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The impact of COVID-19 on small and medium-sized enterprises (SMEs): Evidence from two-wave phone surveys in China[☆]

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ABSTRACT

This paper examines the short-term and mid-term impact of COVID-19 restrictions on SMEs, based on two waves of phone interviews with a previously surveyed large SME sample in China. The outbreak of COVID-19 and the resultant lockdowns took a heavy toll on SMEs. Afflicted by problems of logistics blocks, labor shortages, and drops in demand, 80% of SMEs were 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, were running at partial capacity, primarily due to inadequate demand. Moreover, around 19% of incorporated enterprises and 25% of self-employed businesses had permanently closed between the two waves of surveys.

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 January 2020. Tens of millions of small and medium-sized enterprises (SMEs) were shut down. Given that SMEs generate 80% of employment and that more waves of COVID-19 loom large, it is important to understand the toll that 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 both plentiful in number and small in size.

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 were conducted (Zhu, Liu, & Wei, 2020) to measure the impact of the novel coronavirus on Chinese firms. Online surveys have the advantage of gathering data quickly. However, they are subject to two selection problems (Wang, Cheng, Quan, & Zhang, 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 would naturally be more educated than the typical SME owner. The second selection problem with online surveys is that they tend to appeal to certain groups. For instance, entrepreneurs who seriously suffered from the negative shock of COVID-19 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, we conducted two rounds of follow-up phone interviews in February and May 2020 with previously sampled SMEs in seven provinces.[1] These firms are largely representative at the provincial level and the major industrial level of China as a whole. The phone interviews asked entrepreneurs about the operational status, their major challenges, and their business outlook, as well as their feelings about COVID-19. These rapid telephone interviews, in combination with the baseline survey, provide rich and timely information for studying the impact of COVID-19 on SMEs.

Our phone survey shows that COVID-19 took a heavy toll on SMEs. At the time of the first round of phone interviews in February 2020, although most provincial governments had allowed businesses to reopen (often with stringent conditions), only about 20% of SMEs had resumed production. Fourteen percent of the surveyed firms would have been unable to last beyond a month with their cash flow level at the time, and 50% would not have survived beyond three months. Nearly half of the SMEs did not expect their businesses to reopen within a month or were uncertain about the time of reopening. The findings of our survey suggested that 16% 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 depended on the industry. For example, export firms suffered more than others, due to a decline in external demand and a lack of key parts that had 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 had faded away, a lack of demand had now emerged as the main challenge. Many SMEs, particularly export firms, ran at partial capacity, primarily due to insufficient demand. Moreover, our *ex post* analysis based on the survey data and on the universal firm registration data reveals that about 19% of incorporated enterprises and 25% of self-employed businesses closed for good between the two waves of surveys.

By further gathering lockdown policies and government support policies in different places we further examine their impact on firm operational status We found that more inclusive policies, such as social security and tax deferral, were more effective in helping SMEs than other targeted policies such as credit guarantee.

COVID-19 has unfortunately spread to almost all countries in the world. 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 be applicable to other countries as well. The second and third waves of COVID-19 are striking in 2021. Before the population is fully vaccinated, 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 effects of COVID-19 on firms (Bartik et al., 2020; Crane, Decker, Flaaen, Hamins-Puertolas, & Kurz, 2020; Hassan, Hollander, van Lent, & Tahoun, 2020) and on the Chinese economy (Fang, Wang, & Yang, 2020; Wang et al., 2021; Zhang, Diao, Chen, Robinson, & Fan, 2020). To our knowledge, our study is among the first to conduct longitudinal phone surveys on the impact of COVID-19 on SMEs in a developing country.

The paper is arranged as follows. Section 2 briefly discusses the ESIEC baseline survey and the follow-up phone surveys. Section 3 presents the reopening status of the SMEs. Section 4 reports the major challenges. Section 5 estimates the SME exit rate during the pandemic. Section 6 tests our hypothesis. Section 7 concludes the paper.

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 businesses and private enterprises, collecting information related to start-up history, performance, innovation activities, and the overall business environment. The survey sample from 2017 covers 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. First, we 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 2010–2017 period from the China National Business

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[1] The Enterprise Survey for Innovation and Entrepreneurship in China (ESIEC) team led by Peking University.

Registration Database.[2] The sampling probability for the retail and wholesale sector was set to a quarter of the actual probability, considering the high degree of homogeneity within the sector and its sheer size. 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, a few big cities, such as Shanghai and Shenzhen, had a low response rate because enumerators were not allowed to get into some office buildings and high-end apartment complexes. In order to remedy this problem, in the 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 could not be interviewed 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.[3]

Following the novel coronavirus outbreak, the ESIEC Project Alliance quickly recruited more than one hundred enumerators to conduct phone interviews of incorporated enterprises and self-employed businesses from our ESIEC sample that had been successfully interviewed between 2017 and 2019. All the enumerators had experience in helping conduct previous waves of the ESIEC field survey. Since they were 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 business reopening in most provinces other than Hubei province, the epicenter of the COVID-19 outbreak. Businesses were to reopen after a two-week national lockdown.[4] Although the number of newly infected cases and daily deaths had begun to decline by February 10, as shown in Fig. A1 in the appendix, many local governments were still cautious about resuming production. They imposed various measures to control the spread of the virus in their jurisdictions, such as requiring a permit for a firm to reopen for business, setting up road barriers to slow down cross-border traffic, and restricting the labor flow across regions.[5]

A total of 2513 valid survey samples were collected, as indicated in Table A1. Out of the enterprises with valid contact information, 51.3% accepted our interviews. That response rate is quite high compared to the response rates of other telephone surveys.[6] Out of the 2513 samples collected, 292 (11.6%) firms were closed before our survey concluded, and 57 (2.3%) respondents had closed their business but opened another one, and provided information on their new business. Thus, we gathered 2278 complete questionnaires, which included 481 (21.1%) self-employed businesses and 1797 (78.9%) 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 provincial level, it turns out to be largely representative at the industry level of first-digit SIC code (Standard Industrial Classification) for China as a whole. Fig. 1 plots the share of private firms at the first-digit industry level, drawing from both our sample and the China Economic Census of 2018. The distribution across industries in our sample largely reflects that of Chinese firms in general.

We further compared the firm size distribution, measured in employment and revenues, between our sample and the China Economic Census of 2018. As shown in Fig. 2, both samples are dominated by small firms—more than 60% of enterprises in our sample had fewer than eight workers, and the share of similar-sized small firms in China as a whole was about 70%. In both samples, around 60% of firms reported annual sales below one million Chinese yuan, while approximately 20% fell within the range of one million to five million Chinese yuan, as indicated in Fig. 2B. Even though our ESIEC survey was not designed to be nationally representative, our sample ended up closely resembling the industrial distribution and firm size distribution at the national level.

The second round of surveys took place from May 18 to 24, 2020. In total, we successfully surveyed 2508 SMEs. Among them, 1408 enterprises responded to both rounds of interviews. Out of these 1408, 130 respondents had closed their business even before 2020 for reasons unrelated to COVID-19, and 169 respondents had closed their business by the time of the survey in May. In the second round, we lost 1105 respondents who had completed the first round, but successfully convinced 1100 firms that had declined the survey in the first round. Detailed information about the two-wave survey is shown in Table A1. 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 average anxiety level— listed by province and for China as a whole, based on the February survey. As of

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

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

[4] Twenty-two provinces set February 10 as the official date of resumption of commerce. Out of the seven provinces in our analysis, six marked February 10 as the official date for resuming production. The exception was Gansu province, which had set the opening date for one week earlier.

