SMEs Amidst the Pandemic and Reopening: Digital Edge and Transformation

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Introduction

- Small and Medium-sized Enterprises (SMEs)
  - China: “Five Six Seven Eight Nine”
    - 90% market entities, 80% urban employment, 70% patents, 60% GDP, 50% tax
  - US: 44% employment & 99% firms (Bartlett III and Morse, 2020)

- Yet SMEs are vulnerable to shocks (Davis et al., 1996)
  - COVID-19 pandemic: no exception
    - Bartik et al., 2020; Chetty et al., 2020; Fairlie, 2020; Humphries et al., 2020; Kong et al., 2022;......
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Ways to help SMEs cope with shocks

▶ Policy interventions:
  ● Bartlett III and Morse, 2020; Chen et al., 2020; Dai et al, 2021b; ......

▶ Wide media reports on the importance of e-commerce during the pandemic
Knowledge gap: role of digitization in improving firms’ resilience against shocks

- Digital adoption: disaster (Shklovski et al., 2010), policy intervention (Crouzet et al., 2019), short-run impact of COVID-19 (Tut, 2020; Fu and Mishra, 2020)

Our paper asks two questions:

1. Whether the business digitization helps SMEs better cope with the pandemic?
2. Whether the shock has spurred more rapid adoption of digital technologies?
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Why China?

- Largest e-commerce and FinTech market
- Rapid reopening of the economy in 2020 → SME’s digital transformation post the pandemic shock
- Sporadic outbreaks and localized lockdowns
Timeline

- The timeline of accumulative COVID-19 cases, lockdown, and reopening

Figure 1: COVID-19 Outbreak, Reopening, Mitigation Policies, and Surveys
Roadmap

▶ Offline survey with phone follow-ups: digital edge (*intuitive fact*)

▶ Universal firm registration data:
  ● Textual analysis (NLP + ML): classify e-commerce entries & adoption
  ● Event study framework
    ⇒ SME’s Digital transformation

▶ Online survey on Alipay: extension on digital adoption
Enterprise Survey on Innovation and Entrepreneurship in China (ESIEC)

- Private enterprises and self-employed
- Field surveys (2017-2019) + phone follow-up interviews (2020)

Firms with higher e-commerce sales prior to the pandemic are more likely to:

Table 1: Baseline Regression of Digital Edge

<table>
<thead>
<tr>
<th></th>
<th>Demand: order decline</th>
<th>Cash flow &gt; 1 month</th>
<th>Reopen</th>
<th>Outlook for growth</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pooled sample (3 waves)</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>February</td>
<td>-</td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td>May</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td></td>
</tr>
<tr>
<td>August</td>
<td>-</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>

Control variables on personal characteristics and business performance are controlled. Industry and city FEs are controlled.

Data source: ESIEC.
E-commerce firms are more resilient

- Higher growth in online sales than offline sales at the national level
E-commerce firms are more resilient

- Firms with online sales had faster turnover rate of capital.

Figure 3: Short-term Impact of E-commerce on Corporate Finance during the Early Reopening
1. Does the business digitization help SMEs better cope with the pandemic? ✓

2. Has the pandemic induced SMEs’ digital technology adoption?

Figure 1: COVID-19 Outbreak, Reopening, Mitigation Policies, and Surveys
Digital Transformation
Data and NLP

▶ SAIC Business Registration database
- Universe of registered businesses in China
- “Business operation scope”:

```
<table>
<thead>
<tr>
<th>企业类型</th>
<th>有限责任公司(自然人投资或控股)</th>
<th>行业</th>
<th>畜牧业 livestock industry</th>
<th>人员规模</th>
</tr>
</thead>
<tbody>
<tr>
<td>参保人数</td>
<td>0</td>
<td>登记机关</td>
<td>西安市长安区市场监督管理局</td>
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</tr>
<tr>
<td>曾用名</td>
<td>-</td>
<td>英文名称</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>注册地址</td>
<td>陕西省西安市长安区引镇街道下河滩村南二路3号 附近公司</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
```

[Business Operation Scope] Sales of prepackaged foods, honey, bee pollen, bee paste, cosmetics, and daily necessities (including online sales); bee farming; production and sale of health food; design and production of web pages; business consulting; ……

