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Work from home arrangements and organizational performance in Italian SMEs: evidence from the COVID-19 pandemic

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Abstract
We use survey data on Italian small- and medium-sized enterprises collected during the COVID-19 pandemic to explore the relationship between the adoption of work from home (WFH) practices and organizational performance. In so doing, we investigate several dimensions of organizational performance, including measures of labor productivity and workers' concentration and motivation, the level of absenteeism, the organization of work through management by objectives (MBO), and the presence of coordination and communication costs. We obtain several results. First, we find a significantly enhanced capability of firms that adopted WFH during the pandemic to sustain the overall organizational performance, particularly when such a work practice is used intensively. Less deteriorated labor productivity and workers' concentration and motivation, decreased absenteeism, and a substantial rise in the adoption of MBO practices seem to be important aspects behind the detected benefits related to WFH. Third, when WFH is used at medium levels of intensity, it is associated with augmented coordination and communication costs, which nonetheless do not appear to overcome the benefits associated with WFH.

Keywords Work from home (WFH) · Organizational performance · Labor productivity · Management by objectives (MBO) · COVID-19 · Small- and medium-sized enterprises (SMEs)

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1 Introduction

The global pandemic has led to an unprecedented shift to remote working. Stringent lockdowns were imposed worldwide several times in 2020 and 2021 to contain the spread of the virus. These measures, coupled with the great uncertainty surrounding the end of the pandemic, have led to widespread use of work from home (WFH) practices, so that such a work arrangement has become the norm for millions of workers worldwide. Just to give an idea, close to 40% of those working in the EU began to WFH full-time as a result of the pandemic in 2020 (Eurofound 2020).

Before the pandemic, a shared belief among both employers and employees was that only a small fraction of the work could be done from home (Bloom 2020). Nonetheless, this fraction was expected to increase sharply thanks to technological advancements, which have decreased the marginal costs for firms of work flexibility. Using micro-data on US employees, Oettinger (2022) consistently reports that the number of employees working from home has almost doubled in the period 2000–2010, with a higher concentration in the information and communication technology (ICT) sector. More recently, Dingel and Neiman (2020) predict that the share of total jobs that can be performed entirely at home is around one-third of the total jobs in the USA, including also knowledge workers in the ICT industry. Even if technological feasibility is improving and implementation costs on the firms' side are decreasing, allowing flexibility in the working arrangements may impose additional costs, at least when teamwork and the role of coordination is important (see, for instance, Mas and Pallais 2020, for a review of the literature on alternative work arrangements) or when monitoring workers is difficult (Jensen et al. 2020).

In this picture of the progressive increase of WFH, the COVID-19 pandemic accelerated a process already in place (Amankwah-Amoah et al. 2021): WFH was encouraged by institutions during the pandemic and became mandatory on several occasions during general lockdowns. For the USA, Bartik et al. (2020b) report that 45% of the firms used WFH to some extent during the pandemic. Most importantly, they report that 30% of the firms believe that WFH will remain a common practice after the pandemic. In fact, the preliminary results of this huge—if not randomized—trial are positive: a lot of work can be done at home and, what is more, it seems that it performed well for many employees (Alexander et al. 2022; Bergamante et al. 2022). However, how did it work according to their employers? Do they share the same feeling as employees? The future of WFH eventually hangs on entrepreneurs', managers', and directors' evaluations of the experience during the pandemic.

In this context of the massive adoption of WFH arrangements, small- and medium-sized enterprises (SMEs) might be potentially disadvantaged if the impact of WFH arrangements is not substantially positive on the firm side. Aguilera et al. (2016) find that home-based teleworking is more frequent in large companies as compared with SMEs, because of the limited amount of resources to invest in robust ICT infrastructures dedicated to WFH characterizing the latter. In the same vein, using a large firm-level survey, Bartik et al. (2020a) demonstrate that the small firm size, together

with its downsides (e.g., financial or organizational constraints), may be a barrier to the adoption of WFH arrangements. In particular, the existence of financial barriers for smaller firms, coupled with their difficulties to access formal financing sources during the pandemic, might represent another potential obstacle in the adoption of WFH for such companies (Alekseev et al. 2021).

In general, however, the effect of WFH in SMEs remains largely unexplored. Despite the growing literature on the effects of WFH, mainly driven by its diffusion during the pandemic, to the best of our knowledge, only two studies focus on firm performance in SMEs (Zhang et al. 2021; Barabaschi et al. 2022), although such firms exhibit starkly different dynamics and challenges than larger enterprises. Moreover, no existing study on SMEs investigates the employer perspective, which is fundamental to driving decisions about whether and how much to adopt WFH. By gathering the employers' point of view, this paper aims to shed light on these aspects and can thus contribute to the debate on the role of WFH in the future.

In this study, we assess the relationship between WFH and organizational performance in the context of SMEs. Following the classification of Eurostat, we define as SMEs the firms employing between 10 and 249 employees. We focus on Italian companies, as this country provides an excellent research case for at least two reasons. First, in Italy, SMEs are a prevalent form of enterprise.[1] Second, according to Eurofound (2020), Italy was one of the Member States with the highest increases in WFH practices during the pandemic, partly due to the small rate of adoption of WFH arrangements before 2020 and the severity of the pandemic. The sudden transition to novel forms of work by so many different firms and workers provides an unprecedented shock, which enables us to more accurately assess the relationship between WFH and organizational performance, as well as the main dimensions behind it.

We started from a randomly generated sample of the population of Italian SMEs extracted from the AIDA data set, to which we sent via email the questionnaires from the end of March to the end of June 2021, coinciding with the conclusion of Italy's second COVID-19 wave. Our final data set is a cross-sectional firm-level data set on 690 Italian SMEs. The questionnaires were addressed to the firms' owners (or CEOs or top directors, when the former were not easily contactable), to capture as accurately as possible the employers' perspectives. They were asked several questions on the generalities of the firm, the adoption of WFH before and during the pandemic, as well as on the assessed overall organizational performance change as compared with the pre-pandemic period. They were also asked to indicate how several specific aspects have changed, possibly identifying important dimensions through which the effect of WFH on the overall organizational performance could be conveyed. In particular, they were asked to express changes in (i) workers' performance (i.e., labor productivity, workers' concentration and motivation), (ii) coordination and communication costs (i.e., coordination effectiveness, effectiveness of internal communication), (iii) scope for abuse of WFH by employees (i.e., workers' absenteeism, monitoring effectiveness), and (iv) adoption of specific management practices (i.e., management by objectives—MBO).

[1] According to the permanent business census conducted by the Italian Statistical Office, companies with 10 to 249 employees (i.e., SMEs) represent 20% of all the companies, accounting for 42% of the total paid employment (Istat 2020).

We find that firms using WFH during the pandemic declare a significantly less deteriorated overall organizational performance than firms that did not use such a work practice. Given that the reported change in the overall organizational performance was negative for both categories of firms, we can say that firms resorting to WFH had a better capability to sustain performance levels than firms that did not use WFH. In other words, it seems that firms using WFH schemes were more able to attenuate the negative impact of the pandemic. However, the intensity of WFH (measured both in terms of the number of employees and the total working time) appears to be a critical aspect: the benefits of WFH show up only when it is used somewhat intensively by the firm. Less deteriorated labor productivity and workers' concentration and motivation, decreased levels of absenteeism, and a substantial increase in the adoption of MBO practices seem to be important aspects behind the detected benefits related to WFH. However, our results show that, when used at medium levels of intensity, WFH is associated with higher coordination and communication costs, which nonetheless do not appear to overcome the positive effects mentioned above. Overall, our results indicate that WFH may be an effective instrument for sustaining overall organizational performance, under the conditions that it is uniformly used in the firm and the potential monitoring and coordination issues are properly taken into account.

The rest of the paper is organized as follows. Section 2 presents a brief overview of the relevant literature. Section 3 describes the Italian case and sets it in an international perspective. Section 4 discusses the data set and presents relevant descriptive statistics, while Sect. 5 illustrates our empirical models. Section 6 shows and discusses the results and, finally, Sect. 7 highlights the main conclusions and the policy implications of this study, as well as avenues for future research.

2 Previous literature and conceptual framework

There is a long-standing interest in the effect of WFH arrangements on firms' organizational performance, which has substantially increased in recent periods, particularly after the COVID-19 breakthrough.

The general evidence from more dated literature, resumed in a detailed review by Bailey and Kurland (2002), highlights a potentially positive relationship between WFH and performance, mainly driven by the observed lower absenteeism among remote workers (Kitou and Horvath 2002). Other acknowledged possible determinants for a positive relationship are flexibility, autonomy, and savings in commuting time/costs (Gajendran and Harrison 2007), which allow for longer working hours or harder work (Kelliher and Anderson 2010). Moreover, leveraging on the advantages for employees enhanced by WFH, firms could potentially increase the returns of such a work practice by pushing down wages, as a sort of (reversed) compensating wage differential. In this respect, Mas and Pallais (2017) report that the average worker would be willing to cut her/his wage by 8% in exchange for a WFH arrangement.

More recently, before the pandemic, the literature has highlighted positive outcomes of WFH for firms, but with some exceptions for specific tasks. Using a randomized control trial on remote workers in the call-center sector in China, Bloom et al. (2015) find a significant increase in employees' productivity (+13%), a significant reduction

in their turnover, and substantial cost savings from the reduction in office spaces. Relatedly, relying on a fixed-effects empirical strategy, Beckmann (2016) finds that increasing the autonomy of workers in an organization (e.g., in the distribution of working hours, breaks, vacation days) increases the productivity of German firms by 9%, although the effects on profits are negligible. A different conclusion has been reached by Battiston et al. (2021). Using a natural experiment on emergency radio operators in the UK, they show that productivity is higher when teammates are in the same room and that the effect is stronger for urgent and complex tasks. Consistently with this result, Beham et al. (2015) report a lower propensity among German managers in granting WFH arrangements for job tasks featuring intense teamwork. Another dimension of differentiation is the tasks' content. Dutcher (2012) reports positive productivity effects from remote work among workers involved in creative tasks, and negative outcomes for workers performing dull tasks.

In the COVID-19 era, when several studies try to measure the impact of "emergency" WFH arrangements, the empirical evidence on such practices remains uncertain and strongly dependent on the type of employees or tasks considered, and the type of firms involved. Two main groups of studies can be distinguished. The first one argues a positive effect of WFH arrangements, whereas the second points to negative impacts.

