Performance stability among small and medium-sized enterprises during COVID-19: A test of the efficacy of dynamic capabilities

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Abstract
COVID-19 wreaked havoc on public health and the global economy. Small and medium-sized enterprises (SMEs) were hit especially hard. In this research note, we test the ability of dynamic capabilities (DCs) to predict SME performance during the pandemic. Based on our analysis of data from a survey conducted in the United States, we find that DCs meaningfully predicted both operational levels and revenue. Furthermore, while the empirical literature suggests that SME size is positively related to DC efficacy, we found that this effect was reversed during COVID-19, as the positive link between DCs and performance was stronger for smaller SMEs.

Keywords
COVID-19, dynamic capabilities, small businesses, SMEs

Introduction
COVID-19 wreaked havoc on the global economy; stay-at-home orders and business lockdowns led to historic economic contractions. In May 2020, some regions in the United States began to partly reopen. In this research note, we examine how small and medium-sized enterprises (SMEs) in those regions performed after reopening, via a quantitative analysis of survey data that tests whether (a) dynamic capabilities (DCs) improved performance and (b) SME size moderates this link.

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The *International Small Business Journal* has studied performance in adjacent settings – for example, financial crises, floods, riots and war (Cheung and Kwong, 2017; Doern, 2016; Harries et al., 2018; Roper and Turner, 2020) – and a growing body of commentaries examines COVID-19 directly. For example, Greene and Rosiello (2020) and Lim et al. (2020) examine its capacity to facilitate realignments and attempts to scale. The most common theme is captured by commentaries that study COVID-19’s disproportionate effects for certain groups. Here, we see how it has acutely affected employees who are cosmopolitan (Nummela et al., 2020) or self-employed (Yue and Cowling, 2021) and businesses that are young (Brown et al., 2020; Morgan et al., 2020), small (Brown et al., 2020; Korsgaard et al., 2020; Morgan et al., 2020), located in non-urban locations (Brown and Cowling, 2021) or owned and/or managed by people of colour and women (Manolova et al., 2020; Martinez et al., 2020).

These important commentaries measure the impact of COVID-19 and document business responses. Yet, a gap remains with respect to findings on operational efficacy that may be leveraged by SMEs to improve performance or even thrive in challenging times. Thus, while Brown et al. (2020, 2021) and Cowling et al. (2020) offer findings that policymakers may use to guide their efforts, we offer findings that businesses may use to form strategies. And while Manolova et al. (2020) document strategies used by proactive women-owned businesses attempting to navigate today’s volatile business environment, we quantitatively test a strategy to see whether it actually improved performance during COVID-19. We do so by testing the ability of DCs to improve the performance of SMEs during COVID-19. Teece et al. (1997) define DCs as ‘the firm’s ability to integrate, build, and reconfigure internal and external competences to address rapidly changing environments’ (p. 516). While ordinary capabilities focus on day-to-day operations, dynamic capabilities focus on competitive strategies in turbulent settings (Ambrosini and Bowman, 2009; Eisenhardt and Martin, 2000; Helfat et al., 2009; Schilke et al., 2018). DCs thus seem relevant to firm performance when turbulence is extreme, such as during financial crises (Ahn et al., 2018; Nair et al., 2014) and natural disasters (Martinelli et al., 2018). Extreme levels of environmental disruption and uncertainty allow the COVID-19 pandemic to serve as a ‘stress test’ on the impact of DCs on business resiliency and survival prospects.

Due to a relative lack of financial and economic resources, economic shocks have a larger proportional impact on SMEs (Eggers, 2020; Lee, 2009). Compared to large firms, they have been hit especially hard by COVID-19. Three times as many SMEs exited the market in 2020 versus during the Great Recession (Fairlie, 2020), and the literature highlights their limited access to resources required to survive a crisis (Cowling et al., 2020). Financial and operational advantages of larger firms help explain their superior performance compared to SMEs, making it difficult to empirically isolate links between DCs and SME size.

In response to COVID-19, an unprecedented US government policy measure provided us with a unique opportunity to test for the significance of DCs when certain challenges facing smaller SMEs were mitigated. The government passed the Coronavirus Aid, Relief, and Economic Security (CARES) Act in March 2020. In particular, its Paycheck Protection Program (PPP) and Economic Injury Disaster Loans (EIDLs) sought to stabilise small business finances in proportion to their employment size and operational expenses. PPP loans were forgivable if used to maintain existing payrolls or rehire workers. By the first week of May, over 90% of all loans totalling nearly US$500 billion were distributed among SMEs across the nation (Kapinos, 2021). As a result, unlike during previous crises, government relief aid helped to level the playing field for SMEs of different sizes. This allows us to seek and ultimately offer fresh insights into the role of DCs in SME performance.

