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Research Report

Working from home after COVID-19: Firms expect a persistent and intensive shift

ZEW Expert Brief, No. 22-06

Provided in Cooperation with:

ZEW - Leibniz Centre for European Economic Research

Suggested Citation: Erdsiek, Daniel; Rost, Vincent (2022) : Working from home after COVID-19: Firms expect a persistent and intensive shift, ZEW Expert Brief, No. 22-06, ZEW - Leibniz Centre for European Economic Research, Mannheim

This Version is available at:

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// Daniel Erdsiek (ZEW Mannheim), Vincent Rost (ZEW Mannheim)

Working From Home After COVID-19: Firms Expect a Persistent and Intensive Shift

Executive Summary

This study exploits fine-grained survey data to elicit firms' long-term expectations about the use of working from home (WFH) arrangements after the COVID-19 pandemic. From December 2021 until January 2022, the representative survey was conducted among more than 1,000 managers from the manufacturing industry and the information economy, which includes the ICT sector, media service providers and knowledge-intensive service providers. Firms were asked about their previous use and expected use of five different hybrid and fully remote working models ranging from 1 to 5 WFH days per week. For each model, firms indicated the share of employees who had been using this schedule before the pandemic and the share of employees who are expected to use this schedule after COVID-19.

We find that the pandemic has impacted the intensity of firms' long-term use of WFH in two ways. First, firms increasingly introduced WFH arrangements granting higher workplace flexibility, i.e. a higher number of WFH days per week. Therefore, the share of firms expecting that their employees will make use of hybrid working models with one or more WFH days per week sharply increased. For some hybrid models, the post-COVID expectations are more than two or three times higher than the pre-COVID implementations. For instance, the share of firms planning to offer hybrid models with 3 WFH days increased from 11% to 37% in the information economy and from 4% to 16% in the manufacturing industry.

Second, firms started to allow an increasing share of employees to make use of these newly adopted and more flexible hybrid or fully remote working models. This holds for small, medium-sized, and large firms, but the shift towards a more intensive use of WFH is stronger for larger firms. Before the pandemic, an average share of 8% of the workforce in large manufacturing firms made use of hybrid or fully remote working models. After the pandemic, this share will grow to an expected average of 32%. In the information economy, an average of 70% of the workforce in large firms is expected to use hybrid or fully remote working models, compared to 24% prior to the pandemic.

As a result of the more flexible hybrid models in place and the higher share of employees allowed to use these schedules, an increasing share of firms' overall working time is expected to be performed from home. For the information economy, we estimate that, on average, 24% of firms' overall working time is expected to be performed from home after the pandemic ends. This is almost a threefold increase from the pre-COVID share of 9%. Among manufacturing firms, the expected post-COVID share of working time performed from home amounts to 6% on average while the pre-COVID share was 3%. The expected share of firms' overall working time performed from home increases with firm size and is highest among large firms (information economy: 38%; manufacturing industry: 14%). In the manufacturing industry, nearly 20% of firms expect that more than 10% of their overall working time will be provided from home after the pandemic (in comparison to 4% of firms pre-COVID). In the information economy, nearly 60% of firms expect more than 10% of the overall working time to be performed from home, in comparison to 20% of firms pre-COVID. Moreover, every third firm in the information economy expects that more than 30% of the overall working time will be provided from home after the pandemic (in comparison to 9% of firms pre-COVID).

Taken together, our detailed survey results provide insights into the extent to which the pandemic might change the organisation of work in the future. Firms' plans concerning workplace flexibility may be a fundamental determinant of the long-term shift towards WFH since many employees would take up the opportunity to work from home several days per week. Therefore, the present study contributes to the vast literature on the perception of WFH among workers by focusing on firms' perceptions and expectations.

1. Introduction

In the wake of the COVID-19 pandemic, working from home (WFH) arrangements experienced an unprecedented boost across the globe. To contain the spread of the virus, firms had to quickly implement WFH arrangements and make remote access available to their employees. In Germany, roughly three-quarters of firms had increased their use of WFH by July 2020 (Demmelhuber et al., 2021) and roughly 40 percent of workers had switched to WFH by April 2020 (Eurofound, 2020). At the same time, U.S. workers supplied around half of paid labour services from home (Barrero et al., 2020; Brynjolfsson et al., 2020). Due to this initial push and the ongoing pandemic situation in various countries, many firms and workers had to experiment with WFH over the last two years.