Within the studies documenting a positive relationship between WFH and performance, Patanjali and Bhatta (2022) focus on a sample of 526 professionals from the ICT sector working across the globe. They find higher labor productivity associated with WFH, as reported by the majority of professionals. The main reasons attributed to this increased productivity reside in the time saved from commuting and organizational factors, including the increased autonomy, empowerment, and independence, as well as in a supportive environment associated with WFH practices. Analyzing data from an extensive survey among managers and workers in 25 countries, Criscuolo et al. (2021) find an overall positive relationship between WFH and firms' performance and individuals' well-being. Moreover, they find that a hybrid working arrangement (around two/three days per week in a WFH mode and the rest in presence) might balance the benefits (e.g., less commuting, fewer distractions) and the costs associated with the emerging challenges (e.g., impaired communication and knowledge flows). Using a sample of Italian workers, randomized into WFH practices one day per week, Angelici and Profeta (2020) find that WFH increases productivity and well-being for both blue- and white-collar employees of traditional companies. Based on a survey of individuals in the USA, Barrero et al. (2021) indicate that the majority of respondents who have adopted WFH practices reports higher productivity than what they expected before the start of the pandemic.

Using a survey specifically focused on women, Haridasan et al. (2021) find higher productivity and higher quality of their work performed from home, thanks to fewer interferences. Similarly, Birkinshaw et al. (2020) register higher productivity among knowledge US workers with WFH arrangements, thanks to a better focus on their activities and a reduction in the duration of meetings. In a similar vein, DeFilippis et al. (2021) find more effective collaboration among employees, shorter meetings, and an increase in the workday length by around 45 min during the pandemic in 16 large metropolitan areas in North America, Europe, and the Middle East. Among ICT

employees, two surveys recently conducted in India (Singh and Kumar 2020; Haridas et al. 2021) show that workers spend longer working hours during WFH, with an increase in productivity and a more effective collaboration with their colleagues. Similarly, Seema et al. (2021) analyze survey data from Indian employees of multinational companies and find that half of the respondents perceives a higher productivity level when working remotely, while only around 25% of them perceives a lower level. An analogous conclusion is reached by a survey among US executives and their employees (PwC 2020). General positive productivity effects of WFH practices are reported by both sides (i.e., both executives and employees), but with some differences. While more than 44% of the managers observes productivity increases in their employees, less than 30% of the latter reports an increase in their productivity.

The second group of studies, documenting negative (or negligible) relationships between WFH and performance, is less numerous, but still conspicuous. Among these pieces of research, Morikawa (2022) examines, through matched employer-employee surveys, WFH practices in Japan during the COVID-19 pandemic and finds that average WFH productivity compared with the usual workplace productivity is about 30%-40% lower. However, this study also finds a large dispersion of WFH performance potential, according to both individual and firm characteristics, with poorer performances for employees (and firms) that started WFH practices during the COVID-19 pandemic and better ones for highly educated and high-wage employees. Using a survey on the adoption of WFH practices by 209 employees during the pandemic, Galanti et al. (2021) document a trade-off between the increased autonomy of employees, which positively correlates with performance, and their poorer work-life balance, which negatively correlates with performance. Comparing employees' productivity before and during the pandemic, Beno and Hvorecky (2021) find a drop in productivity while working remotely, mainly due to the difficulties of balancing work with domestic activities. Focusing on white-collar workers, Berstein et al. (2020) find a fall in productivity immediately after lockdowns and a persistent increase in average working hours, by between 10% and 20%, for the employees in WFH arrangements. Finally, Etheridge et al. (2020) use individual-level survey data from the UK and find that productivity associated with WFH practices is not significantly different from that achieved when at the workplace, but this result varies depending on the industry, task, and worker type.

Despite the numerous studies on the relationship between WFH and performance, only a few focus on SMEs, while the effects for these firms could be very specific, given the peculiarities characterizing these firms, for instance, in terms of higher financial or organizational constraints. To the best of our knowledge, only two studies focus on SMEs: Zhang et al. (2021) and Barabaschi et al. (2022). Using aggregated data from a longitudinal survey on US firms and their employees, Zhang et al. (2021) find positive effects of WFH arrangements on revenues and cash flows. Instead, Barabaschi et al. (2022) collect results from a survey of 60 Italian SMEs and 330 employees and investigate the issues of perceived productivity, coordination/control issues, and learning processes. They find that, differently from large organizations more technologically and culturally prepared for WFH practices, Italian SMEs are more reluctant to adopt such alternative working arrangements, but the adoption of WFH during the pandemic stimulated employees' autonomy, motivation, and trust, important aspects

behind labor productivity. As stressed earlier, in this paper, we aim at providing additional evidence on the relationship between WFH and organizational performance for SMEs, specifically concentrating on the point of view of employers and trying to dig into the various aspects of organizational performance.

3 The Italian case: WFH, the pandemic, and prospects

In Italy, WFH is currently regulated by Law n. 81 of 2017, which defines agile work as a method of subordinate work established through an agreement between the employer and the employee, without precise constraints of time or place of work. This law clarifies that agile work must always be voluntary, it must guarantee the same salary and working hours as if it was performed in the office, and the employer must respect the employee's right to disconnect.

Although the first forms of WFH were introduced into the Italian legal system as early as the 1980 s, the diffusion of WFH was extremely slow in Italy compared with other countries (Eurofound 2018), and mainly concentrated in large companies. A study by the Observatory on Smart Working of the Politecnico di Milano indicates that, in 2019, only 12% of SMEs implemented WFH for structured initiatives (Osservatorio Smart Working 2019). Unstructured initiatives were adopted by 18% of the enterprises and only 3% of them foresaw the introduction of such programs in the short term. Notably, 51% of the companies declared that they were not interested in this form of work.

The pandemic dramatically reversed this situation. The first infection clusters of COVID-19 were reported in Italy at the end of January 2020 in a few municipalities in northern Italy. In March, the Italian government prohibited nearly all commercial activities except for essential ones (e.g., supermarkets and pharmacies). By the end of the month, all firms operating in non-essential industries were closed, and the movement of people was restricted. Such restrictions were gradually eased starting from May 2020, although they were brought again in place in October as Italy was hit by the second wave of the pandemic. Between March and June 2021 (i.e., during the period of our survey data collection), in the face of a marked deceleration of the infection rates, restrictions were exclusively implemented at the regional level and updated weekly, based on the regional infection rates. In particular, the national guidelines classified the 20 administrative regions of the Italian territory through a system based on four classes, depending on the level of severity and risk of the COVID-19 pandemic. In the maximum risk (i.e., the so-called red) regions, movements within the municipalities were largely forbidden. " Orange" regions, characterized by high risk, restricted movements outside the municipalities. The regions with lower risk fell into the "yellow" and "white" areas and allowed movements within the region. Figure 1 represents the share of population by each class of risk, showing that significant restrictions were in place up to the summer 2021.

In order to limit the negative economic consequences of the lockdowns, introduced to fight the diffusion of COVID-19, the Government has encouraged the use of WFH since March 2020. In particular, the Prime Ministerial Decree of 22 March 2020, while suspending all non-essential production, industrial, and commercial activities, explic-

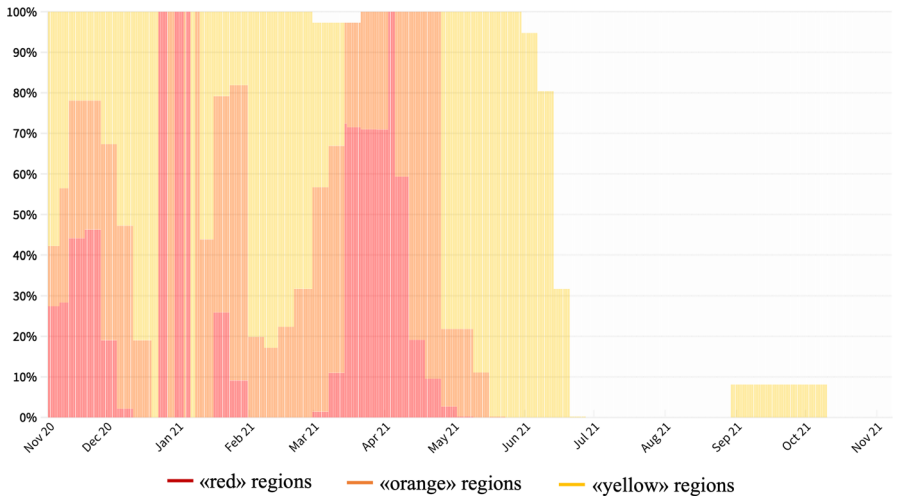


Fig. 1 Share of Italian population by regional risk. *Source*: Press releases of the Italian Ministry of Health. Data elaborated by YouTrend

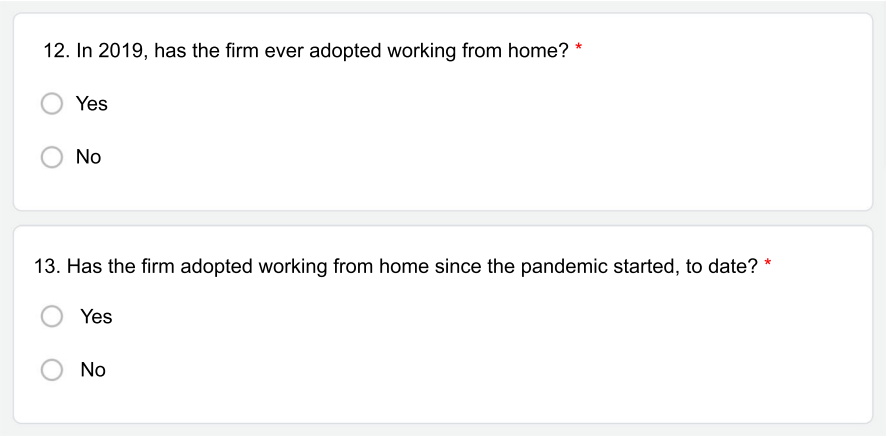


Fig. 2 Survey questions: WFH use; binary variables

itly guaranteed the possibility of continuing the activities remotely for all companies. Moreover, WFH has been incentivized to meet workers' needs for family care during the health emergency, when, often, schools of all levels were closed and only distance learning was allowed. Accordingly, the Legislative Decree n. 34 of 19 May 2020 (the so-called Relaunch Decree) introduced the possibility of using WFH arrangements for the entire emergency period for employees with children under the age of 14, as long as the other parent in the family had a paid job.