To evaluate the significance of DCs, we proceed as follows. First, we draw from the relevant literature to generate our hypotheses. Next, we describe our empirical approach based on
regressions with data from a survey conducted during the first week of June 2020, about one month after the region in our survey began reopening its local economies after initial lockdowns in March–April. Finally, we discuss the implications of our findings for current and future studies, including studies of those disproportionately affected by COVID-19. In particular, due to our sample characteristics, our findings may be especially pertinent for rural SMEs and those owned by women and racial/ethnic minorities.

Hypothesis development

Do DCs help SMEs during COVID-19?

The COVID-19 pandemic created a novel and highly disruptive business environment. The empirical literature suggests that DCs enhance operational performance and revenue by helping firms adjust strategies, enter markets and modify organisational forms in dynamic settings (Fawcett et al., 2011; Teece et al., 2016; Vanpoucke et al., 2014; Wilhelm et al., 2015). Created as an extension of the resource-based view (RBV) of organisations that accommodates change, its focus on studying performance when settings are dynamic has been called ‘the Holy Grail of strategic management’ (Helfat and Peteraf, 2009: 91).

Our central premise is pithy: a theory designed to predict performance in dynamic settings should be especially useful during a pandemic that is highly volatile and uncertain. Consider the analysis by Teece et al. (2016) of the underappreciated difference between risk (with quantifiable probabilities) and uncertainty, as ‘deep uncertainty’ (unknown unknowns) shifts importance from efficiency-based to agility-based DCs. While risk can be managed via hedging or codified contingency plans, uncertainty favours flexible approaches. We believe this insight maps onto the business environment in the shadow of the COVID-19 pandemic. To be specific, the literature suggests that DCs are most helpful when industry turbulence is high, due to their ability to add value when settings are dynamic and disruptive (Helfat and Peteraf, 2009; Teece et al., 1997). We suggest that pandemics are more sudden and disruptive than conventional turbulence. The literature also suggests that the main way DCs add value is by facilitating adaptions that realign resource configurations with novel environments (Jarzabkowski and Wilson, 2006; Teece et al., 1997); we suggest that pandemics produce such novel environments. Finally, the literature suggests that the pace of adaptation can matter, and that DCs can help firms pivot quickly to facilitate fits between business models and changed environments (Pavlou and El Sawy, 2010; Wilhelm et al., 2015). We suggest that the combination of sudden disruption and extreme novelty during COVID-19 means that the ability of SMEs to decide how to pivot and do so quickly is more important than before, while the need for some to do so before going out of business is stronger.

Based on the preceding arguments, we believe that the DC lens is a promising candidate to help guide the plans of SMEs during the current pandemic that must be empirically tested. We therefore, suggest the following effects of DCs on operations and revenue:

Hypothesis 1a. DCs positively predict SME operating levels during COVID-19.

Hypothesis 1b. DCs positively predict SME revenue during COVID-19.

Does SME size moderate these effects?

Next, we explore whether the positive effect of DCs on performance is stronger for larger or smaller SMEs during the COVID-19 pandemic. The empirical literature suggests that organisational size is positively related to DC efficacy, due mainly to the inability of smaller firms to create well-funded
formal processes (e.g. via R&D or market research groups) that are routinised and systematised and, thus, more scalable and repeatable (Caloghirou et al., 2004; Hernández-Linares et al., 2020). Arend (2014) confirms that when analyses are restricted to SMEs (excluding larger firms altogether), smaller SMEs are less likely to possess formal, routinised DCs. Importantly, the more spontaneous, emergent processes that characterise the DCs of smaller SMEs may facilitate quick adaptations that outperform planned DCs when turbulence is extreme or unexpected (Pavlou and El Sawy, 2010; Wilhelm et al., 2015).

Teece et al. (2016) illustrate the trade-off between well-planned DCs of larger firms that rely upon scale-based efficiencies versus the spontaneous pivots of smaller firms by comparing the latter with Britain’s small but agile ships that, during the Battle of Trafalgar, outperformed large French and Spanish vessels via their ability to rapidly assess and quickly adapt to changing conditions. Chaotic conditions meant that strategies and capabilities built around the centralisation and coordination of large assets became more cumbersome than fearsome. Connecting this lesson to business strategy, Teece et al. (2016: 24) note that ‘hierarchy can be the enemy of agility’, leaving the resultant choice-set available to larger organisations ‘ill adapted to environments of rapid change’. During the chaos of COVID-19, then, the more emergent processes utilised by smaller SMEs may be more capable of quickly detecting and implementing beneficial adaptations.