[5] For example, in one region, if a firm wanted to restart its business, it had to complete 15 forms and submit two letters of commitment, a plan for the resumption of production, a plan for cafeteria 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.

[6] The response rates of phone surveys in the U.S. in 2018 averaged only 6% (Kenney & Hartig, 2019).
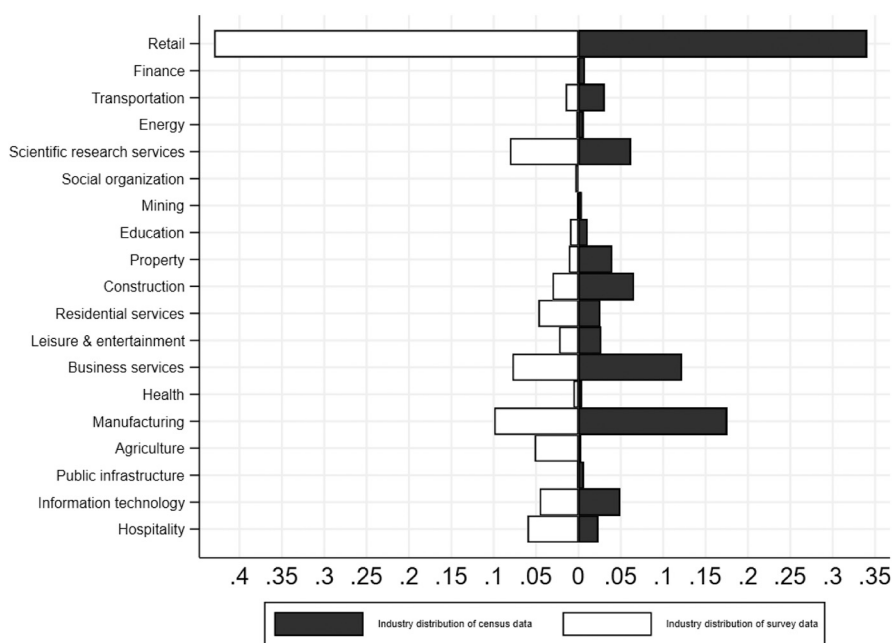
Fig. 1. Industry Distribution of the ESIEC Sample and of the China Economic Census of 2018.
Note: This figure plots the distribution of our survey respondents by industry in comparison with population data. On the vertical axis we list the 19 industries at the SIC one-digit level. The horizontal axis 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 done in February, and excludes responses without industry information. The firm population data comes from the China Economic Census of 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.

February 10 (the official reopening date in most provinces and two weeks after the national lockdown), only 20.8% of businesses had reopened in China.[7] A further 30.8% of firms expected to resume production within one month. Both categories together amount to 51.6%. Still, a large proportion of SMEs (38.0%) 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% of the enterprises foresaw a reduction in revenue by more than 10%. By comparison, only 6.0% of respondents expected an increase in revenues by over 10%.

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 6.0 (with 10 representing the highest level of anxiety and 0, the lowest).

The table also reveals some regional variations. Fig. 3 plots the reopening rate by province. As of February 10, the reported reopening rate in Zhejiang was only 9.9%, and 37.7% more firms planned to resume operations 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% of enterprises estimated their annual rate of revenue to drop by over 10%. By comparison, less than 7% of SMEs expected to see an increase in revenues by more than 10%. These numbers speak to the daunting challenges facing SMEs in Zhejiang province back in February.

Because Henan province housed a large number of returning migrants from Hubei province,[8] the local governments in Henan imposed strict measures to control the spread of the novel coronavirus. As a result, only 11.8% of enterprises resumed production as of February 10, and 26.7% more expected to reopen within a month. More than half of survey respondents (55.5%) expected that their revenues would drop in, far exceeding the proportion expecting an increases in business (6.8%).

By comparison, Shanghai had a much higher reopening rate at 35.3%. Including the businesses expected to reopen within one month, the rate was close to 70%. However, the earnings outlook was grim. About 60% of survey respondents expected negative revenue growth, compared to a mere 6.3% with a positive view on earnings. The disconnect in expected reopening rates and earnings

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

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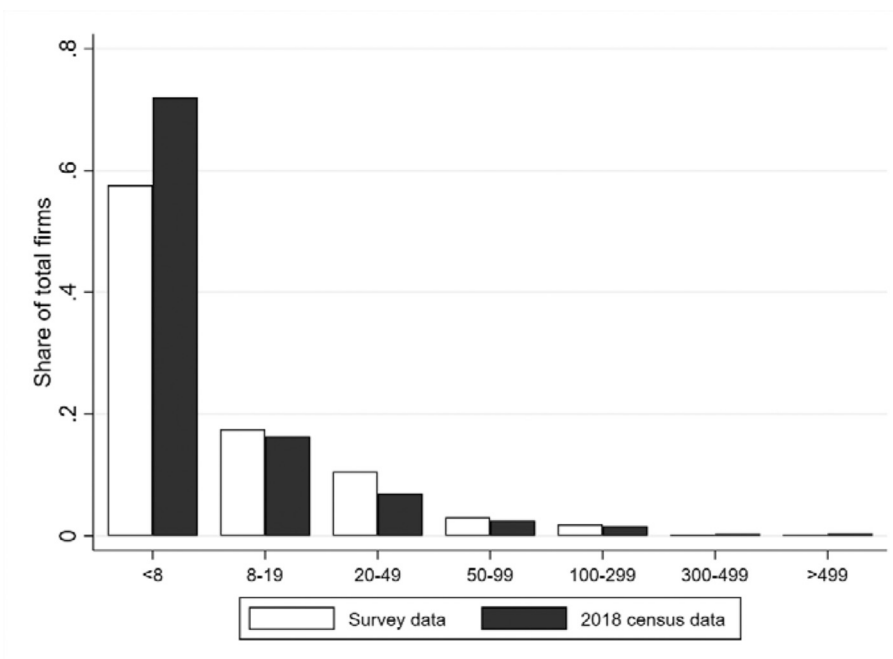
Panel A. Employment
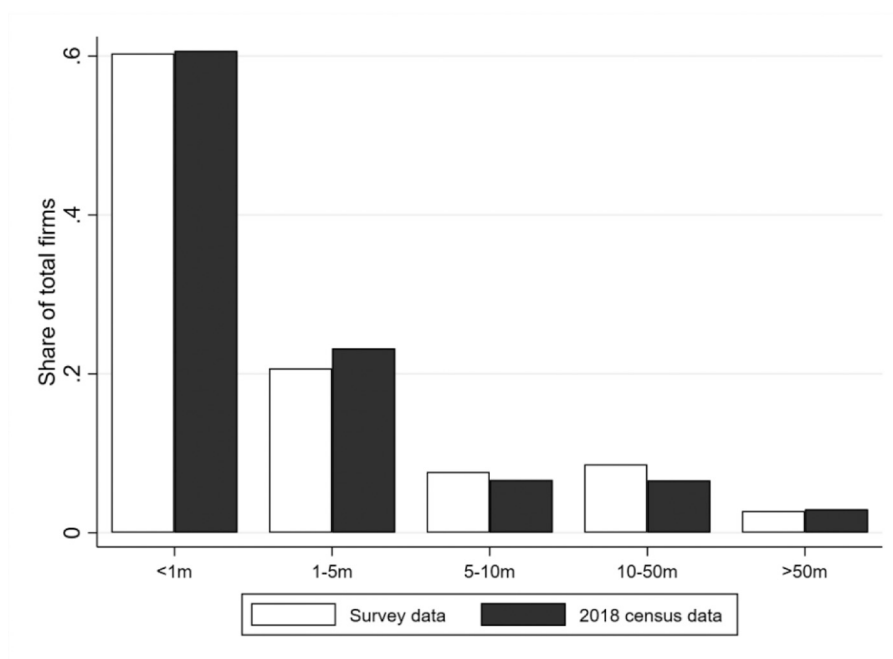
Panel B. Revenue

