DISCUSSION PAPER SERIES

DP15987
(v. 2)

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ORGANIZATIONAL ECONOMICS

CEPR

ISSN 0265-8003

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Discussion Paper DP15987
First Published 31 March 2021
This Revision 04 July 2022

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This Discussion Paper is issued under the auspices of the Centre's research programmes:

- Organizational Economics

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JEL Classification: D22, D24, L20, L25, M11

Keywords: Management, firm performance, COVID-19

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Acknowledgements
We are thankful to Nick Bloom, Luca Citino, Leonardo Iacovone, Alessandro Ilaria, Mariana Pereira-Lòpez, Raffaella Sadun, Chad Syverson, Alessandro Zattoni, and seminar participants at EIEF, LUISS University, Bank of Italy, the Empirical Management Conference (2020), NBER Summer Institute (2021), CAED (2021), ACEGD (2021) and IIM Bangalore for comments and suggestions. Fabiano Schivardi thanks the ERC for financial support (ERC grant 835201). The views expressed herein are those of the authors and are not necessarily those of the Bank of Italy.

Management practices and resilience to shocks: Evidence from COVID-19*

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1 Introduction

A large body of evidence indicates that structured management practices (SMPs), broadly defined as a set of management practices based on formalized procedures to set targets, monitor outcomes and reward employees, are an important determinant of firm performance. Cross-country studies such as Bloom & Van Reenen (2007) suggest that SMPs explain up to a third of the cross-country differences in firm productivity. Within-country studies based on randomized control trials show that SMPs have a causal effect on performance (Bloom, Eifert, Mahajan, McKenzie & Roberts 2013, Bruhn, Karlan & Schoar 2018). Based on these, a consensus is emerging that building up on SMPs can boost firm performance (Bloom, Sadun & Van Reenen 2016, Giorcelli 2019, Schivardi & Schmitz 2020).

While the relationship between SMPs and performance is well-established for "business as usual", little is known about whether such practices help or hinder the response of firms to large shocks. From a theoretical perspective, there can be both positive and negative effects of SMPs on the firm capacity to adapt to a shock. On one hand, organizational practices centered around monitoring, targets and incentives provide firms with tools and information to sense opportunities and threats, and address them by re-configuring and transforming firm organization (Teece 2007). On the other hand, these practices may impose excessive structure and constraints on processes inside the firm, hindering flexibility and managerial discretion during a time in which these are particularly valuable (Augier & Teece 2009).

Surprisingly, the effects of SMPs on firms adaptation capacity are still poorly understood, arguably due to the empirical challenges involved in addressing this question. In fact, the scant empirical literature, which we review below, is inconclusive. In this paper, we exploit an ideal setting to study the effects of SMPs in the face of a large shock: the spread of the COVID-19 pandemic in Italy. Italy was the first Western country to be affected by the pandemic, whose effects on the economic environment could neither be known to nor anticipated by Italian firms. This was in contrast to the subsequent spread of the pandemic in other industrialized countries, where the Italian experience served as a precedent. The virus spread from the end of February 2020 with a speed and virulence that was completely unexpected. The Italian government responded via a bundle of measures that included widespread social distancing and school closures from the 8th of March, and a country-wide lockdown from the 22nd of March to the beginning of May. Firms had to adapt to a completely new and dramatically different environment within a very short period of time.

We study the role of management practices in the Italian experience using extremely rich information from firm surveys conducted by the Bank of Italy through the evolution of the pandemic. Our primary data source is the 2020 INVIND survey, an annual survey conducted since 1984 and representative of firms with at least 20 employees. The 2020 vintage of the INVIND survey includes a module on SMPs based on the Management and Organizational Practice Survey (MOPS) used by Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019). The INVIND MOPS module explicitly refers to practices in place in 2019, that is, before the spread of the pandemic, and we use this to construct a management score. The survey reports, among other things, expected sales growth. Expectations have the advantage of being highly reactive to changes in the economic environment. The survey was conducted between February and May of 2020, which allows us to track how expectations change week by week across the evolution of the pandemic, and to relate such changes to the management score. We leverage this feature to construct our identification strategy.

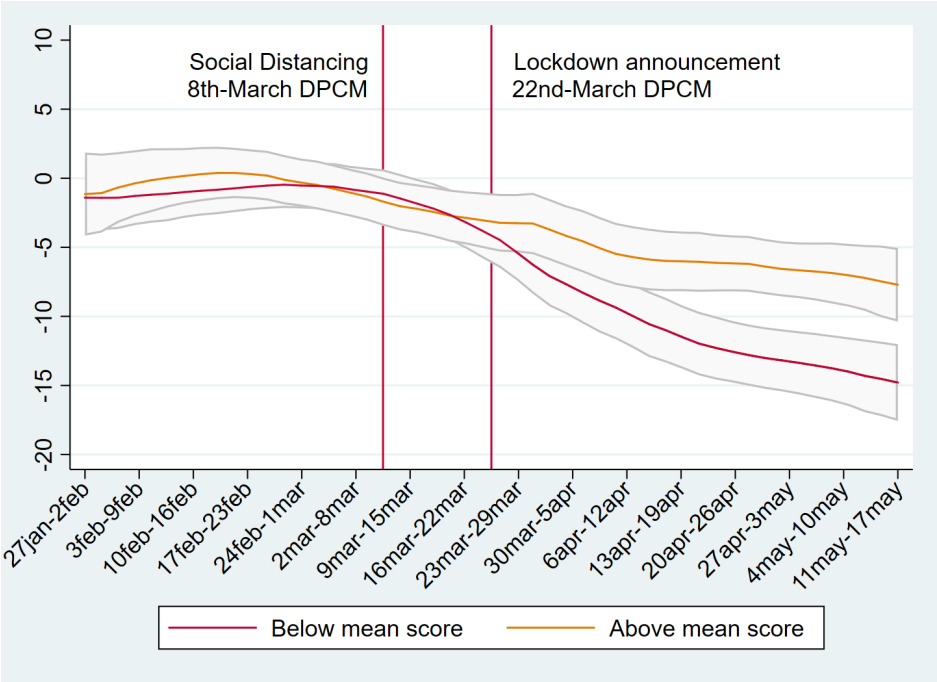
Figure 1 illustrates our key result. We plot the evolution of the average expected sales growth in 2020 by the week of response separately for firms with management scores above and below the mean. Before the announcement of the lockdown, which can be seen as the "normal" period, no difference in expected sales is visible between the two groups.[1] As the pandemic spread, firms' expectations about sales growth quickly deteriorated. However, this decline was not uniform: rather, firms with high SMPs reported substantially lower declines in expected sales.[2] This graphical evidence is fully confirmed in a regression setting, where we estimate the relationship between expected sales growth and the management score separately for firms that answered the survey before the lockdown announcement (for brevity, "pre-lockdown"), and after it ("post-lockdown"). Post-lockdown, SMPs are associated with lower expected sales drops: in our preferred specification, one standard deviation increase in the management score increases expected sales growth by 2.4%, about 30 percent of the average drop (-8.3%). The effect is twice as large as the one estimated the pre–lockdown, and the coefficients are statistically different from each other. This indicates that, rather than hindering firms, SMPs turned out to be an asset particularly useful in tackling a large

[1] This is not at odds with the literature cited above that shows that firms with higher SMPs perform better. That evidence, in fact, shows that such firms are more productive, larger, more profitable etc. *in levels*. This does not imply that they also constantly grow more, a much stronger requirement in terms of performance.

[2] For firms that responded in the last two weeks (from May 4th to May 17th, 2020), the drop in sales is twice as large for the firms with below average management scores relative to the firms with above average scores: -15% against -7.5%.

shock.

Figure 1: Expected sales growth over the evolution of COVID-19 split by management score



Note: The y-axis of the graph shows smoothed values of mean YoY expected sales growth from the 2020 INVIND survey across weeks reported on the x-axis for firms in two groups: those with above mean management score, and those with below it. The outcome variable is calculated through kernel-weighted local polynomial regressions of YoY expected sales growth on week of response for firms. The bands shown are 95% confidence intervals and the vertical lines correspond to the announcement dates of widespread social-distancing restrictions in Italy (March 8th) and country-wide lockdown (March 22nd). A detailed description of the management score is in the text and Appendix B.

We use the richness of our data to corroborate this result by addressing various empirical concerns. We first show that firms that answered the survey before and after the lockdown are indistinguishable in terms of characteristics, consistent with the hypothesis that selection into the period of response is random. Next, we use information on *realized* sales growth from the 2021 vintage of the INVIND survey to show that our findings are robust to the concern that sales expectations might reflect systematic differences in expectation formation across firms. Consistently, we find no correlation between the expectation error, defined as realized minus expected sales growth, and the management score. Third, we control for a rich set of firm characteristics that are typically correlated with management practices and might also affect the response to the shock. These include size, productivity, export status, human capital and technology. Our results are extremely robust: even when we allow for the effects of each characteristic to differ before *and* after the lockdown announcement, the estimated

coefficient of the management score in the period after the lockdown announcement remains unchanged. In fact, the management score is the only feature that consistently emerges as significant in all specifications. Finally, we show that the *channels* through which the COVID-19 shock affected firm operations (lack of demand, labor issues, finance, etc.), as reported in a short ad-hoc survey (the ISECO survey) conducted at the onset of the country-wide social distancing campaign, are orthogonal to our management measure, addressing the concern that the shock may be systematically correlated with SMPs.

Next, we examine the *strategies* firms put in place to counteract the shock using qualitative information from the ISECO survey. Relative to doing nothing, a high management score is significantly associated with the adoption of strategies related to demand management, supply chain management, labor management, and investment planning. This suggests that firms with high SMPs responded more to the COVID-19 shock overall. Finance-related strategies bear no relationship with the management score, suggesting firms with high SMPs relied more on responding to the shock with actual changes in their operations, rather than on liquidity and debt management.

A group of strategies highly associated with structured management were labor policies, which also include the adoption of remote work. We posit that remote work may be easier to implement for firms with SMPs: when managers cannot track the input of workers through direct monitoring, output-based incentives may work better. This is easier when the firm has in place practices to set goals, measures outcomes, and reward workers accordingly. Our analysis confirms this. The management score is positively and significantly associated with increases in the share of employees engaged in remote work in 2020, controlling for the corresponding share in 2019. Specifically, we find that the monitoring and incentives components of the management score are driving the results, consistent with our hypothesis. While remote work might have contributed to reducing the impact of the pandemic, we show that the effects of SMPs extend beyond it: in fact, when we directly include the usage of remote work in the performance regression, we find that the effect of the management score on expected sales is basically unchanged.

Our results on the effects of SMPs during the COVID-19 crisis contribute to different strands of literature. SMPs are primary "operational capabilities", that is, "the capabilities that a firm uses to earn a living in the present" (Helfat & Martin 2015). In this paper, we ask if they add or subtract to the firm's "ability to adapt to changing conditions in their industry environments" (Sirmon & Hitt 2009), that is, to the firm's "dynamic capabilities" (Teece,

Pisano & Shuen 1997). Theoretically, the answer to this question is ambiguous. Dynamic capabilities "enable an organization to alter the way in which it earns a living in the present" (Helfat & Martin 2015). On the one hand, structured measurement, targets and incentives might be instrumental not only for operations, but also for sensing opportunities and threats, seizing them, and transforming the organization. According to Teece (2007), these activities constitute the micro-foundations of dynamic capabilities. On the other hand, SMPs might impose excessive structure when flexibility is particularly needed. For instance, Augier & Teece (2009) stress the importance of managerial discretion to address technological and market changes. Helfat, Finkelstein, Mitchell, Peteraf, Singh, Teece & Winter (2009) point to the role of individual managers and of their characteristics vis-à-vis the structured routines built in SMPs. We show that, on balance, SMPs positively contribute to a firm's dynamic capabilities. Our findings complement the burgeoning literature on SMEs performance and dynamic capabilities during the COVID-19 pandemic (Clampit, Lorenz, Gamble & Lee 2021, Dyduch, Chudziński, Cyfert & Zastempowski 2021, Rashid & Ratten 2021).

Our paper also contributes to the recent but rapidly growing literature on management and firm performance (Bloom, Sadun & Van Reenen 2012, Bloom et al. 2013, Bruhn et al. 2018, Bender, Bloom, Card, Van Reenen & Wolter 2018, Schivardi & Schmitz 2020). We focus on the role of SMPs in responding to large shocks. The body of recent work on the role of firm organization in responding to large shocks demonstrates that we cannot naively extrapolate off of our knowledge of normal times.[3] The scant evidence on this, based on the Great Recession, is inconclusive. Cette, Lopez, Mairesse & Nicoletti (2020) find results that are in line with ours, with cross-country evidence that SMPs were associated with firm resilience and lower declines in productivity in the period following the Global Financial Crisis. Englmaier, Galdon-Sanchez, Gil & Kaiser (2020) find that flexible management styles dominated structured management for firm performance during 2007-2009 in Spain. In addition to using a different shock, our work differs along other dimensions that limit the comparability with these two papers. Cette et al. (2020) use sectoral measures of performance and a country-level measure of management practices, while we use firm-level data for both. Englmaier et al. (2020) use productivity as their preferred measure of performance, while

[3]For example, Aghion, Bloom, Lucking, Sadun & Van Reenen (2021) find that, during the Great Recession, decentralization of decision making became particularly useful to tackle the increased turbulence firms faced. Using stock market data for Italy, Amore, Pelucco & Quarato (2022) show that firms owned and managed by a family, usually associated with poorer performance, had higher abnormal returns during the pandemic period. For the US stock market, Alfaro, Chari, Greenland & Schott (2020) find that, contrary to normal times, investors valued firms with high labor intensity, which could more easily cut costs by shedding labor.

we use expected sales. In our setting, expectations are instrumental to detect the rapid change in performance that occurred with the spread of the pandemic, and to set up a test of differential effects of SMPs in crisis with respect to "normal" times.[4] At a deeper level, the different conclusions could be due to the different nature of the shocks. While the Great Recession was essentially demand-driven, and might have entailed limited scope for reorganization to tackle it, the COVID-19 crisis started out as supply-driven, as firms were facing strong restrictions on the way they could operate, as well as disruptions in the supply chain. SMPs might have proven particularly useful to address the need for reorganization that emerged during the pandemic.

We also contribute to the literature on personnel economics, which has shown that structured human resource practices positively affect firm productivity (Ichniowski, Shaw & Prennushi 1997, Lazear & Oyer 2012). The abrupt, large-scale shift to remote work that many organizations undertook during the pandemic presented new challenges for work organization. The few studies available, typically based on detailed data from one organization, find contrasting effects on productivity, possibly depending on the need of coordination and communication of the specific firm activity (Emanuel & Harrington 2021, Gibbs et al. 2021). Using survey data from employees of a large international corporation, Flassak, Haag, Hofmann, Lechner, Schwaiger & Zacherl (2021) show that remote work entails more standardization of processes and broader autonomy to address the reduced possibilities for direct monitoring. Consistently, we provide evidence from a representative sample of firms that monitoring and incentives practices were particularly useful in shifting to remote work.