Smallness, for instance, enhances a firm’s ability to recognise that customer needs and opportunities to meet them have changed, for example, via input from front-line employees in direct contact with consumers or the ability to easily envision how simpler resource bases might be quickly reconfigured to take advantage of new opportunities (Eggers, 2020; Kaltenbrunner and Reichel, 2018; Uhlaner et al., 2013). Next, smallness enhances the ability to quickly pivot from old to new business models, as the quick reconfiguration of resources is easier when organisations are agile and less saddled with embedded structures, routines, political factions, bureaucracy and other inertial anchors (Eggers, 2020; Kraus et al., 2020; Teece, 2011; Uhlaner et al., 2013). Finally, smaller SMEs are more likely to have personal relationships with key internal and external stakeholders in ways that facilitate the timely generation of new DCs (Borch and Madsen, 2007; Lee, 2021). In short, the types of DCs smaller SMEs possess are likely to help them more quickly adapt to the COVID-19 environment.

Consider the following example. A smaller SME may be managed by an owner who is intimately familiar with its day-to-day operations, and regularly interacts with most employees and customers. Opportunities to reconfigure resources to meet changing needs may thus be directly recognised by this owner, or by someone very close to them, for example, a key customer, supplier or employee. The subsequent decision to pivot can then be made quickly, perhaps at the sole discretion of the owner, who may be able to inspire immediate ‘buy-in’ from employees who feel like ‘a part of the family’, that is, ‘in this fight against COVID together’. Relationships with external stakeholders may also be more personal in nature, and this may facilitate the acquisition of scarce resources needed to enable the pivot, for example, a supplier or banker who has been a family friend for years may be more apt to come through in a pinch.

Two final factors that may affect the link between SME size and DC efficacy involve national governmental aid and the proportionality of DC effects to SME size. In March 2020, the US government enacted policy measures in response to COVID-19 under the CARES Act to specifically help small businesses. The infusion of working capital via its PPP and EIDL programme helped to level the playing field for SMEs of different sizes. In other words, the resource advantages possessed by larger SMEs before COVID-19 struck would have diminished to some degree due to federal aid. The absence of such advantages as potential confounding factors allows us to better disentangle the effects of DCs on SMEs on different sizes. With respect to proportionality, larger SMEs derive revenue from broader DC sets and spread development costs over larger bases.
Clampit et al. (Arend, 2014; Døving and Gooderham, 2008). This suggests an interesting crisis implication: effective DCs quickly implemented by smaller SMEs may comprise a larger percentage of their operations and revenue.

In sum, strengths related to smallness (e.g. spontaneous vs planned DCs) become more complementary during the COVID-19 crisis, resource gaps are closed by federal relief programmes and the proportion of DCs to small-firm operations and revenue rises. As seen in Figure 1’s illustration of our full theoretical model, we thus expect our posited main effects to be stronger for smaller SMEs during COVID-19:

**Hypothesis 2a.** SME size moderates the link between DCs and operating levels, with increasing SME size attenuating the positive effect of DCs.

**Hypothesis 2b.** SME size moderates the link between DCs and revenue change, with increasing SME size attenuating the positive effect of DCs.

### Methods

#### Sample

Our data draw from a survey conducted in the Southern US region during the first week of June 2020. Its objective was to understand COVID-19’s impact on SMEs and how well they recovered after stay-at-home and business shutdown orders were lifted beginning in May. It was disseminated to roughly 2500 businesses by a coalition of 27 local government and development entities (e.g. chambers of commerce and economic development corporations). The majority of the SMEs in the sample were located in the second largest US state, Texas, and were spread across 13 counties and 44 zip codes, many of which have a predominantly Hispanic population.

A total of 581 business owners or managers responded to the survey between 1 June and 5 June, resulting in a response rate of 23%. Given our focus on SMEs, we eliminated businesses with employees more than the official US small business classification cut-off of 500. The resulting sample consists of 338 observations for the outcome of Operating Level (H1a) and 304 for outcome of Revenue Change (H1b), with the difference in observations due to some respondents not answering all performance measure questions.

To test for non-response bias, we compared early and late responses (Armstrong and Overton, 1977). T-tests for independent samples showed that the mean differences between early and late respondents were not statistically significant in relation to the industry sectors (trade, hospitality, business services) each small business belonged to ($p > 0.05$ for all sectors), grant amounts received ($p > 0.05$) or urban-versus-rural locations ($p > 0.05$). Given these test results, we conclude that the study sample does not suffer from non-response bias.

