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## How do managers form their expectations about working from home? Survey experiments on the perception of productivity

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DISCUSSION

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# DISCUSSION PAPER

// DANIEL ERDSIEK AND VINCENT ROST

**How Do Managers Form Their  
Expectations About Working From  
Home? Survey Experiments on the  
Perception of Productivity**

# How Do Managers Form Their Expectations About Working From Home? Survey Experiments on the Perception of Productivity

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## Abstract

The recent shift towards working from home (WFH) has far-reaching implications for social and economic outcomes. While firms are gatekeepers for the ongoing diffusion of flexible work arrangements, there is little evidence on how firms decide to offer WFH. We leverage two survey experiments among nearly 800 knowledge-intensive services firms in Germany to analyse whether managers' beliefs about the productivity effects of WFH affect their adoption decisions. Exploiting exogenous variation in managers' information set, we find that managers update their beliefs about the productivity effects of WFH when they receive information on workers' self-assessed WFH productivity. In addition, the information treatment significantly increases managers' willingness to adopt or intensify WFH policies. Combining our main survey experiment with two follow-up surveys, we find persistent information treatment effects on both managers' beliefs about WFH productivity and firms' expected WFH intensity after the Covid-19 pandemic. A complementary survey experiment confirms our results pointing to a causal relationship between managers' beliefs about WFH productivity and the adoption of WFH practices. These findings have implications for potential policy measures targeting firms' WFH adoption.

**Keywords:** working from home, survey experiment, information provision, firm-level, managers, expectations

**JEL Codes:** D22, D23, L22, O33, M54

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# 1 Introduction

The Covid-19 pandemic has forced firms and workers to fundamentally change how they organise work, leading to a sudden and unprecedented shift towards working from home (WFH). As international studies consistently predict, WFH will remain much more common even after the pandemic has subsided (Aksoy et al., 2022; Barrero et al., 2021). The future diffusion of WFH has implications for many societal and economic outcomes, including productivity (Bloom et al., 2015; Choudhury et al., 2021), job satisfaction and turnover (Bloom et al., 2022; Moen et al., 2011), or gender equality (Alon et al., forthcoming; Goldin, 2014). According to a survey across 27 countries, workers want, on average, to work from home 1.7 days per week after the pandemic, but employers only plan to offer 0.7 WFH days on average (Aksoy et al., 2022). The gap between workers' and employers' preferences for WFH is also documented by Barrero et al. (2021) and Lewandowski et al. (2022) and renders employers' adoption decisions particularly relevant, as they are the main gatekeeper for the future diffusion of WFH. Yet, the literature on how the Covid-19 pandemic has shaped employers' preferences and decisions about WFH is inconclusive. Descriptive evidence suggests that managers changed their perception of WFH due to pandemic-induced experimentation, facilitating a lasting shift towards WFH (Aksoy et al., 2022; Erdsiek, 2021). Barrero et al. (2021) provide a theoretical framework for this mechanism and show that workers' productivity surprise is positively associated with their employers' willingness to offer WFH. In a similar vein, Criscuolo et al. (2021) find that managers who have made positive experiences with WFH during the pandemic prefer higher post-Covid levels of WFH. However, the lack of *ceteris paribus* variation in managers' perceptions complicates the identification of potential effects in existing studies. Therefore, the question whether managers' perception of WFH *causally* affects their willingness to intensify WFH remains open. The aim of the present paper is to address this gap in empirical knowledge.

In this study, we leverage two survey experiments among nearly 800 managers to analyse how they form beliefs about the productivity of WFH and to what extent these productivity beliefs causally impact their willingness to offer WFH in the future. To circumvent identification problems related to purely observational data, we generate and exploit exogenous variation in two ways. First, we use an information provision experiment to randomly alter managers' information set about WFH productivity. Second, we use a priming experiment to randomly increase the salience of potential productivity effects before asking managers about their willingness to offer WFH. Both experiments are conducted within the scope of the ZEW Business Survey in the Information Economy covering knowledge-intensive services sectors in Germany. Hence, we focus on sectors where the majority of jobs entail activities that are suited for WFH to increase the comparability of firms in our analysis (Alipour et al., 2023; Dingel and Neiman, 2020).

Our first survey experiment was conducted in December 2020 and is enriched with follow-up surveys from March 2021 and June 2021. As an initial step of the information provision experiment, we elicit managers' pre-treatment beliefs about the productivity effects of WFH among employees. Managers indicating that WFH is less productive than working on business premises are defined as having a low prior belief. In contrast, a high prior belief indicates that managers perceive WFH as more productive or about as productive as working on business

premises. Once prior beliefs are elicited, we provide managers who are randomly assigned to the treatment group with information about workers' self-assessed WFH productivity as measured in a representative study for Germany (Marschall et al., 2020). The treated managers were informed that: "In a recent and representative survey in Germany, 59 percent of employees reported to be more productive working from home than working on business premises." Since representative evidence about workers' WFH productivity has been scarce in December 2020, we expect up-to-date information about self-assessed WFH productivity to contain relevant and reliable knowledge for managers. Moreover, we interpret the provided information as conveying an overall positive sentiment about WFH productivity since most workers report productivity gains when working from home. In the next step of the experiment, we elicit managers' posterior beliefs about WFH productivity by using a question that is slightly different from the pre-treatment question to reduce potential experimenter demand effects (Coibion et al., 2022; Fuster and Zafar, 2022).

We find that managers' beliefs about WFH productivity are responsive to information. Before the information treatment, roughly two-thirds of managers believe that employees are at least as productive WFH than on business premises (high prior belief), while one-third perceive WFH to be less productive (low prior belief). After receiving the information treatment, we observe that managers with a low prior belief significantly update their beliefs, i.e. for this group the share of managers with a high post-treatment belief increases significantly. For the group of managers with high prior beliefs, we find no significant treatment effect. These results highlight that the information provision only shifts beliefs for those managers whose prior beliefs contradict the overall positive assessment of WFH productivity conveyed by the information treatment. This evidence suggests that the information treatment leads to genuine updating of beliefs (Cavallo et al., 2017).

Focusing on managers' long-run plans for WFH, we first document that they generally expect a substantial and lasting shift towards WFH, which is in line with the previous literature. Before the pandemic, an average share of 11% of employees worked from home in the firms belonging to the control group. However, the average share of employees expected to use WFH after the pandemic nearly triples to 31% in those firms. Therefore, the expected shift towards WFH amounts to roughly 20 percentage points of employees for firms in the control group. Turning to the experimental part of our survey, we find that the expected shift to WFH is significantly higher among managers who have received the information treatment. The significant treatment effect amounts to 3.2 percentage points.

In addition to our main survey, we conducted two follow-up surveys. This allows us to analyse the persistence of treatment effects and to mitigate potential experimenter demand effects. In the first follow-up survey conducted three months after the main survey experiment, we again elicit managers' beliefs about WFH productivity. We find persistent and significant treatment effects, such that managers who received the information treatment in December 2020 are still significantly more likely to have high beliefs about WFH productivity than managers in the control group in March 2021. Again, the treatment effect is primarily driven by managers who changed their belief in response to the information treatment from low to high WFH productivity. Managers' expectations about the long-run shift towards WFH are elicited again

in the second follow-up survey conducted six months after the main survey. Here, we find persistent and significant effects for the subgroup of managers with low prior beliefs about WFH productivity if differences in observable characteristics are accounted for.

In our second survey experiment conducted in June 2022, we focus more directly on the impact of managers' productivity beliefs on their ambition to intensify WFH practices in their firm. Instead of providing managers with new information, this experiment leverages a priming treatment induced by a randomised order of survey questions. Managers in the control group are first asked about their long-run expectations concerning the use of WFH and then asked about their perception of the productivity effects of WFH. In contrast, managers in the treatment group are first asked about their perception of the productivity effects and then about their long-run expectations regarding the use of WFH. Due to this experimental setup, we mentally activate the concept of worker productivity among managers in the treatment group before they are asked about their expectations about their firm's long-run use of WFH. We find that, for managers who believe employees are less productive working from home than on business premises, the priming treatment significantly reduces the average expected shift to WFH by 7.1 percentage points in comparison to the control group. In contrast, if managers perceive WFH as productive, we neither find a positive nor negative priming effect. Therefore, we conclude that the perception that WFH is less productive than working on business premises causally reduces managers' willingness to offer WFH intensively. This evidence supports the argument proposed by Aksoy et al. (2022) and Barrero et al. (2021), that the elimination of overly pessimistic, biased beliefs about WFH productivity due to experimentation with WFH facilitates the lasting shift towards WFH.

We contribute to several strands of the literature. First, our paper adds to the growing literature that uses survey experiments to study the role of subjective beliefs and expectations for decision-making under uncertainty. The broad range of economic fields where these experimental designs are used to study belief formation and how exogenous changes in beliefs affect behaviour are summarised by recent overview articles (Fuster and Zafar, 2022; Haaland et al., forthcoming; Stantcheva, 2022b). While most studies focus on individuals or households, we contribute to this literature by running survey experiments among managers who answer our survey in a business context and as a representative of a firm (see, e.g., Coibion et al., 2018, 2020). Furthermore, our paper is the first to use survey experiments to investigate how important managers' beliefs are for adoption decisions concerning WFH and, thus, the organisation of work in the future.

Second, we add knowledge to the literature on the long-run effects of Covid-19 on the future of work. In particular, our study goes beyond previous surveys focusing on firms' expectations for the post-Covid use of WFH (e.g., Bartik et al., 2020; Demmelhuber et al., 2021) by addressing the underlying decision processes of firms' WFH adoption. In this way, we also contribute to studies providing descriptive evidence on the relationship between managers' perception of WFH and their WFH plans (Criscuolo et al., 2021; Erdsiek, 2021). Notably, our findings concerning the causal relationship between productivity beliefs and adoption decisions contribute to the study by Barrero et al. (2021) who build a theoretical model explaining how firms' better-than-expected experiences with WFH can foster a lasting shift towards WFH.

Third, our analysis relates to the vast literature focusing on the effects of WFH on a broad range of societal and economic outcomes. On the one hand, as firms are the main gatekeeper for the future diffusion of WFH, our focus on managers' decision processes renders the present analysis relevant for studies concerned with the implications of the future prevalence of WFH. On the other hand, our analysis strongly relates to studies providing evidence for productivity gains of WFH (Bloom et al., 2015; Choudhury et al., 2021; Harrington and Emanuel, 2021) since we study how firms might react to learning about the results of this strand of literature.

The remainder of this paper is organised as follows. Section 2 provides a brief discussion of the related literature. Section 3 presents the structure and the key variables of our survey experiments. Section 4 provides summary statistics, a balance test, and a descriptive analysis of the observable correlates of managers' beliefs about WFH productivity. Section 5 provides the results of Experiment A and Section 6 provides the results of Experiment B. Finally, Section 7 concludes.

## 2 Background Discussion

The diffusion of WFH and other flexible work arrangements is not a new trend. Technological advances over recent decades have made it increasingly easier to perform job tasks outside of the workplace. Better connectivity through broadband internet and remote access to digital resources reduced the marginal costs of providing workplace flexibility and made WFH feasible for an increasing range of tasks. However, although available technologies were sufficient to enable WFH, e.g., in knowledge-intensive occupations, the majority of firms have been reluctant to implement WFH practices for a significant share of their employees. Inertia, the lack of know-how, and biased beliefs about the viability of WFH might have contributed to the slow trajectory of WFH adoption and related technology investments before the Covid-19 pandemic. In fact, recent firm surveys document that managers have significantly improved their perception of WFH over the course of the pandemic, revealing strong biases in pre-pandemic beliefs (Criscuolo et al., 2021). Surveying U.S. managers in April 2020, Ozimek (2020) finds that 56% had better-than-expected experiences with WFH in their firm, while for only 9% it has gone worse than expected. For Germany, Erdsiek (2021) shows that 53% of knowledge-intensive services firms and 42% of manufacturing firms indicated that the pandemic has shown that more job tasks are feasible for WFH than previously expected. In June 2022, 37% of firms in these sectors indicated that their perception of WFH productivity has improved in comparison to their pre-pandemic opinion, while only 8% indicated that their perceptions have changed for the worse (Erdsiek, 2022). As discussed by Barrero et al. (2021), the pandemic has created much better conditions for managers to learn about the viability of WFH, because all actors in the corporate ecosystem had to experiment with WFH simultaneously. The lack of this coordinated experimentation might explain the existence of biased pre-pandemic beliefs. In addition, managers' beliefs about WFH productivity might still be prone to asymmetric information, as productivity levels are not easily observable in many occupations. Therefore, managers might fear principal-agent problems in the form of decreasing effort under higher sovereignty and less scope for monitoring by supervisors (Aghion and Tirole, 1997) and, thus, underestimate potential productivity gains

from WFH. The empirical evidence on widespread biases in managers' beliefs about WFH raises the question of to what extent firms' past and future decisions to implement WFH are driven by managers' perceptions. Importantly, if a causal link between managers' beliefs and adoption decisions exists, any biases in their beliefs might also bias subsequent adoption decisions.

