. Financial Challenges Facing SMEs in Relation to Reopening in February 2020, by Industry

Category	Industry	Major cost items			How long can cash flow sustain your business?					Running out of cash before reopening	Observations
		Wage	Rent	Debt	< a month mmomonth	1–3 months	4–5 months	Over 6 months	Cannot tell		
Agriculture	Agriculture	16.8	20.8	26.6	16.8	22.0	6.9	24.9	29.5	13.2	173
Manufacturing	Manufacturing	37.4	50.6	24.6	17.4	28.1	8.4	22.5	23.7	20.4	334
Business Service	Scientific research	69.4	61.3	12.5	5.5	46.9	15.5	22.1	10.0	6.0	271
	Property	55.3	50.0	26.3	15.8	42.1	13.2	10.5	18.4	18.2	38
	Business services	68.3	67.2	13.7	12.6	38.9	10.7	21.0	16.8	15.1	262
	Information technology	66.2	63.6	9.1	6.5	46.1	10.4	22.7	14.3	9.6	154
	Construction	46.6	63.1	23.3	11.7	38.8	7.8	15.5	26.2	19.6	103
	Transportation	50.0	50.0	16.0	14.0	42.0	6.0	16.0	22.0	17.9	50
	Finance	20.0	60.0	20.0	0.0	60.0	0.0	40.0	0.0	0.0	5
	Total	63.9	62.5	14.4	9.4	43.0	11.6	20.4	15.6	11.4	883
Residential Service	Leisure & entertainment	44.7	65.8	17.1	22.4	32.9	11.8	17.1	15.8	25.6	76
	Residential service	29.7	67.1	17.1	17.1	37.3	5.7	19.0	20.9	33.3	158
	Health	45.0	55.0	15.0	10.0	40.0	0.0	15.0	35.0	28.6	20
	Retail	36.3	68.4	23.3	15.8	34.3	6.1	19.4	24.4	16.3	361
	Hospitality	28.4	72.6	21.9	18.9	36.3	4.0	15.9	24.9	31.5	201
	Education	57.6	57.6	12.1	9.1	27.3	9.1	24.2	30.3	11.8	33
	Total	36.0	68.4	22.0	16.4	34.7	6.0	18.9	24.0	19.2	861
Others	Resource	28.6	0.0	14.3	0.0	14.3	0.0	71.4	14.3	20.0	7
	Mining	0.0	50.0	0.0	0.0	50.0	0.0	0.0	50.0	0.0	2
	Public infrastructure	83.3	50.0	0.0	16.7	16.7	16.7	16.7	33.3	0.0	6
	Public Organization	83.3	75.0	8.3	25.0	41.7	0.0	8.3	25.0	20.0	12
Unknown		33.3	25.0	41.7	8.3	33.3	16.7	16.7	25.0	12.5	12
Export firms		50.6	63.3	21.9	17.0	40.4	8.0	19.0	15.6	14.5	424
Non-export firms		40.7	62.0	20.2	14.0	34.4	7.8	20.3	23.5	17.0	1854

Note: The first three columns show the share of enterprises listing wages, rent, or debt as a major cost amid the COVID-19 pandemic. All the variables except for observations are in percentages.

Appendix A

Figure A.1. COVID-19 Spread Pattern and Survey Conducting Period



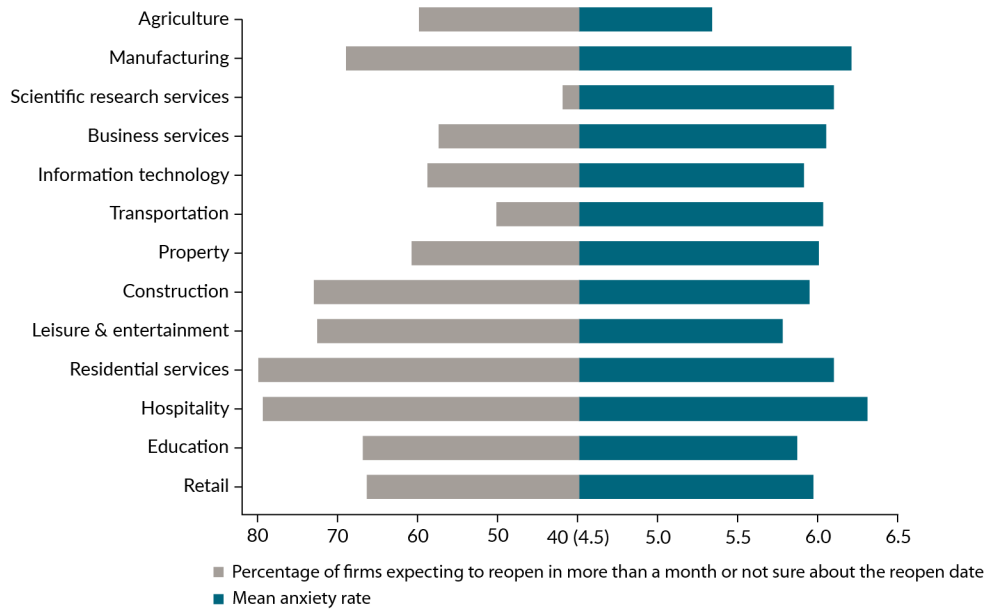
Note: COVID-19 data was calculated by authors and collected from the National Health Commission (NHC). The follow-up survey was conducted between February 11 and February 16. Logarithms of the number of daily new cases and new deaths outside Hubei province is plotted at the vertical axis. Data in February 20 is dropped because the NHC changed the definition of new cases, leading to a jump of the number of new cases switching from clinical suspected cases to new confirmed cases. Details can be found at <http://www.nhc.gov.cn/yzygj/s7652m/202002/54e1ad5c2aac45c19eb541799bf637e9.shtm>.

Table A.1. Contact Status of Two Waves

		May Survey				Total
		Completed	Refused	Failed to contact	Not contacted	
February Survey	Completed	1,408	658	409	38	2,513
	Refused	434	1323	541	84	2,382
	Failed to contact	394	818	1,535	48	2,795
	Not contacted	272	327	385	76	1,060
	Total	2,508	3,126	2,870	246	8,750

Note: Each row reports the number of firms corresponding to each contact status in the February survey, while columns refer to the number of firms by contact type in the May survey. “Completed” means the number of successfully interviewed firms. “Refused” indicates the number of firms that were contacted but refused to participate in our survey. “Failed to contact” refers to the number of firms that could not be reached by all the available contact information. Some enumerators did not fill in the information about the contact status of assigned samples. We labeled them as “Not contacted.”

Figure A.2. The Uncertainty of Reopening and Anxiety in February 2020



Note: This figure plots the reopening expectation and anxiety rate of entrepreneurs from different industries. On the vertical axis we list the one-digit industries from the Chinese category GB/T 4754—2017, excluding Resource, Finance, Mining, and Public infrastructure, all of which we have less than 20 samples each. The left panel represents the percentage of firms that would not expect to reopen in a month or couldn’t tell the time of reopening, while the right panel stands for the mean anxiety rate of entrepreneurs at the industry level. Anxiety rate is a self-reported index ranging from 0–10, with a larger number indicating a high degree of anxiety.