Fig. 2. Size Distribution between the ESIEC Sample and the China Economic Census of 2018.
Note: This figure compares firm size distribution in terms of employment and revenue between our survey sample from February and the China Economic Census of 2018. The employment and annual sales information in the survey data is for 2018, 2017, or 2016, drawn, respectively, from ESIEC baseline surveys done in 2019, 2018, and 2017. The census data reports the employment and annual sales in 2018. Firms that had not disclosed information on employment or annual sales are excluded from the respective figures. 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.

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

Province	Reopening rate	Expect to reopen within					Expected annual revenue change						Anxiety level	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	2278

Note: The reopening rate measures the percentage of firms that resumed production as of February 10. For SMEs that had not opened by then, the survey asked the respondents to estimate the time of reopening. Each cell represents the percentage of firms with the given reopening status. The anxiety column measures the anxiety level of respondents with a score ranging from 0 (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 the telephone interviews were done, if the respondents were busy, we gave them the option to fill out the online questionnaire later on. Some of them did not fill in their firm names. As a result, they could not be linked to the original ESIEC data that included regional and industry information. These respondents are listed 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.
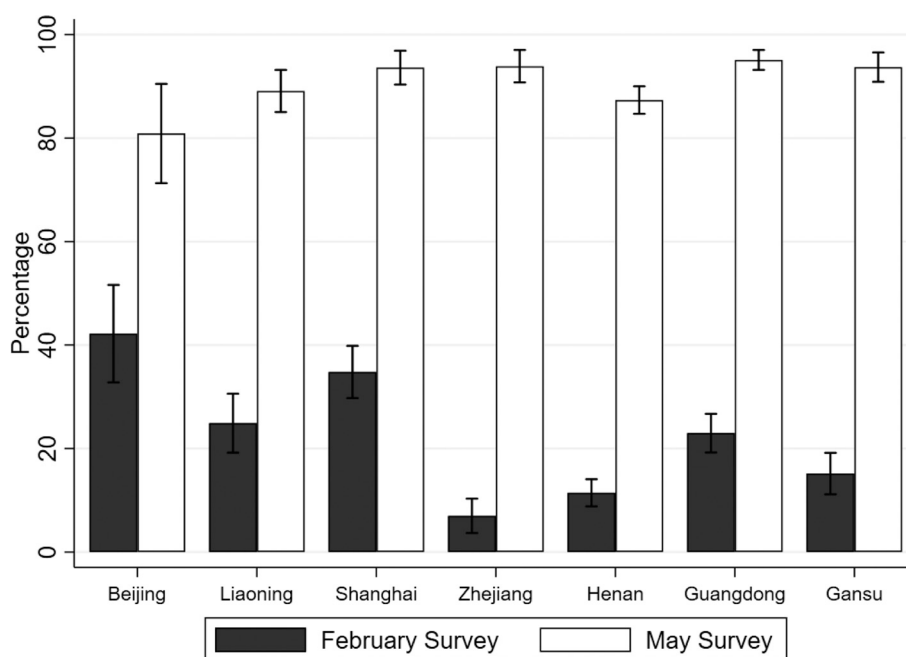
Fig. 3. Reopening Rate in February and May 2020, by Province.
Note: The authors' calculations are based on ESIEC survey data from both February and May. Vertical lines in the bar chart represent 95% confidence intervals. The horizontal axis indicates the fraction of firms interviewed that claimed to have returned 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.

outlooks indicates that businesses in Shanghai were likely expecting to run at partial capacity this year, even after resuming production.

Table 2 repeats the summary statistics from Table 1, except that it replaces provinces with industries. Even at the one-digit SIC code level, there are 19 different industries listed in the official records. To simplify presentation, we grouped them into five broad sectors, as shown in Table 2: agriculture, manufacturing, business services, residential services, and others. As shown in Table 2, as of February 10, 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 services sectors. The rather high reopening rate of general 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 COVID-19 outbreak.

Only 12.0% of manufacturing firms had resumed production at the time of our survey, while 32.4% 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 anticipating earnings growth (6.9%). Entrepreneurs in this subsector reported a level of anxiety of 6.2, higher than the average for survey respondents from all industries (6.0).

Scientific research services, business services, and information technology reported rather high reopening rates, at 36.5%, 23.3%, and 22.1%, respectively. Additional 37.3%, 34.0%, and 40.9% of enterprises in the three industries were planning to reopen in the following month. The percentages of entrepreneurs in these three industries who expected negative revenue growth were 45.7%, 55.7%, and 48.7%, respectively, overwhelming those expecting revenue growth (17.8%, 8.4%, and 13.6%). Despite the rather high actual and expected reopening rates, enterprises in the three industries faced bleak prospects for earnings in 2020.

The reopening rate in the residential services sector was as low as 19.0%. A few subsectors (leisure and entertainment, hospitality, and residential services) in the general residential services sector had reopening rates in the lower teens: 17.1%, 8.0%, and 9.5%, respectively. Additional 22.3%, 22.9%, and 27.9% expected to reopen within a month. Putting them together, the expected reopening rates by mid-March would have been 39.4%, 30.9%, and 37.4%. Not surprisingly, entrepreneurs in these subsectors were pessimistic about their earnings prospects in 2020. Specifically, 30.3%, 53.2%, and 44.3% of respondents in the three industries expected the annual rate of decline in revenue to be more than 10%. The average anxiety level in the three subsectors was as high as 5.8, 6.1, and 6.3, worse than in most other industries. As seen in Fig. A2, the mean measurement of anxiety across industries 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 timeframe. The uncertainty about reopening correlates to anxiety.

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

Table 2

Status of Reopening, Prospects for Earnings, and Anxiety Level in February 2020, by Industry.

Category	Industry	Reopening rate	Expect to reopen within					Expected revenue change						Anxiety level	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		
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
Manufacturing	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
General business services	Scientific research services	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
General residential services	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 services	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	1854

Note: The reopening rate measures the percentage of firms that had resumed production by February 10. For SMEs that had not opened 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 0 (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.