The future prevalence of WFH and a better understanding of firms' underlying decision processes are relevant for a number of reasons. For instance, empirical evidence shows that WFH can generate sizable productivity gains (Angelici and Profeta, 2020; Bloom et al., 2015; Choudhury et al., 2021; Harrington and Emanuel, 2021). These empirical studies correspond well with the productivity effects of WFH as assessed by the workers themselves in international surveys (Aksoy et al., 2022; Barrero et al., 2021; Marschall et al., 2020). Focusing on firm performance, Bai et al. (2021) show how firms' pre-pandemic use of WFH helped them to better navigate through the crisis, e.g. in terms of sales or net income. In the long run, the positive effect of WFH on firms' performance and resilience to unexpected shocks might increase within-industry inequalities. For instance, if the adoption and beneficial use of WFH practices is driven by factors related to firms' previous productivity, the unequal proliferation of WFH might increase the existing gap between firms with high and low productivity (Crisciolo et al., 2021; Syverson, 2011). Moreover, offering WFH might correspond to firms' strategic choices concerning recruiting in times of potential skill shortages, cost reduction for office rents, or compensating wage differentials. Focusing on the individual level, previous studies provide evidence on various work-related outcomes, including higher job satisfaction (Bloom et al., 2015; De Menezes and Kelliher, 2017) and lower turnover (Bloom et al., 2022; Moen et al., 2011). In general, recent findings suggest that workers value WFH as an amenity and would sacrifice a share of their earnings for the option to work from home (Lewandowski et al., 2022; Mas and Pallais, 2017). Therefore, if workers could freely choose, they would work from home 1.7 days per week on average, which exceeds employers' preferences (Aksoy et al., 2022). Another potential benefit of WFH might be to facilitate a reduction of gender gaps in the labour market (Alon et al., forthcoming; Goldin, 2014). Among parents, flexible working schedules might allow couples to more equally share household tasks and childcare responsibilities affecting the labour supply decisions of mothers, such as working longer hours (Arntz et al., 2022; Dettling, 2017). These, and many more, far-reaching implications of WFH highlight the importance of uncovering potential determinants of firms' adoption decisions in light of the recent, but long-lasting shift to WFH. As put forward and theoretically described by Barrero et al. (2021), changes in the perception of WFH induced by pandemic-related experimentation might be one major mechanism facilitating the lasting shift.

In recent years, there has been an increased interest in subjective beliefs and expectations as potential drivers of economic choices (Fuster and Zafar, 2022; Haaland et al., forthcoming). Most studies focusing on the effects of beliefs and expectations rely on experimental designs to circumvent usual identification problems. A general aim of experiments in this research area is to change specific features of the choice environment to analyse decision processes. Survey experiments pursue this goal by providing participants with randomly assigned information to alter the participants' information set before measuring their beliefs on a certain topic or some behavioural outcomes. In this way, survey experiments allow a clean identification of



changes in beliefs or behavioural outcomes by only varying one feature of the information set available to participants before choices are made. Therefore, survey experiments can be leveraged to elicit respondents’ expectations in a first step and to create exogenous variation in expectations in the second step. The exogenously shifted expectations can then be linked to economic choices. In this way, survey experiments can be used to test economic theories and to analyse policy-relevant questions. Haaland et al. (forthcoming) and Fuster and Zafar (2022) provide a comprehensive review of this literature and show that survey experiments are now applied in a wide range of economic fields. Most studies focus on individuals, while survey experiments among firms are much less common.<sup>1</sup> As an example of survey experiments among firms, Coibion et al. (2020) used information treatments to generate exogenous variation in inflation expectations of managers. They found that firms’ economic decisions (such as pricing or credit demand) are affected by beliefs about inflation. Coibion et al. (2018) showed that firms update their inflation expectations when provided with different information signals regarding inflation, e.g. the central bank’s inflation targets or professional forecasts. Finally, Cuéllar et al. (2022) surveyed managers and provided them with different information regarding the (potential) regulation of artificial intelligence (AI). They find significant information treatment effects on firms’ plans concerning the adoption of AI as well as on their AI-related business strategies. Our study contributes to this emerging literature on survey experiments among firms by focusing on managers’ (potentially biased) beliefs about WFH productivity and how these beliefs impact firms’ plans to intensify WFH.

### 3 Survey Structure and Key Variables

#### 3.1 Setting

Our empirical analysis is based on information provision and priming experiments we conducted within the scope of the ZEW Business Survey in the Information Economy. This quarterly business survey is conducted by the ZEW – Leibniz-Centre for European Economic Research and covers the German ICT sector, media services, and further knowledge-intensive service providers. Except for ICT hardware manufacturers that are surveyed as part of the ICT sector, our sample comprises only service firms. We, thus, focus on sectors where the majority of jobs entail activities that are suited to be performed at home (Alipour et al., 2023; Dingel and Neiman, 2020).<sup>2</sup> In each quarter, firms are asked about their current and expected business situation in the first part of the questionnaire. The topics addressed in the rest of the questionnaire change in each wave but are generally focused on the diffusion of digital technologies, innovation activities, and work organisation. In any given wave, firms receive the questionnaire by mail with an accompanying invitation letter addressed directly at the CEO or another member of the executive board. To check for the hierarchy level of respondents, the December 2021 wave of the business survey asked participants to indicate their position. In total, most respondents were members of the executive board (77%) or department heads (15%), while only 8% of

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<sup>1</sup>By “survey experiments among firms” we mean survey experiments among individuals, e.g. managers, who answer surveys in a business context and as a representative of a firm.

<sup>2</sup>A detailed overview of the surveyed industries is presented in Table A.3 in the Appendix.

respondents were team leaders or workers without leadership responsibilities. Therefore, we are confident to collect data from firms’ decision-makers within the covered sectors. After answering the paper questionnaire, firms have the option to send it back by mail, fax machine, or email. Moreover, respondents can answer the online version of the questionnaire using their personalised password provided within the invitation letter. The ordering and wording of questions is identical in the paper version and online version of the questionnaire.

In December 2020, we leveraged the business survey to elicit how firms perceive the productivity of WFH and how they form expectations about the use of WFH after the pandemic (Experiment A). In our experimental setup, we generate and exploit exogenous variation in the information set of firms’ decision-makers and use follow-up surveys to analyse the persistence of treatment effects. In June 2022, we conducted a complementary survey experiment relying on priming effects instead of an information provision treatment (Experiment B).

### 3.2 Experiment A: Survey Questions and Information Provision

Table 1 provides an overview of the basic design and key questions in Experiment A. The following paragraphs discuss the process of the survey experiment in more detail.

#### Pre-treatment variables

As in any wave of the ZEW business survey, the questionnaire started with questions on firms’ current and expected business situation. In the second part of the questionnaire, respondents were first asked to indicate whether they agree to a set of four different statements. One of the statements referred to WFH productivity and reads as follows: “Employees working from home perform at least as well as working on business premises.” We use this statement to measure the managers’ perception of whether employees are as productive or even more productive when they work from home as compared to when they work on business premises. Thus, the variable “*Prior Belief: High WFH Productivity*” takes value one if managers indicated that they agree with this statement, and zero otherwise.

Eliciting prior and posterior beliefs using the same question twice in one survey might introduce biases due to experimenter demand effects (Fuster and Zafar, 2022). To attenuate potential biases, a variation in the design of both questions can be used (e.g., Coibion et al., 2022; Stantcheva, 2022b). We follow this approach and use two slightly different questions to elicit firms’ pre-treatment and post-treatment beliefs about WFH productivity. To obfuscate the repetition of two similar questions, we did not use the word “productivity” in the first question. Furthermore, we did not elicit the prior belief using a separate question but rather by adding the statement referring to WFH productivity to a set of further statements about the perception of WFH. Those further statements are employed as control variables in our analysis and are discussed in the paragraph “Additional characteristics of managers and firms”.

To analyse the expected re-optimisation of working arrangements within firms, i.e. the shift towards WFH, we gathered firms’ pre-pandemic use of WFH. Firms were asked to “Indicate the share of employees who have regularly worked from home at least once a week before the Covid-19 pandemic.” The variable “% employees WFH pre-Covid” contains the firms’ responses

to that question and allows us to differentiate firms according to their pre-pandemic use of WFH in terms of the extensive and intensive margin. In addition, firms' current use of WFH is measured in the same way. Subsequently, firms had to answer two additional questions that are not related to our study. These two questions have been deliberately asked at that stage in the questionnaire to obfuscate the repetition of similar questions on productivity beliefs and to separate the pre-treatment questions from the post-treatment questions.

### **Information treatment**

All firms that have been contacted to participate in the December 2020 wave of the business survey were randomly assigned to either the control group or the treatment group. Both groups received identical invitation letters and questionnaires except for one difference. Before the firms were asked a set of questions about the productivity effects of WFH, both groups received a short introductory information text that differed between both groups in the following way:

- Control group: “The following questions relate to the productivity of employees working from home.”
- Treatment group: “The following questions relate to the productivity of employees working from home. In a recent and representative survey in Germany, 59 percent of employees reported to be more productive working from home than on business premises.”

The information presented to the treatment group stems from a representative survey among workers in Germany conducted in April and May 2020 (Marschall et al., 2020). At that time, pandemic-related restrictions and school closures have been widespread in Germany. Potential detrimental effects of those circumstances on WFH productivity are likely accounted for by the workers' self-assessment. Since the pandemic situation was still similar at the time of our survey experiment in December 2020, the information about self-assessed WFH productivity of workers should contain relevant and relatable knowledge for managers. For instance, the assessment of WFH productivity does not only stem from individuals who have self-selected into WFH but also from individuals who had to switch to WFH due to the pandemic situation. Especially during the early phase of the pandemic, representative evidence on workers' productivity when working from home has been scarce. Therefore, managers and firms might have experienced increasingly asymmetric information concerning the productivity of WFH among their employees during this period of time. Consequently, we expect our information treatment to affect the managers' perception of WFH by providing a representative benchmark for workers' WFH productivity. We interpret the provided information as conveying an overall positive sentiment about the productivity of WFH since nearly 60% of workers indicate to gain in productivity when working from home.

### **Post-treatment variables**

Following the randomly assigned version of the treatment text, firms received a set of questions referring to their perception of WFH productivity. Most importantly, one question was related to managers' general belief about whether employees are more productive or less productive

working from home as compared to working on business premises.<sup>3</sup> The question reads as “In general: Compared to working on business premises, employees working from home are...”, where firms had to indicate their answer on a fully-labelled 5-point scale ranging from “significantly less productive” to “significantly more productive”. We dichotomise these answers to construct the variable “*Posterior Belief: High WFH productivity*” taking value one if respondents indicated that WFH is as productive or more productive as working on business premises, and zero otherwise. In this way, the prior productivity belief and the posterior productivity belief can be directly compared to each other since both measures identify the general perception that WFH is at least as productive as working on business premises.

In addition to the posterior productivity beliefs, we elicited firms’ expectations about the future use of WFH after the pandemic has ended. Similar to the earlier question on the use of WFH before the pandemic, firms were asked to “Indicate the share of employees who are expected to regularly work from home at least once a week after the Covid-19 pandemic”. We leverage managers’ expectations about the share of employees WFH after the pandemic as a continuous measure of their willingness to allow their own employees to work from home in the long run. This is based on the empirical evidence that workers value WFH as an amenity and desire more WFH days than preferred by employers (Aksoy et al., 2022; Mas and Pallais, 2017) which suggests that, on average, workers are likely to use the maximum number of WFH days offered by their employer. To account for differences in firms’ pre-Covid use of WFH, we quantify the firm-level intensity of the expected shift towards WFH. In particular, we measure the variable “*Expectation: Shift to WFH*” as the within-firm difference between the share of employees expected to WFH post-Covid and the share of employees who worked from home pre-Covid.

### **Follow-up surveys**

Follow-up surveys are an important tool to mitigate potential concerns with survey experiments. For instance, rather than measuring true changes in beliefs, information treatment effects might result from consistency bias in survey responses, experimenter demand effects, or short-lived responses to the received information, e.g. numerical anchoring or priming (Falk and Zimmermann, 2012; Haaland et al., forthcoming). In addition to alleviating those concerns, follow-up surveys allow for testing the persistence of information treatment effects. Therefore, we included focal outcome variables in the next waves of the ZEW Business Survey.

In March 2021, i.e. three months after the experiment, the next survey wave was conducted. In this follow-up survey, we again asked managers to indicate whether they agree to the following statement: “Employees working from home perform at least as well as working on business premises”. The variable “*Follow-up belief: High WFH productivity*” takes value one for managers who agreed to this statement, and zero otherwise. Therefore, we elicited the prior belief and the follow-up belief about WFH productivity using the same question. The second follow-up survey was conducted six months after the experiment. In this wave, we repeated the question on

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<sup>3</sup>Two further questions referred to changes in productivity during the pandemic for, both, employees who started WFH during the pandemic and employees who have already used WFH pre-Covid. Rather than eliciting the general beliefs about WFH productivity in normal times, answers to these questions might pick up productivity-decreasing circumstances for WFH up until the time of the survey, e.g. closed schools and lockdowns. We, thus, focus on the question related to general beliefs about WFH productivity.

managers' expectations about the future share of employees working from home. Based on this information, we construct the variable *"Follow-up Expectation: Shift to WFH"* by computing the within-firm difference between the expected share of WFH post-Covid and the pre-pandemic share of WFH.