The rest of the paper is organized as follows. Section 2 describes the timeline of outbreak of COVID-19 in Italy. Section 3 describes the data sources and presents summary statistics of the variables used in our analysis. In Section 4, we describe our empirical strategy and discuss identification challenges. Section 5 documents our results on the role of SMPs for firm performance pre- and post-lockdown, along with robustness results. In Section 6, we examine firm strategies associated with higher SMPs during lockdown. In Section 7, we conclude.

[4]Note also that measuring productivity during our period of study is extremely challenging. The pandemic had strong and differentiated effects on hours worked, given the restrictions imposed on non-essential sectors and the massive government interventions to sustain employment through furloughing. Moreover, there is evidence that moving to remote work changes the number of hours worked (Gibbs, Mengel & Siemroth 2021). It is therefore essential to have a very precise measure of effective hours worked, which we do not have in our data.

2 The COVID-19 shock in Italy

The outbreak of the COVID-19 pandemic required extreme measures limiting freedom of movement, which culminated in the decision of most countries to impose a lockdown of non-essential economic activities.[5] While some Far Eastern countries, which had gone through the experience of the SARS, were more prepared to face the COVID-19 pandemic, Western industrialized countries had not witnessed an event of such magnitude since the Spanish Influenza of the beginning of the 20th century. These countries had to draft and enact plans to contain the effects of COVID-19 in a very narrow time frame, and with limited information.

Italy was the first Western country to be badly affected by the pandemic. The first official case of COVID-19 in the country was found on February 21st, after which the virus spread in a few densely populated provinces with a speed and virulence that was completely unexpected. The first restrictions to mobility were introduced with the Prime Ministerial Decree[6] –henceforth DPCM– of February 23rd, more than two weeks before any such measures in the other big European countries (Poland and Spain followed on March 9th). Initially, the measures were confined to 11 municipalities in Lombardy and Veneto, which were declared *red-zones*. The red-zone status limited mobility to and from these municipalities and imposed *measures of social distancing*, i.e., it shut down schools, suspended social events, closed retailing shops selling non-essential goods and services, instituted the quarantine for people affected by the virus, and imposed the use of masks and other individual protection devices. In the following days, the Government issued a series of emergency DPCMs that demonstrate the mounting attempt to keep up with the spread of the pandemic. On March 8th, the red zone status was extended to fifteen additional provinces, and within three days the measures of social distancing were applied to the whole country (the "stay at home" campaign, which shut down all retail shops, except those in a restricted list). On March 22nd the measures to counteract of the pandemic were scaled up with the introduction of the *lockdown*, consisting of the shutting down of plants producing any goods and services except the ones in the list of essential goods or those belonging to related value chains. Firms were still allowed to continue activities which could be performed by workers at home via remote work. The same list was revised on March 25th. Mobility across regions was also suspended, except for work or health reasons. Eventually, the efforts to contain the spread of the virus

[5] Notable exceptions are Sweden as well as UK and Brazil in the early phase of the outbreak.

[6] A decree is a provisional measure having the force of law that the Government can issue in extraordinary cases of necessity and urgency. It must be confirmed by the Parliament within sixty days from its publication.

were successful, and the restrictions were progressively lifted. On May 4th the reopening of suspended activities started. At the beginning of June, mobility across regions was resumed.

The fact that Italy was the first Western country to be affected makes it a particularly interesting case to study firm response to the pandemic, as for Italian firms it was an entirely unanticipated shock.[7] For the initial part of the pandemic, Italy constituted a lab other countries looked at to prepare their policy response as the pandemic spread. From the perspective of firms in other countries, the lockdown in Italy served as a precedent for the government policies they could anticipate. For example, Buchheim, Krolage & Link (2020) find that, despite the prior spread of the pandemic in Asia, firms in Germany revised their expectations about business conditions twice: first, when COVID-19 began to spread in Europe for the first time, with the increasing restrictions in Northern Italy, and second, following the announcement of the German national lockdown. Italian firms on the other hand, had to adapt very quickly and without any guidance to a dramatically changing business environment.

In Italy, the pandemic took a heavy toll on economic activity both directly, through the nation-wide lockdown, and indirectly, through declines in aggregate demand. The lockdown has directly impacted over one fourth of economic activity (27.7% of the value added). When input-output linkages are also considered, one third of economic activity has been affected by the lockdown.[8] In the first quarter of 2020 Italian GDP decreased by 5.5% QoQ (5.6% YoY); in the second quarter it dropped by 13% QoQ (18% YoY), while increasing by 15.9% QoQ in Q3 (but still decreasing by 5% YoY). Overall, the growth rate of GDP was -8.9% in 2020. COVID-19 also came with a wider cost to Italy with an appalling death toll of approximately 75,000 people during 2020 only.

[7]Appendix Figure A1 plots the evolution of the main Italian stock market index, the FTSE MIB, for 2020. The index increased from 23,237 on January 31 to 25,477 on February 19 (a 9% increase), when it reached a peak, confirming that the shock was totally unexpected. Then it started to fall, with even a small recovery on March 4th, after which the fall was precipitous, reaching 14,894 on March 12, right after the introduction of the social distancing measures of March 8. One might argue that firms exposed to foreign markets, particularly China, might have recognized the extent of the shock earlier. Appendix Figure A2 reports the evolution of expected sales growth separately for exporters and non exporters and for importers from China versus firms that do not import from China. The results suggest that foreign exposure did not convey information to Italian firms. If anything, expectations of firms engaged in foreign activities reacted later.

[8]The provision that the value chain of essential activities may continue to operate has reduced the share of value added suspended; conversely, essential activities did not work at full capacity because the demand from non-essential activities plummeted (Bank of Italy 2020, chapter 6, page 80).

3 Data

The Bank of Italy administered three firm surveys during 2020 that we use to analyze the response of firms to COVID-19: the INVIND Survey, with expectations about sales growth and a management practices module, the ISECO survey, to measure the impact of COVID-19 restrictions on firms, and the SONDTEL survey, on remote work. In addition, we use the INVIND 2021 survey, from which we construct realized sales growth in 2020 over 2019. This section describes each of our data sources, the construction of our key variables, and summary statistics of the baseline sample.

3.1 The INVIND Survey

The INVIND survey is the annual business survey conducted by the Bank of Italy since the early 1980's.[9] It collects high quality data on firms and is regularly used in research (see, among others, Guiso & Parigi 1999, Pozzi & Schivardi 2016, Rodano, Serrano-Velarde & Tarantino 2016). The survey is administered to approximately 5,000 firms and is a representative sample of manufacturing and services firms with at least 20 employees.[10] It is conducted directly by the regional branches of the Bank of Italy and the data collected are used for the official statistics and the econometric models of the Bank of Italy, ensuring high quality of responses.

Among other things, the INVIND survey collects firm expectations about various outcomes, such as sales, investment, and employment. The survey has been collecting expectations since the early nineties, and such questions have been extensively used in previous research, which finds that they track actual performance well.[11] We use expectations of sales growth in 2020 as our preferred performance measure because, as we argue more rigorously when discussing our empirical strategy in Section 4, expectations are very reactive to changes in the economic environment, a feature crucial to our identification strategy. We later also augment our results using measures of realized sales from the INVIND 2021 survey. We focus on sales because they depend on the extent to which the firm was subject to the exogenous COVID-19 shock and on the firm's capacity to contain its effects, while other variables, such

[9] Details about the INVIND survey can be found at https://www.bancaditalia.it/pubblicazioni/indagine-imprese/2019-indagine-imprese/index.html?com.dotmarketing.htmlpage.language=1.

[10] The sample of interviewed firms is quite stable: the same firms are interviewed every year, adjusting only for attrition and to balance the age profile against that of the population.

[11] See Guiso & Parigi (1999) for early work, and Ma, Ropele, Sraer & Thesmar (2020) and Coibion, Gorodnichenko & Ropele (2020) for more recent work.

as employment or investment, are more directly under the control of the firm, and therefore more a measure of the firm's decisions than of its performance.[12]

The second key ingredient of our analysis is the level of SMPs adopted by firms. We obtain this from a module of eight questions on structured management practices included in the INVIND survey of 2020. The design of the module is based on a specialized survey instrument developed and administered by the US Census Bureau.[13] Crucially for us, the questions explicitly refer to the practices that were *already existent* in the organization in 2019, that is, strictly before the pandemic. They therefore represent the stock of practices the firm was already endowed with when hit by the pandemic.[14] Finding an effect of practices would indicate that it is extant monitoring and incentive practices that matter to tackle the pandemic shock, rather than changes thereof, indicating that operational capabilities are useful not only in "business as usual" conditions, but also – and possibly especially – to adapt to a sudden change in environmental conditions (Helfat & Martin 2015).

The survey investigates the use of SMPs along three dimensions: monitoring, targets, and incentives. The monitoring questions ask firms about the collection and use of information such as Key Performance Indicators (KPI, henceforth) to monitor and improve the production process. The targets questions ask about the design and dissemination of production targets, and the incentives questions ask about bonuses, promotions, reassignment and dismissal practices, and how closely they are linked to employee and team performance.

To retain comparability with previous work, we closely follow Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) in the construction of a management score from the survey responses. We restrict our sample to firms with complete responses to the management module, which we define as answering at least 5 of the 8 questions. We construct an aggregate management score for a firm as follows. Each question is first scored on a 0-1 scale (low scores indicating lower use of SMPs). The scores for individual questions are then aggregated by taking the average of the question-wise scores. Next, we standardize this aggregate measure across firms, which transforms the measure to have mean

[12] In addition, the evolution of employment was heavily influenced by government policies introduced during the pandemic that forbade layoffs and offered an encompassing employment protection scheme.

[13] Details about the Management and Organizational Practices Survey (MOPS) administered by the US Census Bureau can be found at https://www.census.gov/programs-surveys/mops.html.

[14] One potential concern is that firms can also implement changes in SMPs during the pandemic. We believe that this is not a concern for our identification strategy. First, as explained above, firms were explicitly asked to refer to practices in place in 2019, strictly before the pandemic outbreak. Second, even in the presence of reporting bias reflecting changes implemented in 2020, it is unlikely that firms were able to substantially change their practices in the short time span of 16 weeks that we use in our main empirical analysis.

zero and standard deviation 1. This is the score we will use in our analysis. Similarly, we create standardized sub-scores on monitoring, targets and incentives for each respondent using specific questions in the MOPS module. Appendix B reproduces the original module included in the INVIND 2020 survey, along with the question-wise scoring scheme. The MOPS survey instrument has been used to assess the use of SMPs in diverse settings and can be considered fairly standardized.[15]

Table 1 Panel A reports summary statistics for the 1803 firms in the baseline sample used in our analysis, which is defined as all firms responding to INVIND 2020 with complete responses to the management module. We show the mean, median, standard deviation and the 5^{th} and 95^{th} percentiles of the main variables from INVIND. Firms are larger than the average Italian firm (the INVIND mean is 482 employees against 4 on average in Italy), since INVIND does not survey firms with less than 20 employees. Firms in our sample are also large as measured by the volume of sales, averaging more than 160 million Euros in 2019. Three-quarters of the firms reported positive profits in 2019.[16] About two-thirds of the firms are exporters and about two-thirds are in manufacturing. Table 1 includes the distribution of the standardized management score we use in our analysis. Throughout the analysis, we trim the expected sales growth variable within five standard deviations.

To complement our measures of expected performance from the INVIND survey, we use data from the INVIND 2021 survey on realized performance for our baseline sample of firms. This gives us 1572 firms who were part of the both the baseline INVIND sample in 2020 and also responded to INVIND 2021. The overall expected YoY sales growth in 2020 for the INVIND sample is -4.5%. However, this varies over the course of the spread of the pandemic and the imposition of restrictions: the average expected sales growth for firms answering post-lockdown is -8.3%. This value is very close to the realized YoY sales growth in 2020, which averaged -8.5%, seen in Panel A of Table 1, and closely follows the aggregate GDP decline in 2020 (-8.9%).

[15]See for example Bloom, Iacovone, Pereira-López & Van Reenen (2019), Kambayashi, Ohyama & Hori (2021) and Choudhary, Lemos & Van Reenen (2018). Prior to using the measure for analysis, we nevertheless validate it for our context. First, we confirm that the relative distribution of management scores in Italy versus the US follows the cross-county findings in the World Management Survey, with a heavier left tail in Italy relative to the US in the management score distribution. Second, we confirm that the management score is correlated with firm performance, as found in Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019). Details on the validation procedure are in Appendix B.

[16]Firms in the INVIND survey are asked to report profits choosing among five possible categories: strong profits, modest profits, substantial break-even, modest loss, and strong loss. We define the indicator of positive profits to take value one for firms reporting either strong or modest profits and zero otherwise.

Table 1: Summary statistics: INVIND and SONDTEL Surveys

	Mean	Std. deviation	5^{th} percentile	Median	95^{th} percentile
	Panel A: INVIND				
Sales (2019, million EUR)	163.70	1192.79	2.20	20.18	446.69
YoY sales growth (2018-2019)	2.50	18.37	-20.84	1.22	28.03
Expected YoY sales growth, 2020	-4.49	17.06	-38.43	0.00	16.20
Sales (2020, million EUR)	146.35	918.83	1.77	18.20	399.46
YoY sales growth (2019-2020)	-8.59	20.62	-42.89	-6.64	19.20
Management score (2019)	0.00	1.00	-1.90	0.10	1.50
Employees (2019)	482.16	3570.22	22.00	79.00	1185.00
$\mathbb{1}_{Exporter}$	0.66	0.47	0.00	1.00	1.00
$\mathbb{1}_{Profits>0}$	0.74	0.44	0.00	1.00	1.00
	Panel B: SONDTEL				
% Remote work (2019)	1.85	6.41	0.00	0.00	7.50
% Remote work (2020)	11.72	15.62	0.00	2.50	50.00

Notes: Panel (A) describes summary statistics for variables used in the analysis computed over the baseline sample who responded to the INVIND survey with complete responses to the MOPS module. Sales are measured in millions of EUR in 2019. Expected sales growth is trimmed to within 5 standard deviations. A detailed description of the management score is in the text and Appendix B. Employment is measured by headcount. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits>0}$ is equal to one for firms that reported having strong or modest profits in 2019. Panel (B) reports the summary statistics for variables used in the analysis from the SONDTEL survey. % Remote work in 2019 and 2020 refer to the number of employees working from home as a share of the firm's average workforce in each of the years.

3.2 The SONDTEL survey

The SONDTEL survey is conducted once a year in September on the same firms that comprise the INVIND sample.[17] The survey measures short-term dynamics of the Italian economy, and in 2020, the SONDTEL survey included a question on remote work in 2019 as well as 2020.