In response to these measures, since the spring of 2020, 94% of the public administration (PA), 97% of large companies, and 58% of SMEs have extended the possibility of working remotely for their employees (Osservatorio Smart Working 2020). In large

companies, on average, 54% of the employees worked remotely, 19% in SMEs, and 58% in the PA. The number of remote workers went from 570,000 in 2019 to 6.58 million in 2020, corresponding to about one-third of total employees (Crespi 2021). Although, in the past, the low diffusion of WFH practices was mainly attributed to the fear that activities could not be performed remotely, Osservatorio Smart Working (2020) shows that, during the emergency, as many as 68% of workers declared that they were able to carry out all the activities remotely. On the contrary, only 29% of the surveyed workers declared to manage to do a part of the activities remotely, and 3% of them declared to be unable to do most of their tasks from home.

The pandemic has thus demonstrated the possibility of implementing WFH on a large scale, with important implications in terms of its prospects. A report from the Bank of Italy estimates that WFH will remain or will become, at the end of the pandemic, a practice present in the organization in 89% of large companies and 35% of SMEs (Basso and Formai 2021), involving more than 4.38 million workers, of which around 700,000 in SMEs (Osservatorio Smart Working 2021). The pandemic shock has plausibly accelerated the evolution of work models toward more flexible forms of organization. Large companies are already moving toward hybrid modes of work that will permanently involve WFH for at least a couple of days per week. However, resistance to change is still strong within SMEs. One-third of those who have experienced WFH during the emergency plan to abandon it, partly because of the lack of organizational culture (Osservatorio Smart Working 2021). Evaluating the effects of WFH on organizational performance in the SMEs landscape is thus of fundamental importance to understand whether (part of) the changes we have witnessed during the emergency can become structural, while allowing our societies to more fully reap the economic, social, and environmental benefits potentially offered by WFH arrangements.

4 Data and descriptive analysis

In order to construct our survey, we started from AIDA (*Analisi Informatizzata delle Aziende Italiane*), a data set yearly provided by Bureau Van Dijk, which collects information on the population of private-sector companies whose balance sheets are required to be filed with the chambers of commerce (i.e., incorporated firms). We then selected companies active in the last available year of observation, that is, 2020, and restricted the attention to firms with 10 to 249 employees in that year. According to the definition of Eurostat, such companies are SMEs.[2] Besides our interest in SMEs for the reasons outlined earlier, concentrating on such firms is also important to ensure that the survey respondents are sufficiently informed about the overall practices, procedures, and performance trends of the firm, which may be more likely in relatively small contexts. We thus exclude from our reference population large firms (i.e., with above 249 employees). At the same time, we do not consider micro enterprises (i.e., with below 10 employees), since they are typically non-incorporated firms and thus not present in AIDA, which would introduce serious selection concerns. We then randomly

[2] Firms employing between 10 and 49 employees are small companies, whereas those with 50-249 employees are medium-sized businesses.

selected 14,000 firms (around 9% of the reference population). For 13,313 of them, AIDA reported valid information about their official website addresses. We then sent the questionnaires through the institutional email addresses indicated on the websites and received valid answers from 690 firms (5.2% response rate).[3] The questionnaires were sent from the end of March to the end of June 2021, at the end of the second COVID-19 wave in Italy. Our estimation sample is thus a cross-sectional data set at the firm level on 690 Italian SMEs.

The survey is divided into several sections. In the first one, we ask general questions about the company, such as the firm location, sector, size, and workforce composition. Table 1 provides descriptive statistics on such variables. As shown in the table, the majority of the companies operates in the manufacturing (39.3%) and services (42.5%) sectors. The remaining companies are split between the constructions (6.8%) and trade (11.5%) industries.[4] Consistently with the large diffusion of small firms in Italy, most of the firms in our sample are small, employing between 10 and 49 workers (79.3%). Medium-sized businesses employing between 50 and 99 workers are 11.6% and the remaining fraction (9.1%) are larger firms, with 100 to 249 employees. Relatedly, we observe that the great majority of firms obtains revenues lower than 10 million euros per year (78.7%). Consistently with the Italian industrial structure, most of our sample firms operate in the Northern regions (75.2%).[5] The firms are typically established companies, active for more than 20 years (70.6%). The variable on the workforce composition by education displays that highly educated employees (i.e., with at least a tertiary education degree) are relatively few. Firms employing more than 25% of such workers are less than one-third of our sample, in line with the low percentage of graduates in Italy.[6] Looking at the workforce composition by age, we can see that most of the firms employ less than 50% of under-40 workers (70.1%). Finally, we asked firms to indicate whether and how long they have been closed due to the lockdowns. Around 55% of our sample firms had to close at least for a short period during the pandemic shock. In the last column of Table 1, we compute the same distributions of observations in the whole sample of firms that received the questionnaire, in order to check potential selection issues. In particular, from the AIDA data set, we were able to obtain the sector of economic activity, the firm size in terms of both employees and revenues, and the firm's location and age.[7] As shown in the table, we find somewhat similar distributions

[3] Such a response rate is comparable with other studies in the literature using detailed online surveys (Baruch and Holtom 2008; Sauermann and Roach 2013).

[4] Table 7 in Appendix A shows the distribution of the sample firms across ATECO 1-digit industries. In the regressions, we control for the sector of economic activity of the firms at the ATECO 1-digit level, consisting of 17 categories.

[5] Tables 8 and 9 in Appendix A show the distribution of the sample across NUTS-2 (i.e., administrative regions) and NUTS-3 (i.e., administrative provinces) classes, respectively. In Subsection 6.2, we conduct robustness tests where we include in the regressions NUTS-2 or NUTS-3 dummies instead of macro area dummies to control for the firms' location.

[6] According to the OECD, only 19% of the Italian population aged 25-64 had at least a tertiary education degree in 2019.

[7] In AIDA, information on workforce characteristics, as well as closing periods during the pandemic, are not available.

Table 1 Descriptive statistics: general information

	Observations	%	% Ref. sample
Industry			
Manufacturing	271	39.28	37.51
Constructions	47	6.81	9.67
Trade	79	11.45	12.45
Services	293	42.46	40.37
Size (employees)			
Between 10 and 49	547	79.28	83.24
Between 50 and 99	80	11.59	10.85
Between 100 and 249	63	9.13	5.91
Size (revenues in million euros)			
Less than 2	184	26.67	30.19
Between 2 and 10	359	52.03	54.32
Between 10 and 25	95	13.77	10.36
Between 25 and 50	30	4.35	3.08
More than 50	22	3.19	2.05
Location			
North	519	75.22	70.26
Center	97	14.06	16.54
South	74	10.72	13.20
Firm age (years)			
Less than 5	29	4.20	3.16
Between 5 and 19	174	25.22	28.19
Between 20 and 49	340	49.28	49.51
More than 50	147	21.30	19.14
Workforce characteristics - % highly educated workers			
Less than 25%	490	71.01	-
Between 25% and 50%	114	16.52	-
Between 50% and 75%	48	6.96	-
More than 75%	38	5.51	-
Workforce characteristics - % under-40 workers			
Less than 25%	187	27.10	-
Between 25% and 50%	297	43.04	-
Between 50% and 75%	156	22.61	-
More than 75%	50	7.25	-
Closing period (lockdowns; weeks)			
Never	309	44.78	-
Less than 4	181	26.23	-

Table 1 continued

	Observations	%	% Ref. sample
Between 4 and 12	157	22.75	-
More than 12	43	6.23	-

Source: WFH&Performance data set
"Workforce characteristics - highly educated %" indicates the percentage of employees with at least a tertiary education degree. "Closing period (lockdowns; weeks)" refers to the compulsory closing period duration during the lockdowns. The last column, "% ref. sample", indicates the relevant percentages in the randomly selected sample of 13,313 firms who received the questionnaire, obtained from the AIDA data set. Please note that information on workforce characteristics, as well as closing periods, are not available in AIDA

Table 2 Descriptive statistics: WFH

	Observations	Percentage
WFH pre-pandemic		
No	532	77.10
Yes	158	22.90
WFH_i		
No	206	29.86
Yes	484	70.14
Of which (WFH intensity - based on the number of employees):		
$lowWFH_i$	270	55.79
$medWFH_i$	129	26.65
$highWFH_i$	85	17.56
Of which (WFH intensity - based on the total working time)		
$lowWFH_i$	323	66.74
$medWFH_i$	111	22.93
$highWFH_i$	50	10.33

Source: WFH&Performance data set
"WFH pre-pandemic" is a dummy variable that turns to one if the firm used WFH before the pandemic. WFH_i is a dummy variable that takes the value of one if the firm has implemented WFH during the pandemic and zero otherwise. $lowWFH_i$, $medWFH_i$, and $highWFH_i$ measure the intensity of WFH during the pandemic, identifying firms with low, medium, and high use of WFH, respectively. The definition of WFH intensity based on the number of employees divides the firms into the low, medium, and high classes based on whether the percentage of employees in WFH during the pandemic was below or equal to 25%, between 25% and 75%, and above 75%, respectively. The second definition replicates the former, except that it expresses the intensity of WFH in terms of the percentage of the total working time in the firm instead of the number of employees

in terms of these characteristics in the two samples, thus attenuating potential selection concerns.[8]

[8] A potential source of selection can stem from the use of emails as a distribution channel. In this respect, it is important to note that the adoption of email communication in Italian firms is widespread. Notably, all firms in Italy are legally obligated to maintain a digital domicile known as PEC—"posta elettronica certificata", through which they receive official governmental and bureaucratic communications. Furthermore, our research focuses on enterprises with 10 to 249 employees, indicating a certain level of organizational