### **Additional characteristics of managers and firms**

In the following, we describe further characteristics that have been gathered within the business survey. In our main survey, we asked managers to indicate whether they agree with four statements related to WFH, out of which one statement is used to measure prior productivity beliefs. The remaining variables taking value one if the respective statement applies are:

- Invest IT training: "In 2020, we have invested in IT training."
- Flexible working time: "We use flexible work time arrangements, e.g. trust-based work time."
- Virtual solutions teamwork: "Virtual solutions enable good teamwork when WFH."

In the June 2020 wave, six months prior to our main survey, we asked managers to indicate whether they agree with four statements related to WFH. We use their answers to create the following dummy variables:

- Feasibility of WFH: "The current pandemic situation makes it evident that more job tasks can be done from home than previously expected."
- Invest new technologies: "We had to make short-term investments in new technologies in order to offer WFH."
- Difficult coordination: "Working from home makes the coordination of work processes more difficult."
- Decreased monitoring: "It is not sufficiently possible to monitor the job performance of employees who work from home."

Some of these variables elicit managers' perception of further dimensions of WFH other than productivity. In particular, we observe managers' perception of whether virtual solutions allow for good teamwork when employees WFH<sup>4</sup>, whether managers noticed an increased feasibility of WFH shortly after the start of the pandemic<sup>5</sup>, and whether managers believe that WFH makes the coordination of work or the monitoring of job performance more difficult<sup>6</sup>. We will use this information to show how these perceptions are related to WFH productivity beliefs and the expected shift towards WFH. The remaining variables are informative about firm characteristics in the context of WFH. In particular, we observe whether firms invested in IT training in 2020 (human capital investments), whether firms had to suddenly invest in new technologies to

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<sup>4</sup>A major concern often put forward against WFH is that it makes teamwork less efficient, reduces team interaction and hampers spillover effects among co-workers. Therefore, the perception of virtual solutions as a useful tool to circumvent those concerns might also be relevant for WFH productivity beliefs.

<sup>5</sup>Using a direct question, this variable measures whether managers updated their beliefs about the share of job tasks that are feasible to be performed from home. Since this question was asked in June 2020, it measures early learning effects induced by the forced experimentation with WFH at the start of the pandemic.

<sup>6</sup>Increasing coordination costs and difficulties to monitor job performance are major concerns against WFH. Eliciting managers' tendency to see those problems, thus, might be informative for their WFH productivity beliefs and expectation about future WFH use.

offer WFH shortly after the pandemic started, and whether firms use flexible working time arrangements, e.g. trust-based working time.

### 3.3 Experiment B: Survey Questions and Priming Effect

This section describes our complementary survey experiment focusing on the causal impact of managers’ beliefs about WFH productivity on firms’ expected shift to WFH. Instead of providing managers with new information, this experiment leverages a priming treatment induced by a randomised order of survey questions. Priming refers to the mental activation of a concept and is well-established in the psychology and economic literature (Bargh and Chartrand, 2014; Cohn and Maréchal, 2016). In general, priming experiments use subtle situational cues to increase the relative salience of the primed concept, e.g. immigration as in Alesina et al. (2023) or financial boom/bust as in Cohn et al. (2015). Exploiting the exogenous and subconscious increase in salience allows for measuring the pure psychological impact of the primed concept on behaviour, emotions, or cognition in subsequent tasks. One established priming technique is to actively prompt subjects to think about a specific concept. As presented in Table 1, we use this technique in the following way: Managers in the control group are first asked about their long-run expectations concerning the use of WFH practices and then asked about their perception of the productivity effects of WFH. In contrast, managers in the treatment group are first asked about their perception of the productivity effects and then about their long-run expectations concerning the use of WFH. Due to this experimental setup, we mentally activate the concept of worker productivity for managers in the treatment group before they are asked about their expectations about their firm’s long-run use of WFH. Managers in the control group, however, are not primed on the topic of worker productivity before answering the question about the future use of WFH.

The question we use to elicit managers’ beliefs about WFH productivity is identical to the measure of posterior beliefs in Experiment A. The question reads as: “In general: Compared to working on business premises, employees working from home are...”, where firms had to indicate their answer on a fully-labelled 5-point scale ranging from “significantly less productive” to “significantly more productive”. Again, we dichotomise the 5-point scale to construct the variable “*Belief: High WFH productivity*” taking value one if respondents indicated that WFH is as productive or more productive as working on business premises, and zero otherwise. In addition, we use the same elicitation for the expected shift to WFH as in Experiment A. Thus, the variable “*Expectation: Shift to WFH*” measures the within-firm difference between the share of employees expected to WFH post-Covid and the share of employees who worked from home pre-Covid.

## 4 Descriptives and Balance Test

### 4.1 Summary Statistics

Summary statistics for key variables in Experiments A and B are provided in Table 2. First, we focus on Experiment A. Prior to receiving any information, a share of 66% of firms agreed with the statement that employees working from home perform at least as well as if they were working in the office. Answering a differently designed question after the treatment, a share of 64% of firms indicated to believe that WFH is at least as productive as working on business premises. Before the pandemic, a share of 67% of firms used WFH arrangements, while the average share of employees WFH at least once per week was 11%. For the time after the pandemic, 83% of firms expect to use WFH arrangements, while the average share of employees expected to use those flexible arrangements has tripled to 32%. We measure firms' expected shift to WFH by computing the within-firm difference between the firms' share of employees WFH before the pandemic and the firms' expected share of employees WFH after the pandemic. The highest expected firm-level shift amounts to an increase of 90 percentage points of employees WFH and the lowest firm-level shift is a reduction of 2 percentage points of employees WFH in the long run.<sup>7</sup> On average, firms plan to increase the share of employees who use WFH by 21 percentage points. In the follow-up survey conducted in June 2021, the average of the expected shift towards WFH amounts to 23 percentage points. On average, firms' perception of WFH productivity and (expected) use of WFH arrangements are very similar in the sample of firms participating in Experiment B in June 2022. In the latter sample, a share of 64% of firms had high WFH productivity beliefs and the expected shift to WFH amounted to 29% percentage points.

Figure 1 provides a more detailed description of managers' perception of WFH productivity. As measured by the question on posterior beliefs, roughly 50% of firms in the control group indicated that they believe that employees exhibit the same productivity working from home as working on business premises. 14% of firms stated that WFH is rather more productive, while less than 1% indicated that WFH is significantly more productive. On the contrary, 33% (3%) of firms stated that WFH is rather less (significantly less) productive than working on business premises. While these results indicate that the majority of firms perceive WFH as productive or more productive than office work, managers' views are, on average, less optimistic than workers' self-assessed WFH productivity (Aksoy et al., 2022; Barrero et al., 2021). Figure 2 provides a more detailed breakdown of firms' expected shift towards WFH. It compares the pre-Covid and post-Covid distributions of WFH usage across firms in the control group. The share of firms in which up to 20% of employees use WFH has decreased considerably and has shifted to a higher expected intensity of WFH in the long run. This highlights that many firms plan a re-optimisation of their working arrangements.

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<sup>7</sup>To control for outliers, the bottom 1% and top 1% of the variable "Expectation: Shift to WFH" are trimmed.

## 4.2 Balance Test

Table 3 provides an overview of the balance between firms assigned to the control group and the treatment group. As the results indicate for Experiment A, the random assignment of respondents into both groups does not seem to be biased. Only two pre-treatment variables are significantly different between groups. Firms in the control group are more likely to use flexible working time arrangements but are less likely to state that the pandemic has shown that more job tasks can be performed from home than previously expected. However, no other observable characteristics, such as the industry or size, differ significantly across groups. Most importantly, the prior belief about the productivity of WFH is, on average, identical in both groups (66% of managers have high productivity beliefs). This is of particular relevance since it might be a concern that respondents read the complete paper questionnaire and, hence, the treatment text, before they start filling out the questionnaire. If this would happen, the measure of the prior belief could be biased. However, the fact that the prior belief is the same in both groups supports our assumption and experience that managers do not read an entire questionnaire before filling it out but rather start answering directly.<sup>8</sup> The balance test for Experiment B indicates that firms in the treatment group are, on average, smaller than firms in the control group. The treated firms are, on average, also less likely to have used WFH pre-Covid and to have high WFH productivity beliefs. However, the group differences in the use and perception of WFH become insignificant if firm size and sector are accounted for in an auxiliary balance test. To account for potential biases in the randomisation process, we control for firm size and industry, WFH usage, and productivity beliefs in our main analysis.

## 4.3 Correlates of Beliefs and Expectations about WFH

This paragraph shows whether managers' prior beliefs about WFH productivity and expectations about the future use of WFH are associated with observable characteristics of managers and firms. Regressing managers' prior beliefs on all observable pre-treatment variables as potential predictors provides the coefficients presented in Figure 3. These coefficients represent controlled correlations that are prone to reverse causality, but are noteworthy for two reasons. First, the coefficients shed light on the anatomy of managers' productivity beliefs and whether they form a bundle with perceptions of other facets of WFH besides productivity. Second, the results on potential bundles of beliefs can serve as a simple robustness check of the elicitation of productivity beliefs.

Managers working in firms that have already used WFH before the pandemic are significantly more likely to hold high WFH productivity beliefs (15 percentage points, see Table A.2 for the regression output). In addition, the perception that virtual solutions enable good teamwork when working from home is positively linked to high WFH productivity beliefs (26 percentage points). A positive association is also found for managers who stated that the pandemic has shown that more job tasks can be performed from home than previously expected (12 percentage

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<sup>8</sup>In addition, the main results in this paper are robust to restricting the sample to only those managers who completed the online version of the questionnaire, where the information text was only visible on the third page of the online questionnaire.



points). In contrast, managers are less likely to hold high productivity beliefs if they think that WFH makes the coordination of work processes more difficult (18 percentage points) or that it is not sufficiently possible to monitor the job performance of employees working from home (18 percentage points). Taken together, managers’ productivity beliefs are strongly related to the perception of other aspects of WFH. In particular, the negative association with managers’ view on potential drawbacks of WFH, namely difficult coordination and less scope for monitoring, forms an interesting bundle with productivity beliefs. We interpret this finding as a simple robustness test for the internal validity of our elicitation of productivity beliefs since managers’ answers align in a way that might be too complex to result from (deliberately) biased answering patterns. Notably, this validity check is unlikely to suffer from consistency biases since the questions about difficult coordination and less scope for monitoring stem from the June 2020 wave, while productivity beliefs were elicited in December 2020.

Figure 4 presents the results of a regression of managers’ expectations about the shift to WFH on observable characteristics. The controlled correlations indicate that managers who perceive WFH as similarly or more productive than working on business premises express a significantly higher willingness to offer WFH. On average, these managers expect the shift to WFH among their employees to be 7 percentage points higher, as compared to managers with a low prior belief. This result suggests a positive association between productivity beliefs and firms’ willingness to offer WFH and is, thus, in line with the descriptive findings by Barrero et al. (2021) and Criscuolo et al. (2021). Using our experimental survey design, we will further contribute to this literature by focusing on causal relationships. Besides their productivity beliefs, managers’ views on other aspects of WFH are also associated with their expectations. For instance, the revised perception of WFH feasibility is positively correlated to WFH plans. If managers indicated in June 2020 that they’ve learned that more tasks can be performed from home than previously expected, they anticipate a roughly 7 percentage points higher shift to WFH in the December 2020 survey. Moreover, firms that invested in IT training or believe that virtual solutions allow for good teamwork are more willing to offer WFH. In contrast, if managers see potential drawbacks of WFH such as difficulties in coordination or less scope for monitoring, they expect a lower shift to WFH. Table A.2 presents the underlying regression results of Figure 4 and an additional specification that does not include prior beliefs as an explanatory variable.<sup>9</sup> The coefficients of firms’ previous use of WFH and the perception of decreased monitoring are statistically significant in this additional specification, but lose their significance once prior beliefs are accounted for. Taken together, this descriptive analysis shows that managers’ perceptions of different aspects of WFH are strongly correlated to their long-term WFH plans.

## 5 Results of Experiment A

In this section, we exploit the experimental setup of our survey to examine information treatment effects on managers’ perception of WFH. First, we analyse to what extent managers’ beliefs about WFH productivity are responsive to information. In particular, we investigate

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<sup>9</sup>Both specifications control for managers’ treatment status since the outcome measure is observed after the potential treatment takes place.

whether managers update their beliefs about WFH productivity after receiving representative information on the self-assessed productivity of employees who work from home. Second, we focus on the impact of providing this information on managers' willingness to adopt or intensify WFH practices in their firms as measured by their expectations about the shift towards WFH.