Panel B of Table 1 shows the incidence of remote work from the SONDTEL sample. Firms were asked to choose among the following intervals on the incidence of remote work: a) none: 0; b) modest: (0-5%]; c) a little relevant: (5%-10%]; d) fairly relevant: (10%-20%]; e) relevant: (20%-35%]; f) very relevant: (35%-50%]; g) extremely relevant: (>50%). To obtain a quantitative measure, we used the midpoint for the interior intervals and the lower limit (50%) for the highest category. The share of remote work increased almost tenfold from 2019 to 2020. On the extensive margin, in 2019, only 13% of firms in our sample used remote work; in 2020 this increased to 75%. On the intensive margin, the share of remote work went from 1.8 to 11.7 percent. These figures are in line with official employment statistics:

[17]Details on the SONDTEL survey can be found at https://www.bancaditalia.it/pubblicazioni/sondaggio-imprese/2020-sondaggio-imprese/index.html?com.dotmarketing.htmlpage.language=1.

according to the Italian Labor Force Survey, the share of private sector workers engaged in remote work increased from 1.4% in the second quarter of 2019 to 14.4% in the same quarter of 2020.

3.3 The ISECO Survey

To provide a timely qualitative assessment of the effects of the pandemic on Italian firms, the Bank of Italy decided to conduct an additional survey, the ISECO survey (*Indagine Straordinaria sugli Effetti del Coronavirus*, or the Extraordinary Survey on the Effects of the Coronavirus). This was administered between March 16th and May 14th 2020, starting from when there were already initial restrictions, and continuing into the period of total lockdown. The ISECO survey directly elicits the channels of impact of COVID-19 on Italian firms as well as the strategies adopted by firms to tackle the impact of the pandemic.[18]

We exploit two unique pieces of information. The first is from the question asking: "In relation to the diffusion of the COVID-19, what factors are negatively affecting your operations in Italy?" with the following seven options: 1. Drop in domestic demand; 2. Drop in foreign demand; 3. Problems with logistics and infrastructure; 4. Lack of labor force; 5. Slowdown in the supply of intermediate goods; 6. Problems of liquidity and/or in the financial structure; and finally, 7. None of the above. This question can be interpreted as investigating the channels through which the pandemic affects firm operations. Firms were required to list at most three factors, ranking them in descending order of importance. We group together answers pointing to drop in either domestic or foreign demand as "Demand", and answers pointing to "Problems with logistics and infrastructure" and "Slowdown in the supply of intermediate goods" as "Supply", so that we end up with five possible responses.[19] Next, we assign to each possible response the maximum rank obtained by each option.

Panel A of Table 2 tabulates responses of the 1582 firms in our baseline sample that answered the above question, with responses listed by order of importance across the sample. Among them, 1060 firms indicated three factors, 301 firms indicated only two, and 221 just one. As clear from the table, demand was the most important driver affecting firms in Italy during this period, with about 63% of firms ranking the factor highest. Following demand, firms

[18]The methodology for the ISECO survey can be found at https://www.bancaditalia.it/pubblicazioni/indagine-imprese/2019-indagine-imprese/metodologia_iseco_2020.pdf and the questionnaire can be accessed at https://www.bancaditalia.it/pubblicazioni/indagine-imprese/2019-indagine-imprese/questionnaire_iseco_eng.pdf?language_id=1.

[19]Our final drivers are: Demand, Supply, Labor, Finance and None. See Appendix Table D1 for further details.

Table 2: ISECO survey: Drivers and Strategies during COVID-19

	Panel A: Drivers			
	1st rank	2nd rank	3rd rank	Never Chosen
Demand	63.08	10.75	1.96	24.21
Supply	18.84	35.27	6.07	39.82
Labor	6.07	9.86	4.42	79.65
Finance	5.18	15.36	6.64	72.82
None	6.83	9.80	4.93	78.45

	Panel B: Strategies			
	1st rank	2nd rank	3rd rank	Never Chosen
Demand	3.55	3.48	6.90	86.07
Supply	8.30	20.46	13.24	58.01
Labor	6.08	14.31	54.02	25.59
Investment	10.70	12.67	4.18	72.45
Finance	16.40	20.58	14.12	48.89
None	7.98	3.86	7.54	80.62

Notes: Panel A tabulates responses of the 1582 firms in our baseline sample that responded to the question: "In relation to the diffusion of the COVID-19, what factors are negatively affecting your operations in Italy?". Panel B shows responses to the question "What strategies have you adopted or are thinking to adopt to counter the negative effect of the spread of the Coronavirus in Italy on the activities of your firm?". Each value is the share of firms in the ISECO sample with the response shown in the row for the order of importance for the given column.

indicated supply as the second-most important factor, with 35% assigning it the second rank. The last column shows the share of firms never mentioning the particular strategy in any of their responses. For example, labor as a driver is very rarely listed, with about 80% of the firms never mentioning it as a factor.

The second key piece of information captured in the ISECO survey is from the question "What strategies have you adopted or are thinking to adopt to counter the negative effect of the spread of the Coronavirus in Italy on the activities of your firm?". Firms were given a series of ten alternative answers. Following the same procedure as before, we group these into five categories: demand policies, production policies, labor policies, investment plans policies and finance. In particular, labor policies refer both to change in the labor input (number of workers/hours/furloughing) and in the use of remote work. Note that firing was forbidden in Italy for all of 2020, meaning that permanent downsizing of the labor force was

not an option. We report the details of the aggregation procedure in Appendix C.

Overall, 1579 firms answered the strategy question described above. Among them, 1024 firms listed three strategies, 279 firms listed two strategies, while 276 listed only one strategy. Panel B of Table 2 shows the share of firms indicating each response by importance. Note that labor-related strategies are the most chosen option: only 25% of firms did not mention labor in one of their possible strategies.[20]

4 Empirical strategy and identification

Our goal is to determine if SMPs constitute an asset or a liability when facing a large, unexpected shock that requires immediate and radical changes in the functioning of the firm. Ex-ante, the effect of management practices could go either way. On one hand, the practice of constantly setting and reviewing goals and monitoring progress towards achieving them could be useful to redirect firm operations when facing the shock. On the other hand, following these practices require such targets to be set, shared and monitored in a structured way. This might be difficult to change abruptly, decreasing the firm's capacity to promptly respond to the shock, whereas a less formalized management style might possibly allow for a faster response in a situation of crisis (Teece 2007, Augier & Teece 2009).

4.1 Empirical strategy

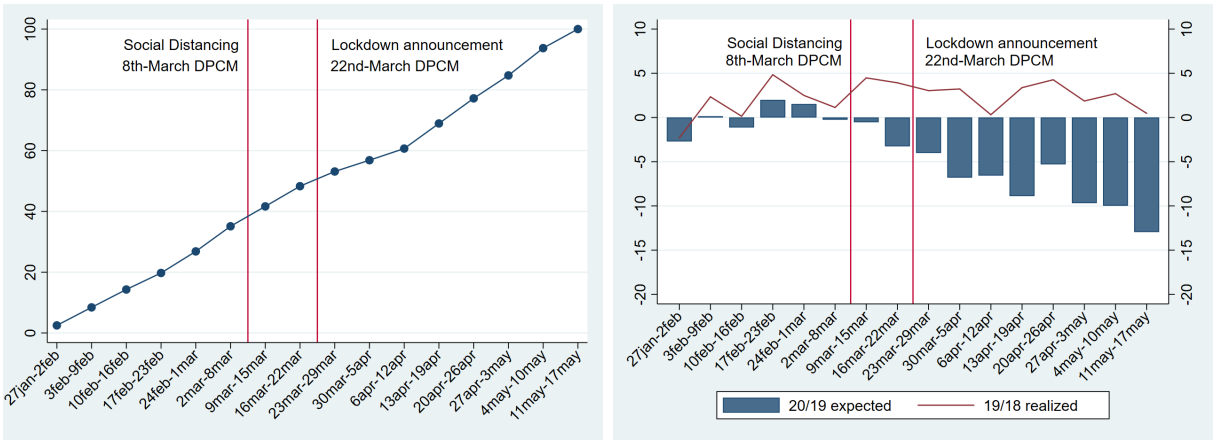
Answering this question is fraught with empirical challenges. First, one needs a large and unexpected shock that materializes quickly and requires immediate action from firms. Second, it is by now well established that the quality of management practices strongly correlates with firm performance in general (Bloom & Van Reenen 2010, Syverson 2011). A better response by high SMP firms might simply be a reflection of a general superior performance of such firms, rather than something specific to their different reaction to the shock. Third, one also needs to control for correlated effects, such as that firms with higher management scores are also on average larger, more productive, more export-oriented etc., and these characteristics might contribute to the determination of the response to the shock.

We argue that the outbreak of the COVID-19 pandemic in Italy, and the datasets we have access to on firm's response to it, offer an ideal setting to address these challenges. In addition

[20] Applying to the same data a Bayesian Mallow model, a statistical model to analyze ranking data, including those in the form of top–k rankings like ours, Crispino (2021) concludes that labor policies were the most adopted corporate strategy to tackle the effects of the pandemic.

to the strength and the speed with which the pandemic hit Italian firms, two features of the INVIND survey are at the core of our identification strategy. First, the survey is collected every year between the beginning of January and the beginning of May. The left panel of Figure 2 plots the cumulative density function of responses to the 2020 INVIND survey by week of response, along with two key dates: the announcement of widespread social distancing in Italy on March 8th, and the nationwide lockdown announcement on March 22th. A little less than half of the firms answered the survey before the announcement of the lockdown. Second, the survey collects information on sales growth expectations for the current year (in our case, 2020). Expectations incorporate all information available to the firm at the time of the response. They therefore can capture sharp changes in expected performance as the business environment evolves. This provides a unique opportunity to observe how the evolution of the pandemic changed the expectations of sales growth week by week from the end of January to the beginning of May. The right panel of Figure 2 shows realized sales growth in 2019 (red line) and expected sales growth in 2020 (blue bars) by the week when the INVIND survey was returned by the firm to the Bank of Italy. Before the lockdown, expected sales growth shows no trend. After the lockdown announcement, they quickly deteriorated: while expected sales growth was still close to zero for firms answering up to March 15th, it progressively plummeted during the next three weeks.

Figure 2: Cumulative share and sales growth by week of response to the 2020 INVIND survey



Note: The blue line in the left panel represents the cumulative density function of responses to the INVIND 2020 survey by week of response shown on the x-axis. The sample consists of 1803 firms which responded to the survey. In the right panel, the y-axis represents the mean YoY sales growth from INVIND of the firms that responded during the week reported on the x-axis. The blue bars are the average 2020 YoY expected sales growth, while the red line is the average 2019 YoY realized sales growth. The vertical lines correspond to the announcement dates of widespread social-distancing restrictions in Italy (March 8th) and country-wide lockdown (March 22nd).

We exploit these two features to set up a *quasi diff-in-diff* analysis, in which the pre period is before and up to March 22nd and the post is after. In this setting, the treatment is the level of SMPs and our goal is to assess if there are differences in its impact on performance between before (the "normal" period) and after (the "shock" period) the lockdown. We use "quasi" because in an actual diff-in-diff setting we would use sales growth expectations measured for the same firm both in the pre and in the post period. Missing this, we estimate the relationship between expected sales growth and management score separately for firms that answered the survey before and after the lockdown.

Formally, we run the following regression:

$$\text{SalesGr}_i = \alpha_0 + \alpha_1 \text{Manag}_i + \alpha_2 \text{Manag}_i * \mathbb{1}_{LD} + \alpha_3' \mathbf{X}_i + W_i + (S_i + P_i) * (1 + \mathbb{1}_{LD}) + \epsilon_i \quad (1)$$

where SalesGr_i is the measure of firm's i sales growth, Manag_i is the management score, $\mathbb{1}_{LD}$ is a dummy equal to one post-lockdown and $\mathbf{X}_i$ is a vector of firm controls, measured in 2019. We include in the regression a series of controls to account for correlated effects. First, as shown by Figure 2, expected sales are heavily dependent on the week of response. To account for this, we always include fixed effects for the week of response W_i, so that we only use the within-week, cross sectional variability to estimate the parameters. Second, the management score might vary systematically for firms in essential sectors relative to others, as these sectors were allowed to operate even during the lockdown. To control for this, we also include 3-digit sector fixed effects S_i. This is by and large the same detail of classification that was used to define essential goods and services.[21] Third, given that the pandemic had a very differentiated spread geographically, we control for local effects with a set of province fixed effects (P_i). To fully account for the differential change in performance both at the sectoral and geographical level occurring with the lockdown, sector and province dummies are also interacted with the lockdown dummy. Finally, we also include a dummy for whether the survey was conducted over the phone or via email. Given the strong sectoral component of the pandemic shock, standard errors are clustered at the 3-digit industry level.

4.2 Identification concerns

The identifying assumption is that, in the absence of COVID-19, the expected performance of firms with different levels of SMPs would have continued to run parallel by week of response. This requires that neither the management score nor other firm characteristics

[21] A list of essentials sectors as defined by the Italian government can be found in the annex 1 of the DPCM of March 22nd, available at https://www.gazzettaufficiale.it/eli/gu/2020/03/22/76/sg/pdf.

can explain the week of response to the INVIND survey, that is, that the selection into the week of response is random. Some preliminary evidence supporting this assumption is reported in the right panel of Figure 2, which shows that realized sales growth in 2019 does not show any trend with respect to the week of response. To further corroborate this assumption, in Appendix Figures A3 and A4 we plot average management score, firm size and productivity by week of response, again not finding any evidence of a trend. In addition to this, we examine this in a regression setting. We construct an indicator variable equal to one for firms that submitted the survey in a given week and zero otherwise. We then run sixteen regressions of each of these "week dummies" on the firm characteristics that we included in our baseline regression: firm size, an indicator that equals one for exporters, firm productivity measured as the log of revenue per worker, and an indicator that takes value one for firms with positive profits, where we take 2019 values of each variable. The results from this exercise are shown in Appendix Table A1. Out of the eighty coefficients (five for each regression), only ten are significant at 10% (none at 1 %), with changing signs in different weeks. We conclude that firm characteristics cannot predict the week of response to the survey. Finally, the richness of the INVIND data and the possibility to match it to other administrative datasets allows us to control for a great deal of correlated effects that may affect firms' responses to the pandemic, further addressing the concern that the firms that answered in the pre and in the post periods are not comparable.

Table 3: Drivers of negative effect of COVID-19

	Demand	Supply	Labor	Finance
Management	1.050	1.077	1.106	0.964
	(0.082)	(0.074)	(0.096)	(0.075)
Log(Employment)	0.894	0.961	1.088	0.811***
	(0.053)	(0.050)	(0.063)	(0.050)
Log(Revenue/Employment)	0.753***	0.854*	0.733***	0.658***
	(0.057)	(0.053)	(0.059)	(0.049)
$\mathbb{1}_{Exporter}$	2.838***	1.922***	2.194***	1.788***
	(0.446)	(0.266)	(0.368)	(0.280)
$\mathbb{1}_{Profits>0}$	0.876	0.871	0.763	0.540***
	(0.155)	(0.136)	(0.140)	(0.091)

Note: The table shows results of the conditional logit regression. Drivers are displayed at the top of each column. The coefficients shown are odds ratios, where the omitted category is *"None of the above drivers"*. A detailed description of the management score is in the text and Appendix B. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Standard errors are shown in parentheses and clustered at 3-digit sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A further concern is that expectations might systematically differ according to the presence

of structured management practices, and that this difference might change during the pandemic. Consider for example a situation in which, compared to firms with low SMPs, firms with high SMPs become relatively more optimistic in the pandemic period and tend to over predict their sales in 2020. In this case, a positive correlation between expected sales and management score in the post period might capture this expectation bias rather than true differences in performance. Our data allows us to directly address this concern. First, we will check if the results with expectations are confirmed with realized sales.[22] Second, we compute the expectation error, i.e., the difference between expected and realized sales growth, and test for any correlation with the management score both pre- and post-lockdown.