Panel A. February 2020

Panel B. May 2020

Fig. 5. Major Challenges of Reopening by Industry.
Note: The authors' calculations are based on ESIEC survey data from both February and May. Vertical lines in the bar chart represent 95% confidence intervals. If vertical lines in a bar chart do not overlap with each other, this means that the average values of the two groups differ at the 95% significance level. The vertical axis represents the percentage of firms indicating that 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.
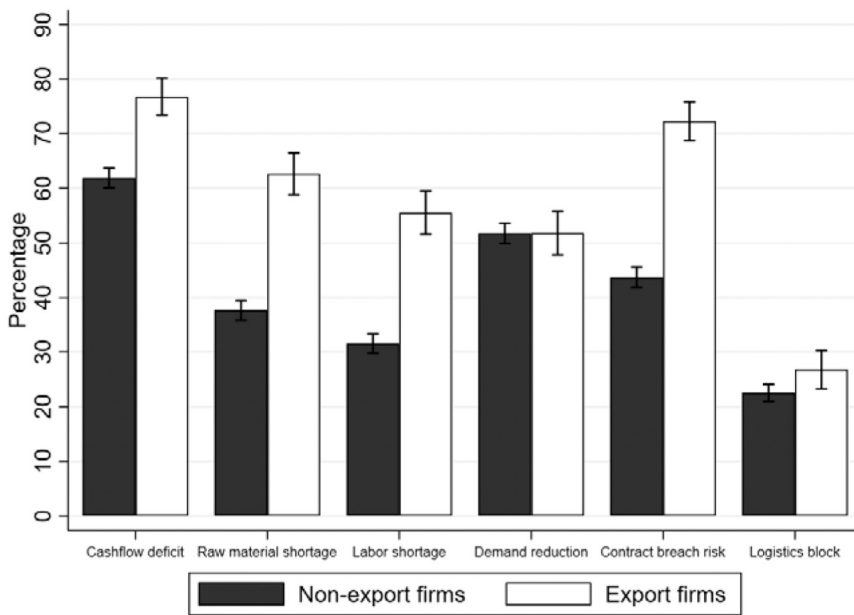
Panel A. February 2020
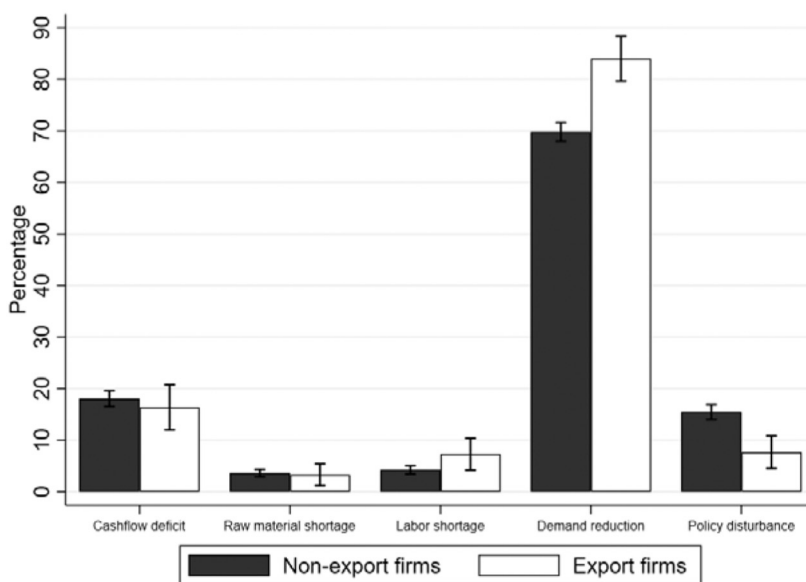
Panel B. May 2020

Fig. 6. Challenges Facing Export and Non-Export Firms.
Note: The authors' calculations are based on ESIEC survey data from both February and May. Vertical lines in the bar chart represent 95% 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% significance level. The term "export firms" refers to firms that had an exporting business before COVID-19.

4.3. Challenges facing export firms

Export has been a key engine of economic growth in China, accounting for 18% of China's GDP in 2019. The questionnaires from both February and May included a question on export status before the pandemic. Out of our sample, 19.0% of Chinese businesses had

been 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 obtained information about employment and about the 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 province than did non-export firms. Migrant workers accounted for 53.7% of the total number employees in export firms, compared to 34.8% 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% of export firms faced labor shortages, which is 25.5 percentage points more than non-export firms.

Besides labor shortages, export firms encountered other challenges. Panel A of Fig. 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 conclusions 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% of export firms suffered shortages in raw materials, while only 35.7% of non-export firms experienced such a problem. According to our ESEIC 2018 baseline, export firms tended to rely on only a few stable suppliers. In normal times, this conferred a cost advantage. However, in the event of a large shock such as COVID-19, export firms struggled to find 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%) signed formal contracts with the largest buyer, compared to 55% for non-export firms. Due to the emerging problems of labor shortages and supply chain disruptions, export firms had more trouble 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 from declining market demand. 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, in March, the pandemic had spread all over the world. Many countries had imposed their own lockdown policies. Both consumer demand and production in these countries had fallen, leading many international orders to be cancelled, including a significant number of orders from China. The lack of external demand then became the gravest challenge for export firms, as shown in Panel B of Fig. 6. More than 80% of export firms reported a lack of demand as the leading challenge, compared to about 70% of non-export firms. However, more recently, because COVID-19 had disrupted production in many countries, there has been an increase in global demand for Chinese products. Since our last survey was conducted in May, this upswing in external demand is not represented here.

5. Financial challenges and firm closure

The COVID-19 restrictions put a strain on the financial situation of SMEs. Table 3 lists by province the major financial challenges facing SMEs in February. Rent was a major expense for 62.3% of firms, while wages were listed as a major expense by 42.5% of the respondents. Survey responses also revealed that 14.6% of firms could not survive beyond one month with the level of cash flow at that time. Additionally, 35.5% of firms reported that their cash flow could only last between one and three months. In summary, if lockdown measures closed businesses for three months with 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—rent and wages were particularly critical costs for entrepreneurs because of higher wages and higher land values. By comparison, in Gansu, one of the poorest provinces in China, only 27.0% of respondents regarded wages as a major cost item for their businesses. Debt was a more burning problem for SMEs in Gansu, where 35.1% listed debt repayment as their main cost pressure—far more than in other provinces. Out of the entrepreneurs interviewed in Gansu province, 56.4% stated that their cash flow

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

Province	Major cost items			How long can cash flow sustain your business?					Expect to run out of cash before reopening	Observations
	Wages	Rent	Debt	Less than a month	1–3 months	4–5 months	Over 6 months	Cannot 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	2278

Note: The first three columns show the share of enterprises listing wages, rent, or debt as major costs during 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 Regard to Reopening in February 2020, by Industry.

Category	Industry	Major cost items			How long can cash flow sustain your business?					Expect to run out of cash before reopening	Observations
		Wages	Rent	Debt	Less than a month	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
General business services	Scientific research services	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
General residential services	Leisure & entertainment	44.7	65.8	17.1	22.4	32.9	11.8	17.1	15.8	25.6	76
	Residential services	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 during the COVID-19 pandemic. All the variables except for observations are in percentages.

could not sustain their business for more than three months. More than a quarter (27.7%) of SMEs would likely run out of cash before reopening. Henan province was also subject to a high risk of SME closure (23.2%).