## 5.1 Treatment Effects on Beliefs about WFH Productivity

### 5.1.1 Main Survey

Managers' posterior belief about WFH productivity is the focal outcome in this part of the analysis. The left panel of Figure 5 depicts the share of managers who believe that employees are at least as productive when they work from home as when they work on business premises. In the control group, 63% of managers have a high posterior belief, compared to 65% in the treatment group. Thus, the information treatment does not significantly shift managers' beliefs about WFH productivity if all firms are considered. An intuitive reason for this may be that the information treatment effect depends on managers' prior beliefs. Since the information conveys an optimistic sentiment about WFH productivity, it may not affect managers who already perceive WFH as productive. In contrast, managers with a low prior belief may update their beliefs after receiving the positive information. Therefore, Figure 5 also shows heterogeneous treatment effects on posterior beliefs depending on managers' prior beliefs. Among managers with a high prior belief about productivity, 87% in the control group and 85% in the treatment group have a high posterior belief. The difference is statistically insignificant. However, focusing on managers with a low prior belief, 16% in the control group but 28% in the treatment group have a high posterior belief. Thus, the raw heterogeneous treatment effect for managers with low prior beliefs amounts to 12 percentage points (significant at the 95%-level). In other words, there is a significant shift in beliefs if the provided positive information contradicts managers' low prior beliefs. This evidence suggests that the information treatment leads to genuine updating of beliefs (Cavallo et al., 2017). The fact that slightly different questions are used to elicit prior and posterior beliefs could lead to apparent changes in beliefs that are independent of the information treatment. The probability to observe changes in beliefs is almost identical among managers with high prior beliefs in both experimental groups as well as among managers with low prior beliefs in the control group (about 15 percentage points). In contrast, only managers with low prior beliefs who received the information treatment have a significantly higher probability to change beliefs (28 percentage points).

Table 4 provides the OLS results of the treatment effects on posterior beliefs. If prior beliefs are controlled for but not interacted with the information treatment, the information treatment has no significant effect in our main survey (Column 1). This result is robust regardless of whether no observable characteristics are controlled for (Panel A) or whether observable characteristics of managers and firms are included to increase precision (Panel B). The control variables include 9 industry dummies, the number of employees, the previous use of WFH, the perception that virtual solutions enable good teamwork, whether the firm uses flexible working time arrangements, and whether the firm invested in IT training during 2020. In Column 2, we allow the information treatment effects to vary with managers' prior beliefs. Among managers with a

low prior belief about WFH productivity, the information treatment increases the probability that they state to believe that WFH is at least as productive as working on business premises by 12 percentage points. This significant shift in posterior beliefs is robust to the inclusion of characteristics of managers and firms. In contrast, for managers with a high prior belief we do not observe a significant treatment effect, most likely because the positive sentiment of the received information is in line with their own perception of WFH productivity.

Table A.1 provides the OLS results if we use the posterior belief on the 5-point scale rather than the dichotomised posterior belief as the dependent variable in our regressions. The information treatment significantly increases the average productivity belief scale by 0.15 points for managers with low prior beliefs in comparison to the average among the control group amounting to 2.06 points. If all observable characteristics are controlled for, the treatment effect is slightly reduced in terms of size and significance level. As shown in Figure A.1, among managers with low prior beliefs, the treatment mostly increases the share of managers who indicate that "WFH is about as productive" as working on business premises when posterior beliefs are elicited. For managers with high prior beliefs much less and only insignificant differences between the control and treatment group are detectable. Therefore, our earlier results using the dichotomised posterior belief point to the same conclusions as if we would use the 5-point scale of posterior beliefs directly.

### 5.1.2 Follow-up Survey

To mitigate potential experimenter demand effects and to test the persistence of the information treatment effect, we elicited managers' productivity beliefs in a follow-up survey conducted three months after the main survey experiment. The right panel of Figure 5 shows the share of managers with high WFH productivity beliefs in the follow-up survey by experimental group. In the control group, 53% of managers have a high productivity belief while in the treatment group this share is 60%. The difference, however, is not statistically significant. This also holds if the sample is partitioned according to managers' prior beliefs. Table 4 provides the OLS results using the follow-up belief as the dependent variable in Columns 3 and 4. As already discussed, the treatment effects are insignificant if no control variables are included in the model (Panel A). However, the treatment effects slightly increase and become significant at the 90%-level if characteristics of managers and firms are included (Panel B). As the results indicate, the significant treatment effect is primarily driven by adjustments of beliefs among managers who perceived WFH as rather unproductive before the information was provided. For these managers with low prior belief, receiving the information treatment in December 2020 increased the probability to perceive WFH as similarly productive or more productive than working in the office in March 2021 by 11 percentage points. In contrast, the treatment coefficient for the group of managers with high prior beliefs is smaller and insignificant.

Since not every firm that participated in the main survey also answered the follow-up survey, the previous results are based on a lower number of observations ( $N=489$ ) as compared to the main survey ( $N=759$ ). To allow for a better comparison of effects, Figure 6 additionally provides the treatment effects for the main survey based on the balanced sample ( $N=489$ ) alongside

the previously described results. Based on the regression specification including all controls gathered in the main survey, the figure presents the simple treatment effects for all firms as well as the heterogeneous effects depending on managers' prior beliefs for the unbalanced and balanced samples. Our key findings from the main survey remain unchanged if the balanced sample is used, showing a significant treatment effect for managers with low prior beliefs only.

The prior belief in the main study and the belief in the follow-up survey have been elicited using the identical question. Therefore, a manager's shift between prior belief and follow-up belief may not be caused by a different wording of the question (as in the main survey). Therefore, our data are not only informative about the persistence of treatment effects but also about the persistence of managers' beliefs about WFH productivity. Focusing on the control group, 74% of managers who believed that WFH is at least as productive as working at the office in the main survey had the same perception three months later. Among managers with low prior beliefs, 87% had not changed their beliefs by the time of the follow-up survey. The overall persistence of beliefs about WFH productivity is, thus, strong among managers and validates our elicitation of productivity beliefs.

### **5.1.3 Perception of Additional Aspects of WFH**

As we have shown earlier, the prior belief about WFH productivity is correlated with a number of observed characteristics of managers and firms (see Figure 3). Some of those characteristics have been surveyed six months before Experiment A was conducted. The OLS results including these characteristics as additional explanatory variables are presented in Table 5. Results for the main survey are shown in Columns 1 and 2, while the results for the follow-up survey are shown in Columns 3 and 4. In the case of the follow-up results, the number of observations drops to 378 firms since three waves of the Business Survey have to be merged to include the additional characteristics (June 2020), the key variables of Experiment A (December 2020), and the posterior belief as measured in the follow-up survey (March 2021). For estimating specifications 1 and 2 for the main survey, we rely on the balanced sample, but using all available observations results in qualitatively and quantitatively the same results. The size and significance of the information treatment effects discussed so far remain highly stable if we include the additional variables and the number of observations is reduced. Managers' perception of WFH productivity is significantly shifted upwards by the information treatment if they originally held a low prior belief. Based on the follow-up survey, we find that this shift is persistent over a time span of three months.

Posterior beliefs are significantly correlated with the perception that WFH increases coordination costs and decreases monitoring opportunities, even if prior beliefs are accounted for. Focusing on the main survey and controlling for prior beliefs, managers are roughly 10 percentage points less likely to have high posterior beliefs if they think that WFH makes the coordination of work more difficult or that it is not sufficiently possible to monitor workers' job performance (Columns 1 and 2). The same holds for the follow-up results, with even slightly stronger correlations. We see this as suggestive evidence that managers' beliefs about WFH

productivity are less malleable if they perceive WFH as a source for increasing coordination costs and making performance monitoring more challenging.

## 5.2 Treatment Effects on the Expected Shift to WFH

### 5.2.1 Main Survey

In this section, we focus on the impact of providing information about workers' self-assessed WFH productivity on firms' expectations about their future use of WFH. The intensity of the expected shift towards WFH is measured as the within-firm difference between the share of employees expected to WFH post-Covid and the share of employees who worked from home pre-Covid. As Figure 7 shows, managers in the control group expect an average shift of 19.5 percentage points more employees working from home post-Covid than before the pandemic. In contrast, the average shift towards WFH expected by managers in the treatment group is significantly higher by 3.2 percentage points and amounts to 22.7 percentage points in total. On average, the information treatment, hence, increases firms' expectations about the long-run intensity of WFH if no control variables are accounted for. In a next step, we focus on heterogeneous effects and allow the treatment effect to vary with managers' prior belief about WFH productivity. While there is no significant effect among managers with a low prior belief, the significant treatment effect on the expected shift to WFH is driven by the group of managers with a high prior belief. Among these managers, the average expected shift towards WFH is 23.4 percentage points in the control group but 28.8 percentage points in the treatment group. This result might reflect that, even for managers with high prior beliefs, receiving our information about workers' self-assessed WFH productivity conveyed useful and maybe unexpected knowledge, e.g. in terms of the high share of workers reporting productivity gains of WFH. In addition, the treatment text might have reinforced and validated managers' prior optimistic views on WFH productivity, leading to an increased willingness to allow WFH.

Table 6 provides further results from OLS regressions. In addition to the treatment indicator, Column 1 in Panel A includes the prior belief as an explanatory variable for the expected shift towards WFH. The prior belief about WFH productivity is strongly related to managers' expectations about the future use of WFH. On average, managers with a high belief about WFH productivity expect a 14.7 percentage points higher share of employees working from home after the pandemic than managers with low prior beliefs. Importantly, the inclusion of the prior belief about WFH productivity does not alter the significant information treatment effect of 3.2 percentage points. The size and significance of the information treatment effect are also robust to the inclusion of additional characteristics of managers and firms. As depicted in Column 1 in Panel B, firms that had already used WFH before the pandemic expect a 5.6 percentage points higher shift towards WFH after the pandemic. Moreover, managers whose firms use flexible working time arrangements, e.g. trust-based working time, expect a roughly 7 percentage points higher use of WFH. The same holds for managers who believe that virtual solutions enable good teamwork when WFH. Lastly, firms that have invested in IT training in 2020 also expect a slightly higher shift towards WFH. After controlling for those characteristics alongside the firm size and sector, the coefficient of the prior belief is reduced in size but not

in significance. Column 2 additionally introduces the interaction term between the information treatment and managers' prior beliefs. If no control variables other than the prior belief, the information treatment, and their interaction term are included in the regression model, the treatment effect of receiving the information as a manager with high prior beliefs is positive and significant at the 95%-level. After including the other control variables, the interaction coefficient is slightly reduced, but remains significant at the 90%-level. In contrast, we find no significant treatment effect for managers with a low prior belief about WFH productivity.

### 5.2.2 Follow-up Survey

Six months after the main survey experiment, we included identical questions on the pre-Covid share and expected post-Covid share of employees who work from home in a subsequent wave of the ZEW Business Survey to test the persistence of treatment effects and to avoid potential anchoring biases. As shown in the right panel of Figure 7, firms in the control group expect a shift towards WFH of 21.8 percentage points and firms in the treatment group expect a shift of 23.6 percentage points, but the difference is not statistically significant. When we take potential heterogeneities depending on the managers' prior beliefs into account, we see a marginally larger treatment effect for the group of managers with a low prior belief than for the managers with a high prior belief. However, both differences are insignificant if we do not control for additional variables. To increase precision, the OLS estimations provided in Table 6 take observable differences into account. As presented in Column 3 of Panel B, the information treatment effect is positive and statistically significant if characteristics of managers and firms are accounted for. The information provision increases the expected shift towards WFH by roughly 3.2 percentage points. Column 4 additionally introduces the interaction term between the information treatment and managers' prior beliefs. The results indicate that the significant treatment effect is primarily driven by the group of managers with low prior beliefs. In response to the information treatment in December 2020, they expect a 5.3 percentage points higher shift towards WFH, when asked in June 2021.

Again, the results of the follow-up survey are based on fewer observations ( $N=464$ ) compared to the main survey ( $N=759$ ). Figure 8 additionally provides the treatment effects for the main survey based on the balanced sample. Based on regressions including all controls gathered in the main survey, the treatment effects for all firms as well as the heterogeneous effects depending on managers' prior beliefs are presented for the unbalanced and balanced samples. Reducing the sample size does not change the size or the significance of the average treatment effect in the main survey. However, the results concerning the heterogeneous treatment effects are affected. The treatment effect for managers with a high prior belief loses its significance, but the treatment effect for managers with low priors gains in size, while still missing the 90%-significance level. Overall, the results for the main survey based on the balanced sample more strongly resemble the results for the follow-up survey. Therefore, the composition of the sample might contribute to the earlier finding that the treatment effect was only significant for managers with a high prior belief in the main survey, but significant for managers with a low prior in the follow-up survey.

### 5.2.3 Perception of Additional Aspects of WFH

The OLS models presented in Table 7 additionally control for further characteristics surveyed in June 2020. Again, the number of observations drops to 363 since an additional wave of the Business Survey is used and we provide results for the balanced sample. Using the expected shift to WFH in the main survey as the dependent variable, the treatment effect is still statistically significant and amounts to 5.1 percentage points (Column 1). When the interaction effect between information treatment and prior beliefs is additionally included in the model, the treatment effect only remains significant for the group of managers with a low prior belief (Column 2). The same patterns emerge if the expected shift to WFH in the follow-up survey is used as the dependent variable. Therefore, even after controlling for managers' perception of other aspects of WFH, we find significant and persistent information treatment effects which are primarily driven by the group of managers with low prior productivity beliefs.