The recent shift towards WFH is likely to induce persistent changes in the organisation of work. As several studies indicate, the majority of firms and workers have made rather positive experiences with WFH during the pandemic (Aksoy et al., forthcoming; Teodorovicz et al., 2021; Ozimek, 2021; Criscuolo et al., 2021). A widespread improvement in the perception of WFH may support the notion that WFH will stick. In line with this notion, results from representative surveys suggest that firms and workers expect a more intensive use of WFH after the pandemic as compared to the situation before the pandemic (Aksoy et al., forthcoming; Erdsiek, 2021; Criscuolo et al., 2021). Employing an ongoing survey of U.S. workers, Barrero et al. (2021a) identify investments in physical and human capital, reduced stigma, and innovation as further mechanisms that might facilitate a long-lasting increase in WFH. An increase in WFH may have an impact on various outcomes, such as productivity (Bloom et al., 2015; Angelici and Profeta, 2020; Choudhury et al. 2021; Viete and Erdsiek, 2020), gender differences in labour market participation (Goldin, 2014; Alon et al., forthcoming; Mas and Pallais, 2017), or real estate markets (Gupta et al., 2021; Mondragon and Wieland, 2022). To what extent the pandemic may shape the future of work and affect those outcomes will strongly depend on the longevity and intensity of the shift towards WFH. The extent to which employers are planning to allow WFH may be a fundamental determinant of this long-term shift since many employees would take up the opportunity to work from home several days per week (Aksoy et al, forthcoming). For instance, Barrero et al. (2021b) show for the US that around 40% of workers value the flexibility of WFH to an extent that they would look for another job if their current employer demanded a full return to the business premises. In addition, experimental evidence by Mas and Pallais (2017) suggests that workers are, on average, willing to pay for the flexibility to choose their place of work.

The present study exploits fine-grained survey data to elicit firms' long-term expectations about the use of hybrid and fully remote working models after COVID-19. The data stem from the December 2021/January 2022 wave of the quarterly ZEW Business Survey in the Information Economy.¹ This survey is conducted among firms in the German manufacturing industry and information economy, which includes the ICT sector, media service providers, and knowledge-intensive service providers. The specific sectors covered by the survey and the number of observations in the December 2021/January 2022 wave are presented in Table 1. In total, the analysis is based on responses from 1,054 managers, e.g., the firm's CEO, CIO, or head of HR. Based on detailed information on managers' expectations, we provide representative results for two sectors that are highly distinct in terms of the feasibility of WFH.² First, the information and knowledge-intensive sector where the majority of jobs entail activities that are suited to be performed at home (Alipour

¹ See Erdsiek (2021) for a summary of results on firms' perception and use of WFH before, during, and after the pandemic based on earlier waves of the ZEW Business Survey in the Information Economy.

² Survey responses are weighted based on 39 cells, made up of 13 sectors and 3 firm size classes. The 13 sectors are presented in Table 1 and firm size classes are: 5-19, 20-100, and ≥ 100 employees. See www.zew.de/WS380-1 for more details on the ZEW Business Survey in the Information Economy.

et al., 2020; Dingel and Neiman, 2020). Second, the manufacturing industry where operating machinery and other manual tasks are much more common, leading to a lower potential for WFH.

Figure 1 depicts the survey question we employ to precisely measure firms' expectations about post-COVID WFH usage. In particular, we asked firms to separately estimate the share of employees they expect to work under different hybrid and fully remote working models that range from 1 to 5 WFH days per week. This survey question elicits two interrelated components of the intensity of firms' use of WFH: First, the number of WFH days per week is an important indicator for the intensity of WFH at the individual level, i.e. at the level of employees. Second, the share of employees making use of WFH arrangements is an important indicator of the intensity of WFH usage at the firm level. Therefore, managers' responses to this survey question can be employed to precisely measure firms' expected long-run intensity of WFH usage. Moreover, leveraging these fine-grained survey data allows us to approximate each firm's share of working time that is expected to be performed from home after the pandemic has ended.³ Finally, firms were also asked to estimate the share of employees who had been using the different WFH arrangements before the start of the pandemic. Based on this information, we can compare firms' expectations about their post-COVID WFH intensity with their previous use of WFH prior to the pandemic.