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

Using the reported reopening status from Table 1 and cash flow information from Table 3, we computed 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 closure rate due to liquidity problems induced by COVID-19. For China as a whole, the rate was 15.3% for incorporated enterprises and 22.4% for self-employed businesses, as shown in Table 5.

Based on businesses' operational status observed in the second wave of interviews, we could infer the actual exit rate of firms that had survived in February at the time of the second survey in May. However, our estimated firm closure rate based on survey data suffered from a sample selection problem. We only know the operational status of SMEs that had accepted our interviews during the two phone surveys in 2020. There is likely a systematic difference in actual exit rates between respondents and non-respondents. We used the official exit rate calculated based on the business exit records from the administrative business registration database to verify this. According to government regulations, firms are required to cancel their business licenses after they go out of business.

However, the official exit status is under-reported. Businesses often fail to file the paperwork because of the rather high exit barriers, such as posting an ad in newspapers and accounting liquidation certified by the third party. In addition, some local governments do not regularly update the exit records. Given the under-reporting problem, if we assume the same under-reporting ratio for the official exit rate between the completed sample and uncompleted sample, we can extrapolate the actual exit rate of different groups based on the known under-reporting ratio in the sample successfully interviewed in May and the official exit rate among those who failed to be interviewed.

We used the following imputation procedure. We imputed the exit rates for incorporated enterprises and for self-employed businesses separately because of their many systematic differences, such as differences in registration requirements, tax rate, and access to credit. Let D_i^j denote whether firm j actually exits, and let R_i^j denote whether firm j officially cancels its registration or has its registration revoked in period i, where 1 means yes and 0 means no. We have two periods in the calculation: $i = 0$ refers to the period before February 2020, and $i = 1$ refers to May 2020. The under-reporting ratio can be written as $P(R_i^j = 1 | D_i^j = 1)$. For each period, we know both D_i^j and R_i^j from the survey data and the registration database. We apply this ratio to the sample of firms that either declined our interviews or could not be reached, assuming the same under-reporting ratio across the three groups. The exit rate could be calculated based on the Bayesian formula for period i and firm j:

$$P(D_i^j = 1) = \frac{1}{P(R_i^j = 1 | D_i^j = 1)} \cdot P(R_i^j = 1) P(D_i^j = 1 | R_i^j = 1), \forall j$$

$$P(D_i^j = 1 | R_i^j = 1) \equiv 1$$

As shown in Table A1, the February sample can be divided into three groups based on contact status: "completed," "refused," and "not reached". Conditional on the three groups, the survey sample from the May survey can be classified into nine groups. Based on the total probability theorem, we write a firm's actual exit probability as the summation of the product of the exit rate corresponding to each contact status group and its shares as follows:

$$P(D_i = 1) = \sum_{s \in S_i} P(D_i^j = 1 | j = s) \cdot P(s)$$

Then the imputed death rate can be written as a conditional exit probability as follows:

$$\text{Imputed death rate} = \frac{P(D_1 = 1)}{P(D_0 = 0)}$$

Table 5
Firm Exit Rate, by Method and Sample.

Exit rate	Incorporated enterprises	Self-employed businesses
Official record	0.027	0.056
Based on completed sample from both waves of survey	0.078	0.088
Predicted based on February survey	0.153	0.224
Imputed	0.189	0.251

Note: The official exit rate is the ratio of firms that had officially cancelled their licenses or had their licenses revoked between January 1 and September 30, 2020, to all the firms surviving as of the end of 2019, as listed in the administrative business registration database. The exit rate of the survey sample is the share of firms that had closed before the May survey in the successfully interviewed sample. The predicted exit rate is the share of firms that would run out of money before their expected date of reopening, based on the February survey. The imputed exit rate is computed based on the survey data and the business registration data according to the formula given in Section 5.

$$= \frac{P(D_1 = 1 \cap D_0 = 0)}{P(D_0 = 0)}$$

$$= \frac{P(D_1 = 1)}{1 - P(D_0 = 1)}$$

$$= \frac{\sum_{s \in S_1} P(D_1^j = 1 | j = s) \cdot P(s)}{1 - \sum_{s \in S_0} P(D_0^j = 1 | j = s) \cdot P(s)}$$

$$= \frac{\sum_{s \in S_1} \frac{1}{\mu} \cdot P(R_1^j = 1 | j = s) \cdot P(s)}{1 - \sum_{s \in S_0} \frac{1}{\theta} P(R_0^j = 1 | j = s) \cdot P(s)}$$

where μ and θ can be computed based on the sample successfully interviewed in February and May in combination with the business registration data.

$$\mu = P(R_1^j = 1 | D_1^j = 1), \forall j$$

$$\theta = P(R_0^j = 1 | D_0^j = 1), \forall j$$

Fig. 7 (A) and (B) report, respectively, the official exit rate and the imputed death rates of incorporated enterprises by contact status. Self-employed enterprises have similar pattern as Fig. 7. Table 5 shows the official exit rate and three estimated exit rates using different methods and samples. The official exit rate is defined as the ratio of newly cancelled or revoked incorporated enterprises in our sample from between January 1, 2020 and September 30, 2020 to all the firms surviving as of the end of 2019. The ratio is as low as 0.027. Using the finished phone survey sample from May, the actual death rate between our two waves of surveys in February and May in 2020 is 0.078. The under-reporting ratio is 2.889 (=0.078/0.027). By adjusting the under-reporting ratio for different contact groups, we obtained a much higher imputed exit rate of 0.189 for incorporated enterprises. By comparison, self-employed businesses had a higher failure rate. The official, surveyed, and imputed exit rates were 0.056, 0.088, and 0.251 respectively, higher than those of incorporated enterprises. This estimated exit rate is similar to the estimate by Zhang et al. (2020). Based on their multiple-wave phone surveys of more than 700 villages, they found that one in six self-employed businesses closed its doors between February and August 2020. We also compared the imputed exit rate with the predicted exit rate based on the February survey by sector (see Fig. A.3). The correlation coefficient between the two exit rates is as high as 0.553. Two methods consistently show that the hospitality and residential sectors were hit hard[9].

Due to the under-reporting problem in the official data, we don't know the actual firm exit rates from before this pandemic. Crane et al. (2020) reported that the annual exit rate in the US averaged around 7% before 2020. If we use the US exit rate as a benchmark for normal years, the imputed death rate of 0.189 for incorporated enterprises is more than twice the normal level. The excess rate of business closure would translate into higher unemployment.

6. Empirical analysis

The descriptive analyses have revealed that in the short run, SMEs were mainly subjected to supply-side shocks because of the lockdown policy, while in the long run, the biggest problem facing SMEs is declining demand, especially for residential services industries. To test this hypothesis, we manually collected lockdown restrictions and government support policies at the local level and ran regressions to evaluate the impact of COVID-19 restrictions and government support policies on the operational status of SMEs.