Managers' expectations about the future use of WFH are significantly related to their perceptions of potential drawbacks of WFH. Focusing on the main survey, the perception that WFH increases coordination costs or reduces the scope for performance monitoring is negatively related to firms' expected shift to WFH (approx. minus 5 percentage points), even after controlling for managers' productivity beliefs. For the expectations gathered in the follow-up survey, the coefficients become slightly smaller and lose their statistical significance. Managers who indicated in June 2020 that the pandemic has shown that more job tasks can be done from home than previously expected, plan to have a significantly higher share of employees using WFH in the future. On average, those managers expect a 7 percentage points higher shift towards WFH in the main survey and a 5 percentage points higher shift in the follow-up survey. We interpret this finding as suggestive evidence that firms' expectations about the WFH feasibility of job tasks has been biased before the pandemic and learning about the higher-than-expected WFH feasibility facilitates the lasting shift towards WFH as discussed by Barrero et al. (2021) and Erdsiek (2021).

## 6 Results of Experiment B

This section presents the results of our complementary survey experiment focusing on the causal impact of managers' productivity beliefs on their willingness to offer WFH in the future. Instead of providing managers with new information, this experiment leverages a priming treatment induced by a randomised order of questions about productivity beliefs and future plans for WFH. Due to the experimental design, we mentally activate the concept of worker productivity for managers in the treatment group before they are asked about their WFH plans. Managers in the control group, however, are not primed on the topic of productivity before answering this question.

Figure 9 provides the average expected shift to WFH by experimental groups. Managers in the control group expect an average shift towards WFH of 30.5 percentage points of employees, whereas the average shift to WFH is insignificantly smaller by 3 percentage points among managers who have been primed. However, making managers think about WFH productivity might

shift their expectations concerning the future use of WFH in different directions depending on their initial perception of WFH productivity. In particular, activating the concept of productivity might reduce the ambition to intensify WFH for managers who perceive WFH as rather unproductive, whereas it might increase managers' ambition to use WFH if they perceive WFH as productive. Therefore, we allow the priming effect to vary with managers' beliefs about WFH productivity. For managers who believe employees are less productive working from home than on business premises, the priming treatment significantly reduces the average expected shift to WFH by 7.1 percentage points in comparison to the control group. However, if managers perceive WFH as productive, we neither find a positive nor negative priming effect. To investigate whether the priming treatment might have a positive effect for the (small) share of managers who perceive WFH to be even more productive than working on business premises, we divide the sample accordingly. However, the priming treatment does not change the average expected shift to WFH for this group of managers. Apart from the priming treatment, Figure 9 shows how the shift to WFH gradually increases with the improving perception of WFH productivity.

The corresponding OLS results are presented in Table 8. Column 1 shows the aforementioned significant priming effect of minus 7.1 percentage points among managers with a low belief about WFH productivity. The model in column 2 additionally controls for firms' previous use of WFH before the pandemic, firm size, and industry. The estimated priming effect slightly decreases in size and significance but is still significant at the 90%-level. Columns 3 and 4 provide the results if we distinguish managers into 3 groups according to their perception of WFH productivity: 1) WFH is less productive than working on business premises, 2) WFH is as productive as working on business premises, 3) WFH is more productive than working on business premises. We do not find treatment effects for groups 2 and 3. A visualisation of the priming effects for each group is provided in Figure 10. The results of our priming experiment suggest that managers' perception of potential productivity effects enters their decision-making process concerning the future use of WFH in their firm. In particular, we conclude that the perception that WFH is less productive than working on business premises causally reduces managers' willingness to offer WFH intensively.

## 7 Discussion and Conclusion

This study uses two survey experiments to analyse how managers form beliefs about the productivity effects of WFH and to investigate whether productivity beliefs are causally linked to the willingness to offer WFH in the future. Based on a sample of nearly 800 knowledge-intensive services firms in Germany, we first document that roughly one-third of managers believe that employees are less productive when they work from home than when they work on business premises (low prior belief). We further show that managers expect a significant and lasting shift to WFH as measured by the within-firm difference between the pre-Covid and the expected post-Covid share of employees WFH. On average, managers with a high prior belief expect a significantly larger shift to WFH than managers with a low prior belief, supporting previous descriptive evidence on a positive association between productivity beliefs and the willingness to offer WFH (Barrero et al., 2021; Criscuolo et al., 2021).



In our first survey experiment, we randomly provide a subset of managers with information about workers' self-assessed productivity when working from home. Our findings suggest that the information provision induced genuine belief updating among managers with low prior beliefs. For these managers, we show that the information treatment significantly increases the probability of high posterior beliefs about WFH productivity by roughly 11 percentage points. Conducting a follow-up survey three months after the experiment, we show that the treatment effects on managers' beliefs are persistent and not driven by experimenter demand. Therefore, managers' WFH productivity beliefs seem to be malleable by learning about workers' self-assessments that might reduce asymmetric information problems and uncertainty. In addition, we provide evidence that receiving the information treatment increases managers' willingness to offer WFH in the long run. On average, treated managers expect the share of employees working from home after the pandemic to increase by 22.7 percentage points as compared to pre-pandemic times. In contrast, the average expected shift to WFH is significantly lower by 3.2 percentage points for managers in the control group. If all observable characteristics of firms and managers are accounted for, the information treatment effect is still significant in a follow-up survey conducted six months after the main experiment.

In our second survey experiment, we use a priming technique to directly focus on the subconscious relationship between managers' WFH productivity beliefs and future plans for WFH. In our experimental design, we randomly reverse the order of the questions eliciting managers' beliefs and WFH expectations. We find that making managers think about the productivity effects of WFH significantly reduces their willingness to offer WFH, but only if they believe that WFH is less productive than working on business premises. If managers perceive WFH as equally productive as working on business premises, however, the mental activation of potential productivity effects does not change their willingness to offer WFH. Therefore, this complementary survey experiment supports the notion that managers' perceptions of potential productivity effects causally contribute to their decision-making concerning the adoption of WFH policies.

Our findings have implications for current debates highlighting that the pandemic-induced increase in WFH has the potential to alleviate structural inequalities but also entails the risk of exacerbating those inequalities (Autor and Reynolds, 2020; Bonacini et al., 2021; Stantcheva, 2022a). Reaping the benefits of the changing organisation of work while reducing its risks for vulnerable groups might call for targeted policy measures. For instance, an unequal adoption of WFH across firms might contribute to the rising within-industry gap between highly productive and less productive firms. A widening of the productivity gap could occur if better-performing firms are more likely to exploit the potential benefits of WFH in terms of productivity gains and increased resilience to unanticipated shocks, e.g. future pandemics (Bai et al., 2021). If differences in WFH adoption are caused by more strongly biased expectations among underperforming firms, correcting these biases might counteract the strengthening of within-industry productivity gaps.

## Tables

Table 1: Experimental Design

Experiment A

Main Survey			Follow-up Surveys
Pre-treatment	Treatment	Post-treatment	
Prior belief about WFH productivity	No information vs. information on workers' self-assessed WFH productivity	Posterior belief about WFH productivity	Posterior belief about WFH productivity
% employees WFH pre-Covid		% employees WFH post-Covid	% employees WFH post-Covid

Experiment B

Treatment: Change in the order of survey questions	
Control group	Treatment group
Question 1: % employees WFH post-Covid	Question 1: Belief about WFH productivity
Question 2: Belief about WFH productivity	Question 2: % employees WFH post-Covid

*Note:* See Table A.4 for variable descriptions.

Table 2: Summary Statistics

	Mean	SD	Min	Max	Count	Wave
<b>Experiment A</b>						
Pre-treatment variables:						
Prior Belief: High WFH Productivity	0.66	0.5	0	1	759	Dec 20
Use of WFH pre-Covid	0.67	0.5	0	1	759	Dec 20
% employees WFH pre-Covid	11.28	17.2	0.0	100.0	759	Dec 20
Virtual solutions teamwork	0.74	0.4	0	1	759	Dec 20
Flexible working time	0.83	0.4	0	1	759	Dec 20
Invest IT training	0.66	0.5	0	1	759	Dec 20
Invest new technologies	0.37	0.5	0	1	512	Jun 20
Feasibility of WFH	0.65	0.5	0	1	509	Jun 20
Difficult coordination	0.61	0.5	0	1	511	Jun 20
Decreased monitoring	0.44	0.5	0	1	509	Jun 20
Post-treatment variables:						
Posterior Belief: High WFH Productivity	0.64	0.5	0	1	759	Dec 20
Expectation: Use of WFH post-Covid	0.83	0.4	0	1	759	Dec 20
Expectation: % empl. WFH post-Covid	32.42	30.5	0.0	100.0	759	Dec 20
Expectation: Shift to WFH	21.13	23.2	-2.0	90.0	759	Dec 20
Follow-up Belief: High WFH Productivity	0.57	0.5	0	1	482	Mar 21
Follow-up Expectation: Shift to WFH	22.70	22.4	0.0	90.0	464	Jun 21
Sector and firm size:						
ICT hardware	0.10	0.3	0	1	759	Dec 20
ICT services	0.21	0.4	0	1	759	Dec 20
Media services	0.12	0.3	0	1	759	Dec 20
Legal and accounting	0.10	0.3	0	1	759	Dec 20
Management consultancy	0.07	0.3	0	1	759	Dec 20
Architecture & engineering	0.17	0.4	0	1	759	Dec 20
Scientific R&D	0.07	0.3	0	1	759	Dec 20
Advertising & market research	0.11	0.3	0	1	759	Dec 20
Other prof., scien., techn. services	0.04	0.2	0	1	759	Dec 20
Log. employees	3.60	1.4	1.4	10.2	759	Dec 20
<b>Experiment B</b>						
Key variables:						
Belief: High WFH Productivity	0.64	0.5	0	1	665	Jun 22
Use of WFH pre-Covid	0.63	0.5	0	1	665	Jun 22
% employees WFH pre-Covid	10.16	18.0	0.0	100.0	665	Jun 22
Expectation: % empl. WFH post-Covid	39.10	33.1	0.0	100.0	665	Jun 22
Expectation: Shift to WFH	28.95	28.9	-5.0	100.0	665	Jun 22
Sector and firm size:						
ICT hardware	0.08	0.3	0	1	665	Jun 22
ICT services	0.20	0.4	0	1	665	Jun 22
Media services	0.15	0.4	0	1	665	Jun 22
Legal and accounting	0.11	0.3	0	1	665	Jun 22
Management consultancy	0.07	0.3	0	1	665	Jun 22
Architecture & engineering	0.16	0.4	0	1	665	Jun 22
Scientific R&D	0.09	0.3	0	1	665	Jun 22
Advertising & market research	0.09	0.3	0	1	665	Jun 22
Other prof., scien., techn. services	0.05	0.2	0	1	665	Jun 22
Log. employees	3.55	1.3	1.4	10.2	665	Jun 22

*Note:* See Table A.4 for variable descriptions. *Source:* ZEW Business Survey in the Information Economy, June 2020, December 2020, March 2021, June 2021, June 2022.

Table 3: Balance Test

	Control	Treated	Diff.	t-Stat.
<b>Experiment A</b>				
Pre-treatment variables:				
Prior Belief: High WFH Productivity	0.66	0.66	0.00	0.10
Use of WFH pre-Covid	0.66	0.67	0.01	0.15
% employees WFH pre-Covid	11.41	11.17	-0.24	-0.19
Virtual solutions teamwork	0.71	0.76	0.05	1.49
Flexible working time	0.86	0.80	-0.05	-1.96
Invest IT training	0.67	0.64	-0.03	-0.90
Invest new technologies	0.39	0.35	-0.04	-0.90
Feasibility of WFH	0.60	0.69	0.10	2.30
Difficult coordination	0.62	0.61	-0.01	-0.31
Decreased monitoring	0.42	0.46	0.05	1.02
Post-treatment variables:				
Posterior Belief: High WFH Productivity	0.63	0.65	0.03	0.74
Expectation: Use of WFH post-Covid	0.83	0.83	0.00	0.15
Expectation: % empl. WFH post-Covid	30.87	33.86	2.99	1.35
Expectation: Shift to WFH	19.46	22.69	3.24	1.92
Follow-up Belief: High WFH Productivity	0.53	0.60	0.08	1.71
Follow-up Expectation: Shift to WFH	21.77	23.61	1.84	0.88
Sector and firm size:				
ICT hardware	0.11	0.09	-0.02	-0.93
ICT services	0.23	0.19	-0.03	-1.13
Media services	0.13	0.12	-0.01	-0.37
Legal and accounting	0.09	0.11	0.02	0.75
Management consultancy	0.07	0.07	0.00	0.15
Architecture & engineering	0.16	0.18	0.02	0.71
Scientific R&D	0.07	0.08	0.01	0.43
Advertising & market research	0.10	0.11	0.01	0.36
Other prof., scien., techn. services	0.04	0.05	0.01	0.52
Log. employees	3.56	3.63	0.07	0.70
Observations in main survey	366	393		
<b>Experiment B</b>				
Key variables:				
Belief: High WFH Productivity	0.68	0.60	-0.08	-2.19
Use of WFH pre-Covid	0.67	0.59	-0.07	-1.98
% employees WFH pre-Covid	11.20	9.19	-2.01	-1.44
Expectation: % empl. WFH post-Covid	41.70	36.69	-5.01	-1.96
Expectation: Shift to WFH	30.50	27.50	-3.00	-1.34
Sector and firm size:				
ICT hardware	0.09	0.07	-0.02	-0.86
ICT services	0.23	0.18	-0.05	-1.55
Media services	0.14	0.15	0.01	0.47
Legal and accounting	0.10	0.12	0.01	0.53
Management consultancy	0.07	0.08	0.01	0.49
Architecture & engineering	0.15	0.18	0.03	1.05
Scientific R&D	0.10	0.08	-0.01	-0.58
Advertising & market research	0.08	0.10	0.01	0.65
Other prof., scien., techn. services	0.05	0.05	-0.00	-0.04
Log. employees	3.66	3.45	-0.22	-2.07
Observations	320	345		

Note: See Table A.4 for variable descriptions. Source: ZEW Business Survey in the Information Economy, June 2020, December 2020, March 2021, June 2021, June 2022.