#### Measures

The survey data allowed us to evaluate the role of DCs with respect to firm performance. To measure firm performance, we relied on data related to changes in operating and revenue indicated by respondents. Current operating level is defined as the degree to which an SME is operating with respect to its current versus ‘normal’ pre-pandemic operating capacity on a percentage basis (e.g. a restaurant that serves 20 patrons per hour during COVID that used to serve 40 is operating at 50% of its pre-COVID capacity). Revenue change is the corresponding difference versus pre-COVID-19 revenue. Although the data were self-reported, they are deemed reliable as their overall patterns
closely match findings from real-time geolocation data that track local business operations (Chetty et al., 2020).

With respect to DC measurement, Arend and Bromiley (2009) note that ‘a lack of consensus on how to measure dynamic capabilities’ has resulted in scholars adopting a variety of sometimes ‘unusual’ proxies extracted from archival data (p. 84). Self-created single- and double-item measures are common (Doving and Gooderham, 2008). The lack of established scales and a desire to capture discrete subchannels (e.g. the ability to sense new opportunities vs the ability to capitalise on them) have also led to the creation of long formative scales that aggregate DC perceptions across different processes and are adapted to settings on a study-by-study basis (Arend, 2014; Kump et al., 2019; Pavlou and El Sawy, 2010).

Due to the urgent nature of COVID-19 and a desire to maximise response rates while accommodating multiple stakeholders, the consortium conducting our survey allowed us to insert a limited number of questions, many of which were earmarked to measure dependent and control variables. After conferring with subject matter experts (to gauge construct validity) and consulting both the DC and multi-item measurement literatures (to assess the validity of general vs specific DC measures and single versus multi-item measures), we decided to employ a general, three-item DC measure.² Our DC variable was thus measured via a Likert-type scale, from disagree (1) to agree (5). This scale captured the views of respondents of their business capabilities during COVID-19 via three items: (a) ‘My business quickly developed new capabilities to meet customer needs during the stay-at-home period’, (b) ‘New operating capabilities developed after the stay-at-home orders allow my business to meet customer needs today’ and (c) ‘My business has continued to improve its capacity in meeting customer needs after the stay-at-home orders ended’. We applied principal component analysis to these three items. As a measure of scale reliability, the Cronbach’s α statistic of 0.71 suggests that the three instruments are internally consistent.

SME size as a moderating variable for the DCs-performance relationship and is measured by the number of employees as indicated by respondents in the survey. To minimise nonlinear effects due to staffing size disparities, we applied natural log transformation to the data. Other than the consideration of SME size, our analysis of the DCs-performance relationship is potentially biased if other variables are omitted from our regressions.

Based on preliminary regression analysis of the survey data, we include the following control variables in our regressions. The first set of variables controls for industry effects via dummy variables that equal 1 if SMEs are in trade, hospitality or business services sectors and 0 if in the goods production sector.³ Service-oriented industries outside of the business services sector were disproportionately impacted by COVID-19, as most hotels and restaurants in the hospitality sector shut down or reduced operations during and even after the April lockdown period. The goods-producing sector (which included agricultural and manufacturing SMEs) was deemed ‘essential’ during the stay-at-home order.⁴ In the trade sector, while most brick-and-mortar retailers were closed, grocery stores gained customer traffic. The operations of the business services sector (which includes financial, insurance, and management services) were least interrupted due to the feasibility of remote work.

To account for other potential influences on performance besides DCs, we controlled for external support SMEs received from the government, particularly through the CARES Act programmes.⁵ This is a set of three variables that indicate views of survey respondents on the effectiveness of government programmes to help their business move forward (1 = detrimental to 5 = very effective): (a) grants/loans under the CARES Act, (b) extended unemployment insurance under the CARES Act and (c) COVID-19-related protocols (e.g. social distancing guidelines, limited capacity). To explore whether COVID-19 affected businesses in a rural community differently than those in a city, we included a geographic location variable in our regression via a dummy
variable for businesses located in urban counties (as defined by the US Department of Housing and Urban Development). While the initial spread of COVID-19 impacted densely populated areas more quickly, rural areas were subject to the same sweeping lockdown orders that most governors imposed state-wide.

**Results**

**Data analysis**

Our empirical analysis is based on regressions with revenue change and operating levels as dependent variables and DCs as the key independent variable. Table 1 shows the descriptive statistics and the correlations of all variables in the regression models. Industry distribution among respondents closely resembles the composition of local economies in the Southern US region: 72% in service and 28% in goods-producing industries (e.g. manufacturing, mining). Within the service sector, 38% were in the business services sector (SD = 0.49), 13% in the hospitality sector (SD = 0.33) and 21% in the trade sector (SD = 0.40). SMEs were spread rather evenly between urban and rural counties, with 48% (SD = 0.50) in a city or metro area.