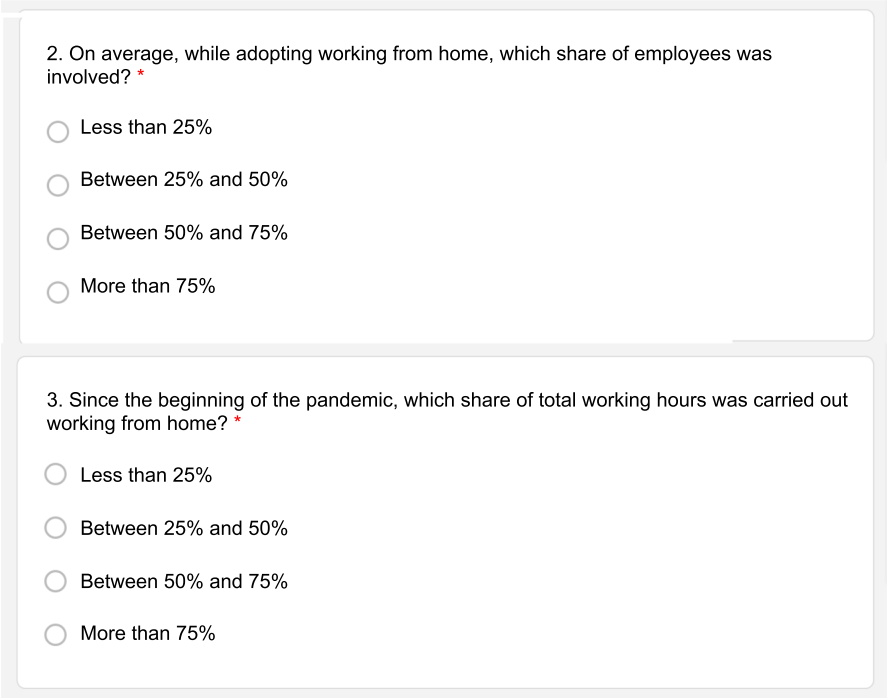
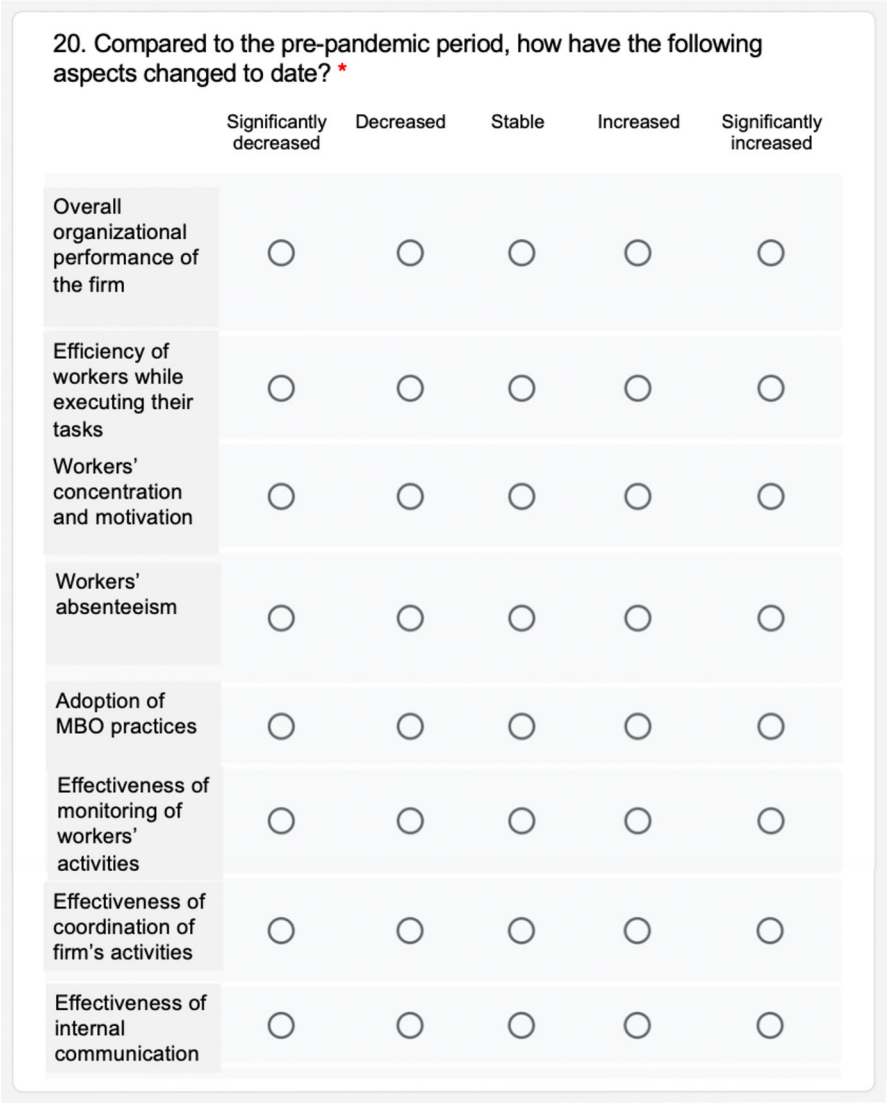


Fig. 3 Survey questions: WFH use; intensity

The second part of our survey collects questions about the use of WFH arrangements before and during the pandemic. In particular, WFH_i is a dummy variable taking the value of one if the firm has implemented WFH during the pandemic, and zero otherwise. Table 2 shows descriptive statistics related to such variables, while Figs. 2 and 3 report the specific survey questions. As expected, and consistently with the institutional data discussed earlier, WFH was used by relatively few firms before the pandemic (22.9%; first panel of Table 2). On the contrary, it has become a widespread work arrangement during the pandemic: as much as 70.1% of our sample firms declared to have used WFH in that period (WFH_i = Yes; second panel of Table 2).

As shown in Fig. 3, we also asked more detailed questions, which allowed us to measure the intensity of WFH use in the firm during the pandemic through two variables. The first one is related to the percentage of employees in WFH. We classified firms with low WFH use if this percentage was below 25, medium WFH use if it ranged between 25 and 75, and high WFH use if it was above 75 (the associated dummy variables are $lowWFH_i$, $medWFH_i$, and $highWHF_i$, respectively). The second variable instead

Footnote 8 continued
structure where the use of email is even more prevalent. The analysis presented in Table 1 allows us to also examine whether SMEs with specific characteristics might exhibit varying attitudes toward the use of email. As highlighted above, we do not observe any significant differences between Columns (3) and (4), thus alleviating concerns about potential bias originating from the specific distribution channel employed for our survey. We thank an anonymous reviewer for this comment.



20. Compared to the pre-pandemic period, how have the following aspects changed to date? *

	Significantly decreased	Decreased	Stable	Increased	Significantly increased
Overall organizational performance of the firm	○	○	○	○	○
Efficiency of workers while executing their tasks	○	○	○	○	○
Workers' concentration and motivation	○	○	○	○	○
Workers' absenteeism	○	○	○	○	○
Adoption of MBO practices	○	○	○	○	○
Effectiveness of monitoring of workers' activities	○	○	○	○	○
Effectiveness of coordination of firm's activities	○	○	○	○	○
Effectiveness of internal communication	○	○	○	○	○

Fig. 4 Survey questions: performance outcomes

refers to the percentage of the total working time in the firm performed remotely during the pandemic. As for the definition of intensity based on the number of employees, we divided the firms into three classes, with low, medium, and high use of WFH, depending on whether the total working time in the firm performed remotely was below 25%, between 25% and 75%, and above 75%, respectively. Among those firms that used WFH during the pandemic, more than half used WFH with low intensity. In particular, 55.8% of them used WFH for less than 25% of the employees and 66.7% for less than 25% of the total working time. Interestingly, a not negligible percentage of the firms

Table 3 Descriptive statistics: performance outcomes/1

	Pooled	$WFH_i = No$	$WFH_i = Yes$	Diff.
Statement				
(0) Overall organizational performance	2.852	2.655	2.936	+0.281***
	(0.033)	(0.062)	(0.039)	(0.072)
(1) Labor productivity	2.917	2.791	2.971	+0.180***
	(0.027)	(0.047)	(0.033)	(0.059)
(2) Workers' concentration and motivation	2.877	2.806	2.907	+0.101
	(0.029)	(0.053)	(0.034)	(0.063)
(3) Workers' absenteeism	2.925	2.966	2.907	−0.059
	(0.028)	(0.051)	(0.033)	(0.060)
(4) MBO	3.177	3.034	3.238	+0.204***
	(0.027)	(0.045)	(0.032)	(0.058)
(5) Monitoring effectiveness	2.909	2.976	2.880	−0.096*
	(0.024)	(0.049)	(0.028)	(0.053)
(6) Coordination effectiveness	2.935	2.971	2.919	−0.051
	(0.030)	(0.051)	(0.036)	(0.065)
(7) Effectiveness of internal communication	3.068	3.102	3.054	−0.048
	(0.030)	(0.048)	(0.038)	(0.066)
Observations: 690				

Source: WFH&Performance data set

Standard errors in parentheses. Statements from (0) to (7) are the answers given to the following question: "Compared to the pre-pandemic period, how has *Statement (0-7)* changed to date?". Each of these statements ranges from one to five, where one is "substantially decreased" and five is "substantially increased", with three indicating stability. "Diff." computes the difference in average values between firms that used WFH during the pandemic and those that did not. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively

that have used WFH during the pandemic declared to have used it intensively, for over 75% of the employees or total working time in the firm (17.6% and 10.3% for the two definitions, respectively).

Finally, the third section collects questions related to performance outcomes. We asked firms to evaluate how their overall organizational performance and other indicators have changed as compared with the pre-pandemic period. Figure 4 reports the specific survey questions. As can be seen from the figure, each statement is evaluated on a five-class Likert scale. The possible answers range from "significantly decreased" (we attribute to this answer the value of one) to "significantly increased", to which we attach the value of five. The middle point, "stable", indicates stability and is attached the value of three. The remaining classes are "decreased" and "increased", which are given the values of two and four, respectively. Table 3 reports descriptive statistics for each of the probed statements, displaying averages for the pooled sample (first column) and by use of WFH arrangements during the pandemic (WFH_i; second and third columns), as well as the differences, together with significance levels, between these two sub-samples (last column).

Table 4 Descriptive statistics: performance outcomes/2

		% of responses				
	WFH_i	1	2	3	4	5
Statement						
(0) Overall productivity of the firm	No	11.17	28.64	44.17	15.53	0.49
	Yes	5.58	19.83	53.31	17.98	3.31
(1) Individual productivity of labor	No	7.28	13.11	73.30	5.83	0.49
	Yes	3.51	14.46	65.70	14.05	2.27
(2) Workers' concentration and motivation	No	5.83	22.33	58.25	12.62	0.97
	Yes	3.10	22.52	56.40	16.53	1.45
(3) Workers' absenteeism	No	6.31	8.74	67.48	16.99	0.49
	Yes	5.99	11.98	68.39	12.60	1.03
(4) MBO	No	2.43	11.17	67.48	18.45	0.49
	Yes	1.65	8.26	57.85	29.13	3.10
(5) Monitoring effectiveness	No	4.37	11.17	68.45	14.56	1.46
	Yes	3.10	15.50	72.31	8.47	0.62
(6) Coordination effectiveness	No	3.88	15.53	61.17	18.45	0.97
	Yes	3.93	22.73	52.48	19.21	1.65
(7) Effectiveness of internal communication	No	2.43	10.19	63.59	22.33	1.46
	Yes	3.31	19.63	47.93	26.65	2.48
Observations: 690						

Source: WFH&Performance data set
Statements from (0) to (7) are the answers given to the following question: "Compared to the pre-pandemic period, how has *Statement (0-7)* changed to date?". Each of these statements ranges from one to five, where one is "substantially decreased" and five is "substantially increased", with three indicating stability

In line with the economic crisis engendered by the COVID-19 pandemic, the assessed overall organizational performance has decreased during the pandemic (Statement (0) in Table 3), displaying a value below three (i.e., stability). Interestingly, there is a significant difference between firms that have adopted WFH during the pandemic and those that have not. The former display an average value of 2.936 as compared with 2.655 for the latter, thereby providing preliminary evidence that WFH might have contributed to mitigating the negative effects of the pandemic.