Our results indicate that firms expect a massive and long-lasting shift towards WFH. Many firms in Germany are planning to offer hybrid working arrangements after the end of the COVID-19 pandemic, thus enabling employees to have a part-home, part-office schedule. The share of firms planning to use hybrid or even fully remote working models has increased across all firm sizes and both the manufacturing sector and the information economy. At the same time, larger firms and services firms expect a substantially more intensive use of WFH arrangements than smaller firms and manufacturing firms. Overall, almost half of the manufacturing firms in Germany plan to use WFH arrangements after the pandemic (in comparison to 24% before COVID-19). For the information economy, the share of firms using WFH is expected to increase from 51% pre-COVID to 76% post-COVID. For the post-pandemic period, hybrid models with 1-3 WFH days per week are most popular among firms in the information economy (37% - 46%) and in the manufacturing industry (16% - 33%). However, the post-pandemic expectations are higher than the pre-pandemic implementation for every surveyed hybrid and remote working model.

In addition to the workplace flexibility provided by the different WFH models, we measure the intensity of a firm's use of WFH arrangements in terms of the share of its workforce that is expected to use the WFH schedules. How intensively a firm uses WFH arrangements strongly depends on its size and industry. On average, half of the workforce of large firms in the information economy and a quarter of the workforce of large firms in the manufacturing industry are expected to use schedules with 1-3 WFH days. In small firms, this applies to about 30% of the workforce in the information economy and 7% of the workforce in the manufacturing industry. However, in comparison to the situation prior to the pandemic, the expected use of WFH has strongly increased across firms in both sectors and all firm sizes.

As a result of the more flexible hybrid models in place and the higher share of employees allowed to use these schedules, an increasing share of firms' overall working time is expected to be performed from home. For the information economy, we estimate that, on average, 24% of firms' overall working time is expected to be performed from home after the pandemic ends. This is almost a threefold increase from the pre-COVID share of 9%. Among manufacturing firms, the expected post-COVID share of working time performed from home amounts to 6% while the pre-COVID share was 3%. Again, the expected share of firms' overall working time performed from home increases with firm size and is highest among large firms (information economy: 38%; manufacturing industry: 14%).

³ See the underlying assumptions and calculation in Section 4.

The remainder of this study is organised as follows: Section 2 provides results on the share of firms that are planning to use different hybrid or fully remote working models after the pandemic. Section 3 additionally incorporates the intensive margin and provides results on the firm-specific share of the workforce expected to use the different WFH models. Section 4 leverages the information on the WFH intensity of work schedules and the share of the workforce expected to use each schedule to approximate the firms' share of overall working time expected to be performed from home. Section 5 summarises potential implications of an increasing workplace flexibility on various economic and social outcomes. Finally, Section 6 concludes.

Table 1: Number of observations and classification of industries

	Number of observations	NACE Rev. 2	
		Codes	Section ^a
Information economy			
ICT hardware	61	26.1 - 26.4, 26.8	C
ICT services	130	58.2, 61, 62, 63.1	J
Media service providers	85	58.1, 59, 60, 63.9	J
Legal and accounting activities	74	69	M
Management consultancy activities	42	70.2	M
Architectural and engineering activities	105	71	M
Scientific research and development	51	72	M
Advertising and market research	71	73	M
Other professional, scientific, and technical activities	38	74	M
Manufacturing industry			
Chemical products and pharmaceuticals	76	20, 21	C
Machinery and equipment	86	28	C
Motor vehicles and other transport equipment	57	29, 30	C
Other manufacturing	178	10-33 ^b	C
Total	1,054		

Note: a) NACE Rev. 2 Sections: C – Manufacturing; J – Information and Communication; M – Professional, Scientific, and Technical Activities. b) Other manufacturing includes the NACE Rev. 2 Codes 10-33 except for the codes already covered by before mentioned industries. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 1: Survey question on firms' use of WFH arrangements before and after COVID-19

Please estimate the share of your employees who have worked or will work from home with the following frequency?

	<i>before COVID-19</i>	<i>after COVID-19</i>
Never or rarely	_____ %	_____ %
approx. 1 day per week	_____ %	_____ %
approx. 2 days per week	_____ %	_____ %
approx. 3 days per week	_____ %	_____ %
approx. 4 days per week	_____ %	_____ %
approx. 5 days per week	_____ %	_____ %
	Total: 100%	Total: 100%