Table 4: Experiment A - Treatment effects on posterior beliefs about high WFH productivity

	Posterior Belief: High WFH Productivity							
	Main Survey				Follow-up Survey			
	(1)		(2)		(3)		(4)	
Panel A: Without control variables								
Treatment	0.02	(0.03)	0.12**	(0.05)	0.06	(0.04)	0.08	(0.06)
Prior: High WFH Productivity	0.64***	(0.03)	0.71***	(0.04)	0.60***	(0.04)	0.62***	(0.05)
Treatment * Prior: High			-0.14**	(0.06)			-0.04	(0.08)
Constant	0.21***	(0.03)	0.16***	(0.03)	0.14***	(0.03)	0.13***	(0.04)
Observations	759		759		489		489	
Adjusted $R^2$	0.40		0.40		0.32		0.32	
Panel B: With control variables								
Treatment	0.02	(0.03)	0.11**	(0.05)	0.07*	(0.04)	0.11*	(0.06)
Prior: High WFH Productivity	0.58***	(0.04)	0.65***	(0.04)	0.53***	(0.05)	0.57***	(0.06)
Treatment * Prior: High			-0.13**	(0.06)			-0.06	(0.07)
Use of WFH pre-Covid	0.05	(0.03)	0.04	(0.03)	0.01	(0.05)	0.01	(0.05)
Virtual solutions teamwork	0.09**	(0.04)	0.09**	(0.04)	0.09*	(0.05)	0.09*	(0.05)
Flexible working time	0.02	(0.04)	0.02	(0.04)	0.04	(0.05)	0.04	(0.05)
Invest IT training	-0.02	(0.03)	-0.01	(0.03)	0.02	(0.04)	0.02	(0.04)
Constant	0.32***	(0.09)	0.28***	(0.09)	0.19*	(0.11)	0.17	(0.11)
Firm size & sector	Yes		Yes		Yes		Yes	
Observations	759		759		489		489	
Adjusted $R^2$	0.41		0.42		0.34		0.34	

Note: Dependent variable: "Posterior Belief: High WFH Productivity". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: March 2021. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

Table 5: Experiment A - Treatment effects on posterior beliefs about high WFH productivity, perception of additional aspects of WFH

	Posterior Belief: High WFH Productivity							
	Main Survey				Follow-up Survey			
	(1)		(2)		(3)		(4)	
Treatment	0.05	(0.04)	0.17***	(0.07)	0.08*	(0.04)	0.11*	(0.07)
Prior: High WFH Prod.	0.55***	(0.06)	0.64***	(0.06)	0.38***	(0.06)	0.41***	(0.07)
Treatment * Prior: High			-0.18**	(0.08)			-0.05	(0.08)
Use of WFH pre-Covid	-0.03	(0.04)	-0.04	(0.04)	-0.02	(0.05)	-0.03	(0.05)
Virtual solutions teamwork	0.10*	(0.05)	0.10*	(0.05)	0.07	(0.06)	0.07	(0.06)
Flexible working time	-0.00	(0.05)	0.01	(0.05)	0.05	(0.06)	0.06	(0.06)
Invest IT training	-0.01	(0.04)	0.00	(0.04)	0.01	(0.05)	0.02	(0.05)
Invest new technologies	-0.00	(0.04)	0.00	(0.04)	0.04	(0.05)	0.04	(0.05)
Feasibility of WFH	0.03	(0.04)	0.02	(0.04)	0.05	(0.05)	0.05	(0.05)
Difficult coordination	-0.14***	(0.04)	-0.13***	(0.04)	-0.13***	(0.05)	-0.13**	(0.05)
Decreased monitoring	-0.09*	(0.05)	-0.10**	(0.05)	-0.20***	(0.06)	-0.20***	(0.06)
Constant	0.38***	(0.13)	0.31**	(0.12)	0.29**	(0.15)	0.28*	(0.15)
Firm size & sector	Yes		Yes		Yes		Yes	
Observations	378		378		378		378	
Adjusted $R^2$	0.47		0.48		0.36		0.36	

Note: Dependent variable: "Posterior Belief: High WFH Productivity". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: March 2021. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

Table 6: Experiment A - Treatment effects on the expected shift to WFH

	Expectation: Shift to WFH							
	Main survey				Follow-up Survey			
	(1)		(2)		(3)		(4)	
Panel A: Without control variables								
Treatment	3.19**	(1.60)	-0.99	(2.24)	1.96	(1.99)	2.04	(2.94)
Prior: High WFH Productivity	14.72***	(1.55)	11.44***	(2.27)	13.86***	(1.96)	13.92***	(2.76)
Treatment * Prior: High			6.35**	(3.10)			-0.12	(3.91)
Constant	9.81***	(1.43)	11.96***	(1.70)	12.26***	(1.78)	12.22***	(2.09)
Observations	759		759		464		464	
Adjusted $R^2$	0.09		0.10		0.08		0.08	
Panel B: With control variables								
Treatment	3.17**	(1.50)	-0.42	(2.20)	3.15*	(1.89)	5.31*	(2.92)
Prior: High WFH Productivity	7.75***	(1.74)	4.89**	(2.40)	10.51***	(2.15)	12.16***	(3.03)
Treatment * Prior: High			5.43*	(2.99)			-3.12	(3.82)
Use of WFH pre-Covid	5.58***	(1.91)	5.71***	(1.92)	1.30	(2.33)	1.23	(2.33)
Virtual solutions teamwork	6.87***	(1.68)	7.02***	(1.67)	2.95	(2.23)	2.87	(2.25)
Flexible working time	6.56***	(1.83)	6.44***	(1.82)	8.56***	(2.04)	8.62***	(2.04)
Invest IT training	2.82*	(1.56)	2.60	(1.58)	-0.55	(2.11)	-0.46	(2.13)
Constant	-3.08	(4.64)	-1.25	(4.73)	-4.42	(6.89)	-5.71	(7.14)
Firm size & sector	Yes		Yes		Yes		Yes	
Observations	759		759		464		464	
Adjusted $R^2$	0.22		0.22		0.20		0.20	

Note: Dependent variable: "Expectation: Shift to WFH". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: June 2021. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

Table 7: Experiment A - Treatment effects on the expected shift to WFH, perception of additional aspects of WFH

	Expectation: Shift to WFH							
	Main survey				Follow-up Survey			
	(1)		(2)		(3)		(4)	
Treatment	5.12**	(2.04)	5.82*	(3.33)	3.66*	(2.05)	8.07***	(2.87)
Prior: High WFH Prod.	4.35*	(2.59)	4.86	(3.34)	9.37***	(2.50)	12.60***	(3.34)
Treatment * Prior: High			-1.00	(4.42)			-6.32	(4.05)
Use of WFH pre-Covid	3.30	(2.64)	3.26	(2.68)	0.44	(2.50)	0.21	(2.50)
Virtual solutions teamwork	4.90**	(2.35)	4.89**	(2.35)	1.08	(2.33)	1.01	(2.34)
Flexible working time	2.44	(3.03)	2.46	(3.04)	6.43***	(2.42)	6.51***	(2.45)
Invest IT training	2.61	(2.23)	2.67	(2.32)	1.00	(2.23)	1.36	(2.25)
Invest new technologies	1.35	(2.44)	1.38	(2.42)	2.07	(2.40)	2.23	(2.39)
Feasibility of WFH	6.93***	(2.17)	6.91***	(2.17)	5.24**	(2.25)	5.08**	(2.25)
Difficult coordination	-4.98*	(2.56)	-4.94*	(2.56)	-3.67	(2.54)	-3.44	(2.56)
Decreased monitoring	-6.06**	(2.51)	-6.10**	(2.52)	-3.43	(2.49)	-3.70	(2.48)
Constant	-6.91	(7.66)	-7.21	(7.87)	-8.33	(7.48)	-10.24	(7.40)
Firm size & sector	Yes		Yes		Yes		Yes	
Observations	363		363		363		363	
Adjusted $R^2$	0.27		0.26		0.24		0.25	

Note: Dependent variable: "Expectation: Shift to WFH". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: June 2021. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

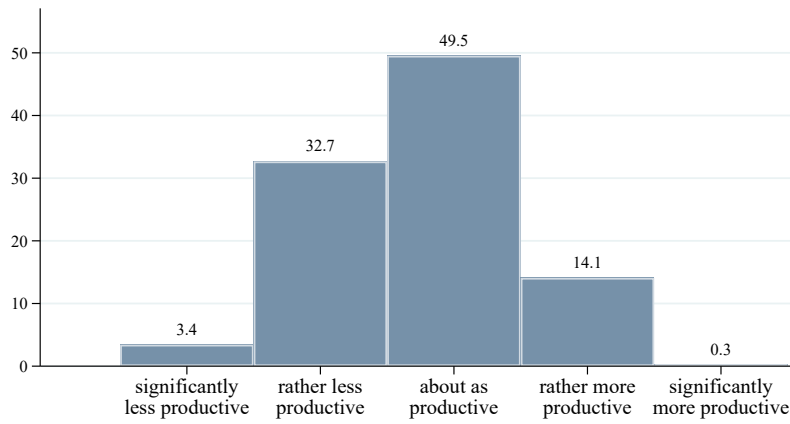
Table 8: Experiment B - Priming treatment effects on the expected shift to WFH

	Expectation: Shift to WFH							
	Productivity Belief: 2 Groups				Productivity Belief: 3 Groups			
	(1)		(2)		(3)		(4)	
Treatment	-7.10**	(3.46)	-5.67*	(3.14)	-7.10**	(3.47)	-5.70*	(3.14)
WFH same/higher productivity	8.32**	(3.41)	6.53**	(3.17)				
Treatment * WFH same/higher prod	7.92*	(4.50)	7.61*	(4.09)				
WFH same productivity					6.67*	(3.57)	5.22	(3.32)
WFH higher productivity					13.89***	(4.81)	11.29**	(4.48)
Treatment * WFH same prod					7.96*	(4.80)	7.72*	(4.38)
Treatment * WFH higher prod					6.52	(6.62)	6.21	(6.13)
Use of WFH pre-Covid			4.46*	(2.42)			4.34*	(2.42)
Constant	24.81***	(2.83)	7.14	(6.44)	24.81***	(2.83)	6.83	(6.42)
Firm size & sector	No		Yes		No		Yes	
Observations	665		665		665		665	
Adjusted $R^2$	0.05		0.19		0.05		0.19	

*Note:* Dependent variable: "Expectation: Shift to WFH". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Survey: June 2022. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

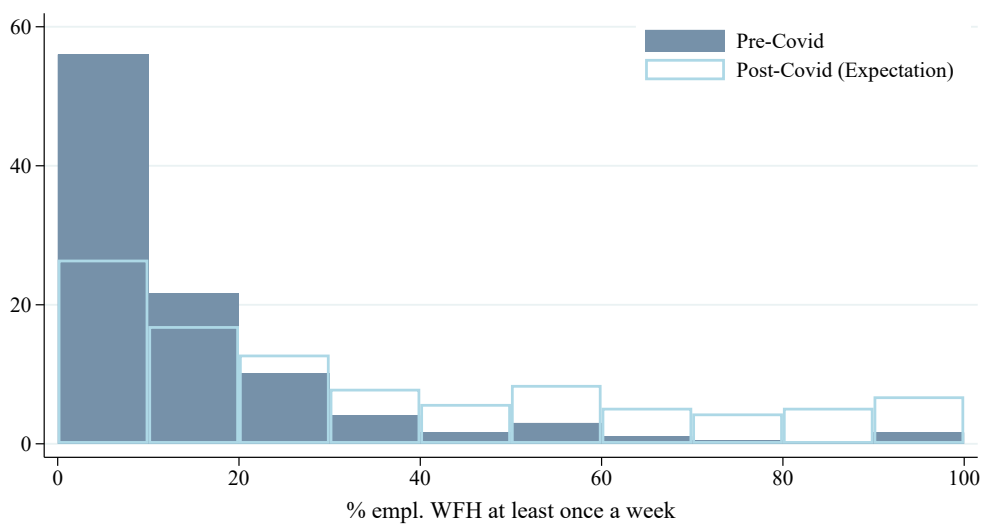
## Figures

Figure 1: Perception of the productivity of WFH in comparison to working on business premises



*Note:* The figure displays the distribution of posterior beliefs about WFH productivity among managers in the control group, as measured in Experiment A. See Table A.4 for variable descriptions.