The DC variable mean is 4.08 (SD = 0.93), suggesting a relatively high level of DCs on average. By comparison, respondents expressed diverging views about the effectiveness of federal and local policy measures, collectively valuing government financial aid (mean of 3.65) more than extended unemployment benefits (mean of 2.87). Views on government imposed or recommended protocols were rather mixed.

In addition to variable means and standard deviations (SDs), Table 1 shows pair-wise correlations of our regression model variables. In line with our expectation, the correlation between DCs and operating level ($r = 0.31, p < 0.01$) is positive and statistically significant. The same result is observed for the correlation between DCs and revenue change ($r = 0.29, p < 0.01$). SME size is positively and significantly correlated with DCs ($r = 0.22, p < 0.01$), operating level ($r = 0.24, p < 0.01$) and revenue change ($r = 0.12, p < 0.05$).

Interestingly, high ratings regarding the satisfaction of respondents with CARES Act grants/loans are positively correlated with operating level ($r = 0.23, p < 0.01$), but the correlation with revenue change is weaker ($r = 0.09, p > 0.05$). Correlations between guidance/protocol variables and our performance measures are also weaker. Satisfaction with extended unemployment insurance under the CARES Act did not significantly correlate with our outcome measures, suggesting that the federal unemployment programmes benefitted unemployed workers rather than SMEs. Despite statistically significant correlations among some independent variables, variance inflation factors (VIFs) for the independent variables are all well below 5, mitigating concern of multicollinearity in the regression models. We thus proceed with regression models using the variables presented in Table 1.

Table 2 shows regression results for operating levels and revenue change. The first column of each of the two panels lists the coefficient estimates of the control variables. The second column adds the key independent variables of our study: DCs, SME size and their interaction term. The interaction term captures the effect of DCs on the independent variable conditional on SME size. A comparison of the regression results between these two columns highlights the explanatory power of DCs and SME size beyond that from the control variables that capture inherent business attributes.

Coefficient estimates of control variables confirm the larger adverse impact of COVID-19 on SME operating levels in the hospitality sector. On the contrary, the revenues of business services firms tended to be less affected, due in part to the feasibility for remote work. The results also
Table 1. Descriptive statistics and correlations.

|                      | Mean  | SD    | 1    | 2    | 3    | 4    | 5    | 6    | 7    | 8    | 9    | 10   |
|----------------------|-------|-------|------|------|------|------|------|------|------|------|------|------|
| 1. Sector hospitality| 0.13  | 0.33  |      |      |      |      |      |      |      |      |      |      |
| 2. Sector trade      | 0.21  | 0.40  | -0.19** |      |      |      |      |      |      |      |      |      |
| 3. Sector business services | 0.38  | 0.49  | -0.30*** | -0.40** |      |      |      |      |      |      |      |      |
| 4. Effectiveness: grants/loans | 3.65  | 1.12  | 0.01  | 0.10 | -0.00 |      |      |      |      |      |      |      |
| 5. Effectiveness: unemployment insurance | 2.87  | 1.21  | -0.06 | 0.03 | 0.05 | 0.36** |      |      |      |      |      |      |
| 6. Effectiveness: protocols | 3.28  | 1.19  | -0.18** | -0.03 | 0.17** | 0.28** | 0.39** |      |      |      |      |      |
| 7. Urban location    | 0.48  | 0.50  | -0.22** | -0.05 | 0.20** | 0.15** | 0.03 | 0.11* |      |      |      |      |
| 8. Dynamic capabilities | 4.08  | 0.93  | -0.11* | -0.02 | 0.14** | 0.27** | 0.21** | 0.21** | 0.15** |      |      |      |
| 9. SME size (ln)     | 2.16  | 1.51  | -0.03 | -0.06 | -0.06 | 0.12* | -0.07 | 0.12* | 0.28** | 0.22** |      |      |
| 10. Operating levels | 79.77 | 25.98 | -0.19** | 0.07 | 0.09 | 0.23** | 0.09 | 0.12* | 0.14** | 0.31** | 0.24** |      |
| 11. Revenue change (%)| -31.47| 28.90 | -0.08 | 0.00 | 0.15** | 0.09 | 0.10 | 0.19** | 0.08 | 0.29** | 0.12* | 0.32** |

SME: small and medium-sized enterprises.
*p < 0.1; **p < 0.01; ***p < 0.01.
emphasise the positive impact of government grants/loans on operating levels, and the positive impact of COVID-19 protocols on revenues. The roles of DCs and SME size in firm performance can be realised via sizable increases of the adjusted $R^2$ statistics when these variables are added to regressions. The coefficient estimates for DCs in both models are positive and statistically significant. For SME size, the coefficient estimate is positive and statistically significant for operating levels, but not statistically meaningful for revenue change. However, the interaction term between DCs and SME size is statistically significant in both models.