Table 6 reports the regression results on two outcome variables for SMEs from February: reopening and cash flow problems. In the most parsimonious specification (shown in the first column), only two independent variables and sector fixed effects are included. The first one, "labor mobility ratio," is defined as the ratio of the population flow across local borders in February 2020 to that in the same period in 2019, capturing the degree of labor mobility under COVID-19 restrictions. The second variable is local infection rate. The coefficient for the labor mobility ratio is 0.906 and is highly significant. Workers are an essential input in any production. Thus restrictions on labor mobility hinder business reopening.

In column (2), we included four additional government policy variables. They are dummy variables indicating whether the local government implemented credit support, rent exemption, social security deferral, or tax deferral policies. The coefficients for social security and tax deferral, which are more inclusive and less targeted than other two policy variables, are positive and significant at the 1% level. By comparison, the two highly targeted policies—credit guarantees and rent exemptions—are negatively associated with SMEs' reopening status. Given the vast number of SMEs, it is difficult to accurately target those SMEs that need help.

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[9] Self-employed businesses are mainly concentrated in retail and residential services sectors. The two measures yield very similar results for these two sectors.
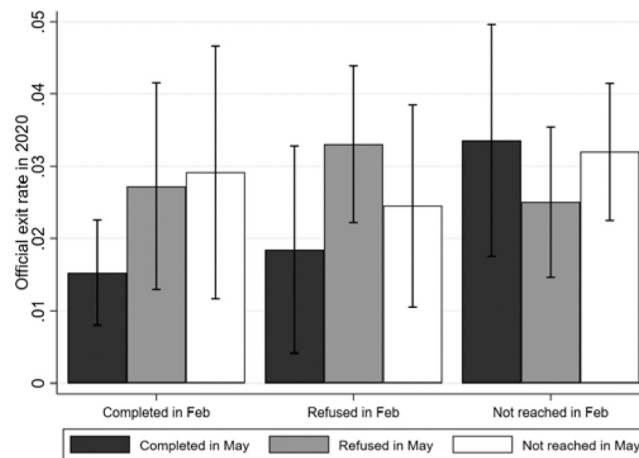
Panel A. Official Death Rate, by Contact Status
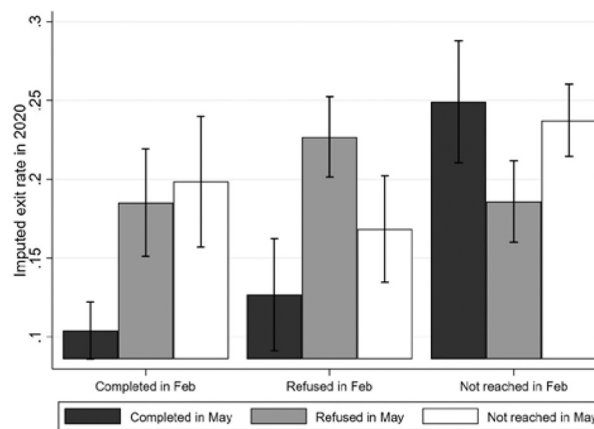
Panel B. Imputed Death Rate, by Contact Status

Fig. 7. Official and Imputed Death Rate, by Contact Status.
Note: The official death rate was computed using firm registration data. The imputed death rate is based on our survey data and on firm registration data. The method is described in Section 5. Vertical lines in the bar chart represent 95% confidence intervals. In Panel B, though we do not impute the living status of each firm, we assume that it follows a Bernoulli distribution with expectation equal to our imputed mean death rate. The standard deviations, standard errors, and confidence intervals are based on it.

Columns (3) and (4) repeat the previous exercise with cash flow problems as an outcome variable. As shown in Column (3), the labor mobility ratio remains positive, but loses statistical significance. When the four policy variables are included in Column (4), the social security deferral variable is still negatively significant. The policy of social security deferral applies to all the firms with formal employees. The infection rate variable in all four regressions is insignificant, suggesting that, at least in China, the degree of local infection had little to do with the performance of SMEs outside Hubei province.

Our surveys asked respondents about the major challenges facing their businesses. Labor shortage, raw material shortage, and demand reduction were the main ones. Next, we investigated whether the reported challenges were associated with three firm performance variables —cash flow problems, revenue prospects for the remaining year, and recovery rate of revenues in May compared to the previous year. As shown in Column (1) of Table 7, in February, the supply-side challenges (labor shortage and raw material

Table 6

Firm Reopening Status and Cash Shortage Problems in February.

	(1)	(2)	(3)	(4)
Dependent variable:	Reopening		Cash shortage problems	
Labor mobility ratio	0.906***	0.816***	0.199	0.232
	(0.219)	(0.188)	(0.167)	(0.156)
Credit guarantee		−0.079**		0.032
		(0.037)		(0.019)
Rent exemption		−0.028		−0.024
		(0.025)		(0.023)
Social security deferral		0.065**		−0.043**
		(0.031)		(0.020)
Tax deferral		0.103***		0.024
		(0.027)		(0.021)
Infection rate	−0.004	−0.050	−0.011	0.015
	(−0.076)	(0.053)	(−0.060)	(0.046)
Mean of dependent variable	0.194	0.194	0.146	0.146
Sector fixed effects	Yes	Yes	Yes	Yes
Adjusted R-squared	0.036	0.059	0.008	0.010
Observations	2108	2108	2108	2108

Note: The variable "reopening" is a dummy variable indicating whether a firm had reopened by February 10. "Cash shortage problems" is a dummy variable that equals 1 if a firm has reported that its cash flow could not sustain normal operation for more than a month. The labor mobility ratio is defined as the ratio of the total population flow across local borders in the first lunar month of 2020 to that from the same period in 2019. Credit guarantees, rent exemptions, deferrals of social security payments, and deferrals or reduction of tax payments are defined as dummy variables at the city level, which equal 1 if a policy applies and 0 otherwise. The infection rate is the cumulative confirmed number of infections divided by the local population. Sector fixed effects include dummies for agricultural, manufacturing, business services, and residential services industries. Standard errors are clustered at the city level and reported in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

Table 7

Firm performance in relation to major challenges in February and May.

	(1)	(2)	(3)	(4)	(5)
Period:	February		May		
Dependent variable:	Cash shortage	Prospect	Cash shortage	Output recovery	Prospect
Labor shortage	0.051***	0.001	0.026	−0.113***	−0.0002
	(0.018)	(0.008)	(0.040)	(0.037)	(0.058)
Raw material shortage	0.060***	−0.015**	0.050	−0.066	−0.104
	(0.017)	(0.008)	(0.050)	(0.046)	(0.071)
Demand reduction	−0.004	−0.039***	0.015	−0.310***	−0.084***
	(0.016)	(0.007)	(0.017)	(0.016)	(0.025)
Mean of dependent variable	0.146	0.893	0.161	0.592	1.011
Sector fixed effects	Yes	Yes	Yes	Yes	Yes
City fixed effects	Yes	Yes	Yes	Yes	Yes
Adjusted R-squared	0.039	0.046	0.010	0.200	0.077
Observations	2108	1474	1807	1807	1762

Note: "Cash shortage" is a dummy variable that equals 1 if a firm's cash flow was insufficient to support normal operations for over a month. "Prospect" is firm's expectations regarding revenue in 2020, with larger number indicating better prospects. Revenue recovery is the ratio of the output in May to that before the pandemic.

"Labor shortage," "Raw material shortage," and "Demand reduction" are dummy variables indicating whether a firm claimed that it was facing the given problem.