Despite being an aggregate shock, the COVID-19 pandemic hit different firms with different intensities, most notably in terms of belonging to an essential sector, but also along other dimensions. The key assumption for the consistency of our estimates is that these differential effects are not systematically related to SMPs. Ex-ante, there is no obvious reason why this correlation could arise. The effects were clearly heterogeneous at the sectoral level, and in our regressions we will always control for sectoral differences through fixed effects. Still, theoretically there might be within-sector effects that are not captured by our controls. We use a unique piece of information contained in the ISECO survey to test this assumption directly: the ISECO asks firms about the factors related to COVID-19 that negatively affected the firm operations in Italy, that we grouped into factors in terms of demand (domestic and foreign), supply (logistics, supply chain), labor, finance and none (as described in Section 3). Firms were asked to choose up to three factors, ranking them according to their relevance. The setting of the question is suitable to be analyzed with the conditional logit model of McFadden (1974), where each factor corresponds to a choice and "none" represents the outside option; there are no characteristics specific to the factors, while we do observe firm characteristics. In Appendix C we report the details of how we construct the model and how we adapt it to the fact that, compared to the standard model, firms could choose up to three options. We also discuss the conditions under which the model produces consistent estimates, arguing they are likely to be met in our setting. Table 3 reports the odds ratios from the estimation, where a coefficient larger than one indicates that the corresponding variable is positively correlated with the probability of choosing that alternative. No correlation between the management score and the likelihood of indicating any particular factor

[22] We use realized sales as a robustness check rather than our preferred performance measure because we cannot implement our diff-in-diff identification strategy, given that realized sales are independent from the week in which the firm filed the survey.

emerges. This is consistent with the assumption that the shock was exogenous with respect to SMPs in place in a firm. The only determinant that is consistently significant across factors is exporter status: being an exporter increases the likelihood of reporting any factor as important. One possible explanation for this is that exporting is a more complex activity than selling on the domestic market, and therefore more generally susceptible to shocks.

5 Results

We now present our key results on the relationship between performance and SMPs, and then explore robustness of the results and extensions.

5.1 Main results

Figure 1 showed evidence on the relationship between performance and the management score during the pandemic. The trends of expected sales growth by week of response for firms above and below the mean value of the management score did not differ before the lockdown, but diverged as the shock spread and restrictions were introduced, becoming statistically different by mid-April. However, this evidence is just suggestive, because SMPs can be correlated with other determinants of performance. We employ the richness of our data and examine this further by estimating Equation 1. In addition to the sector, area, and week fixed effects, we further include a set of firm controls that may be correlated with both the management score and expected performance, all measured in 2019. First, we include size (log of the number of employees) and labor productivity (log of revenues per employee), as larger and more productive firms may be better equipped to face the pandemic relative to smaller and less productive ones.[23] We also include indicator variables that capture if the firm has positive exports and if it recorded positive profits. The selected variables are those which may be correlated with the management score and the ability of firms to react to the shock, and which are readily available in INVIND, allowing us to maximize the size of our baseline sample. In the robustness exercises we will expand on the controls linking the survey to another source of information, at the cost of losing some observations.

In Table 4 we report the results of the regression analysis. We first estimate a version of Equation 1 without distinguishing between pre- and post-lockdown. The result is shown in Column (1). There is positive and significant effect of the management score on ex-

[23] In the context of the US, Bartik, Bertrand, Cullen, Glaeser, Luca & Stanton (2020) show that small firms experienced a significantly negative impact of COVID-19.

pected sales growth: a one standard deviation increase in the management score is associated with 1.72 percentage point increase in expected sales growth. This supports the evidence suggested by Figure 1 that SMPs enabled rather than hindered firms in withstanding the pandemic.

Table 4: Management and sales growth

	Expected					Realized
		Interaction		Sample split		
	Full sample		Excl. week 12&13	Before	After	
	(1)	(2)	(3)	(4)	(5)	(6)
Management	1.725***	1.111**	0.905	1.026	2.407***	1.469***
	(0.467)	(0.553)	(0.660)	(0.666)	(0.651)	(0.487)
Management*$\mathbb{1}_{LD}$		1.202*	1.686**			
		(0.702)	(0.784)			
Log(Employment)	0.0821	0.0540	-0.226	-0.723	0.257	-0.142
	(0.357)	(0.359)	(0.405)	(0.564)	(0.529)	(0.435)
Log(Revenue/Employment)	0.658	0.649	0.648	-0.793	2.209**	1.201
	(0.548)	(0.555)	(0.596)	(0.886)	(0.908)	(1.031)
$\mathbb{1}_{Exporter}$	-0.409	-0.430	-1.521	-1.763	-1.593	-1.983
	(1.112)	(1.107)	(1.389)	(1.653)	(1.700)	(1.534)
$\mathbb{1}_{Profits>0}$	-1.619	-1.626	-2.082**	-0.432	-4.153**	2.639*
	(0.996)	(0.988)	(1.029)	(1.125)	(1.709)	(1.448)
Fixed effects						
Sector	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y			
Province*$\mathbb{1}_{LD}$	Y	Y	Y			
H_0: Management before=Management after (p-value)				0.087		
Observations	1803	1803	1596	751	845	1549

Note: The dependent variable is the expected YoY sales growth in 2020 over 2019 in Columns (1)-(5) and realized YoY sales growth in 2020 over 2019 in column (6), sourced from INVIND 2019 and 2020 respectively. A detailed description of the management score is in the text and Appendix B. $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22nd March. Employment is based on headcount, revenues refer to total sales; for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Interview type is an indicator variable that takes value 1 for interviews conducted over phone (as opposed to email). Column (4) includes week up to the 15th of March (i.e. week 11), Column (5) includes week starting from the 30th of March (i.e. week 14). Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

The correlation between expected sales growth and SMPs might arise if firms with higher management scores have higher expected sales growth in normal times as well. In this

case, the difference in expected sales growth would not be due to a better ability of these firms to deal with the COVID-19 shock but it would simply reflect structural differences in growth. To address this important concern, we exploit the fact that firms answered the survey both before and after the outbreak of the pandemic. Therefore, we can check if the correlation between expected sales and management score is stronger before the lockdown –the "normal" period– or after it, i.e. when the shock materializes. Columns (2)-(5) of Table 4 expand in a regression framework the evidence suggested by Figure 1, which showed significant divergence in expected sales growth with the management score following the lockdown announcement. Column (2) adds an interaction of the management score with an indicator variable that takes value 1 post-lockdown. The coefficient of the management score is 1.1 in the pre-lockdown period, significant at 5%, but its value more than doubles post-lockdown, to 2.3, with the difference between the two estimates statistically significant at the 10% level. As the average decline in expected sales growth in the post-lockdown period is -8.3%, the effect of one standard deviation increase in the management score is almost a 30 percent reduction in the expected sales drop.

The left panel of Figure 2, which plots expected sales growth by week, shows that the two weeks around the beginning of the lockdown recorded sales growth that are halfway between the pre-lockdown and the lockdown period. The week of March 16$^{\text{th}}$-22$^{\text{nd}}$ is right before the lockdown announcement, when the situation was rapidly deteriorating and firms started to revise the expectations in the light of the escalating restrictions, for example by incorporating the possible introduction of a nation-wide lockdown. Moreover, firms that returned the questionnaire the following week (March 23$^{\text{th}}$-29$^{\text{th}}$) might have filled it in before the announcement of the lockdown and filed it afterwards, and therefore with a different outlook on the future sales dynamics than once the lockdown was already in place. Data for these two weeks are not clearly classifiable as referring to before or after the moment in which the severity of the shock was fully understood and might attenuate the results. In Column (3) we therefore exclude firms that answered in those weeks (211 out of 1803 firms). As expected, the coefficient in the pre-lockdown period remains positive but decreases in magnitude and loses statistical significance, while the coefficient of the interaction term increases in magnitude (from 1.2 to 1.7) and becomes significant at the 5% level. In what follows, we therefore focus our attention to this restricted sample (all our results hold and are only slightly weaker when we include all firms).

In Columns (1)-(3) of Table 4, we controlled for a series of firm characteristics potentially

related to sales growth and correlated with SMPs. However, we imposed a unique coefficient in the two periods for these characteristics. One possible concern is that the effect of these characteristics on performance changed, too, during the pandemic with respect to normal times. To level the playing field, in Columns (4) and (5) we report the results of two regressions in which we separately estimate the model for the pre-lockdown and the post-lockdown period, therefore allowing *all* the coefficients to vary between the two periods. The results are fully in line with those of Column (3): the coefficient of the management score is positive but not significant in the pre-lockdown period, and more than twice as large and significant at the 1% level post-lockdown. Moreover, we reject the hypothesis that the two coefficients are statistically equal (p-value 0.087). Post-lockdown, the coefficient of productivity becomes positive and significant, indicating that more productive firms were able to limit the effects of the shock. However, accounting for this does not decrease the coefficient of the management score.[24]

To further confirm our results, we use data on realized sales from the INVIND 2021 survey. In this case, we cannot perform any pre-post analysis. Column (6) of Table 4 uses as the dependent variable annual sales growth in 2020 over 2019. Firms with higher management scores show sizable larger sales growth in realization as well, in line with the results of Columns (1)-(5). The magnitude, at 1.5, is similar to that for expected sales growth for the whole sample (Column 1) and smaller than that for the post period only (Column 5). As explained above, this difference might be due to government policies enacted throughout 2020 and not fully understood by entrepreneurs at the outbreak of the pandemic. Government policies targeted preferentially weaker firms, such as those which recorded sales drops above a certain threshold in the first half of the year, possibly reducing the ex post performance difference between firms with high and low management scores.

In addition to directly using realized sales, we can also check if expectation errors systematically correlate with SMPs. In fact, it might be that, during the pandemic, firms with different management scores systematically under or over predicted sales, questioning the validity of our expectations variable. To check for this possibility, we run the regressions of Table 4 using the expectations error for 2020, defined as expected sales growth minus realized sales growth, as the dependent variable. The results, reported in Appendix Table A3, show that both the coefficient of the management score and that of its interaction with the post dummy are never significantly different from zero. This confirms that our results

[24]To address potential collinearity problems among the controls, Appendix Table A2 repeats the estimation adding controls one at a time. The estimates are extremely stable.

are not driven by systematic differences in expectations errors according to the management score, neither in the pre nor in the post period.

To sum up, the evidence of Table 4 corroborates the descriptive evidence of Figure 1. Both lend support to the hypothesis that SMPs were particularly helpful to firms in tackling the economic effects of the pandemic. Next, we analyze the robustness of this result along a series of dimensions.

5.2 Robustness

Essential sectors Our three digit sector dummies account for most of the essential sector status, with a few exceptions in which the definition was finer than the three digits.[25] Given that essential sector status is expected to have a substantial impact on sales, we used the list from the official gazette and constructed an indicator variable to control for it. In Column (1) of Table 5 we include both this variable and its interaction with the lockdown dummy. The estimate shows that the coefficient of the indicator for non-essential sectors is insignificant in the pre-lockdown period and becomes negative (-8.1) and highly significant following the announcement, confirming that the status of the industry the firm operates in is a fundamental determinant of sales growth during this period. However, the coefficient of the interaction between the management score and the lockdown dummy is virtually identical to that of Column (3) in Table 4 (for which the only difference is the absence of the essential sector dummy).

Human capital and technology A further issue we address is that SMPs might be correlated to other firm characteristics that might allow for a better response to the pandemic. This is indeed a serious problem, as it challenges the causal interpretation of our estimates. Ideally, one would need an instrument to fully address this concern. Unfortunately, the management literature has not yet been able to identify suitable instruments. So far, the causality issue has been addressed in experimental settings in developing economies (Bloom et al. 2013, Bruhn et al. 2018). Lacking an instrument, we increase the number of controls, in addition to those already included in the basic regression (size, productivity, export status and profitability).

[25] In our sample, firms cover 159 different 3-digit sectors. In 71 of these 3-digit sectors all 4-digit industries are closed, in 71 3-digit sectors all 4-digit industries are open, and in the remaining 17 3-digit sectors around 70% of 4-digit industries are closed. A complete list of essential sectors can be found at https://www.gazzettaufficiale.it/eli/id/2020/03/26/20A01877/sg.

Table 5: Robustness results

	Expected sales growth					
	Interaction				Sample split	
					Before	After
	(1)	(2)	(3)	(4)	(5)	(6)
Management	0.893	1.197*	1.179*	1.107*	1.205*	2.903***
	(0.660)	(0.614)	(0.648)	(0.663)	(0.651)	(0.915)
Management*$\mathbb{1}_{LD}$	1.695**	1.595*	1.884**	2.153**		
	(0.790)	(0.809)	(0.802)	(0.837)		
Log(Employment)	-0.276	-0.286	-0.532	-0.632	-1.297**	0.108
	(0.409)	(0.421)	(0.450)	(0.448)	(0.574)	(0.619)
Log(Revenue/Employment)	0.531	-0.0282	-0.255	-0.368	-1.730	1.494
	(0.587)	(0.650)	(0.715)	(0.715)	(1.070)	(1.109)
$\mathbb{1}_{Exporter}$	-1.271	-2.074	-2.034	-1.727	-1.758	-1.536
	(1.384)	(1.366)	(1.373)	(1.440)	(1.536)	(2.113)
$\mathbb{1}_{Profits>0}$	-1.952*	-1.437	-1.301	-1.309	-0.491	-3.216
	(1.014)	(1.112)	(1.097)	(1.145)	(1.081)	(2.004)
Closed sector	0.249	-0.326	-1.003	-1.456	-2.294	-10.84***
	(2.566)	(2.434)	(2.395)	(2.342)	(2.136)	(3.497)
Closed sector *$\mathbb{1}_{LD}$	-8.172**	-8.622**	-7.882*	-9.421**		
	(3.732)	(4.000)	(4.036)	(3.947)		
log(average wage)		2.498	2.990*	2.685	2.592	3.624
		(1.864)	(1.688)	(1.730)	(2.295)	(3.342)
Skill (% white collar)			0.033	0.031	-0.012	0.078*
			(0.0287)	(0.030)	(0.035)	(0.046)
Average human capital			-5.125	-5.867	-12.84	1.265
			(6.737)	(6.769)	(9.298)	(10.38)
Manager human capital			2.832	3.414	8.301	-1.020
			(5.360)	(5.445)	(8.646)	(6.936)
Advanced technologies				1.021	1.667	0.285
				(1.222)	(1.364)	(1.914)
Fixed effects						
Sector	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y	Y		
Province*$\mathbb{1}_{LD}$	Y	Y	Y	Y		
H_0: Management before=Management after (p-value)					0.080	
Observations	1596	1421	1389	1348	665	683

Note: The dependent variable is the expected YoY sales growth in 2020 sourced from INVIND. A detailed description of the management score is in the text and Appendix B. $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22nd March. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales figures, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Closed sector is a dummy for 4-digit sectors whose activities were not permitted during the lockdown. Average wage is measured in 2019 and the share of white collar workers is taken from social security data from 2018. Average human capital and manager human capital is the mean level of individual fixed effect measured over the period 2005–2018. Manager human capital is the mean employee ability in the top quartile of the within-firm distribution (see Bender et al. (2018) for further details). Advanced technologies is an indicator variable which takes value one if the firm uses at least one of the following: cloud computing, big data or artificial intelligence. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Interview type is a dummy for interviews conducted over phone (as opposed to email). Column (5) includes week up to the 15th of March (i.e. week 11), Column (6) includes week starting from the 30th of March (i.e. week 14). Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We see two main sources of correlated effects that can threaten our causal interpretation. The first is human capital. Using matched employer-employee data for Germany, Bender et al. (2018) show that SMPs and human capital are positively associated, and that the association between SMPs and productivity decreases by 30-50% when including measures of human capital. Cornwell, Schmutte & Scur (2021) find similar results for Brazil. Human capital might also be a factor in the response to the COVID-19 shock, for example, because more educated workers can more efficiently work remotely. The second is technology. It is well known that structured management is complementary to IT (Bloom, Sadun & Van Reenen 2012, Schivardi & Schmitz 2020). It might then be that the firms with higher management scores also have invested more in IT, and the level of IT in the firm was a factor in determining the firm response to the shock, confounding the role of SMPs.