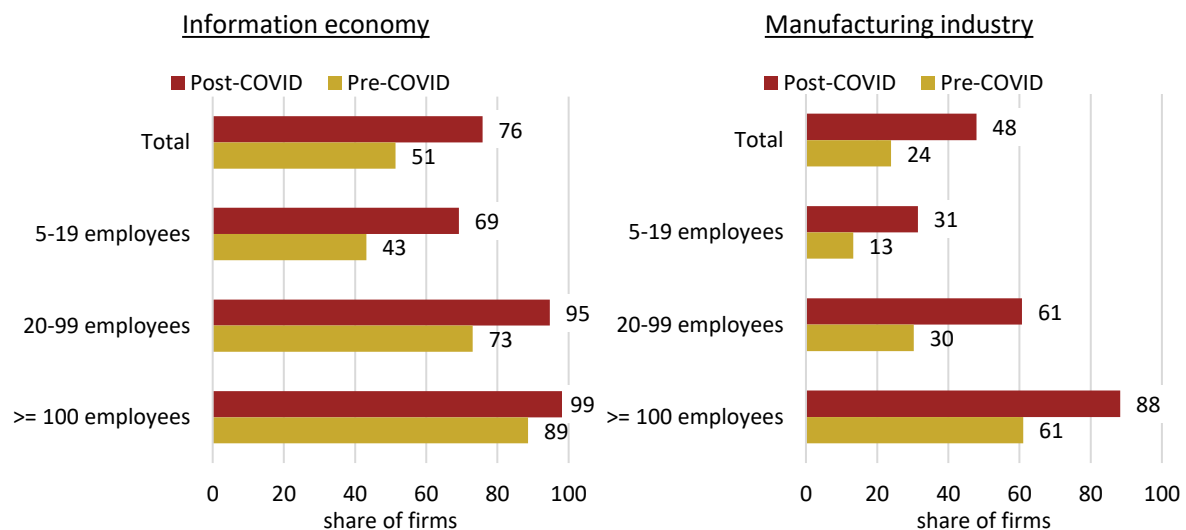
Note: Translated version of the original survey question in German language: "Wie hoch schätzen Sie den Anteil Ihrer Beschäftigten ein, die in der folgenden Frequenz im Homeoffice gearbeitet haben bzw. arbeiten werden? Vor Corona; Nach Corona". Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

2. Share of firms expecting to use hybrid and fully remote working models

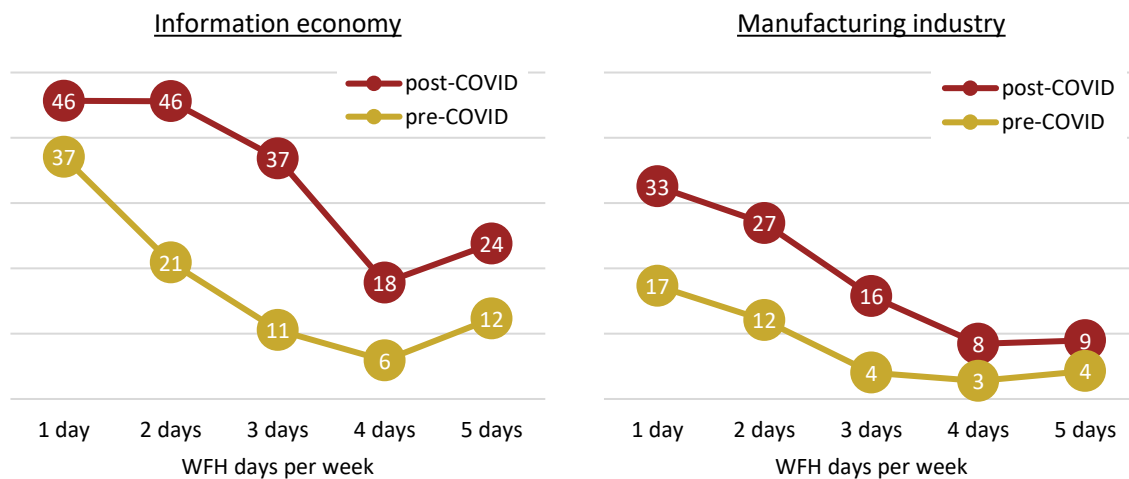
Before COVID-19, around half of the firms in the information economy allowed some of their employees to work from home at least once a week (Figure 2). By January 2022, a share of 76% of firms in the information economy plans to use such WFH arrangements after the pandemic has ended. The shift to WFH is remarkable for small firms (5-19 employees), medium firms (20-99 employees), and large firms (≥ 100 employees) alike. Before and after the pandemic, larger firms tend to use WFH more often than smaller firms. In the manufacturing industry, the share of firms using WFH arrangements has doubled (from 24% to 48%). Again, the shift to WFH is significant across all firm sizes while larger firms are more likely to offer WFH.