As summarized in Fig. 4 and Table 3, we probed seven additional indicators, referring to different aspects of a firm's overall organizational performance and setting. They include (1) labor productivity; (2) the concentration and motivation of workers; (3) workers' absenteeism; (4) the implementation of MBO practices; (5) the effectiveness in monitoring employees; (6) the effectiveness in coordinating the activities of the firm; and, finally, (7) the effectiveness of internal communication. We chose these specific variables based on previous literature on the effects of WFH on organizational outcomes, as well as on previous studies examining the relevant dimensions of organizational performance more broadly. Concerning the relationship between WFH, absenteeism/motivation, and productivity, Bennedsen et al. (2019) find a negative relationship between an average day of absence from work and revenues per employee

using worker-level data from Denmark. Similarly, Grinza and Rycx (2020) find a large negative relationship between absenteeism and total factor productivity using matched employer-employee Belgian data, thus highlighting that absenteeism levels are an important aspect of overall performance levels. On the motivation of workers, Rupietta and Beckmann (2016) show that WFH has a positive and significant effect on workers' efforts thanks to their higher degree of autonomy. This evidence thus motivates the introduction of questions on the direct perception of productivity, but also on workers' motivation and absenteeism. If, on the one hand, WFH may potentially spur workers' efforts thanks to a better work-life balance, on the other side, it introduces relevant managerial and organizational challenges. Previous works highlight that managerial practices and monitoring activities change drastically with the physical absence of workers from the workplace, as recently reported by Flassak et al. (2023). In particular, the reduced observability of workers limits the managers' possibility for direct monitoring (Greer and Payne 2014), while the physical separation among employees may reduce coordination and information flows (Arya et al. 1997). This thus motivates the introduction of the outcome variables related to HR practices, monitoring, and communication/coordination issues within the organization.

As shown in Table 3, in the overall sample, indexes related to Statements (1), (2), (5), and (6), display average values below three, indicating a general worsening of various performance outcomes. On the contrary, the use of MBO practices and the effectiveness of internal communication have increased during the pandemic, while absenteeism has decreased. Notably, when comparing firms that have used WFH during the pandemic with those that have not, we find a significant attenuation of the negative trend associated with labor productivity as well as a significant increase in the use of MBO practices by the former.

Finally, in Table 4, we report the cross-tabulation of the answers (i.e., according to the five-class Likert scale) across all the dimensions analyzed by the WFH status. This table displays the same pattern as Table 3. For example, the distribution of the answers to Statement (0) among firms that used WFH during the pandemic is substantially shifted toward higher values as compared to firms that did not use it (e.g., 53.3% *versus* 44.2% reported stability, whereas 19.8% *versus* 28.6% reported a decrease).[9]

5 Empirical model

In order to provide evidence on the relationship between WFH arrangements and firm performance, we first concentrate on the assessed change in the overall organizational performance of the firm, that is, Statement (0). In particular, we estimate the following model:

$$OverallOrgPerf_i = \alpha + \beta WFH_i + \delta X_i + \epsilon_i, \tag{1}$$

[9] In Subsection 6.2, we conduct a robustness analysis in which we aggregate responses rated as 1 and 2, as well as those labeled as 4 and 5. This is because the distinction between "substantially decreased" and "decreased", as well as "substantially increased" and "increased", may be subjective.

where the dependent variable is the score of firm i referring to Statement (0); WFH_i is a dummy variable indicating firm's i use of WFH during the pandemic, as defined in Sect. 4; X_i is a vector of observable firm characteristics (e.g., sector, size, location, workforce characteristics); finally, ϵ_i is the error term of the regression. The β parameter is our object of interest. It measures whether and how much the assessed overall organizational performance change before and during the pandemic is different for firms that used WFH as compared with those that did not.

However, Equation (1) provides a mere comparison between the two types of firms, without taking into account the differential intensities in the use of WFH by firms. In order to explore whether the intensity of WFH use matters, we estimate the following model:

$$\begin{aligned} OverallOrgPerf_i = \alpha + \beta_1 lowWFH_i + \beta_2 medWFH_i \\ +\beta_3 highWFH_i + \delta X_i + \epsilon_i, \end{aligned} \tag{2}$$

where the variables $lowWFH_i$, $medWFH_i$, and $highWFH_i$, indicating, respectively, low, medium, and high use of WFH in the firm during the pandemic, are defined as specified in Sect. 4. In the empirical analysis, we implement the estimation of Equation (2) by using both the measure of intensity based on the percentage of employees and that based on the percentage of the total working time. In both cases, the reference category is represented by firms that did not use WFH during the pandemic.

All of these estimates are obtained from ordinary least squares (OLS) regressions, which prevent us from a causal interpretation of the results. In fact, there are potential sources of endogeneity to take into account. For instance, it may be that firms with higher performance levels are more likely to implement employee-friendly work practices, such as WFH. Moreover, firms with better management may also be more prone to adopt WFH schemes, while reaching higher performances, thus leading to an omitted variable bias (Bloom and Van Reenen 2007). However, it is important to stress several particular features of the present analysis, which may attenuate such endogeneity issues.

First, the dependent variable considers the *change* in the overall organizational performance before and during the pandemic. This allows us to keep into account, as much as possible with cross-sectional data, the starting levels and, therefore, can make our estimates less sensitive to unobserved (time-invariant) heterogeneity.

Secondly, we control for a comprehensive set of observable firm characteristics, which are likely to significantly influence both the adoption of WFH and the performance dynamics during the pandemic. Specifically, we consider the firm's industry sector (at the ATECO 1-digit level), its size (measured by both employee count and revenues), and age. Moreover, we account for the educational and age composition of the workforce, closure period during the pandemic (some firms were compelled to cease operations during national lockdowns), and prior adoption of WFH, if any. Additionally, we incorporate controls for the socio-economic environment in which the firm operates by including dummies for macro areas. As a robustness check, we extend the analysis to include controls for socio-economic conditions at finer geographical levels, namely, administrative regions (i.e., NUTS-2) or provinces (i.e., NUTS-3). This

involves introducing NUTS-2 or NUTS-3 dummies in the regressions, as described in Subsection 6.2. The inclusion of NUTS-2 dummies captures the regional heterogeneity in pandemic-related policies, which, as discussed in Sect. 3, were determined at the regional level. However, pandemic and socio-economic conditions may not necessarily align with regional boundaries. Therefore, we conduct the additional robustness check of introducing dummies at the more granular NUTS-3 level.[10]

Third, and most importantly, our variable of interest (i.e., the use of WFH) was less of a spontaneous decision to implement a given human resource (HR) management practice, but rather a constrained decision in many cases. In fact, during the initial periods of the pandemic (i.e., the time frame under investigation), the Italian government *de facto* imposed the use of WFH in all the cases in which it was possible to implement it, as highlighted in Sect. 3. In this sense, endogeneity problems stemming from the non-random decision to adopt a given HR practice are substantially attenuated, so that the pandemic represents, so to say, a source of exogeneity to our estimates. Moreover, building on this latter feature, we perform a robustness check where we estimate Equations (1) and (2) on a sub-sample that only includes firms that did not use WFH prior to the pandemic (see Subsection 6.2). On these firms, the adoption of WFH schemes after the pandemic assumes more strictly the characteristic of a forced decision, thereby further mitigating potential endogeneity problems.[11]

With similar OLS regressions, we then move to the analysis of the other outcome variables probed in the questionnaire, that is, Statements from (1) to (7) described in Sect. 4. In particular, we run the following regressions, one for each Statement (j), $j = \{1, ..., 7\}$:

$$Statement\ (j)_i = \alpha + \beta_1 low WFH_i + \beta_2 med WFH_i + \beta_3 high WFH_i + \delta X_i + \epsilon_i, \quad (3)$$

where the regressors are defined as in Equation (2). Hence, for these analyses, we use the specification accounting for the intensity of WFH (definition based on the percentage of employees). The full set of regressions for the seven additional statements, ranging from measures of labor productivity to the implementation of MBO practices and monitoring and coordination effectiveness, together with the investigation based on the intensity of WFH use, provides a detailed picture of the differential impacts that WFH may have on many important aspects of a firm's performance and HR practices.

6 Results

6.1 Overall organizational performance and WFH

Table 5 presents our main results, obtained from the estimation of Equations (1) and (2). In both models, the dependent variable is the assessed change in the overall organizational performance of the firm as compared with the pre-pandemic period, that is,

[10] We would like to thank an anonymous reviewer for suggesting this approach.

[11] We thank two anonymous reviewers for insightful comments on these issues.

the score variable related to Statement (0). Therefore, the results of this set of equations allow us to capture whether firms using WFH during the pandemic experienced different trajectories in their overall performance as compared with firms that did not use WFH.

Column (1) of Table 5 refers to the estimation of Equation (1). As discussed in Sect. 5, the regressor of interest is WFH_i, that is, a dummy variable indicating whether the firm used WFH arrangements during the pandemic period. More specifically, we control for the firm's sector of economic activity (ATECO 2007 1-digit classification; 17 classes), its size (both in terms of the number of employees and revenues; three and five classes, respectively), socio-economic context (macro areas dummies; three categories), the firm's age (four classes), and relevant workforce characteristics. In particular, we control for the percentage of the workforce in the firm with at least a tertiary education degree (four quartiles). Moreover, we control for the share of the workforce under 40 years of age (again, subdivided into four quartiles). Finally, we further control for the closing period of the firm during the pandemic (four classes) and include a dummy variable indicating the use of WFH before the pandemic. Notably, all the subsequent estimations include this set of controls. Moreover, for all the estimations, we compute robust standard errors and report the R-squared.

The coefficient related to WFH_i is positive, equal to 0.159, and significant at the 5% level. Therefore, after controlling for the above-mentioned firm and workforce characteristics, the firms that used WFH during the pandemic reported a significantly higher score related to Statement (0), by 0.159 points on the five-point scale. Therefore, the firms using WFH during the pandemic declared a significantly better performance change as compared with firms that did not use such a work practice. Since, for both categories of firms, the reported change was negative (see Table 3), this result indicates that the firms resorting to WFH had a better capability to sustain overall performance levels as compared with firms that did not use WFH.