▶ Natural language processing (NLP): identify “e-commerce” related firms
- ML algorithms with proprietary training set in W & R sector
- Interpretability: keywords
- Alteration record on business operation scope: incumbents’ digital adoption

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Digital Transformation

Identification

- Aggregate at city-industry-month level (2015-2021)
  - Extensive margin: e-commerce $\Rightarrow$ # new entries
  - Intensive margin: e-commerce adoption $\Rightarrow$ # incumbents’ alterations

- Difference-in-differences event study framework:
  - Following Fang et al. (2020) and Chen et al. (2020)

$$\ln(Y_{cjmy}) = \sum_m (\beta_m \times COVID_y \times Dummy_m) + FE + f(y, c, j) + \varepsilon_{cjmy}$$

- $c$ indicates the city, $j$ the industry, $m$ the month, and $y$ the year.
Digital Transformation

Extensive margin

▶ V-shaped pattern:
  - E-commerce entrants experienced a slighter initial drop and a quicker rebound.

▶ Extensive margin ↑

Figure 4: Event Study of COVID-19 Outbreak and Reopen on New Firm Entry, by E-commerce and Others

Cong, Yang, and Zhang (2021)
Robustness check: wholesale & retail sector naturally classified by industry code

Figure 5: Event Study of COVID-19 Outbreak and Reopen on Wholesale and Retail New Firm Entry, by Online and Offline
Digital Transformation

Entrants in agriculture and manufacturing sectors also adopt more e-commerce

Placebo test

Figure 6: Heterogeneous Effect of COVID-19 Outbreak and Reopen on New Firm Entry for the E-commerce Subgroup, by Industry

Cong, Yang, and Zhang (2021)
Digital Transformation

Intensive margin

- Incumbent’s alteration of operation scope to include e-commerce
  (non-e-commerce $\rightarrow$ e-commerce)
- Intensive margin $\uparrow$

Figure 7: Event Study of COVID-19 Outbreak and Reopen on Operation Scope Alteration, by E-commerce Adoption and Others

Cong, Yang, and Zhang (2021)
SMEs Amidst the Pandemic and Reopening
Digital Transformation

Intensive margin

- Incumbents take more e-commerce transformation, including traditional industries like agriculture, manufacturing, and services.

Figure 8: Heterogeneous Effect of COVID-19 Outbreak and Reopen on Incumbents’ Business Operation Scope Alteration to E-commerce, by Industry
Digital Transformation

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Figure 1: COVID-19 Outbreak, Reopening, Mitigation Policies, and Surveys
Digital Transformation
OSOME data

- Online Survey of Micro-and-small Enterprises in China (OSOME):
  - Quarterly survey since 2020Q3
  - Active users of Alipay

- SMEs’ digital adoption:
  - More micro businesses (38.7% are unregistered)
  - More aspects: online operation, remote work, electronic information systems

- Sporadic localized lockdowns $\rightarrow$ analogous specification
Digital Transformation

Result

Table 2: Impact of Local Lockdowns on SMEs’ Digital Adoption

<table>
<thead>
<tr>
<th></th>
<th>Online business</th>
<th>(Online only)</th>
<th>Online sales</th>
<th>Remote work</th>
<th>Sale system</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Full sample</strong></td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td><strong>Newly established subsample</strong></td>
<td>+</td>
<td></td>
<td>+</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Incumbent subsample</strong></td>
<td>+</td>
<td></td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
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Control variables on personal characteristics and business performance are controlled. City, industry, quarter, city \times industry, city \times year, and industry \times year FEs are controlled.

Data source: OSOME.
Takeaways

- E-commerce has provided SMEs with an edge in coping with the pandemic.
  - Less demand-side challenge, faster turnover, .......
- Both new entries and incumbents have increasingly embraced e-commerce after lockdowns, and the effect persists after one year of full reopening.
  - Traditional sectors also accelerate the digital adoption.
- Impact of other types of digitization also exists, even for micro businesses.
Appendix

ESIEC sample

Figure A 1: Industrial Distribution of the ESIEC Sample and of the China Economic Census of 2018 (Dai et al., 2021b)
Appendix

ESIEC sample

(a) Employment
(b) Revenue

Figure A 2: Size Distribution of the ESIEC Sample and of the China Economic Census of 2018 (Dai et al., 2021b)