Before the pandemic, 37% of firms in the information economy had at least one employee working from home 1 day per week (Figure 3). Hybrid models with 2 or 3 WFH days were still much less common (21% and 11% of firms). By January 2022, the share of firms that want to use hybrid working models in the long run has risen sharply. Almost every second firm plans to use hybrid models with 1-2 WFH days post-COVID. Hybrid set-ups with 3 WFH days are planned by 37% of firms (a three-fold increase since March 2020). The share of firms that want to allow employees 4 WFH days has also tripled and currently stands at 18%. In addition, almost every fourth firm in the information economy assumes that some of its employees will generally work from home 5 days a week. For the post-pandemic period, every third firm in the manufacturing industry plans to allow some of its employees to work from home 1 day per week. In addition, a sizeable share of firms considers hybrid models with 2 days (27%), 3 days (16%), or 4-5 days (8%) of remote working. Before the pandemic, the corresponding shares were much lower in the manufacturing industry.

Figure 2: Share of firms using WFH arrangements with at least 1 WFH day per week



Note: In 51 percent of firms in the information economy, some employees worked from home at least once a week pre-COVID. For the time after the pandemic, 76 percent of firms expect to use WFH. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

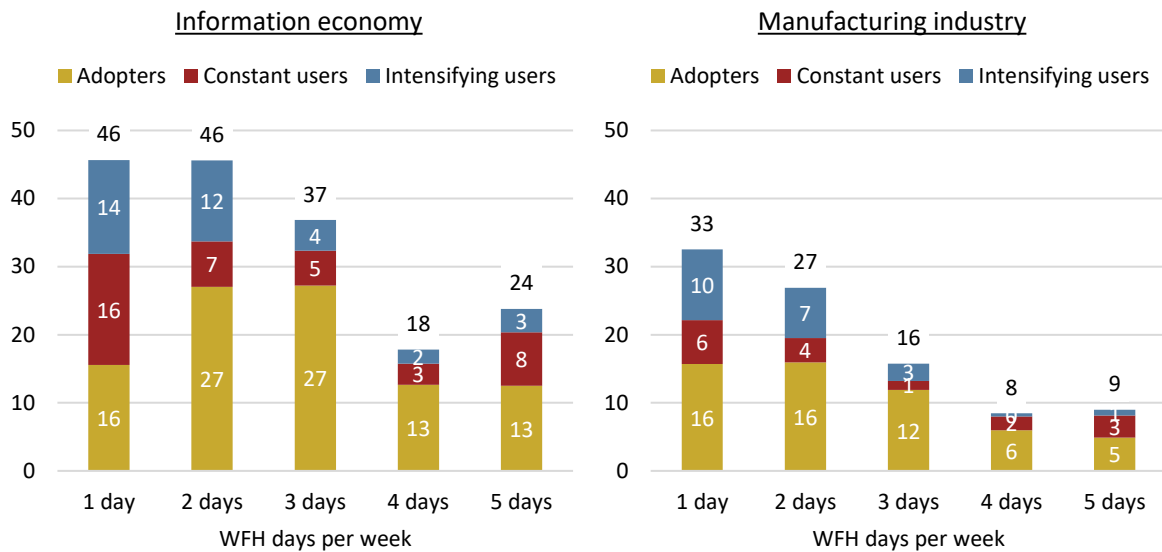
Figure 3: Share of firms using hybrid or fully remote working models

Note: In 21 percent of the firms in the information economy, at least one employee worked from home 2 days per week before the pandemic. After the pandemic, 46 percent of the firms expect that a part of their workforce will work from home 2 days per week. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 4 divides firms planning to use hybrid models after the pandemic into three groups: a) adopters, i.e. firms that have not used the specific hybrid model pre-COVID, b) constant users, i.e. firms expecting the same share of employees to use the specific hybrid model post-COVID as compared to the pre-COVID situation, c) intensifying users, i.e. firms expecting a higher share of employees to use the specific hybrid model post-COVID as compared to the pre-COVID situation. Focusing on the hybrid model with 2 WFH days, a share of 27% of firms in the information economy are adopters. In addition, 7% of firms are expecting to use the hybrid model in the same intensity as before the pandemic and 12% of firms expect that the share of employees who use the hybrid model will further increase (in comparison to a positive pre-COVID share). In the information economy and the manufacturing industry, the share of intensifying and constant users is highest for models with 1-2 WFH days. However, the share of adopters is predominant for almost all hybrid models and the fully remote working model.⁴ A share of 16% of manufacturing firms plans to adopt working schedules with 1 or 2 WFH days while 27% of firms in the information economy plan to adopt models with 2 or 3 WFH days.