Test of hypotheses

To formally test our hypotheses, we utilised bias-corrected bootstrap-confidence intervals (CI) to confirm statistical significance (demonstrated when intervals do not include zero). Following Hayes (2018), we mean-centred independent and moderating variables.

According to Hypothesis 1a, operating levels of SMEs with higher DCs recovered faster once the economy reopened in May 2020. The estimated DC regression coefficient is statistically significant and positively related to operating levels ($b = 5.10$, $p < 0.01$; 95% CI = 1.91 to 8.30). Hypothesis 1a is thus supported. Hypothesis 1b predicts that SMEs with high DCs will experience a stronger recovery in their revenues once COVID-related business restrictions were lifted. The estimate for the revenue change variable is positive and statistically significant ($b = 6.78$, $p < 0.01$; 95% CI = 2.74 to 10.83)). Hypothesis 1b is thus supported.

Hypotheses 2a and 2b concern the moderating relationships from the perspective of SME size. The test results for these hypotheses draw from the coefficient estimates of the firm’s employment size in the two performance models. According to the estimation results, SME size negatively

| Table 2. Regression results. | Operating levels ($n = 338$) | Revenue change ($n = 304$) |
|-----------------------------|-----------------------------|-----------------------------|
|                             | $b$ (SE)                    | $b$ (SE)                    | $b$ (SE)                    | $b$ (SE)                    |
| Constant                    | 56.73*** (5.74)             | 64.67*** (5.71)             | −53.48*** (6.81)            | −41.80*** (7.20)            |
| Controls                    |                             |                             |                             |                             |
| Sector hospitality          | −11.30* (4.67)              | −12.20** (4.44)             | −1.66 (5.47)                | 3.92 (5.43)                 |
| Sector trade                | 4.39 (3.98)                 | 3.93 (3.83)                 | 4.52 (4.86)                 | 6.64 (4.55)                 |
| Sector business Services    | 2.99 (3.38)                 | 3.38 (3.26)                 | 5.62 (4.22)                 | 8.42* (4.06)                |
| Effectiveness: grants/loans | 5.06*** (1.35)              | 3.53** (1.31)               | 2.68 (1.58)                 | −1.57 (1.60)                |
| Effectiveness: unemployment insurance | 0.18 (1.26) | 0.32 (1.22) | 0.34 (1.52) | 0.22 (1.51) |
| Effectiveness: protocols    | 0.69 (1.30)                 | 0.21 (1.24)                 | 3.87* (1.53)                | 3.40* (1.52)                |
| Urban location              | 3.45 (2.85)                 | 0.26 (2.80)                 | 0.16 (3.44)                 | 0.33 (3.39)                 |
| Dynamic capabilities        | 5.10** (1.62)               | $H1$                        | 6.78** (2.05)               | $H2$                        |
| SME size (ln)               | 3.55*** (0.95)              |                            | 2.09 (1.16)                 |                            |
| Dynamic capabilities × company size (ln) | −2.77** (1.06) | $H3a$                        | −2.74* (1.23)               | $H3b$                        |
| Adjusted $R^2$              | 0.08                        | 0.22                        | 0.04                        | 0.14                        |
| $R^2$ change due to interaction | 0.02                        |                            | 0.01                        |                            |

SME: small and medium-sized enterprises.
Independent and moderating variables were mean-centred for hypotheses testing.
*p < 0.1; **p < 0.01; ***p < 0.01.
moderates the relationship between DCs and (a) operating levels \( (b = -2.77, p < 0.01; 95\% \text{ CI} = -4.86 \text{ to } -0.68) \) as well as (b) revenue change \( (b = -2.74, p < 0.05; 95\% \text{ CI} = -5.35 \text{ to } -0.14) \). Our data thus support Hypotheses 2a and 2b, which predicted that the relationship between DCs and firm performance would be weaker for larger SMEs.