Columns (2) and (3) of Table 5 refer to the estimation of Equation (2). While including the same control variables of Column (1), they account for the firm's use of WFH during the pandemic more flexibly, considering the degree of intensity of WFH use (i.e., $lowWFH_i$, $medWFH_i$, and $highWFH_i$). In particular, Column (2) is based on the definition of WFH use in terms number of employees with WFH arrangements. As mentioned earlier, these variables classify the firms into four categories. The first category (i.e., the reference variable) is represented by the firms that did not use WFH during the pandemic. Then, there are the firms that used WFH for less than 25%, between 25% and 75%, and over 75% of their employees, respectively. Column (3) replicates the analysis in Column (2) but uses a definition of WFH intensity based on the total working time instead of the number of employees. This latter variable is divided into four classes, replicating the subdivision adopted for the former. It takes the value of zero for no use of WFH (this is the reference category). Then, there are the categories identifying firms with less than 25%, between 25% and 75%, and above 75% of the total working time performed in WFH.

The results in Column (2) highlight a clear differential pattern in the relationship of interest. The coefficient associated with low use of WFH ($lowWFH_i$; below 25% of employees), while positive, is relatively small and not significant. When considering higher intensities of WFH use (i.e., $medWFH_i$ and $highWFH_i$; between 25% and

Table 5 Results: overall organizational performance and WFH

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
WFH_i	0.159**	(0.081)				
WFH intensity—based on the number of employees						
$lowWFH_i$			0.103	(0.083)		
$medWFH_i$			0.188*	(0.109)		
$highWFH_i$			0.665***	(0.152)		
WFH intensity—based on the total working time						
$lowWFH_i$					0.123	(0.081)
$medWFH_i$					0.176	(0.127)
$highWFH_i$					0.790***	(0.168)
% highly educated workers (between 25% and 50%)	0.022	(0.095)	−0.026	(0.096)	−0.011	(0.094)
% highly educated workers (between 50% and 75%)	0.191	(0.126)	0.110	(0.128)	0.114	(0.119)
% highly educated workers (more than 75%)	0.042	(0.190)	−0.175	(0.202)	−0.131	(0.193)
% under-40 workers (between 25% and 50%)	−0.103	(0.082)	−0.109	(0.080)	−0.097	(0.081)
% under-40 workers (between 50% and 75%)	0.123	(0.097)	0.119	(0.096)	0.121	(0.096)
% under-40 workers (more than 75%)	0.055	(0.164)	0.052	(0.165)	0.071	(0.162)
Closing period (less than 4 weeks)	0.036	(0.083)	0.066	(0.082)	0.069	(0.082)
Closing period (between 4 and 12 weeks)	−0.255***	(0.095)	−0.231**	(0.094)	−0.220**	(0.093)
Closing period (more than 12 weeks)	−0.510**	(0.227)	−0.522**	(0.219)	−0.491**	(0.226)
WFH pre-pandemic	0.097	(0.083)	0.056	(0.083)	0.046	(0.083)
Industry (ATECO 1-digit)		✓		✓		✓
Size		✓		✓		✓

Table 5 continued

Dep. var.: (0) Overall productivity of the firm (1)	(2)	(3)
Location (macro area)	✓	✓	✓
Firm age	✓	✓	✓
R-squared	0.130	0.151	0.156
Observations	690	690	690

Source: WFH&Performance data set

OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. The dependent variable is the answer given to the following question: "Compared to the pre-pandemic period, how has the overall organizational performance of the firm changed?". It ranges from one to five, where one is "substantially decreased" and five is "substantially increased", with three indicating stability. WFH_i, $lowWFH_i$, $medWFH_i$, and $highWFH_i$ are defined as in Table 2. In the estimations based on WFH intensity, that is, Columns (2) and (3), the reference category is represented by firms that did not implement WFH during the pandemic. Industry accounts for 17 different industries (ATECO 2007 classification, 1-digit). The other control variables are defined as in Table 1. Notably, size collects dummies for firm size, measured both in terms of the number of employees (three classes) and revenues (five classes)

Table 6 Results: dimensions of organizational performance, HR practices, and WFH

	Dependent variable (statement)						
	(1) Labor productivity	(2) Workers' concentration and motivation	(3) Workers' absenteeism	(4) MBO	(5) Monitoring effectiveness	(6) Coordination effectiveness	(7) Effectiveness of internal communication
$lowWFH_i$	0.034	0.089	0.003	0.066	−0.082	−0.025	0.023
	(0.066)	(0.072)	(0.069)	(0.065)	(0.065)	(0.074)	(0.072)
$medWFH_i$	−0.009	0.053	−0.098	0.266***	−0.193**	−0.213**	−0.259**
	(0.088)	(0.097)	(0.085)	(0.093)	(0.081)	(0.103)	(0.105)
$highWFH_i$	0.349***	0.339**	−0.446***	0.429***	−0.104	0.202	0.041
	(0.130)	(0.133)	(0.131)	(0.128)	(0.123)	(0.138)	(0.149)
Industry (ATECO 1-digit)	✓	✓	✓	✓	✓	✓	✓
Size	✓	✓	✓	✓	✓	✓	✓
Location (macro area)	✓	✓	✓	✓	✓	✓	✓
Firm age	✓	✓	✓	✓	✓	✓	✓
% highly educated workers	✓	✓	✓	✓	✓	✓	✓
% under-40 workers	✓	✓	✓	✓	✓	✓	✓
Closing period (lockdowns)	✓	✓	✓	✓	✓	✓	✓
WFH pre-pandemic	✓	✓	✓	✓	✓	✓	✓
R-squared	0.133	0.081	0.104	0.115	0.103	0.096	0.099
Observations	690	690	690	690	690	690	690

Source: WFH&Performance data set

OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. The dependent variables are displayed in the first column. These estimations include the same set of controls as in Table 5. Each dependent variable is the answer given to the following question: "Compared to the pre-pandemic period, how has *Statement (1-7)* changed to date?". Each of these statements ranges from one to five, where one is "substantially decreased" and five is "substantially increased", with three indicating stability

75% and above 75% of employees), the coefficients increase in magnitude and become statistically significant. In particular, we detect a very large and strongly significant coefficient associated with high use of WFH (i.e., $highWFH_i$). When comparing such firms with firms that did not use WFH, the estimates predict a 0.665 points increase in the five-point scale relative to the change in the overall organizational performance. A similar result emerges when looking at the definition of WFH intensity based on the total working time, that is, Column (3). In this case, the estimated coefficient for $highWFH_i$ is equal to 0.790 and significant at the 1% level. Together, these results indicate that the intensity of WFH use matters a great deal. The benefits associated with WFH, in terms of its capability to sustain the firm's overall organizational performance, seem to emerge when WFH is used with higher intensities.

6.2 Robustness checks

In this subsection, we present several robustness tests. The relevant tables are reported in Appendix A.

The first test, in Table 10, excludes from the sample the firms that did implement WFH arrangements before the pandemic. As highlighted in Sect. 5, by doing this, we narrow our focus to companies where the implementation of WFH policies in the pandemic period is more likely to be a constrained decision, which helps us to reduce the likelihood of potential endogeneity issues.

In the second test, presented in Table 11, we consider a different definition of our dependent variable. We aggregate the five-point scale used up to now into a three-point scale. In particular, we attribute the value of one if the overall organizational performance is reported to be either "substantially decreased" or "decreased"; the value of two is given to stability; finally, the value of three is attached to answers indicating either a substantial increase or an increase. As highlighted before, this is to prevent the likelihood that the interpretation of the term "substantially" may be influenced by the subjective views of the respondents.

The third robustness check takes into account, as highlighted in Sect. 3, that the policies aimed at contrasting the pandemic were defined at the regional level. Table 12, therefore, includes in the estimation NUTS-2 dummies, instead of the more aggregated macro area dummies used in the previous regressions. This allows us to take into account all the heterogeneity related to the policies aimed at contrasting the pandemic. In addition, it allows us to take into account more in detail important local socio-economic conditions (e.g., related to the labor market, industrial structure, institutional setting, etc.).

The fourth test takes into account that, despite all COVID-related policies have been enforced at the NUTS-2 level, pandemic or socio-economic conditions are not necessarily distributed along the regional boundaries. Table 13, therefore, includes in the estimation NUTS-3 dummies, instead of the more aggregated macro area or NUTS-2 dummies used in the previous regressions. This allows us to take into account important local socio-economic conditions at an even finer level.

These four tables replicate the results of Table 5 according to the above-mentioned tests. As can be seen from the tables, the results are qualitatively similar to our main

results, thereby confirming a positive relationship between WFH arrangements and overall organizational performance change, particularly when such work arrangements are intensively used in the firm.

6.3 Dimensions of organizational performance, HR practices, and WFH

In this subsection, we explore the underlying aspects behind the WFH performance effect detected in the previous analysis. In particular, we explore various dimensions of the firm's overall performance and look at how its dynamics evolved before and during the pandemic based on the use of WFH.

As described in Sect. 4, we asked our surveyed firms several questions concerning the change in seven additional outcomes, ranging from labor productivity and workers' absenteeism to the use of MBO practices and effectiveness of internal communication (see Table 3, Statements (1) to (7)). Following Equation (3), we estimate several models, where the dependent variables are each of these seven additional statements. Given the importance of WFH intensity documented in the main results, these analyses are conducted by considering the intensity in the use of WFH. We use the definition of WFH intensity based on the number of employees.[12] Finally, as mentioned earlier, all of these regressions include the same set of controls as in Columns (1-3) of Table 5. Table 6 shows the results of these analyses. Each column of the table refers to one particular statement (e.g., the first column refers to the assessed change in labor productivity, the second column refers to Statement (2), relating to change in workers' concentration and motivation, and so on). For each column, which corresponds to one regression, we report the relevant coefficients associated with WFH, that is, $lowWFH_i$, $medWFH_i$, and $highWFH_i$.