INVIND has no direct measure of the workers' human capital. We first use as proxy the average wage of the employees, based on the assumption that, conditional on controls, firms that pay higher wages also employ more skilled workers. In Column (2) we add this measure, and find that the coefficient of the interaction in the post-lockdown period remains very similar while the average wage is not significant. The only difference is that the coefficient of the management score in the pre-lockdown period becomes significant at the 10% level.

Average wage is an imperfect measure of human capital.[26] To obtain alternate measures, we use the matched employer-employee version of INVIND, for which we have data on workers available up to 2018.[27] The administrative data do not report the education but only the occupational status. We compute the share of white collar workers. Accounting for occupational status is important, both because typically white collar workers have higher human capital and because they are more likely to be able to work remotely, an important factor during the lockdown. We also estimate worker fixed effects from a standard two-way fixed effects regression following Bender et al. (2018). The worker fixed effect captures the average worker's wage over her career, and therefore is a summary measure of ability, under the (reasonable) assumption that workers with higher skills earn on average higher wages (Card, Heining & Kline 2013). Following Bender et al. (2018), we construct two measures: the average worker effects and the average effects of the top 25% of the skill distribution. In fact, Bender et al. (2018) show that the latter is more strongly correlated with the quality

[26]For example, a large employer-employee literature shows that there is a wage component at the firm level that is not explained by workers skills (Abowd, Kramarz & Margolis 1999). Moreover, labor market regulation on wage determination can weaken the link between human capital and wage.

[27]We lose 34 observations of firms that are not matched with the INPS database.

of SMPs. Column (3) of Table 5 includes these three additional controls. None of them is significant. More importantly for our analysis, the coefficient of the interaction between the management score and the lockdown dummy increases from 1.6 to 1.9 and gains statistical significance. This indicates that SMPs are not just proxying for worker skills.

The 2020 INVIND elicited the use of advanced technologies, asking if firms were using cloud computing, big data or artificial intelligence. We construct a dummy which is equal to 1 if the firm uses at least one of these technologies.[28] Table 5, Column (4) includes this measure. If anything, the effect of SMPs in the post-lockdown period increases slightly.[29]

Next, as in Columns (4) and (5) in Table 4, we allow the coefficient of all variables to differ between pre- and post-lockdown by estimating the model separately for the two sub-periods. Results are reported in Column (5) and (6). Even with this fully flexible specification, we obtain exactly the same results. The coefficient of the management score is much larger in the post-lockdown period (2.9 against 1.2), significant at the 1% level, and we reject the hypothesis that the two coefficients are equal (p-value 0.08).

The general lack of significance that we find in Columns (5) and (6) for the human capital and technology indicators might be due to multicollinearity. To investigate this issue more systematically, we repeat the estimation including one variable at a time, both directly and interacted with the post dummy. Appendix Table A4 shows that, for the share of white collar, the average human capital and the managerial human capital, the interaction with the post-lockdown dummy has a positive coefficient, significant at 10%. This suggests that the role of human capital might have also become more important during the pandemic. The coefficient of the management score in the post-lockdown period is always twice as large as that in the pre-lockdown period, with p-values in terms of statistical difference around 10%, confirming that SMPs exert an independent effect with respect to these variables.[30]

[28] Of course, advanced technologies only measure one aspect of IT, and others might have mattered during the pandemic. Unfortunately, this is the only measure of IT available in the survey. Despite not fully capturing the degree of digitization of the firm, we show below that it is positively correlated with the extent to which firms adopted remote work, suggesting that it is a useful variable to include in the regression to control for the possibility that firms with more SMPs might also adopt better IT technologies.

[29] One might be concerned with the fact that none of the controls is significant. As explained above, however, it is important to distinguish between the effects on level and on growth rates. In unreported regressions, we have used the logarithm of sales level in 2019 as the dependent variable, finding that most of the controls are significant and with the expected sign, while the management score loses significance. This lends further support for the hypothesis that, compared to other firm characteristics, SMPs are particularly important to counter a large shock.

[30] In Appendix Table A5 we repeat the regressions of Table 5 with realized sales growth as the dependent variable. All the results are fully confirmed.

Heterogeneity We next explore the heterogeneity of the results, focusing on five dimensions: geography, sector, essential vs. non-essential, firm size, and the propensity to export. Ex-ante, the direction of heterogeneity is not obvious. For example, in terms of geographical heterogeneity, the pandemic was more diffused in certain areas of the North. However, for the period we look at (up to May 2020), all the policies adopted applied to the whole national territory, irrespective of where the impact was higher. The same applies to the other dimensions. Therefore, rather than speculating, we directly check for indications of heterogeneity in the data.

We explore heterogeneity using the interaction between the management score and the specific heterogeneity dimension. The problem with our preferred specification, based on the pre-post division, is that it entails adding a triple interaction between the heterogeneity dimension, the post variable and the management score, so that we use the management score to estimate four parameters. It turns out that the statistical power of our dataset is not sufficient to obtain precise estimates. To address this issue, we use the specification with realized sales, that entails the addition of only the interaction between the management score and the heterogeneity dimension. We use the same set of controls as in the baseline specification, with also a dummy for closed (non-essential) sectors during the lockdown. The results of this exercise are reported in Appendix Table A6. While the coefficient of the management score remains stable and significant, with the exception of Industry heterogeneity, where we lose significance at the margin, the interaction between each heterogeneity dimension and the management score is never statistically different from zero. We interpret these results as indicating that the effect we find is general, and fairly homogeneous along the dimensions we explore.

Expected growth with respect to 2017-2019 As a final check, we have also computed the expected growth rate of sales in 2020 with respect to average 2017-2019 sales, rather than only 2019 sales, to make sure that results are not driven by some specificity of 2019. Appendix Table A7 shows that results become stronger.

Overall, we conclude that the correlation between sales and the management score during the lockdown is extremely robust and survives the (flexible) inclusion of the most likely confounding effects.

6 Why did firms with SMPs perform better?

We leverage the ISECO survey to investigate the strategies the firms adopted or considered adopting to counter the negative effects of the pandemic. As explained in detail in Section 3, we construct five categories: demand policies, production policies, labor policies, investment plans policies and financial policies. We estimate the same conditional logit model introduced in Section 4 and report the results in Table 6. Interestingly, in this case we find that a higher management score increases the chance of adopting any of the strategies, except financial strategies. This indicates that SMPs were instrumental to reorganize the "real" part of the firm activity, rather than relying on financial factors. The results are consistent with the assumption that firms with higher SMPs expected a better sales performance because they were more likely to act to counter the effects of the COVID-19 shock.

Table 6: Strategies adopted to counteract the COVID-19 shock and management

	Demand	Supply	Labor	Investment	Finance
Management	1.329**	1.375***	1.298**	1.260**	1.053
	(0.134)	(0.106)	(0.105)	(0.105)	(0.077)
Log(Employment)	0.861	1.124	1.194**	1.243***	0.959
	(0.079)	(0.071)	(0.079)	(0.081)	(0.060)
Log(Revenue/Employment)	0.933	0.791**	0.743***	0.901	0.838*
	(0.087)	(0.059)	(0.056)	(0.073)	(0.060)
$\mathbb{1}_{Exporter}$	2.007***	1.476*	1.010	1.138	1.232
	(0.414)	(0.230)	(0.160)	(0.187)	(0.178)
$\mathbb{1}_{Profits>0}$	0.730	1.013	0.921	1.072	0.709*
	(0.153)	(0.167)	(0.156)	(0.196)	(0.112)

Note: The table shows results of the conditional logit regression. Strategies are displayed at the top of each column. The coefficients shown are odds ratios, where the omitted category is *"No strategy will be adopted"*. A detailed description of the management score is in the text and Appendix B. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Standard errors are shown in parentheses and clustered at the 3-digit sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

We now focus on one specific strategy that is positively related to SMPs and that might have been particularly important during the pandemic: labor policies, which, as shown in Section 3.3, was the one most often cited by firms. The question on labor policies explicitly mentions as an example changes in the use of remote work. Indeed, during the most acute phase of the pandemic, as well as also after it, many companies moved extensively to remote work.

SMPs might be a fundamental asset to successfully move a substantial amount of workers to remote work very quickly, and with no possibility to plan the move in advance. In fact, one of

the fundamentals of SMPs is to assign workers clearly defined responsibilities, systematically keeping track of outcomes and taking decisions based on the information collected. This "organization philosophy" enables delegation and worker autonomy ex-ante and assessment of outcomes ex-post.[31] This approach to human resource management reduces the need to monitor progress and effort by direct interaction and allow for a more productive use of remote work. Our hypothesis is therefore that better-managed firms were more ready to shift abruptly and substantially to remote work.

We test this hypothesis in Table 7 using the information on remote work from the SONDTEL survey. In Column (1), we find that the management score does correlate with remote work usage in 2020: we estimate a coefficient of 1.5, significant at the 5% level. Given that the average remote work in 2020 is 11.7%, one standard deviation increase in the management score implies an increase in the share of remote work of 13 percentage points with respect to the mean. Next, we also control for the usage of remote work in 2019. It might be that firms using remote work already in 2019 were more prepared to increase its usage in 2020. In Column (2) we add remote work in 2019 to the regression, and find that the coefficient of the management score decreases only marginally (from 1.5 to 1.4) and remains significant at the 5% level.

To delve into this deeper, we examine if the effect is related to any specific component of SMPs. To do this, we keep the same specification as in Column (2) and now use the management sub-scores on monitoring, targets and incentives as regressors. We report the results in Columns (3), (4) and (5) of Table 7. We find that the overall result is driven by the monitoring and incentives components of the management scores. This may be expected ex-ante: the monitoring section captures how many KPIs the firm tracks, including worker absenteeism. Monitoring performance through measurable outcomes may help substitute for direct monitoring of workers at the workplace. The same holds for incentives: using structured incentives-based schemes require some measurable notion of output, that can be used to assess worker performance when working remotely. In contrast, targets are not significant, arguably because this component captures setting medium to longer term targets, which may not be particularly relevant in the acute phase of the pandemic and lockdown.

The overall score bears a larger coefficient than any of the components, suggesting that the different dimensions of SMPs are complementary in allowing a more efficient organization

[31] In fact, early studies on changes in firm organization related to the diffusion of IT stressed the importance of the decentralization of authority, the "delayering" of managerial functions, team-based work organization (Caroli & Van Reenen 2001, Bresnahan, Brynjolfsson & Hitt 2002).

Table 7: Remote work and management in 2020

	Overall		Monitoring	Targets	Incentives
	(1)	(2)	(3)	(4)	(5)
Management	1.452***	1.341***	1.194***	0.594	0.860**
	(0.429)	(0.411)	(0.327)	(0.390)	(0.367)
Log(Employment)	2.937***	2.640***	2.712***	2.853***	2.765***
	(0.396)	(0.371)	(0.373)	(0.360)	(0.377)
Log(Revenue/Employment)	2.804***	2.528***	2.564***	2.594***	2.513***
	(0.569)	(0.524)	(0.526)	(0.538)	(0.524)
$\mathbb{1}_{Exporter}$	0.160	0.342	0.233	0.415	0.513
	(0.740)	(0.723)	(0.726)	(0.742)	(0.743)
$\mathbb{1}_{Profits>0}$	-0.464	-0.249	-0.106	-0.0177	-0.266
	(0.698)	(0.671)	(0.679)	(0.676)	(0.682)
Advanced technologies	1.853**	1.723**	1.924***	2.096***	1.952**
	(0.743)	(0.743)	(0.725)	(0.730)	(0.771)
Skill (% white collar)	0.164***	0.153***	0.154***	0.154***	0.153***
	(0.024)	(0.023)	(0.023)	(0.024)	(0.023)
% Remote work (2019)		0.395***	0.391***	0.396***	0.400***
		(0.056)	(0.056)	(0.055)	(0.057)
Observations	1499	1494	1492	1491	1490

Note: The dependent variable is the percentage of employees at the firm working remotely in 2020. A detailed description of the management score is in the text and Appendix B. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Advanced technologies is an indicator variable which takes value one if the firm uses at least one of the following technologies: cloud computing, big data or artificial intelligence. The share of white collar workers is measured 2018 from social security data (last year available). % Remote work (2019) refers to the number of employees working from home as a share of the firm's average workforce in 2019. Regressions include 3-digit sector and province fixed effects. Standard errors are shown in parentheses and are clustered at the 3-digit sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

of remote work. This is in line with the experimental results of Bruhn et al. (2018) on Mexican SMEs, who show that there is no silver bullet, that is, no single managerial practice that in itself improves firm performance. Our results are consistent with the framework of Brynjolfsson & Milgrom (2013), who emphasize the role of complementarities in practices within organizations, i.e. the added value of clusters of practices working in concordance relative to their independent effects.

One may argue that structured management mattered mostly because it was instrumental to switching activity to remote work. While perfectly in agreement with our interpretation, this argument would limit the generalizability of our results, as specific to the pandemic context. One first piece of evidence that goes against this hypothesis comes from Table 6, which shows that firms with higher management scores were more active in addressing the shock along all the inquired dimensions (demand, supply, investment plans) except finance. To

assess more directly if remote work is the main element, we check how our results in Tables 4 and 5 change if we include remote work among the regressors. Under the assumption that SMPs simply facilitate the switch to remote work, we should find that the effect of the management score becomes smaller or, in the limit, disappears once we directly control for remote work. Appendix Table A8 reports the results. First, the coefficient of the interaction of the management score with the post dummy decreases somewhat in most specifications, in accordance with the idea that part of its effect goes through remote work, but the drop is small.[32] The coefficients of the remote work variable and its interaction with the post dummy are generally positive but small and non significant. This evidence is against the hypothesis that SMPs mostly acted as a facilitator to move to remote work and supports the hypothesis that they represented a more general asset to tackle the shock along a series of dimensions.