To further explore the nature of different relationships between DCs and performance with respect to larger (closer to our upper limit of 500 employees) versus smaller SMEs (with very few employees), we conduct a simple slope analysis. Figure 2 shows the results for smaller \((-1 \text{ SD})\),
average-sized and larger (+1 SD) SMEs. There is a statistically significant and stronger (deeper slope) relationship between DCs and SME operating levels when SME size is relatively smaller ($b = 9.23$, $p < 0.001$; 95% CI = 5.56 to 12.96) or around the mean ($b = 5.10$, $p < 0.001$; 95% CI = 1.90 to 8.30), but not when it is 1 SD larger ($b = 0.94$, $p > 0.05$; 95% CI = −4.19 to 6.08). Thus, when SMEs are relatively smaller, increasing DC levels enhance operating levels. However, DCs do not significantly facilitate an increase in SMEs operating levels when SMEs are 1 SD larger than the mean size.

The corresponding results for revenue change reveal a similar pattern (see Figure 3), as the DCs and revenue change relationship is both statistically significant and stronger for relatively smaller ($b = 10.86$, $p < 0.001$; 95% CI = 6.22 to 15.51) and mid-sized ($b = 6.78$, $p < 0.01$; 95% CI = 2.74 to 10.83) SMEs. The hypothesised relationship is not statistically significant for the relatively larger ones ($b = 2.70$, $p > 0.05$; 95% CI = −3.71 to 9.11).

Because the size threshold for SMEs varies around the world, we chose to confirm the robustness of our results by running additional regressions with samples using alternative SME employee cut-offs of 150 and 250. Table 3 compares regression results with alternative SME size thresholds. Within our sample, differences in size limits do not alter the overall finding for the absence of moderating effects among ‘larger’ SMEs, supporting the generalisability of our results for SMEs when lower size thresholds than 500 employees are adopted.

**Discussion**

*Implications for research and practice*

While the burgeoning COVID-19 literature has yielded crucial insights, a conspicuous gap exists with respect to quantitative tests of whether managerial actions were effective during COVID-19. As conventional wisdom and findings generated before COVID-19 may or may not generalise to
the COVID-19 setting, we study business conduct and performance during COVID-19. We focus on SMEs because they have been hit especially hard and need help.

As hoped, our findings confirm that the positive effect of DCs during typical times continued during COVID-19. Interestingly, we also found strong evidence regarding firm size that is contrary to popular findings in the literature (Eggers, 2020; Lee, 2009). Our findings regarding SME size extend DC theory by introducing a new boundary condition that suggests that under certain conditions (e.g. during crisis), the established positive link between size and DC efficacy is reversed, as smallness helps rather than hurts performance. More important perhaps, are the implications of our findings for practice. Managerial guidance that has been empirically validated during COVID-19 is in short supply. We can now say, with some degree of confidence, that SMEs that consider employing DCs – especially during COVID-19. In fact, our finding that DC efficacy was strongest for smaller SMEs suggests that no SME manager, regardless of how small their business is, should assume that DCs are only for businesses bigger than theirs. The literature describes several SME channels that facilitate their ability to create DCs via spontaneous and emergent processes that allow SMEs to pivot more rapidly than larger firms. Our results suggest that these processes may be especially valuable during the chaos of COVID-19. For example, we suggest that SME managers pay particular attention to the fact that they are well-positioned to quickly receive direct information from stakeholders (e.g. front-line employees, customers, suppliers) with respect to emerging market gaps. SME managers would also do well to take advantage of relationships with key external stakeholders (e.g. lenders, suppliers) that are more likely to be personal in nature versus less personal links between large corporations. And SME managers should keep in mind that resource reconfigurations are easier when resource bases are simpler and when ‘buy-in’ can be achieved by personally and quickly appealing to a small number of key employees.

An illustrative real-world example is provided by Flags of Valor, an SME employing a majority-disabled workforce that makes wooden flags. It relied on furloughs, working-hour cuts and social distancing to stay alive, until it spotted and pivoted towards an entirely new market: craft kits for schoolchildren on extended breaks. Restaurant Ocean234, meanwhile, relied on takeout orders to stay afloat, until a trip to the grocery store and a conversation with a local non-profit organisation.
provided a eureka moment for owner, Danielle Rosse. Leveraging relationships with her suppliers allowed her to utilise existing meal preparation capacity to feed hungry children who were not in school, while extending her access to hard-to-find items like hand sanitiser, eggs and toilet paper to the community. Within 24 hours, it began transforming into a community market that not only thrives during COVID-19 but is viewed as an important citizen that delivers vital services when others cannot.

In sum, our advice for SME managers is to exploit these DC channels that are more readily available to SMEs than to larger firms. Combine knowledge from studies that has been empirically verified during COVID-19 with your own local knowledge to spot opportunities and leverage personal relationships. Use this to pivot your strategy if possible, but if not, then make the tactical adjustments needed to survive until it is possible or until COVID-19 passes.