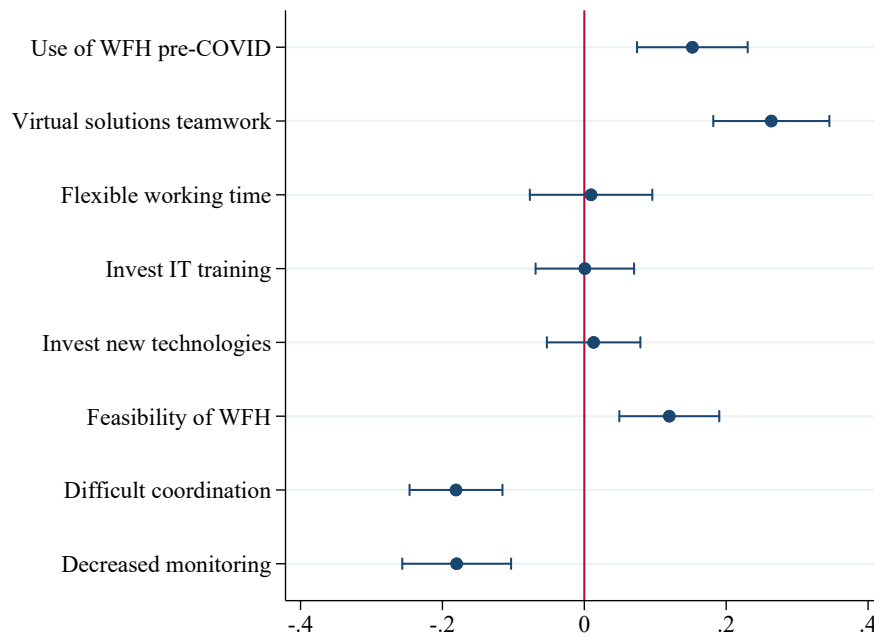
Figure 2: Distribution of pre-Covid and post-Covid share of employees working from home



*Note:* The figure displays the distribution of firms' pre-Covid share of employees WFH and expected post-Covid share of employees WFH, as measured among firms in the control group in Experiment A. See Table A.4 for variable descriptions.

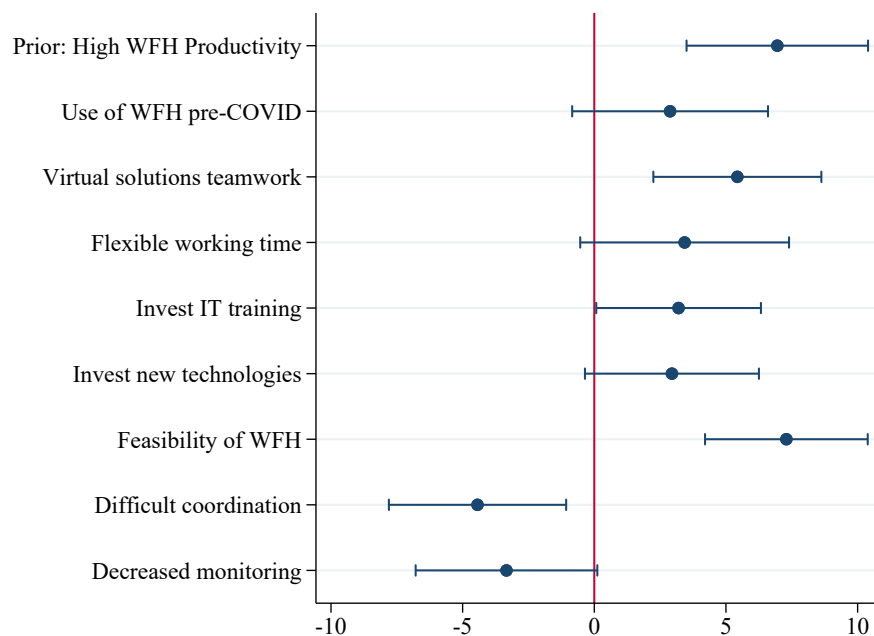


Figure 3: Experiment A - Correlates of prior beliefs about high WFH productivity



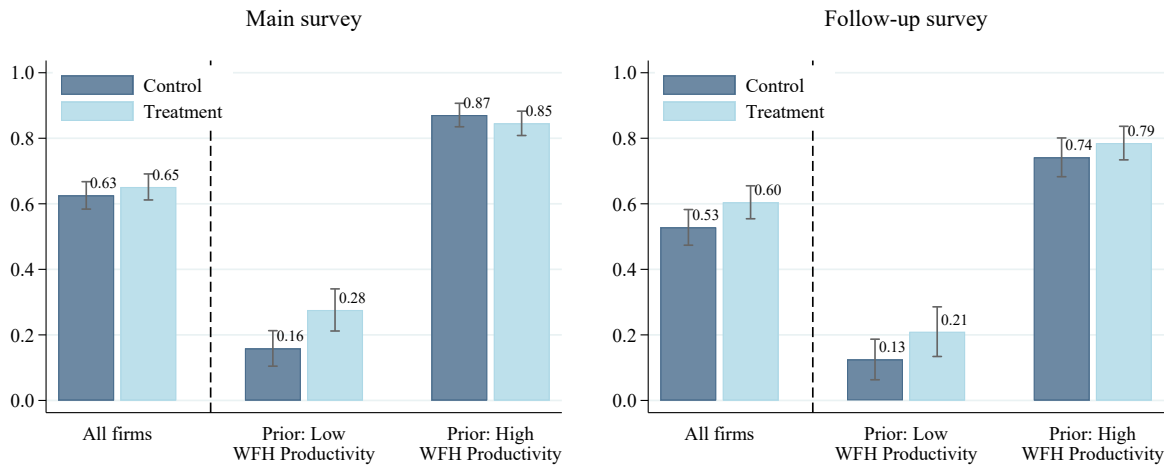
*Note:* Coefficients of an OLS regression with dependent variable “Prior belief: High WFH productivity”, as measured in Experiment A in December 2020. In addition to the presented coefficients, the regression contains 9 industry dummies (see Table A.3) and the (squared) number of employees. Dummy variables “Invest new technologies, Feasibility of WFH, Difficult coordination, and Decreased monitoring” stem from the survey wave in June 2020. See Table A.4 for variable descriptions. 90% confidence intervals.

Figure 4: Experiment A - Correlates of the expected shift to WFH



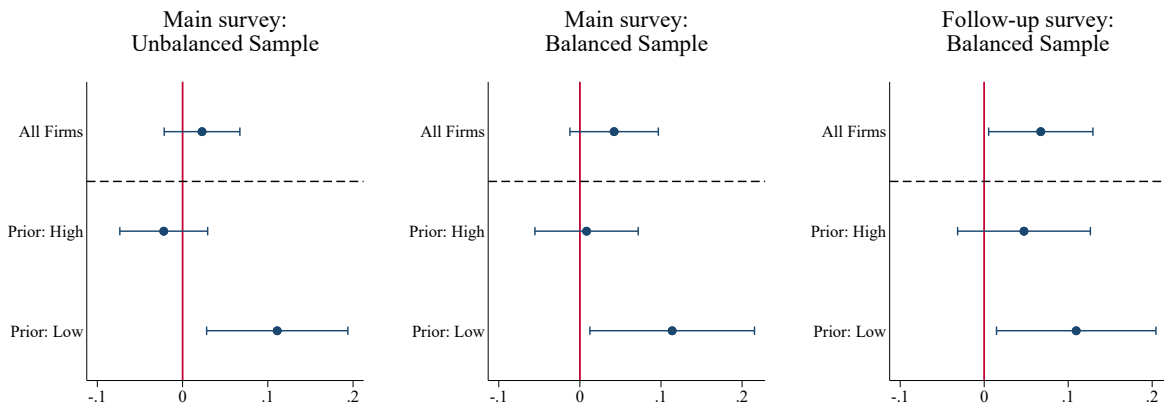
*Note:* Coefficients of an OLS regression with dependent variable “Expected shift to WFH”, as measured in Experiment A in December 2020. In addition to the presented coefficients, the regression contains 9 industry dummies (see Table A.3) and the (squared) number of employees. Dummy variables “Invest new technologies, Feasibility of WFH, Difficult coordination, and Decreased monitoring” stem from the survey wave in June 2020. See Table A.4 for variable descriptions. 90% confidence intervals.

Figure 5: Experiment A - Posterior beliefs about high WFH productivity



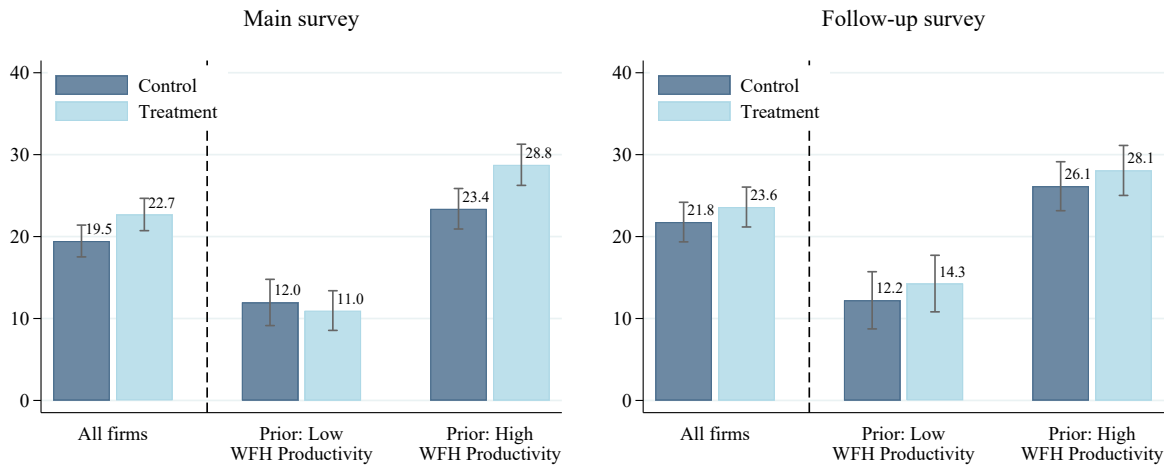
Note: Share of managers with high posterior beliefs about WFH productivity in the control and treatment group. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: March 2021. 90% confidence intervals.

Figure 6: Experiment A - Treatment effects on posterior beliefs, by sample



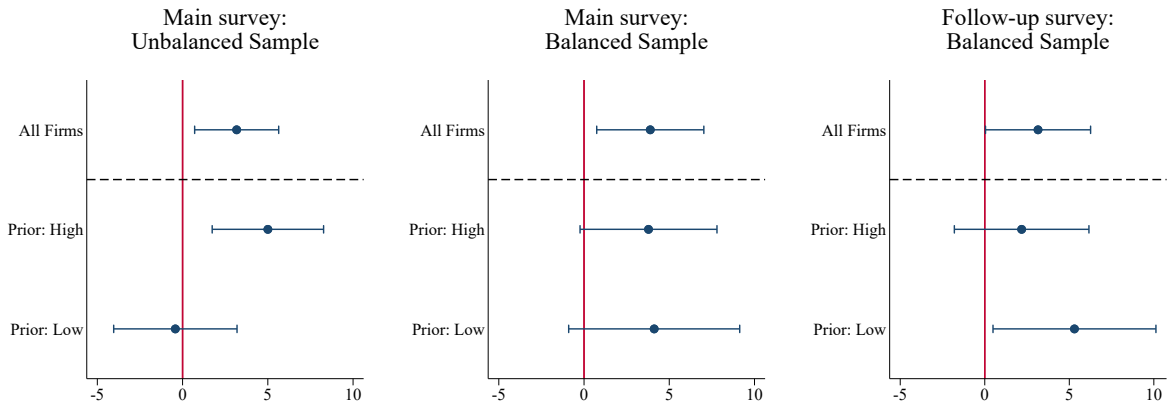
Note: Treatment effects on high posterior beliefs about WFH productivity controlling for all characteristics observed in the main survey as in Columns 2 and 4 of Panel B in Table 4. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: March 2021. Unbalanced sample: N=759; Balanced sample: N=489. OLS estimations; 90% confidence intervals.