Sector fixed effects include dummies of agricultural sector, manufacturing sector, general business services sector, and general residential services sector industries. Standard errors are reported in parentheses. *significant at 10%; **significant at 5%; ***significant at 1%.

shortage) were positively associated with cash flow problem. The coefficient for the demand-side challenge was insignificant from zero. As indicated in the second column, raw material shortages and demand reduction dimmed the business prospects for the remaining year.

By May, most firms resumed production, although many of them did not run at full capacity. The two supply-side variables do not have much effect on cash shortages and business prospects. By comparison, demand reduction is negatively correlated with the degree of production capacity recovery and with business prospects. After COVID-19 was under control, the demand problem emerged as a bottleneck for normal firm operation. Of course, the table presents only some of the associations. Due to data limitations, we cannot draw a strong causal conclusion. Nonetheless, the results provide some support for our hypothesis that the major challenges have

shifted from the supply side to the demand side as the pandemic was brought under control and COVID-19 restrictions were lessened.

7. Conclusions

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

Between February and May, the major challenges facing firms had shifted from the supply side to the demand side. The lack of demand has become the most critical challenge, especially 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.

Although COVID-19 is largely under control in China, there are still sporadic outbreaks and lockdowns. Understanding the impact of COVID-19 restrictions on SMEs is essential for designing appropriate policies to help SMEs navigate the days ahead, when the pandemic may strike again.

China now accounts for 17% of the world's economy, compared to 4.3% in 2003, when the SARS epidemic was unfolding. China drives 30% 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 how much more interconnected the world has become since the SARS epidemic in 2003.

Because COVID-19 struck China earlier than other countries, and because China is the first major economy to get COVID-19 under control, the findings on the impact of the pandemic on SMEs in China may also provide clues as to what would happen in other countries. SMEs underpin massive employment in every country, particularly in developing countries. Therefore, solving the issues facing SMEs in developing countries amid COVID-19 is imperative.

First, based on China's experiences, the lockdowns are likely to have a pronounced harmful effect on SMEs in developing countries. Second, it is imperative to get the virus under control. As explained above, once COVID-19 was reined in, SMEs quickly resumed production. Third, after the COVID-19 restrictions are lifted, lack of demand likely replaces supply-side challenges as the major problem. This calls for more demand-side policy interventions to buffer the COVID-19 shock and boost the recovery of SMEs. Fourth, general policies seem to be more effective at supporting SMEs than targeted policies. Of course, these conjectures are speculative and should be subjected to more rigorous examinations based on data from more countries.

After we posted our survey instrument online in March, more than 20 countries adopted our questionnaire to conduct similar SME surveys.[10] It would be interesting to do an international comparison on the impact of COVID-19 on SMEs when datasets from different countries become available in the future. Our work serves as a steppingstone by providing descriptive survey evidence from China.

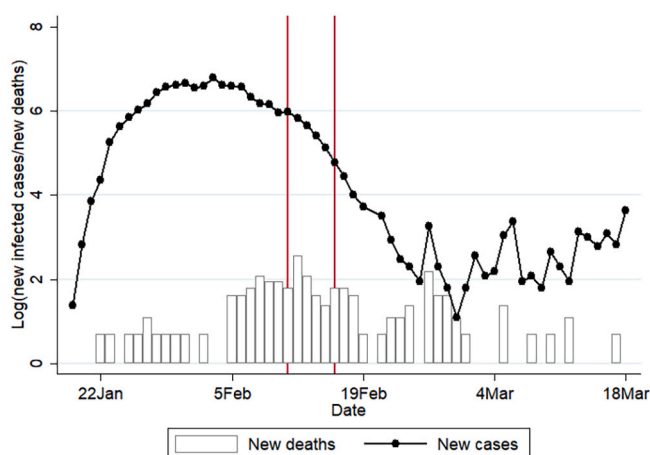## Declaration of competing interest

None

Appendix A

Fig. A.1. COVID-19 spread pattern and the survey conducting period.
Note: COVID-19 data was calculated by the authors and collected from the National Health Commission (NHC). The follow-up survey was conducted

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[10] The survey instrument in Chinese, English, and Spanish can be found at https://www.cgdev.org/blog/measuring-impact-coronavirus-global-smes-survey-instrument-chinese-english-and-spanish.

between February 11 and February 16. Logarithms of the number of daily new cases and new deaths outside Hubei province is plotted on the vertical axis. Data from February 20 is dropped because that was when the NHC changed the definition of new cases, switching suspected clinical cases to new confirmed cases. This led to a jump in new cases on that day. Details can be found at http://www.nhc.gov.cn/yzygj/s7652m/202002/54e1ad5c2aac45c19eb541799bf637e9.shtm.

Table A1
Contact status during the two waves.

		May survey			
		Completed	Refused	Not reached	Total
February survey	Completed	1408	658	447	2513
	Refused	434	1323	625	2382
	Not reached	666	1145	2044	3855
	Total	2508	3126	3116	8750