Limitations and future research

To shed light on business performance during a critical moment of the pandemic, the survey in our study was conducted during a short period, resulting in a limited data sample. Our empirical work could be supplemented by subsequent surveys with larger and richer samples. In addition to validating our findings, our study would be more fruitful with extensions in several directions. First, we know that crises may have disparate effects for women and minorities in SMEs (Manolova et al., 2020; Martinez et al., 2020), and that outcomes for them may differ when comparing larger firms with SMEs (Saridakis et al., 2021). Thus, our work on SME size as a moderator during crisis could be extended to discretely analyse performance predictors of SMEs owned by woman and ethnic minorities.

Second, while our study predicted that DCs would be especially useful for SMEs during COVID-19, as smaller firm traits like agility complement crisis settings, we were unable to directly measure these traits. Future studies may measure effects within direct and indirect, and alternate channels (e.g. proportionality versus agility) while testing channel-specific boundary conditions (e.g. perhaps agility is only useful in the presence of other traits).

Third, the empirical evidence from our study could be enhanced with an analysis of ‘before’ and ‘after’ samples. Our focus was not to compare DC efficacy during versus after COVID-19. It was, rather, to help SMEs as soon as possible, by testing whether DCs helped during COVID-19 or not. Follow-up studies, however, may compare the role of DCs during versus after COVID-19. Future studies may also conduct deeper, more granular examinations of discrete industries, or focus on the smallest SMEs (e.g. with less than 10 employees).

Finally, our hypothesis test results would be more insightful with a more granular DC scale. Teece et al. (2016), for instance, offer one of several major DC paradigms that deconstructs DCs into three discrete yet complementary subcomponents: sensing and seizing opportunities, and transforming resource configurations to take advantage of them. Future studies with surveys explicitly designed for scholars may measure and compare subcomponents.

Conclusion

This study informs the SME-crisis literature by mapping a key strategic management construct onto actions that SMEs can apply during crisis, and then testing its efficacy during COVID-19. In summary, the types of DCs that SMEs are likely to generate improved operating performance and revenues during COVID-19, with stronger benefits for smaller SMEs. During a very rare health and macroeconomic crisis such as COVID-19, it is therefore imperative that SMEs consider mov-
ing beyond tactical adaptations towards the creation of DCs that facilitate discovery-driven strategic pivots.

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Notes
1. To measure current operating levels, respondents were asked to indicate the operating level of their business at the time of the survey against the benchmark of 100% of their ‘normal’, pre-pandemic capacity. The range is between 0 and 100. For the question on revenue, respondents were asked to indicate the percentage change between the level during the survey and the ‘normal’ pre-pandemic level.
2. Regarding the efficacy of general versus specific dynamic capability (DC) measures, Pezeshkan et al. (2016) documents 173 tests of general measures on measures of performance and/or competitive advantage, with support ranging from 54% to 67% depending on whether effects were direct or moderated. This compares favourably to 45%–59% of supported tests when using specific measures. Furthermore, studies comparing the validity of multi- versus single-item measures suggest that (a) multi-item scales are ‘unnecessary’ and ‘single-item measures should be used’ (Bergkvist and Rossiter, 2007: 175, 2009: 607) or, conversely, (b) multi-item measures show larger validities in most cases, but the magnitude can be small, and under certain circumstances (e.g. when cross-item correlations are less than 0.3 or general questions are asked), ‘single items appear to be a reasonably safe bet’ (Diamantopoulos et al., 2012). While we do not use a single-item DC measure, these studies (and the fact that our DC correlations never exceed 0.3) do nevertheless provide a degree of reassurance with respect to the utility of our three-item instrument (especially since this is, essentially, an exploratory research note with a predictor that is, at this stage, general).
3. While all industries were categorised according to established industry codes, we grouped some industries together into larger clusters because they had very few observations: trade sector (wholesale, retail and transportation), hospitality sector (arts and entertainment, and accommodation and food services) and business service sector (information, finance, real estate, professional and management).
4. For industry categories, our benchmark, the goods production sector (agricultural, mining, manufacturing), was left out of the model to avoid perfect collinearity in estimations.
5. While we obtained information from some firms about the actual loan amount received and the number of employees retained because of the Coronavirus Aid, Relief, and Economic Security (CARES) Act Policies, we omitted them because these numbers were correlated with the self-evaluated CARES Act measures, and also because they would have substantially reduced our sample size due to the fact that the majority of small and medium-sized enterprises chose not to answer these questions.

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