7 Discussion and Conclusions

We study the role of modern SMPs in responding to a large, unanticipated shock, the COVID-19 pandemic in Italy. We find that firms with better SMPs were more likely to take action to address the challenges posed by the pandemic and were able to limit its negative effects. One special feature of our empirical setting is that we can compare the relationship between SMPs and expected sales growth in a narrow window around the outbreak of the pandemic. Therefore, we can conclude that SMPs were particularly useful to tackle a large, totally unanticipated shock, above and beyond their contribution to firm management in "normal times".

One important question is external validity, due to the specificity of the COVID-19 shock. The pandemic induced a large, unexpected and extremely rapid disruption in the firm operations. As such, our results are likely to extend to other unexpected events that severely constrain firm operations, such as natural disasters, wars, disruptions in the supply chain, shocks to the availability or the cost of essential inputs, such as energy or microchips. They apply to a lesser extent to demand-driven recessions, where firms are not constrained in their operations but by the lack of demand. This can explain the contrasting results found by the (small) literature focused on the Great Recession (Cette et al. 2020, Englmaier et al. 2020).

[32] Due also to the reduction in the sample size, as we can only run the regression for firms for which we have the remote work information, in some specifications we marginally lose significance, but the p-value is never above 15%.

The features of our exercise have important implications about what we can (and cannot) learn about structured management practices. Our empirical design measures changes in the relationship between SMPs and performance occurring over a very short period of time, so we capture the ability to cope with the immediate effects of the pandemic. Our analysis indicates that, to tackle the immediate effects of an unexpected shock, it is extant monitoring and incentive practices that mattered, rather than changes thereof, as it is unlikely that firms radically changed SMPs in the short time frame around the outbreak of pandemic we consider. We therefore conclude that, despite being primarily designed for operations management, SMPs are also a good "fit" for adaptation, and that there is no trade-off between the two dimensions. On the contrary, our results cannot be extrapolated to firms re-positioning to long-term changes induced by the pandemic (the so-called "new-normal"). This is indeed an important and exciting area of future research for strategic management and organization design (Englmaier, Foss, Knudsen & Kretschmer 2018).

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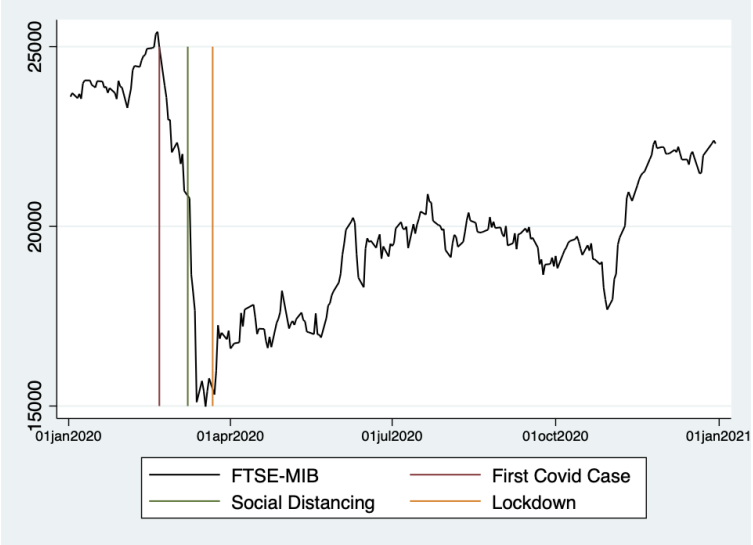
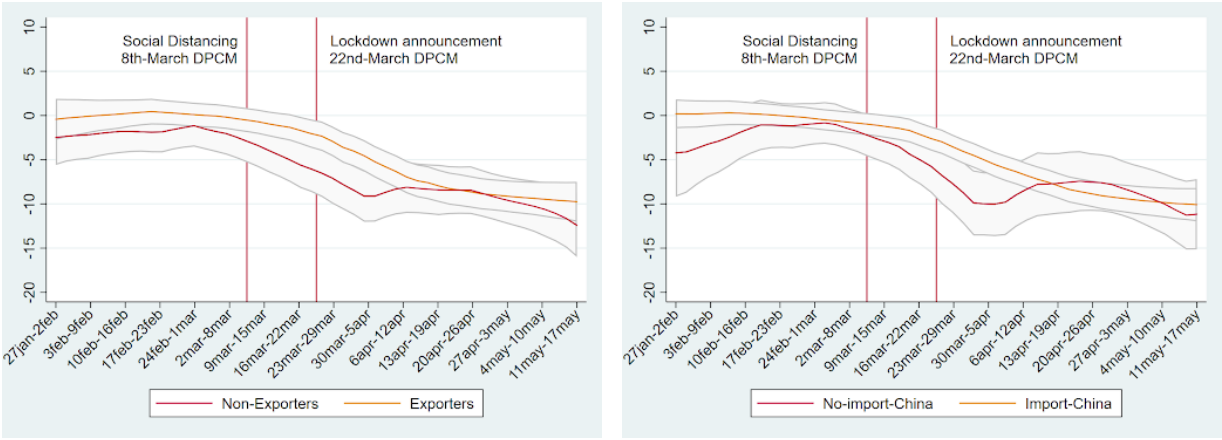
A Additional figures and tables

Figure A1: The evolution of the Italian stock market index FTSE MIB in 2020



Note: The y-axis shows the value of the main Italian stock market index for 2020. The first COVID case occurred on February 21st, the widespread social distancing measures in Italy were introduced on March 8th, and the national lockdown on March 22nd.

Figure A2: Expected sales growth over the evolution of COVID-19 split by foreign activity

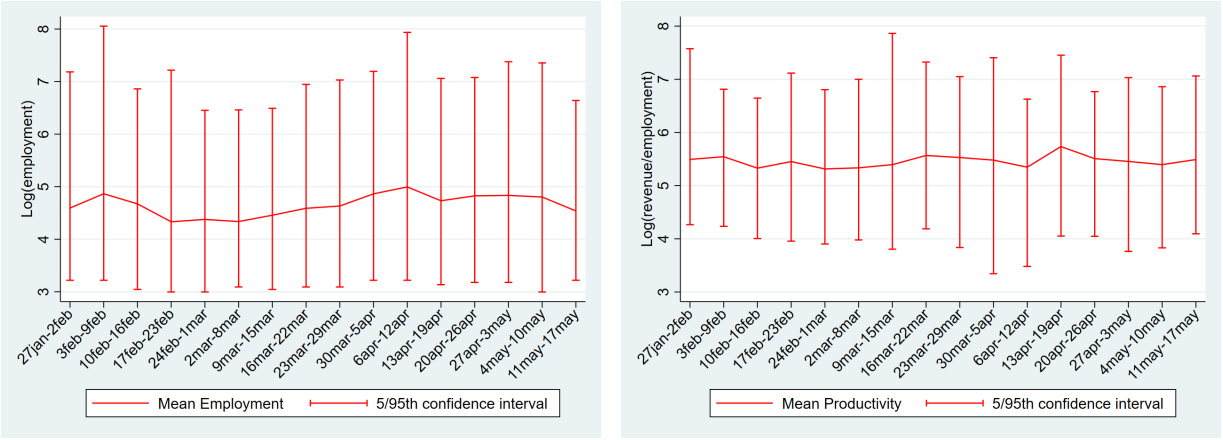


Note: The y-axis of the graph shows smoothed values of mean YoY expected sales growth from the 2020 INVIND survey across weeks reported on the x-axis for firms in two groups: the left panel compare exporting versus non-exporting firms, the right panel compare firm importing from China versus all other firms (i.e. those not importing from China). The outcome variable is calculated through kernel-weighted local polynomial regressions of YoY expected sales growth on week of response for firms. The bands shown are 95% confidence intervals and the vertical red lines correspond to the announcement dates of widespread social-distancing restrictions in Italy (March 8th) and country-wide lockdown (March 22nd).

Figure A3: Management score by week of response

Note: The y-axis shows the average management score with the corresponding 95% confidence interval taken across firms responding in the week reported on the x-axis. The sample consists of 1803 firms which responded to the INVIND survey with complete responses to the MOPS module. A detailed description of the management score is in the text and Appendix B.

Figure A4: Employment and Productivity by week of response



Note: In the left panel, the y-axis shows the average log of employment with the corresponding 95% confidence interval across firms responding in the week reported on the x-axis. The right panel shows the same for average log productivity, measured by the log of revenue per worker. Employment is based on headcount, revenues refer to total sales; for both we take the 2019 value. The sample consists of 1803 firms that responded to the INVIND survey with complete responses to the MOPS module.

Table A1: Week of response and firm characteristics

	Management	Log(Emp)	$\mathbb{1}_{Exporter}$	$\mathbb{1}_{Profits>0}$	Log(Rev/Emp)
Week 1	0.000	-0.003	-0.023*	0.001	0.004
	(0.005)	(0.002)	(0.013)	(0.008)	(0.006)
Week 2	-0.010	0.006	0.004	-0.009	-0.010
	(0.010)	(0.006)	(0.013)	(0.013)	(0.009)
Week 3	-0.015**	0.004	-0.009	-0.005	-0.011
	(0.006)	(0.007)	(0.017)	(0.016)	(0.009)
Week 4	0.007	-0.014***	-0.003	0.014	-0.011
	(0.005)	(0.005)	(0.016)	(0.011)	(0.007)
Week 5	-0.009	-0.003	0.012	0.008	-0.015*
	(0.007)	(0.006)	(0.015)	(0.016)	(0.009
Week 6	-0.008	-0.011**	0.026	0.024	-0.008
	(0.008)	(0.006)	(0.018)	(0.016)	(0.009)
Week 7	0.003	0.003	0.006	-0.016	0.015
	(0.007)	(0.004)	(0.019)	(0.014)	(0.010)
Week 8	-0.004	0.003	0.009	-0.003	0.009
	(0.006)	(0.006)	(0.018)	(0.015)	(0.009)
Week 9	-0.002	0.003	0.009	-0.006	0.005
	(0.007)	(0.004)	(0.014)	(0.013)	(0.007)
Week 10	0.001	0.005	-0.004	0.002	0.010
	(0.005)	(0.005)	(0.014)	(0.011)	(0.007)
Week 11	-0.002	0.010**	0.000	-0.014	-0.002
	(0.005)	(0.005)	(0.011)	(0.010)	(0.005)
Week 12	-0.001	-0.001	-0.019	0.008	0.025**
	(0.005)	(0.006)	(0.017)	(0.014)	(0.010)
Week 13	0.014**	-0.003	-0.003	0.004	0.001
	(0.007)	(0.006)	(0.018)	(0.015)	(0.009)
Week 14	0.002	0.006	-0.006	0.014	-0.010
	(0.006)	(0.008)	(0.018)	(0.014)	(0.009)
Week 15	0.019**	0.001	-0.002	-0.029	-0.001
	(0.008)	(0.008)	(0.022)	(0.018)	(0.010)
Week 16	0.005	-0.004	0.003	0.007	-0.001
	(0.006)	(0.005)	(0.016)	(0.012)	(0.008)

Note: Each line reports the coefficients of a separate OLS regression in which the dependent variable is an indicator corresponding to the week in which the firm responded to the INVIND 2019 survey and the regressors are listed by column. A detailed description of the management score is in the text and Appendix B. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales figures, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. All 16 regressions feature sectors and provinces fixed effects. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. All 16 regressions are run on the same sample of 1781 observations. Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A2: Sales growth, management, and firm's characteristics

	Expected sales growth									
	Log(Emp)	$\mathbb{1}_{Exporter}$	$\mathbb{1}_{Profits}$	Lprod	Closed	Wage	White	AvgHC	ManHC	AdvTech
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Management	1.068*	1.073*	1.136**	1.046*	1.071*	1.235**	1.163**	1.193**	1.178**	0.992*
	(0.545)	(0.545)	(0.551)	(0.543)	(0.544)	(0.547)	(0.547)	(0.556)	(0.552)	(0.551)
Management*$\mathbb{1}_{LD}$	1.200*	1.204*	1.212*	1.191*	1.187*	1.343*	1.136*	1.157*	1.223*	1.563**
	(0.700)	(0.695)	(0.703)	(0.697)	(0.693)	(0.754)	(0.685)	(0.679)	(0.693)	(0.750)
Control	0.001	-0.294	-1.534	0.522	-4.941**	2.475	0.032	1.841	1.985	1.116
	(0.352)	(1.081)	(0.982)	(0.545)	(2.239)	(1.641)	(0.023)	(2.876)	(2.308)	(0.935)
Fixed effects										
Sector	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Province*$\mathbb{1}_{LD}$	Y	Y	Y	Y	Y	Y	Y	Y	Y	Y
Observations	1803	1803	1803	1803	1803	1600	1772	1771	1768	1738

Note: The dependent variable is the expected YoY sales growth in 2020 sourced from INVIND. A detailed description of the management score is in the text and Appendix B. Control is a catch-all name for the controls for firm's characteristics that we introduce one at the time in the regression. The specific control is spelled out in the column header (so that Control is Log(Emp) in column (1), $\mathbb{1}_{Exporter}$ in column (2), etc.). $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22nd March. Employment (Emp) is based on headcount; labor productivity (Lprod) is defined as the log of revenue divided by employment, where revenues refer to total sales, for both, we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales figures, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Closed sector is a dummy for 4-digit sectors whose activities were not permitted during the lockdown. Average wage is measured in 2019 and the share of white collar workers is taken from social security data from 2019. Average human capital (AvgHC) and manager human capital (ManHC) is the mean level of the individual fixed effect measured over the period 2005–2018. Manager human capital is the mean employee ability in the top quartile of the within-firm distribution (see Bender et al. (2018) for further details). Advanced technologies (AdvTech) is an indicator variable which takes value one if the firm uses at least one of the following: cloud computing, big data or artificial intelligence. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Interview type is an indicator variable that takes value 1 for interviews conducted over phone (as opposed to email). Column (5) includes week up to the 15th of March (i.e. week 11), Column (6) includes week starting from the 30th of March (i.e. week 14). Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A3: Management and expectation error