Note: Each row reports the number of firms corresponding to each contact status in the February survey, while the columns refer to the number of firms by contact status in the May survey. "Completed" represents the number of successfully interviewed firms. "Refused" indicates the number of firms that were contacted but refused to participate in our survey. "Not reached" refers to the number of firms that could not be reached because of incorrect contact information or other problems.
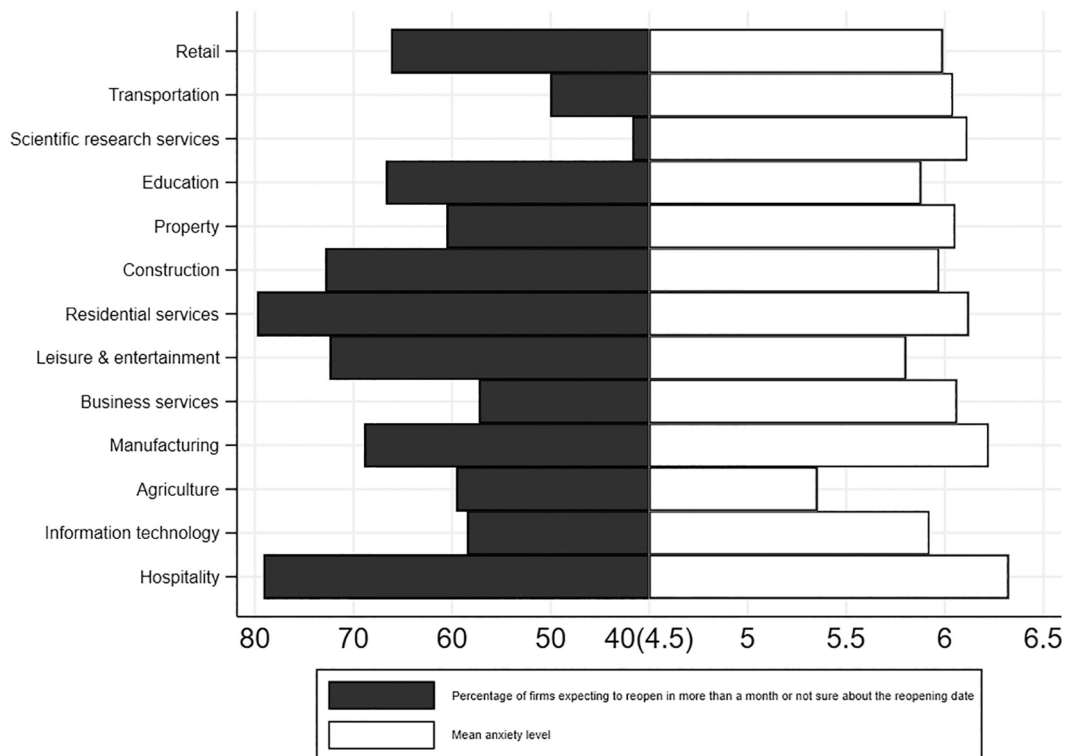
Fig. A.2. The Uncertainty of Reopening and the Level of Anxiety in February 2020.
Note: This figure plots the expectation of reopening and the anxiety rate of entrepreneurs from different industries. On the vertical axis we list the one-digit industries from the Chinese category GB/T 4754—2017, excluding resources, finance, mining, and public infrastructure, for all of which we have less than 20 samples each. The left panel represents the percentage of firms that were not expecting to reopen in a month or didn't know the time of reopening. The right panel represents the mean anxiety of entrepreneurs at the industry level. The anxiety level is a self-reported index ranging from 0 to 10, with a larger number indicating a higher degree of anxiety.
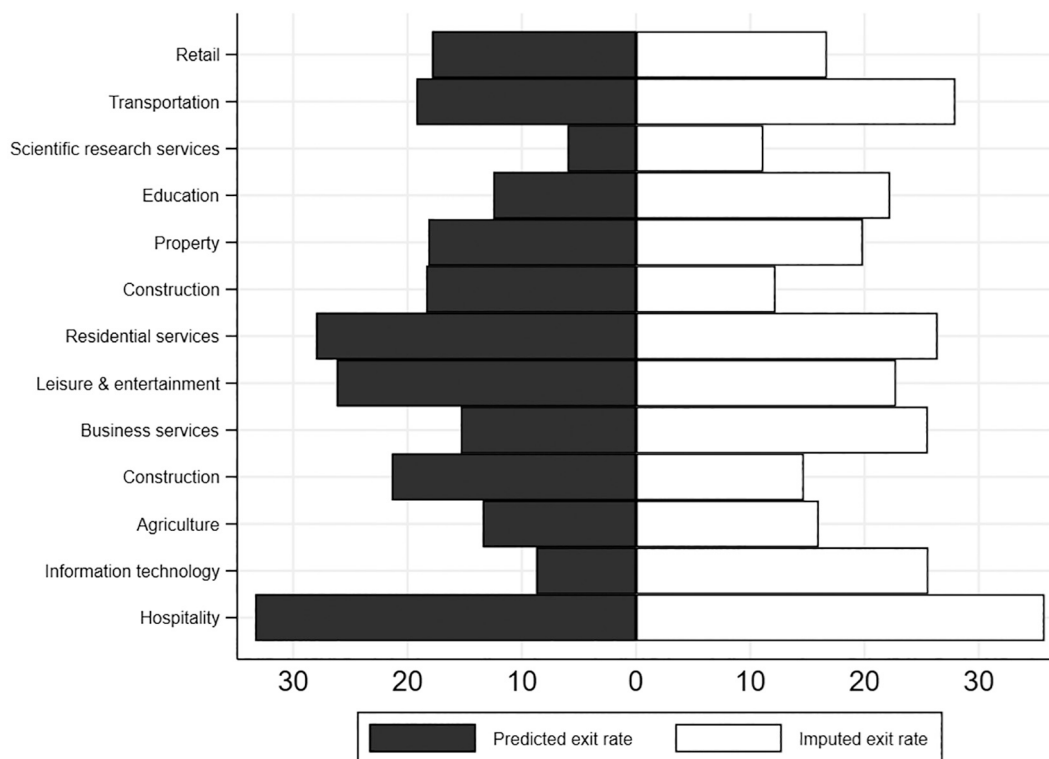
Fig. A.3. Comparison between the Predicted Exit Rate in February and the Imputed Exit Rate in May, by Industry.
Note: The authors' calculations are based on ESIEC phone survey data from February and May 2020. The predicted exit rate is the fraction of firms that would run out of cash before their expected reopening time, based on the survey in February. The imputed exit rate is imputed from the firm registration database and from the survey in May. This comparison is for incorporated enterprises.

References

Bartik, A. W., Bertrand, M., Cullen, Z. B., Glaeser, E. L., Luca, M., & Stanton, C. T. (2020). How are small businesses adjusting to COVID-19? Early evidence from a survey. In *National Bureau of Economic Research working paper no. 26989*.

Crane, L. D., Decker, R. A., Flaaen, A., Hamins-Puertolas, A., & Kurz, C. (2020). *Business exit during the covid-19 pandemic: non-traditional measures in historical context. Finance and economics discussion series 2020–089*. Washington: Board of Governors of the Federal Reserve System.

Fang, H., Wang, L., & Yang, Y. (2020). Human mobility restrictions and the spread of the novel coronavirus (2019-nCoV) in China. In *National Bureau of Economic Research working paper no. 26989*.

Fang, H., Wang, L., & Yang, Y. (2020). Human mobility restrictions and the spread of the novel coronavirus (2019-ncov) in china. *Journal of Public Economics, 191*.

Hassan, T. A., Hollander, S., van Lent, L., & Tahoun, A. (2020). Firm-level exposure to epidemic diseases: COVID-19, SARS, and H1N1. In *National Bureau of Economic Research working paper no. 26971*.

Kenney, C., & Hartig, H. (2019). *Response rates in telephone surveys have resumed their decline*. Pew Research Center. February 27. Available from https://www.pewresearch.org/fact-tank/2019/02/27/response-rates-in-telephone-surveys-have-resumed-their-decline/.

Kremer, M. (1993). The O-ring theory of economic development. *Quarterly Journal of Economics, 108*(3), 551–575.

Qianxi.baidu.com. (2020). 百度迁徙-百度地图慧眼. Available from https://qianxi.baidu.com/?from=mappc> [Accessed 21 February 2020].

Wang, R., Cheng, Z., Quan, Y., & Zhang, X. (2020). Sampling bias of internet survey—Analysis based on the ESIEC survey of COVID19 impact on SMEs [in Chinese]. Retrieved from http://cec.blog.caixin.com/archives/222636.

Wang, H., Zhang, M., Li, R., Zhong, O., Johnstone, H., Zhou, H., … Rozelle, S. (2021). Tracking the effects of COVID-19 in rural China over time. *International Journal for Equity in Health, 20*.

Zhang, Y., Diao, X., Chen, K. Z., Robinson, S., & Fan, S. (2020). Impact of COVID-19 on China's macroeconomy and Agri-food system: An economy-wide multiplier model analysis. *China Agricultural Economic Review*. https://doi.org/10.1108/CAER-04-2020-0063. Article in press. Available from.

Zhu, W., Liu, J., & Wei, W. (2020). A joint Tsinghua-PKU survey of 965 SMEs: How to survive the first three months. Retrieved from https://www.chainnews.com/articles/521353356966.htm.