By looking at the table, we can see several interesting results, each suggesting differential patterns in the various dimensions of organizational performance and HR practices probed. As for the first statement, related to the assessed change in labor productivity, we can see a very large and strongly significant positive coefficient associated with high use of WFH (0.349, significant at the 1% level). A similar pattern is observed for Statement (2), probing the change in workers' concentration and motivation (0.339, significant at the 5% level). Therefore, the firms that intensively used WFH during the pandemic reported substantially less deteriorated changes in the performances of their employees, as compared with the firms that did not use WFH arrangements. When considering the change in workers' absenteeism, we detect a similar tendency. The coefficient associated with high use of WFH is -0.446, significant at the 1% level. In this case, a negative coefficient should be interpreted as a good thing for the firm, pointing to a reduction in workers' absenteeism. In other words, firms intensively using WFH during the pandemic reported a significantly higher decrease in their workers' absenteeism levels as compared with firms not using WFH. Overall, the results associated with these three statements suggest that WFH might have helped firms to sustain their performance levels through a smaller reduction in productivity of their workers, who have been more concentrated and motivated in performing their tasks, and

[12] We have run robustness analyses by using the definition of WFH intensity based on the total working time and obtained unchanged results (available upon request).

less absent from work. Interestingly, as observed for the overall performance, these benefits associated with WFH only emerged when it was used intensively, covering a substantial proportion of the firm's workforce.

Another important aspect to look at is the use of MBO schemes, which are typically associated with a structural reconfiguration of the firm's HR practices. In adopting MBO schemes, the firm moves from a paradigm of inflexible working time with rigid task sequences to be performed, to a new paradigm based on flexible working time and the definition (and evaluation) of targets to be reached by employees at a certain deadline. The fourth column of Table 6 allows us to explore whether WFH is associated with an increased tendency of firms to implement such HR provisions. The results give a clear positive answer to such a question. We detect positive, large, and strongly significant coefficients associated with the use of WFH when considering Statement (4) (at medium and high intensities, with increasing magnitudes, equal to 0.266 and 0.429, respectively). With respect to firms not using WFH, the firms using it with a medium or high intensity have thus declared a significantly higher tendency to adopt MBO practices. Given the nature of remote work, which is not performed physically in the firm, WFH arrangements might have significantly contributed to pushing firms to adopt alternative HR management schemes, more based on objectives and less on definite working time and rigid paradigms. In turn, this might contribute to explaining the detected positive association between WFH and overall organizational performance.

Finally, we explore the dimensions related to effectiveness in monitoring (Statement (5)), coordination (Statement (6)), and internal communication activities (Statement (7)). These statements probe important aspects of the firm's overall organizational performance, related to the ability to reduce coordination and communication costs, as well as costs attributable to employees' shirking and other moral hazard behaviors. Interestingly, by looking at the results associated with these statements, we can see a substantially different pattern as compared with the other statements previously examined. For all of these three dimensions, we obtain a negative, relatively large, and significant coefficient associated with the intermediate category (i.e., $medWFH_i$), and not significant coefficients for the two extreme categories (i.e., $lowWFH_i$ and $highWFH_i$). As compared with firms not using WFH, firms using it with medium levels of intensity report a significantly lower effectiveness in monitoring, coordination, and internal communication activities. On the contrary, no significant difference is detected for firms using low or high levels of WFH with respect to firms not using it. These results suggest several considerations. First, the observed negative coefficients suggest that WFH is not necessarily a panacea for all aspects of organizational performance. Second, intermediate levels of WFH might create organizational problems in the coordination activities, for instance, interfering with effective internal communication. Having half of the employees working remotely and half physically in the firm might interfere with the daily exchange of information and cause delays in communication flows. For instance, something that is discussed in presence (possibly, informally) might have to be reported to other employees working remotely, thereby duplicating communication and coordination efforts. In contrast, if a few or many employees work remotely, the possibility for coordination and communication costs is reduced, since information and decisions are either spread and taken prevalently

in the presence (when a few employees work remotely) or online (when WFH is intensively used). Third, a similar consideration might apply to monitoring activities. Having to manage a substantial part of the workforce remotely and another substantial part in presence might entail inefficiencies. What is suitable for remote monitoring (e.g., adoption of an *ad hoc* software), might not be particularly relevant when applied to in-presence work, thereby causing duplications of costs and efforts.

In sum, these results indicate that the detected positive association between WFH and less deteriorated overall organizational performance hides contrasting forces. While critical aspects of labor productivity and new HR practices seem to be enhanced by WFH when used at high intensity, aspects more related to communication, coordination, and monitoring might be hindered by WFH, but only when there is a substantially balanced mix between the two work arrangements.

7 Conclusions

Despite the increasing diffusion of WFH practices, little is known about the effects of their adoption by SMEs. This has important economic implications, as SMEs are not only the prevalent form of enterprise in most economic environments, but they are also those more skeptical to implement remote forms of working. In this paper, we assess the relationship between WFH and firms' overall organizational performance, by also exploring the various dimensions through which such an association unfolds. We implemented and relied upon a survey conducted in the spring-summer of 2021 on 690 SMEs in Italy.

We found that the adoption of WFH is associated with a significant improvement in the capability of the firm to attenuate the negative impact of the pandemic on its overall organizational performance, particularly when WFH is used with higher intensities. Less deteriorated labor productivity and workers' concentration and motivation, decreased levels of absenteeism, and a substantial increase in the adoption of MBO practices seem to be important aspects behind the detected benefits related to WFH. At the same time, WFH has been found to be associated with increased coordination, communication, and monitoring costs, particularly when it is adopted at intermediate intensity levels. However, overall, such costs seem to be outweighed by the benefits associated with WFH.

Our research results are highly consistent with the existing body of literature and shed new light on the multifaceted aspects of WFH arrangements. We conducted our study on a unique and original sample, revealing a nuanced interplay between positive and negative effects on overall productivity, a phenomenon that had already begun to emerge prior to the COVID-19 pandemic. In particular, our findings regarding the significant reduction in absenteeism align closely with previous research by Bailey and Kurland (2002) and Kitou and Horvath (2002). Likewise, our observations related to increased motivation and enhanced work effort resonate with the findings of Kelliher and Anderson (2010) and Mas and Pallais (2017). Furthermore, our research supports the notion of positive outcomes associated with higher autonomy, as originally proposed by Gajendran and Harrison (2007) and Beckmann (2016). We confirm these positive effects, especially in the context of MBO practices, which promote greater

self-organization of work processes. On the flip side, our study identifies the presence of increasing coordination costs in WFH arrangements, in line with the findings of Beham et al. (2015) and Battiston et al. (2021). In summary, our research not only reinforces the existing knowledge base but also contributes new insights, highlighting the intricate dynamics of WFH arrangements and their impacts on productivity.

While our results cannot be interpreted in a causal setting, they nonetheless provide important insights on several fronts. From a policymaking perspective, they provide useful information on the potential for improved performances stemming from WFH organizational practices within SMEs. Our results suggest that WFH might indeed represent an effective tool for such firms to face the productivity crisis associated with the pandemic. Despite the benefits WFH might bring at the smaller scale of SMEs, many of such firms continue to lag in adoption. Policymakers could thus consider taking actions to promote it. For instance, they could conduct informative campaigns on WFH, as well as reduce bureaucracy requirements behind its implementation.

From a managerial point of view, our results can usefully inform entrepreneurs and managers of SMEs about the potential performance gains associated with WFH practices and induce a shift toward such a work arrangement. During the pandemic emergency, WFH was, in practice, mandatory for many firms by government decrees. Under normal circumstances, however, the margins for voluntary adoption of WFH by firms are significantly larger, and SMEs have been particularly reluctant to adopt them. Moreover, the results of this paper can support an effective implementation of WFH schemes by firms. Investigating several critical aspects of organizational performance, we highlighted the potential for detrimental effects associated with WFH, particularly regarding communication, coordination, and monitoring aspects. If firms are adequately informed of these potential criticalities associated with WFH practices, they can more fully address the organizational challenges it poses and take advantage of its strengths.

A Additional descriptive statistics and robustness checks: tables

Table 7 Descriptive statistics: ATECO 1-digit distribution

ATECO 1-digit	Observations	%
Mining and quarrying	3	0.43
Manufacturing	268	38.84
Electricity, gas, steam, and air conditioning supply	5	0.72
Water supply; sewerage, waste management, and remediation activities	5	0.72
Construction	47	6.81

Table 7 continued

ATECO 1-digit	Observations	%
Wholesale and retail trade; repair of motor vehicles and motorcycles	79	11.45
Transportation and storage	18	2.61
Accommodation and food service activities	23	3.33
Information and communication	32	4.64
Financial and insurance activities	2	0.29
Real estate activities	3	0.43
Professional, scientific, and technical activities	27	3.91
Administrative and support service activities	5	0.72
Education	2	0.29
Human health and social work activities	6	0.87
Arts, entertainment, and recreation	7	1.01
Other service activities	158	22.90

Source: WFH&Performance data set

Table 8 Descriptive statistics: NUTS-2 distribution

NUTS-2	Observations	%	NUTS-2	Observations	%
Abruzzo	11	1.59	Molise	1	0.14
Basilicata	5	0.72	Piemonte	88	12.75
Calabria	3	0.43	Puglia	17	2.46
Campania	21	3.04	Sardegna	5	0.72
Emilia Romagna	69	10.00	Sicilia	11	1.59
Friuli-Venezia Giulia	19	2.75	Trentino Alto Adige	16	2.32
Lazio	22	3.19	Toscana	44	6.38
Liguria	12	1.74	Umbria	7	1.01
Lombardia	221	32.03	Valle d'Aosta	1	0.14
Marche	24	3.48	Veneto	93	13.48

Source: WFH&Performance data set

Table 9 Descriptive statistics: NUTS-3 distribution

NUTS-3	Observations	%	NUTS-3	Observations	%
Agrigento	1	0.14	Matera	5	0.72
Alessandria	7	1.01	Messina	3	0.43
Ancona	8	1.16	Milano	69	10.00
Aosta	1	0.14	Modena	9	1.30
Arezzo	2	0.29	Monza e Brianza	20	2.90
Ascoli Piceno	1	0.14	Napoli	8	1.16
Asti	4	0.58	Novara	11	1.59
Avellino	3	0.43	Oristano	1	0.14
Bari	5	0.72	Padova	8	1.16
Barletta-Andria-Trani	2	0.29	Palermo	2	0.29
Belluno	2	0.29	Parma	3	0.43
Benevento	3	0.43	Pavia	6	0.87
Bergamo	34	4.93	Perugia	4	0.58
Biella	6	0.87	Pesaro e Urbino	7	1.01
Bologna	22	3.19	Pescara	2	0.29
Bolzano	7	1.01	Piacenza	4	0.58
Brescia	24	3.48	Pisa	8	1.16
Brindisi	4	0.58	Pistoia	5	0.72
Cagliari	2	0.29	Pordenone	5	0.72
Caltanissetta	1	0.14	Potenza	3	0.43
Caserta	1	0.14	Prato	1	0.14
Catania	3	0.43	Ragusa	2	0.29
Catanzaro	1	0.14	Ravenna	7	1.01
Chieti	8	1.16	Reggio Calabria	2	0.29