	(1)	(2)	(3)	(4)	(5)
Management	-0.002	-0.006	-0.011	-0.006	-0.007
	(0.007)	(0.010)	(0.011)	(0.012)	(0.010)
Management*$\mathbb{1}_{LD}$		0.009	0.008		
		(0.015)	(0.016)		
Log(Employment)	-0.003	-0.003	-0.009	-0.012	-0.004
	(0.008)	(0.008)	(0.009)	(0.014)	(0.009)
$\mathbb{1}_{Exporter}$	-0.007	-0.008	-0.020	-0.001	-0.033
	(0.022)	(0.022)	(0.024)	(0.033)	(0.034)
$\mathbb{1}_{Profits>0}$	-0.074***	-0.074***	-0.082***	-0.107***	-0.051*
	(0.023)	(0.023)	(0.024)	(0.034)	(0.026)
Log(Revenue/Employment)	0.009	0.009	0.002	-0.018	0.029
	(0.020)	(0.020)	(0.020)	(0.029)	(0.023)
Fixed effects					
Sector	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y		
Province*$\mathbb{1}_{LD}$	Y	Y	Y		
Observations	1523	1523	1332	636	696

Note: The dependent variable is the expectation error, defined as the difference between realized sales growth in 2020 and the prediction of sales growth in 2020 formed in 2019. A detailed description of the management score is in the text and Appendix B. $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22$^{\text{nd}}$ March. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales figures, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Interview type is a dummy for interviews conducted over phone (as opposed to email). Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A4: Expected sales growth and human capital and technology

Control:	Expected sales growth				
	Wage	White Collar	Human Capital	Managerial Human Capital	Advanced Technologies
	(1)	(2)	(3)	(4)	(5)
Management	1.397**	1.262**	1.190**	1.206**	1.142**
	(0.560)	(0.558)	(0.567)	(0.565)	(0.557)
Management*$\mathbb{1}_{LD}$	1.181	1.074	1.264*	1.277*	1.388*
	(0.793)	(0.693)	(0.686)	(0.699)	(0.830)
Control	-0.589	-0.0156	-5.271	-3.560	0.314
	(1.811)	(0.029)	(3.451)	(3.462)	(1.158)
Control*$\mathbb{1}_{LD}$	5.494	0.079*	11.78**	9.274**	1.487
	(3.683)	(0.044)	(5.392)	(4.626)	(1.868)
Fixed effects					
Sector	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y	Y	Y
Province*$\mathbb{1}_{LD}$	Y	Y	Y	Y	Y
Observations	1534	1708	1707	1704	1676

Note: The dependent variable is the expected YoY sales growth in 2020 over 2019, sourced from INVIND 2019 survey. A detailed description of the management score is in the text and Appendix B. Control is a catch-all name for the controls for human capital and technology that we introduce one at the time in the regression. The specific control is spelled out in the column header (so that Control is Wage in column (1), Share of White collar workers in column (2), etc.). $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22$^{\text{nd}}$ March. Average wage is measured in 2019 and the share of white collar workers is taken from social security data from 2018. Average human capital and manager human capital is the mean level of individual fixed effect measured over the period 2005–2018. Managerial human capital is the mean employee ability in the top quartile of the within-firm distribution (see Bender et al. (2018) for further details). Advanced technologies is an indicator variable which takes value one if the firm uses at least one of the following: cloud computing, big data or artificial intelligence. Interview type is an indicator variable that takes value 1 for interviews conducted over phone (as opposed to email). Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A5: Management and realized sales growth

	Sales Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Management	1.541***	1.469***	1.536***	1.606***	1.505***	1.708***
	(0.470)	(0.487)	(0.484)	(0.545)	(0.550)	(0.541)
Log(Employment)		-0.142	-0.239	-0.296	-0.247	-0.221
		(0.435)	(0.420)	(0.422)	(0.427)	(0.436)
Log(Revenue/Employment)		1.201	0.881	1.295	1.571	1.563
		(1.031)	(1.042)	(1.119)	(1.164)	(1.190)
$\mathbb{1}_{Exporter}$		-1.983	-1.743	-2.247	-2.218	-1.852
		(1.534)	(1.526)	(1.416)	(1.469)	(1.478)
$\mathbb{1}_{Profits>0}$		2.639*	2.647*	2.350	2.220	2.594*
		(1.448)	(1.446)	(1.497)	(1.468)	(1.515)
Closed sector			-8.506***	-7.630**	-7.773**	-8.224**
			(3.215)	(3.441)	(3.434)	(3.202)
Log(Average wage)				-1.627	0.663	0.390
				(2.289)	(2.198)	(2.264)
Skill (% white collar)					-0.042	-0.042
					(0.033)	(0.034)
Average human capital					-12.22	-14.78*
					(8.172)	(8.160)
Manager human capital					3.319	5.854
					(6.504)	(6.578)
Advanced technologies						-0.621
						(1.059)
Fixed effects						
Sector	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Observations	1594	1594	1594	1422	1426	1353

Note: The dependent variable is realized YoY sales growth in 2020 relative to the same period in 2019, sourced from the INVIND 2021 survey. A detailed description of the management score is in the text and Appendix B. Employment is based on headcount; revenues refer to total sales, for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales figures, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Closed sector is a dummy for 4-digit sectors whose activities were not permitted during the lockdown. Average wage is measured in 2019 and the share of white collar workers is taken from social security data from 2018. Average human capital and manager human capital is the mean level of individual fixed effect measured over the period 2005–2018. Managerial human capital is the mean employee ability in the top quartile of the within-firm distribution (see Bender et al. (2018) for further details). Advanced technologies is an indicator variable which takes value one if the firm uses at least one of the following: cloud computing, big data or artificial intelligence. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A6: Heterogeneity and realized sales growth

	Sales Growth					
	(1)	(2)	(3)	(4)	(5)	(6)
Heterogeneity:		South	Industry	Closed	Large	$\mathbb{1}_{Exporter}$
Management	1.536***	1.667***	1.256	1.384**	1.753**	2.014**
	(0.484)	(0.544)	(0.818)	(0.655)	(0.696)	(0.850)
Management×Heterogeneity		-0.297	0.467	0.313	-0.599	-0.782
		(0.743)	(0.966)	(0.783)	(0.899)	(0.945)
Fixed effects						
Sector	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Observations	1594	1594	1594	1594	1594	1594

Note: The dependent variable is realized YoY sales growth in 2020 relative to the same period in 2019, sourced from the INVIND 2021 survey. A detailed description of the management score is in the text and Appendix B. Heterogeneity is a catch-all name for the controls for heterogeneity that we introduce one at the time in the regression. The specific control is spelled out in the column header (so that there is no control for Heterogeneity in column (1), while Heterogeneity is the South dummy in column (2), an industry dummy in column (3), etc.). The set of controls for heterogeneity include: a South indicator variable that takes value 1 if the firm is located in a Southern region (including Sicily and Sardinia); an indicator for firms operating in the industrial sector defined as section C, D and E of Nace rev. 2 classification; an indicator for closed sectors that takes value 1 if the firm operates in one of the sectors which were obliged to work from remote during the lockdown; Large is an indicator which takes value 1 if the firm's sales are larger than the median value in 2019 computed across all firms; $\mathbb{1}_{Exporter}$ is an indicator that takes value 1 if the firm reports foreign sales. In all regressions we include: the heterogeneity term; the interaction between the heterogeneity term and the indicator variable for lockdown, that takes value 1 if the firm answered the 2020 INVIND survey after 22$^{\text{nd}}$ March; the following controls: log of employment and log of labor productivity, measured as output per worker (employment is based on headcount; revenues refer to total sales, for both we take the 2019 value), positive export sales in 2019, an indicator variable equal to one for firms that reported having strong or modest profits in 2019, if the firm operated in a non-essential sector; sector and province fixed effects. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A7: Management and expected sales growth with respect to 2017-2019

	Expected sales growth				
		Interaction		Sample split	
		Full sample	Excluding weeks 13 and 14	Before	After
	(1)	(2)	(3)	(4)	(5)
Management	2.308***	1.574**	1.328*	1.314*	3.266***
	(0.542)	(0.715)	(0.779)	(0.782)	(0.724)
Management*$\mathbb{1}_{LD}$		1.435*	1.961**		
		(0.845)	(0.939)		
Log(Employment)	0.508	0.474	0.204	0.0162	0.363
	(0.450)	(0.449)	(0.474)	(0.720)	(0.559)
Log(Revenue/Employment)	2.487***	2.477***	2.510***	2.285*	2.649**
	(0.885)	(0.892)	(0.948)	(1.374)	(1.238)
$\mathbb{1}_{Exporter}$	-0.361	-0.386	-1.504	-1.797	-1.334
	(1.364)	(1.359)	(1.574)	(2.067)	(1.865)
$\mathbb{1}_{Profits}$	3.626***	3.617***	3.197**	4.734***	1.205
	(1.339)	(1.327)	(1.358)	(1.667)	(2.033)
Fixed effects					
Sector	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y		
Province*$\mathbb{1}_{LD}$	Y	Y	Y		
Observations	1740	1740	1529	716	813

Note: The dependent variable is the expected YoY sales growth in 2020 over the average sales in 2017-2019, sourced from INVIND 2017,2018, 2019 and 2020. A detailed description of the management score is in the text and Appendix B. $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22nd March. Employment is based on headcount, revenues refer to total sales; for both we take the 2019 value. $\mathbb{1}_{Exporter}$ is equal to 1 for firms reporting in 2019 positive export sales, $\mathbb{1}_{Profits}$ is equal to one for firms that reported having strong or modest profits in 2019. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Interview type is an indicator variable that takes value 1 for interviews conducted over phone (as opposed to email). Column (4) includes week up to the 15th of March (i.e. week 11), Column (5) includes week starting from the 30th of March (i.e. week 14). Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A8: Management and Remote Work in 2020

Panel A

				Sample Split		Realized
				Before	After	Sales
	(1)	(2)	(3)	(4)	(5)	(6)
Management	1.843***	1.292**	1.270*	1.318*	2.412***	1.552***
	(0.513)	(0.611)	(0.699)	(0.702)	(0.714)	(0.485)
Management*$\mathbb{1}_{LD}$		1.102	1.246			
		(0.705)	(0.823)			
% Remote work (2020)	0.020	0.022	-0.029	-0.001	0.053	-0.067*
	(0.033)	(0.033)	(0.048)	(0.048)	(0.055)	(0.036)
% Remote work (2020)*$\mathbb{1}_{LD}$			0.103			
			(0.072)			
Controls	Y	Y	Y	Y	Y	Y

Panel B

					Sample Split	
					Before	After
	(1)	(2)	(3)	(4)	(5)	(6)
Management	1.252*	1.455**	1.336*	1.244*	1.420**	2.788***
	(0.700)	(0.650)	(0.720)	(0.743)	(0.710)	(0.973)
Management*$\mathbb{1}_{LD}$	1.270	1.211	1.527*	1.889**		
	(0.825)	(0.841)	(0.835)	(0.894)		
% Remote work (2020)	-0.027	-0.042	-0.045	-0.052	0.017	-0.058
	(0.048)	(0.052)	(0.050)	(0.050)	(0.051)	(0.057)
% Remote work (2020)*$\mathbb{1}_{LD}$	0.097	0.073	0.053	0.052		
	(0.073)	(0.077)	(0.075)	(0.078)		
Controls	Y	Y	Y	Y	Y	Y
Fixed effects						
Sector	Y	Y	Y	Y	Y	Y
Province	Y	Y	Y	Y	Y	Y
Week of response	Y	Y	Y	Y	Y	Y
Interview type	Y	Y	Y	Y	Y	Y
Sector*$\mathbb{1}_{LD}$	Y	Y	Y	Y		
Province*$\mathbb{1}_{LD}$	Y	Y	Y	Y		

Note: A detailed description of the management score is in the text and Appendix B. $\mathbb{1}_{LD}$ is an indicator variable that takes value 1 if the firm answered the 2020 INVIND survey after 22nd March. % Remote work in 2020 refers to the number of employees working from home as a share of the firm's average workforce in 2020. The controls in Panel A include log of employment (measured as the headcount of employees in 2019), log of productivity (measured as revenue per worker, where revenues refer to total sales in 2019), an indicator that equals 1 for firms reporting positive export sales in 2019, and an indicator equal to 1 for firms that reported having strong or modest profits in 2019. Controls in Panel B include all of these as well as: column (1) to (6) an indicator equal to 1 for firms in 4-digit sectors whose activities were not permitted during the lockdown, the interaction of this with $\mathbb{1}_{LD}$; column (2) to (6): the average wage measured in 2019; column (3) to (6): the share of white collar, average human capital and manager human capital, measured as the mean level of individual fixed effect over the period 2005–2018, where Manager human capital as the mean employee ability in the top quartile of the within-firm distribution (see Bender et al. (2018) for further details); column (4) to (6): a dummy for advanced technologies measured as an indicator variable which takes value one if the firm uses at least one of the following: cloud computing, big data or artificial intelligence. Sectors are defined according to the 3-digit Nace rev. 2 classification. Provinces refers to NUTS3 Eurostat classification. Interview type is a dummy for interviews conducted over phone (as opposed to email). Column (5) includes week up to the 15th of March (i.e. week 11), Column (6) includes week starting from the 30th of March (i.e. week 14). Standard errors are clustered at the 3-digit industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

B Management score: construction and validation

To measure the use of SMPs in Italian firms, a module of eight questions following Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) was administered through the INVIND survey by the Bank of Italy. The module was administered in 2020, inquiring about the use of structured practices in the organization during 2019.

Table B1 reproduces the "pratiche manageriali" (PM) module included in the INVIND 2020 survey along with the question-wise scoring scheme. We closely follow the scoring mechanism of Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) to arrive at an aggregate management score, as well as for three components of structured management: monitoring, targets and incentives. To calculate the aggregate score, we restrict our sample to firms that have "complete" responses, i.e. firms who responded to at least 5 of the 8 management questions of the module.[33] Each of the questions is first scored on a 0-1 scale based on the scheme (see Table B1). The scores for individual questions are then aggregated by taking the average of the question-wise scores across all the answered questions. Then, we standardize this aggregate measure across firms, to have mean zero and standard deviation 1. This is the overall management score we use for our analysis. We similarly create standardized sub-scores on monitoring, targets and incentives for each respondent firm, where the monitoring sub-score is constructed from the average of the responses to questions PM1-PM3, the targeting sub-score from the average of responses to PM4 and PM5, and the incentives sub-score from PM6-PM8.

The validity of the management practices measure developed by Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) and adopted to our context is prima facie supported by the findings of the preceding paper-based surveys on SMPs that have been conducted in diverse country settings.[34] To validate the measure of management practices is meaningful in our context, we first check the distribution of the aggregate score and whether this validates the cross-country comparisons seen for Italian firms in previous work. The two are shown in Figure B1. From the figure, we can see that the management score has a heavier left tail compared to the equivalent score in the US MOPS distribution, with 44.5% vs 27% firms adopting less than half of the practices. This is in accordance with the findings of the WMS that, on average, US firms employ higher SMPs than Italian firms (Bloom, Genakos, Sadun & Van Reenen 2012). We also assess the correlation of the score with measures of firm performance, which we expect based on the previous literature to be positive if our measure is meaningful. The management score does indeed have a positive and significant correlation with labor productivity of 0.03, very similar to the equivalent value of 0.04 found in the average management score across countries in the WMS (Bloom & Van Reenen 2007).