Figure 7: Experiment A - Expected shift to WFH



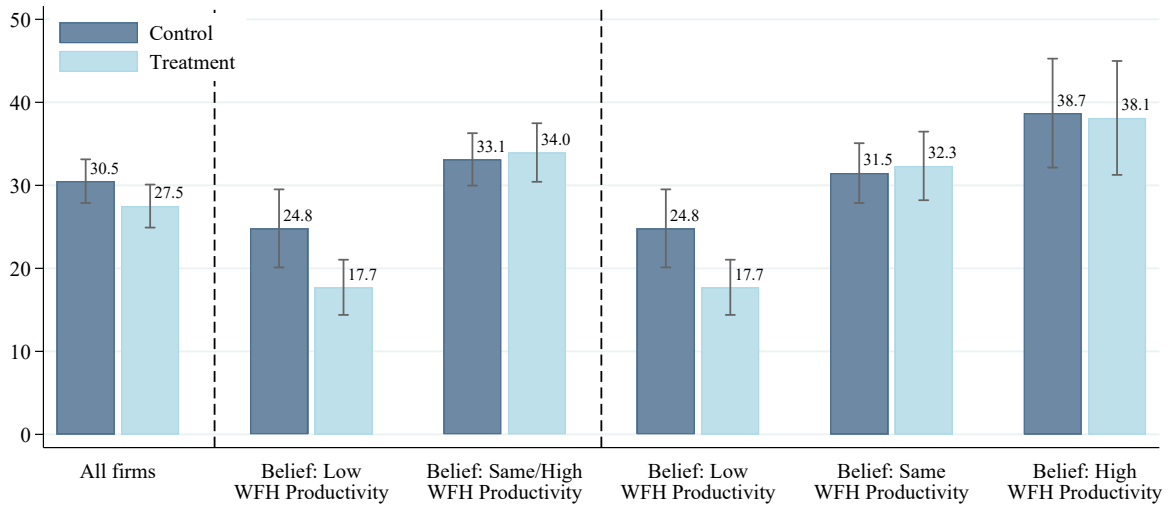
Note: Average expected shift to WFH, i.e. within-firm difference in post-Covid % of employees WFH and pre-Covid % of employees WFH, in the control and treatment group. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: June 2021. 90% confidence intervals.

Figure 8: Experiment A - Treatment effects on the expected shift to WFH



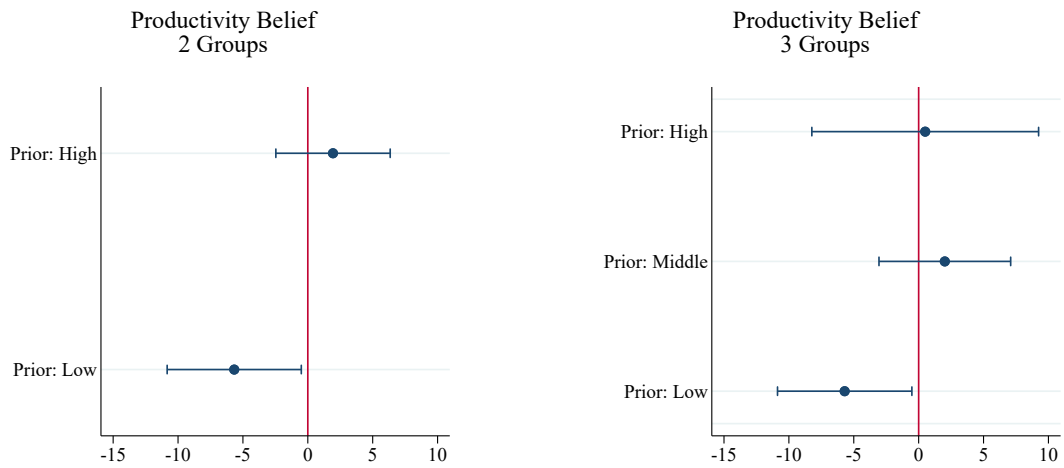
Note: Treatment effects on expected shift to WFH controlling for all characteristics observed in the main survey as in Columns 2 and 4 of Panel B in Table 6. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: March 2021. Unbalanced sample: N=759; Balanced sample: N=464. OLS estimations; 90% confidence intervals.

Figure 9: Experiment B - Expected shift to WFH



Note: Average expected shift to WFH, i.e. within-firm difference in post-Covid % of employees WFH and pre-Covid % of employees WFH, in the control and treatment group. See Table A.4 for variable descriptions. Survey: June 2022. 90% confidence intervals.

Figure 10: Experiment B - Treatment effects on the expected shift to WFH



Note: Treatment effects on expected shift to WFH controlling for all characteristics observed in the survey as in Columns 2 and 4 in Table 8. See Table A.4 for variable descriptions. Survey: June 2022. OLS estimations; 90% confidence intervals.

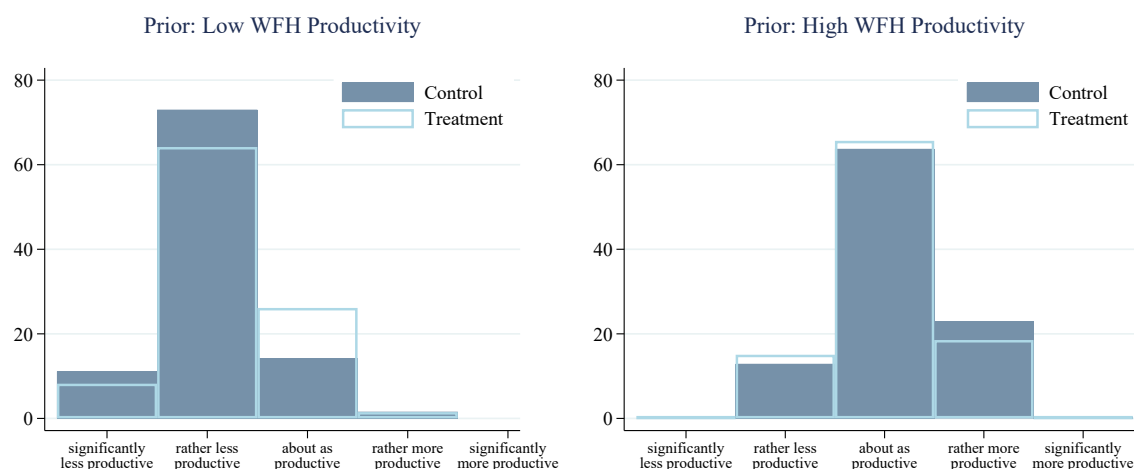
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## Appendix

Figure A.1: Experiment A - Distribution of posterior beliefs (5-point scale)



*Note:* The left panel shows the distribution of posterior beliefs among managers with low prior beliefs. The right panel shows the distribution of posterior beliefs among managers with high prior beliefs. See Table A.4 for variable descriptions.

Table A.1: Experiment A - Treatment effects on posterior beliefs (5-point scale)

	Posterior Belief: WFH Productivity			
	(1)		(2)	
Treatment	0.15**	(0.07)	0.13*	(0.07)
Prior: High WFH Productivity	1.04***	(0.06)	0.91***	(0.06)
Treatment * Prior: High	-0.22**	(0.09)	-0.20**	(0.09)
Use of WFH pre-Covid			0.14***	(0.05)
Virtual solutions teamwork			0.17***	(0.05)
Flexible working time			0.05	(0.06)
Invest IT training			-0.02	(0.05)
Constant	2.06***	(0.05)	2.20***	(0.15)
Firm size & sector	No		Yes	
Observations	759		759	
Adjusted $R^2$	0.36		0.39	

*Note:* Dependent variable: "Posterior Belief: WFH Productivity", as measured on a 5-point scale ranging from "significantly less productive" to "significantly more productive". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

Table A.2: Experiment A - Correlates of prior belief and expected shift to WFH

	Prior Belief: High WFH Productivity		Expectation: Shift to WFH			
	(1)		(2)		(3)	
Prior: High WFH Productivity					6.95***	(2.09)
Use of WFH pre-COVID	0.15***	(0.05)	3.94*	(2.25)	2.88	(2.26)
Virtual solutions teamwork	0.26***	(0.05)	7.27***	(1.83)	5.43***	(1.94)
Flexible working time	0.01	(0.05)	3.49	(2.38)	3.43	(2.41)
Invest IT training	0.00	(0.04)	3.20*	(1.91)	3.20*	(1.90)
Invest new technologies	0.01	(0.04)	3.03	(2.00)	2.95	(2.00)
Feasibility of WFH	0.12***	(0.04)	8.15***	(1.90)	7.29***	(1.87)
Difficult coordination	-0.18***	(0.04)	-5.69***	(2.04)	-4.43**	(2.04)
Decreased monitoring	-0.18***	(0.05)	-4.57**	(2.05)	-3.33	(2.09)
Treatment			3.79**	(1.77)	3.95**	(1.75)
Constant	0.45***	(0.13)	-0.34	(6.57)	-3.52	(6.55)
Firm size & sector	Yes		Yes		Yes	
Observations	505		505		505	
Adjusted $R^2$	0.29		0.27		0.28	

*Note:* Dependent variable: "Expectation: Shift to WFH". Firm size: Number of employees, squared number of employees. Sector: 9 industry dummies as displayed in Table A.3. See Table A.4 for variable descriptions. Main survey: December 2020; Follow-up survey: June 2021. OLS estimations. Robust standard errors in parentheses. \* $p < .10$ , \*\* $p < .05$ , \*\*\* $p < .01$ .

Table A.3: Classification of industries

*ICT hardware*

Manufacture of electronic components, computers, communication equipment, consumer electronics, magnetic and optical media (26.1-26.4, 26.8)

*ICT services*

Software publishing (58.2); Telecommunications (61); Computer programming, consultancy and related activities (62); Data processing, hosting & related activities; web portals (63.1)

*Media services*

Publishing of books, periodicals and other publ. activities (58.1); Video and television programme production, music publishing (59); Programming and broadcasting activities (60); Other information service activities (63.9)

*Legal and accounting activities (69)**Management consultancy activities (70.2)**Architectural and engineering activities (71)**Scientific research and development (72)**Advertising and market research (73)**Other professional, scientific and technical activities (74)*

*Note:* Overview of industries covered in sample. Industries in italics are indicated by 9 industry dummies in our analysis. NACE Revision 2 codes in parantheses.



Table A.4: Variable descriptions

Variable	Question	Answer	Wave
<b>Experiment A</b>			
Pre-treatment variables:			
Prior Belief: High WFH Productivity	Employees working from home perform at least as well as working on business premises	yes/no	Dec 20
% employees WFH pre-Covid	Indicate the share of employees who have regularly worked from home at least once a week before Covid-19	% empl.	Dec 20
Virtual solutions teamwork	Virtual solutions enable good teamwork when WFH	yes/no	Dec 20
Invest IT training	In 2020, we have invested in IT training	yes/no	Dec 20
Flexible working time	We use flexible working time arrangements, e.g. trust-based working time	yes/no	Dec 20
Invest new technologies	We had to make short-term investments in new technologies in order to offer WFH	yes/no	Jun 20
Feasibility of WFH	The current pandemic situation makes it evident that more job tasks can be done from home than previously expected	yes/no	Jun 20
Difficult coordination	Working from home makes the coordination of work processes more difficult	yes/no	Jun 20
Decreased monitoring	It is not sufficiently possible to monitor the job performance of employees who work from home	yes/no	Jun 20
Information treatment:			
Control: The following questions relate to the productivity of employees working from home.			
Treated: The following questions relate to the productivity of employees working from home. In a recent and representative survey in Germany, 59 percent of employees reported to be more productive working from home than on business premises.			
Post-treatment variables:			
Posterior Belief: WFH Productivity	In general: Compared to working on business premises, employees working from home are... 1 significantly less productive, 2 rather less productive, 3 about as productive, 4 rather more productive, 5 significantly more productive	5-point scale	Dec 20
Posterior Belief: High WFH Productivity	<i>Computed:</i> Takes value one if "Posterior Belief: WFH Productivity" equals 3, 4, or 5, and zero otherwise	yes/no	Dec 20
Expectation: % empl. WFH post-Covid	Indicate the share of employees who are expected to regularly work from home at least once a week after Covid-19	% empl.	Dec 20
Expectation: Shift to WFH	<i>Computed:</i> Within-firm difference between "Expectation: % empl. WFH post-Covid" and "% empl. WFH pre-Covid"	% empl.	Dec 20
Follow-up Belief: High WFH Productivity	Employees working from home perform at least as well as working on business premises.	yes/no	Mar 21
Follow-up Expectation: Shift to WFH	<i>Computed:</i> Within-firm difference between "Expectation: % empl. WFH post-Covid" and "% empl. WFH pre-Covid", as measured in the follow-up survey	yes/no	Jun 21
<b>Experiment B</b>			
Key variables:			
Belief: WFH Productivity	In general: Compared to working on business premises, employees working from home are... 1 significantly less productive, 2 rather less productive, 3 about as productive, 4 rather more productive, 5 significantly more productive	5-point scale	Jun 22
Belief: High WFH Productivity	<i>Computed:</i> Takes value one if "Posterior Belief: WFH Productivity" equals 3, 4, or 5, and zero otherwise	yes/no	Jun 22
% employees WFH pre-Covid	Indicate the share of employees who have regularly worked from home at least once a week before Covid-19	% empl.	Jun 22
Expectation: % empl. WFH post-Covid	Indicate the share of employees who are expected to regularly work from home at least once a week after Covid-19	% empl.	Jun 22
Expectation: Shift to WFH	<i>Computed:</i> Within-firm difference between "Expectation: % empl. WFH post-Covid" and "% empl. WFH pre-Covid"	% empl.	Jun 22

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