Table 9 continued

NUTS-3	Observations	%	NUTS-3	Observations	%
Como	8	1.16	Reggio Emilia	9	1.30
Cosenza	2	0.29	Rieti	1	0.14
Cremona	3	0.43	Rimini	4	0.58
Cuneo	14	2.03	Roma	16	2.32
Enna	1	0.14	Rovigo	2	0.29
Fermo	2	0.29	Salerno	6	0.87
Ferrara	6	0.87	Sassari	3	0.43
Firenze	19	2.75	Savona	3	0.43
Foggia	4	0.58	Siena	3	0.43
Forlì-Cesena	7	1.01	Siracusa	3	0.43
Frosinone	2	0.29	Sondrio	1	0.14
Genova	11	1.59	Taranto	4	0.58
Gorizia	1	0.14	Teramo	2	0.29
Grosseto	2	0.29	Terni	2	0.29
Imperia	2	0.29	Torino	42	6.09
Isernia	1	0.14	Trapani	3	0.43
L'Aquila	3	0.43	Trento	9	1.30
La Spezia	3	0.43	Treviso	19	2.75
Latina	5	0.72	Trieste	2	0.29
Lecce	4	0.58	Udine	10	1.45
Lecco	4	0.58	Varese	25	3.62
Livorno	4	0.58	Venezia	12	1.74

Table 9 continued

NUTS-3	Observations	%	NUTS-3	Observations	%
Lodi	2	0.29	Verbano-Cusio-Ossola	1	0.14
Lucca	4	0.58	Vercelli	2	0.29
Macerata	3	0.43	Verona	22	3.19
Mantova	10	1.45	Vibo Valentia	1	0.14
Massa-Carrara	2	0.29	Vicenza	27	3.91

Source: WFH&Performance data set

Table 10 Robustness check: main estimates excluding firms that implemented WFH prior to the pandemic

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
WFH_i	0.130[a]	(0.086)				
WFH intensity - based on the number of employees						
$lowWFH_i$			0.084	(0.342)		
$medWFH_i$			0.155	(0.121)		
$highWFH_i$			0.553***	(0.199)		
WFH intensity - based on the total working time						
$lowWFH_i$					0.107	(0.085)
$medWFH_i$					0.107	(0.148)
$highWFH_i$					0.678***	(0.262)
% highly educated workers (between 25% and 50%)	−0.032	(0.115)	−0.053	(0.118)	−0.043	(0.116)
% highly educated workers (between 50% and 75%)	0.257*	(0.150)	0.213	(0.153)	0.212	(0.137)
% highly educated workers (more than 75%)	0.131	(0.264)	−0.059	(0.282)	−0.014	(0.272)
% under-40 workers (between 25% and 50%)	−0.024	(0.091)	−0.032	(0.090)	−0.033	(0.091)
% under-40 workers (between 50% and 75%)	0.115	(0.111)	0.121	(0.111)	0.115	(0.111)
% under-40 workers (more than 75%)	0.027	(0.195)	0.042	(0.200)	0.058	(0.195)
Closing period (less than 4 weeks)	0.024	(0.092)	0.044	(0.091)	0.035	(0.091)

Table 10 continued

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
Closing period (between 4 and 12 weeks)	−0.210**	(0.105)	−0.193*	(0.104)	−0.196*	(0.104)
Closing period (more than 12 weeks)	−0.548**	(0.229)	−0.553**	(0.227)	−0.555**	(0.228)
Industry (ATECO 1-digit)		✓		✓		✓
Size		✓		✓		✓
Location (macro area)		✓		✓		✓
Firm age		✓		✓		✓
R-squared		0.129		0.140		0.140
Observations		532		532		532

Source: WFH&Performance data set

OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. This table replicates Table 5 on the sub-sample of firms that did not implement WFH prior to the pandemic

[a] p-value=0.131

Table 11 Robustness check: main estimates with aggregated outcome variable (three classes)

Dep. var.: (0) Overall productivity of the firm (three classes)	(1)		(2)		(3)	
WFH_i	0.110*	(0.065)				
WFH intensity - based on the number of employees						
$lowWFH_i$			0.061	(0.067)		
$medWFH_i$			0.142	(0.091)		
$highWFH_i$			0.521***	(0.114)		
WFH intensity - based on the total working time						
$lowWFH_i$					0.078	(0.066)
$medWFH_i$					0.149	(0.105)
$highWFH_i$					0.580***	(0.124)
% highly educated workers (between 25% and 50%)	−0.018	(0.078)	−0.061	(0.078)	−0.049	(0.077)
% highly educated workers (between 50% and 75%)	0.100	(0.104)	0.032	(0.107)	0.037	(0.101)
% highly educated workers (more than 75%)	−0.039	(0.139)	−0.218	(0.147)	−0.174	(0.143)
% under-40 workers (between 25% and 50%)	−0.061	(0.066)	−0.066	(0.065)	−0.055	(0.065)
% under-40 workers (between 50% and 75%)	0.144*	(0.081)	0.141*	(0.080)	0.145*	(0.080)
% under-40 workers (more than 75%)	0.084	(0.122)	0.082	(0.122)	0.094	(0.120)
Closing period (less than 4 weeks)	0.012	(0.068)	0.036	(0.068)	0.039	(0.068)
Closing period (between 4 and 12 weeks)	−0.183**	(0.079)	−0.164**	(0.079)	−0.156**	(0.078)

Table 11 continued

Dep. var.: (0) Overall productivity of the firm (three classes)	(1)		(2)		(3)	
Closing period (more than 12 weeks)	−0.277*	(0.153)	−0.287**	(0.144)	−0.261*	(0.151)
WFH pre-pandemic	0.095	(0.067)	0.062	(0.066)	0.056	(0.067)
Industry (ATECO 1-digit)		✓		✓		✓
Size		✓		✓		✓
Location (macro area)		✓		✓		✓
Firm age		✓		✓		✓
R-squared		0.101		0.124		0.124
Observations		690		690		690

Source: WFH&Performance data set

OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. This table replicates Table 5 with an aggregated version of the dependent variable, ranging from one to three, where one is "decreased" and three is "increased", with two indicating stability

Table 12 Robustness check: main estimates with NUTS-2 dummies

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
WFH_i	0.159*	(0.082)				
WFH intensity—based on the number of employees						
$lowWFH_i$			0.115	(0.084)		
$medWFH_i$			0.144	(0.111)		
$highWFH_i$			0.622***	(0.156)		
WFH intensity—based on the total working time						
$lowWFH_i$					0.129	(0.081)
$medWFH_i$					0.139	(0.131)
$highWFH_i$					0.719***	(0.173)
% highly educated workers (between 25% and 50%)	0.011	(0.096)	−0.020	(0.097)	−0.009	(0.096)
% highly educated workers (between 50% and 75%)	0.263*	(0.136)	0.203	(0.139)	0.204	(0.131)
% highly educated workers (more than 75%)	0.029	(0.188)	−0.163	(0.205)	−0.120	(0.195)
% under-40 workers (between 25% and 50%)	−0.072	(0.082)	−0.074	(0.080)	−0.069	(0.081)
% under-40 workers (between 50% and 75%)	0.145	(0.098)	0.140	(0.097)	0.134	(0.098)
% under-40 workers (more than 75%)	0.066	(0.163)	0.063	(0.165)	0.073	(0.162)
Closing period (less than 4 weeks)	0.041	(0.084)	0.073	(0.083)	0.069	(0.084)

Table 12 continued

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
Closing period (between 4 and 12 weeks)	−0.254***	(0.095)	−0.227**	(0.094)	−0.224**	(0.094)
Closing period (more than 12 weeks)	−0.547**	(0.232)	−0.557**	(0.223)	−0.532**	(0.231)
WFH pre-pandemic	0.088	(0.082)	0.053	(0.082)	0.050	(0.083)
Industry (ATECO 1-digit)		✓		✓		✓
Size		✓		✓		✓
Location (NUTS-2)		✓		✓		✓
Firm age		✓		✓		✓
R-squared		0.158		0.176		0.179
Observations		688		688		688

Source: WFH&Performance data set

OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. This table replicates Table 5 but uses administrative region (i.e., NUTS-2) dummies instead of dummies for macro area

Table 13 Robustness check: main estimates with NUTS-3 dummies

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
WFH_i	0.168*	(0.087)				
WFH intensity—based on the number of employees						
$lowWFH_i$			0.119	(0.087)		
$medWFH_i$			0.143	(0.122)		
$highWFH_i$			0.633***	(0.162)		
WFH intensity—based on the total working time						
$lowWFH_i$					0.142*	(0.086)
$medWFH_i$					0.143	(0.138)
$highWFH_i$					0.720***	(0.177)
% highly educated workers (between 25% and 50%)	0.109	(0.104)	0.082	(0.105)	0.089	(0.104)
% highly educated workers (between 50% and 75%)	0.337**	(0.154)	0.282*	(0.159)	0.297**	(0.150)
% highly educated workers (more than 75%)	0.110	(0.201)	−0.073	(0.215)	−0.036	(0.206)
% under-40 workers (between 25% and 50%)	−0.070	(0.088)	−0.075	(0.087)	−0.063	(0.087)
% under-40 workers (between 50% and 75%)	0.148	(0.106)	0.139	(0.105)	0.136	(0.106)
% under-40 workers (more than 75%)	0.028	(0.176)	0.022	(0.176)	0.031	(0.173)
Closing period (less than 4 weeks)	0.042	(0.088)	0.069	(0.088)	0.066	(0.089)

Table 13 continued

Dep. var.: (0) Overall productivity of the firm	(1)		(2)		(3)	
Closing period (between 4 and 12 weeks)	−0.259**	(0.103)	−0.235**	(0.102)	−0.235**	(0.102)
Closing period (more than 12 weeks)	−0.332	(0.240)	−0.346	(0.232)	−0.309	(0.240)
WFH pre-pandemic	0.062	(0.086)	0.025	(0.086)	0.018	(0.086)
Industry (ATECO 1-digit)		✓		✓		✓
Size		✓		✓		✓
Location (NUTS-3)		✓		✓		✓
Firm age		✓		✓		✓
R-squared		0.243		0.260		0.262
Observations		674		674		674

Source: WFH&Performance data set
OLS estimates. Robust standard errors in parentheses. ***, **, and * represent the 1%, 5%, and 10% significance levels, respectively. This table replicates Table 5 but uses administrative province (i.e., NUTS-3) dummies instead of dummies for macro area

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