To further validate our management measure, we follow the strategy of Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019), and examine the relationship between the management score and firm performance. We examine the relationship *prior* to the pandemic.[35] If our survey questions

[33] This includes firms that missed questions by correctly following the skip pattern encoded in the survey: if option 4 is chosen for PM2, the firm skips PM3 and if option 4 was chosen for PM4, skip PM5 and PM6.

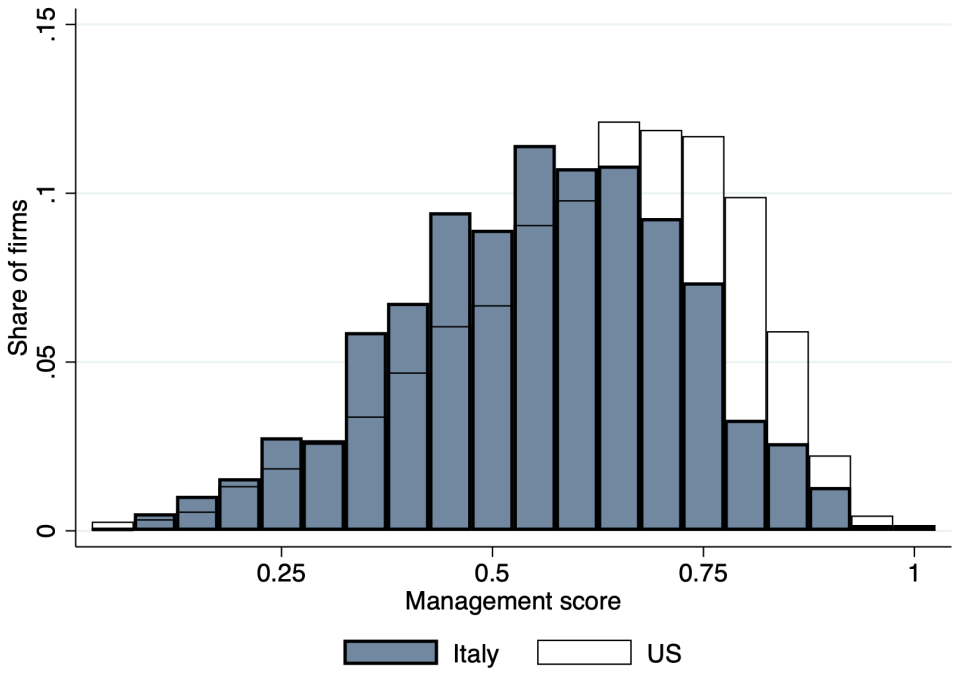
[34] The measurement of SMPs in organizations began with phone interviews under the World Management Survey (WMS) and were subsequently adapted through a careful process of cognitive testing into a multiple choice paper-based format in the Management and Organizational Practices survey (MOPS) Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019). Scur, Sadun, Van Reenen, Lemos & Bloom (2021) provide a comprehensive review of survey instruments to measure management practices in firms.

[35] We use performance measures from 2019 with the management score of early 2020. Our implicit as-

Table B1: Scoring scheme for MOPS module of INVIND 2020

Siamo interessati a conoscere le principali pratiche manageriali utilizzate dalla Vostra impresa **nel 2019**. Per pratiche manageriali si intende l'insieme dei comportamenti e delle prassi utilizzate nella gestione dell'attività di produzione di beni e/o servizi della Vostra Impresa.		
PM1	**Quando si è presentato un problema nella produzione dei Vostri beni e/o servizi, che cosa è avvenuto?**	
1	È stato risolto ma non sono stati presi ulteriori provvedimenti	1/3
2	È stato risolto e sono stati presi ulteriori proveddimenti affinché non accadesse di nuovo	2/3
3	È stato risolto, sono stati presi ulteriori proveddimenti affinché non accadesse di nuovo ed è stato intrapreso un continuo processo di miglioramento per prevenire problemi di questo tipo	1
4	Non è stato preso alcun provvedimento	0
5	Non si è mai presentato un problema nella produzione	0
PM2	**Quanti indicatori di performance sono stati monitorati?**	
1	Da 1 a 2	1/3
2	Da 3 a 9	2/3
3	10 o più	1
4	Nessuno	0
*Se l'impresa **non ha risposto 'Nessuno'** alla domanda precedente:*		
PM3	**Quanto spesso sono stati modificato/aggiornati gli indicatori di performance?**	
1	Annualmente	1/6
2	Trimestralmente	1/3
3	Mensilmente	1/2
4	Settimanalmente	2/3
5	Giornalmente	5/6
6	Ogni ora o più frequentemente	1
7	Mai	0
PM4	**Su quale orizzonte temporale sono definiti principali obiettivi di produzione?**	
1	Breve termine (fina ad un anno)	1/3
2	Lungo termine (più di un anno)	2/3
3	Una combinazione di breve e lungo termine	1
4	Non ci sono obiettivi di produzione	0
*Se l'impresa non ha risposto '4 - Non ci sono obiettivi di produzione', rispondere alle **prossime due domande:***		
PM5	**Quanto è stato facile o difficile perseguire gli obiettivi di produzione dei vostri beni e/o servizi?**	
1	È stato molto facile	0
2	È stato abbastanza facile	1/2
3	non è stato nè facile nè difficile	3/4
4	È stato abbastanza difficile	1
5	È stato molto difficile	1/4
PM6	**Su cosa principalmente basati i premi di produzione?**	
1	Sulle performance del singolo in rapporto agli obiettivi di produzione	1
2	Sulla performance del team in rapporto agli obiettivi di produzione	3/4
3	Sulla performance dello stabilimento in rapporto agli obiettivi di produzione	1/2
4	Sulla performance di tutta l'impresa in rapporto	1/4
5	Non ci sono premi di produzione	0
PM7	**Su quale criterio sono principalmente basate le promozione dei lavoratori?**	
1	Promozioni basate solamente su performance e abilità	1
2	Promozioni basate in parte su performance e abilità e in parte su altri fattori, come l'anzianità sul lavoro	2/3
3	Promozioni basate principalmente su fattori diversi da performance e abilità, come l'anzianità sul lavoro	1/3
4	Generalmente non sono previste promozioni	0
PM8	**Quando un lavoratore (non-manager) di scarsa produttiva è stato spostato dal suo ruolo?**	
1	Entro 6 mesi dall'accertamento della scarsa produttiva dell'impiegato	1
2	Dopo 6 mesi dall'accertamento della scarsa produttiva dell'impiegato	1/2
3	Raramete o mai	0
4	Nessun lavoratore si è rivelato di scarsa produttiva	0

Figure B1: Management distribution across firms



Note: Management scores of firms in Italy from INVIND (2019) against the distribution for U.S. plants following Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019).

Table B2: Performance and management

	Log (Output/Employment)		Profit/Sales	EBITDA/Assets
	(1)	(2)	(3)	(4)
Management	0.097***	0.033**	0.779*	16.365**
	(0.018)	(0.013)	(0.402)	(6.597)
Log(Capital/Employment)		0.041***	0.422	-8.304
		(0.014)	(0.419)	(7.684)
Log(Employment)		0.015	0.592**	-8.788***
		(0.014)	(0.263)	(3.337)
Log(Materials/Employment)		0.441***	0.088	13.451
		(0.039)	(0.793)	(8.581)
Skill (% White Collar)		0.005***	-0.019	-0.306
		(0.002)	(0.016)	(0.291)
Observations	1803	1696	1685	1696

Note: The dependent variable is shown at the top of each column, as measured in 2019. Output is measured by revenue (in thousands of Euros), Employment by headcount of employees in 2019. EBITDA is constructed from 2020 INVIND variables. Capital is measured at the book value and the Share of white collar workers is taken from the 2018 INVIND survey. EBITDA is measured as value added minus labor costs. The scale of the dependent variable in Columns (3) and (4) is multiplied by 100 for readability. All regressions include 3-digit sector fixed effects, and standard errors are shown in parentheses and are clustered at the 3-digit sector level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

meaningfully capture the use of SMPs in Italian firms, we can expect to find a strong positive relationship with performance in normal times, with magnitudes similar to previous studies. At first glance, we see for example that structured management is positively correlated with firm size and exporting activity. In Table B2, we begin in Column (1) with a basic regression of labor productivity measured as log(output/ employee) on the management score without controls, where output is measured as total revenues or sales. We find a highly significant coefficient of 0.0975. This implies that a one standard-deviation increase in the management score is associated with 10.24 percent (exp(0.0975)-1) increase in labor productivity. In Column (2), we follow Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) and estimate a specification associated with a production function with management practices as an input similar to labor and capital, and with total factor productivity substituted with fixed effects for industry and province. Capital is measured as the book value of total fixed assets and employment is measured by the headcount of employees. We control for skilled labor, which is positively correlated with the management score in our data. We proxy for skill using the share of white collar workers in the firm (latest measure from 2018). We also include survey fixed effects (week of response of the survey and whether the survey was conducted over phone or email). These controls reduce the coefficient of the management score on labor productivity from 0.0975 found in Column (1) to 0.033, but the value is very similar to the literature. Bloom & Van Reenen (2007) find the equivalent coefficient for the regression to be 0.04 in cross-country data from the World Management Survey, to which our coefficient is reassuringly similar. We also consider profitability, which is an indicator firms care about. In Column (3) of Table B2, we consider the profit rate calculated using operating profits scaled by sales as the outcome and estimate the specification of Column (2). We find a positive and significant relationship between management practices and profitability. Finally, in Column (4), we consider an alternative measure of the profit rate using Earnings Before Interest, Taxes, Depreciation and Amortization (EBITDA) scaled by assets. We regress this against the management score following the same specification as Columns (2) and (3) and again find a positive and significant relationship between management practices and profitability.

These correlations suggest the measure of the use of SMPs in organizations developed by Bloom, Brynjolfsson, Foster, Jarmin, Patnaik, Saporta-Eksten & Van Reenen (2019) has high explanatory power for firm performance in our context, and thus meaningfully captures the use of these practices for firms in Italy, supporting our use the measure for empirical analysis.

sumption here is that the management-performance relationship is relatively stable in the short run.

C Details of the conditional logit model

We explain details of the empirical strategy that we adopt for analysis using information from the ISECO survey. The original choice set for the strategy questions ("What strategies have you adopted or are thinking to adopt to counter the negative effect of the spread of the Coronavirus in Italy on the activities of your firm?") comprised of 10 strategies and a "No strategy has been adopted" option. The options were: 1. Revision of prices; 2. Revision of sales markets; 3. Revision of suppliers; 4. Conversion of productive activities; 5. Changes in the logistics; 6. Personnel policies (for example changes in the number of employees, in the time schedule, remote work); 7. Reduction in production; 8. Revision of investment plans; 9. Delay in payments to suppliers/from customers; 10. Changes in bank loan usage. demand policies (1 and 2), production policies (3, 4, 5, 7), labor policies (6), investment plans policies (8) and finance (9 and 10) (see Table D2). As before, we assign to each possible grouped response the maximum rank obtained by each option. Compared to the standard model, in this case a firm can rank up to three options. To exploit this additional information, we proceed as follows. The factor that is chosen as most important is preferred to all the others. The second is preferred to the others, once the first factor is excluded from the choice set, and correspondingly for the third factor. To build our data for estimation we stack all these alternative choices and to account for the fact that a firm can choose more than one factor, standard errors are clustered at the firm level. As an example, consider the case of a firm ranking three options. In our final dataset, firms will be represented with three choice sets: the first one will have all options available, the second choice set will exclude the first preferred option and include only the remaining one, and the third will have all combinations excluding the first two choices.

The conditional logit model rests on the Independence of Irrelevant Alternative (IIA) assumption. In practice, this means that the relative odds of choosing one option over another is not affected by the elimination of other alternatives. This is particularly important given our estimation strategy. In fact, to exploit the fact that firms rank up to three alternatives, we use the first choice as the alternative preferred to all others, then we delete this alternative from the choice set and obtain another observation in which the second choice is the preferred alternative when the first choice is not available, and similarly for the third choice. This requires that the second choice would have been preferred to all the others excluding the first choice even in the case that the first choice was not available. We believe that this assumption is reasonable in our setting. In fact, we have aggregated the choices into clearly separated ones: demand, supply (intermediates, logistic and infrastructure), labor, finance, none. If a firm ranks (say) labor above finance when demand is available, it is unclear why this rank could be reversed in the case in which the demand option is not available. The IIA assumption fails when one choice has different degrees of substitutability with each of the other choices. This would be likely if choices have a certain degree of overlap. For example, slowdown in the supply of intermediate and problems with logistics are more similar than drop in demand. Therefore, eliminating one could increase the relative likelihood of the other. But, given our definition of the choice set, we see no overlap, that is, no "Blue bus-Red Bus" choices.

Table D1: Drivers in COVID-19 affecting firms

ISECO Survey Original Options	Aggregate Responses	1st factor	2nd factor	3rd factor	Total
1. Decrease in foreign demand	DEMAND	293	236	87	616
2. Decrease in domestic demand	DEMAND	705	310	63	1078
3. Problems in logistics and/or in the functioning of infrastructure	SUPPLY	200	259	212	671
4. Unavailability of labour	LABOR	96	99	127	322
5. Delays in the supply of raw materials or intermediate goods	SUPPLY	98	225	222	545
6. Problems relating to liquidity or to the financial structure of the firm	FINANCE	82	133	215	430
7. None of the above factors	NONE	108	99	134	341
Total		1582	1361	1060	4003

Note: The first column shows the original options available for firms in the ISECO survey to answer the question: "In relation to the diffusion of the COVID-19, what factors are negatively affecting your operations in Italy?". The second column shows how we group these options into aggregate categories used in the analysis. The remaining columns show the number of firms that choose each option by their rankings indicated at the top of the column.

Table D2: Strategies of firms in response to COVID-19

	Aggregate Responses	1st factor	2nd factor	3rd factor	Total
1. Revision of prices	DEMAND	59	17	29	105
2. Revision of sales markets	DEMAND	50	56	37	143
3. Rethinking of domestic/foreign suppliers	SUPPLY	15	25	26	66
4. Conversion of production activity	SUPPLY	25	19	13	57
5. Changes in logistics (i.e. different transport modes for supplies/deliveries)	SUPPLY	59	67	48	174
6. Staffing policies (e.g. changes in the number of employees/working hours/rotating schedules/recourse to wage supplementation/remote work)	LABOR	853	226	96	1175
7. Reduction of the degree of utilization of plant and machinery and/or of production	SUPPLY	110	225	92	427
8. Revision of investment plans	INVESTMENT	66	200	169	435
9. Extended payment terms for your clients/by your suppliers	FINANCE	108	214	195	517
10. Extended payment terms by banks and/or granting of new credit lines	FINANCE	115	193	193	501
11. No strategy has been/will be adopted	NONE	119	61	126	306
Total		1579	1303	1024	3906

Note: The first column shows the original options available for firms in the ISECO survey to answer the question: "What strategies have you adopted or are thinking to adopt to counter the negative effect of the spread of the Coronavirus in Italy on the activities of your firm?". The second column shows how we group these options into aggregate categories used in the analysis. The remaining columns show the number of firms that choose each option by their rankings indicated at the top of the column.