⁴ The hybrid model with 1 WFH day is the only exception where adopters do not make up the predominant group of post-COVID users of WFH.

Figure 4: Adopters, constant users, and intensifying users of hybrid or fully remote working models



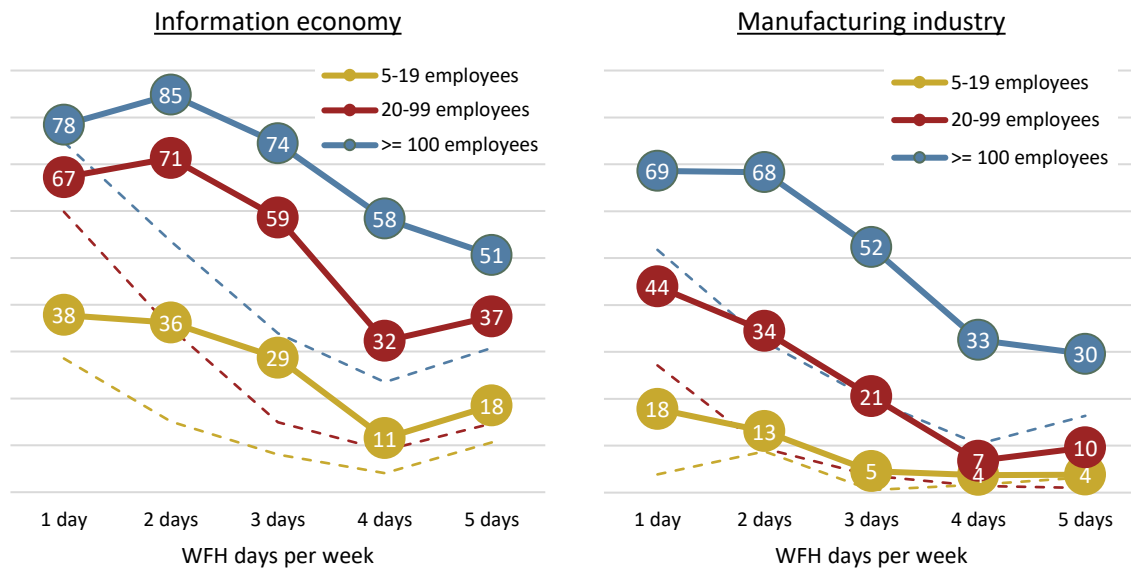
Note: Firms planning to use hybrid or fully remote models post-COVID are divided into three groups: a) adopters, i.e. firms that have not used the specific model pre-COVID, b) constant users, i.e. firms expecting the same share of employees to use the specific model post-COVID as compared to the pre-COVID situation, c) intensifying users, i.e. firms expecting a higher share of employees to use the specific model post-COVID as compared to the pre-COVID situation. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Although every surveyed WFH model experienced a substantial shift from pre-pandemic implementation to post-pandemic expectations, there are noteworthy differences regarding firm size. Larger firms are more likely to use hybrid or fully remote working models (Figure 5).⁵ In the information economy, more than three-quarters of firms with at least 100 employees plan to use hybrid models with 1-3 WFH days. In about half of the large firms, some employees are expected to work from home for 4-5 days. In manufacturing, large firms also frequently plan to use hybrid models with 1-2 WFH days (68%), 3 WFH days (52%), or 4-5 WFH days (30%). In both sectors, smaller firms are considerably less likely to use hybrid models post-COVID. The increase in the use of each hybrid model is indicated by the difference between the solid lines (post-COVID expectations) and dashed lines (pre-COVID usage) in a given colour.

The use of hybrid models among the subsectors of the information economy and the manufacturing industry is depicted in Figure 6. Within the information economy, firms in the ICT sector and media services providers tend to be more likely to use hybrid models than providers of professional, scientific, and technical services. Within the manufacturing industry, chemical products and pharmaceuticals is the sector with the highest share of firms using the various WFH models. As the difference between the solid lines (post-COVID expectations) and dashed lines (pre-COVID usage) indicate, all subsectors experienced a substantial shift in the expected use of hybrid working models.

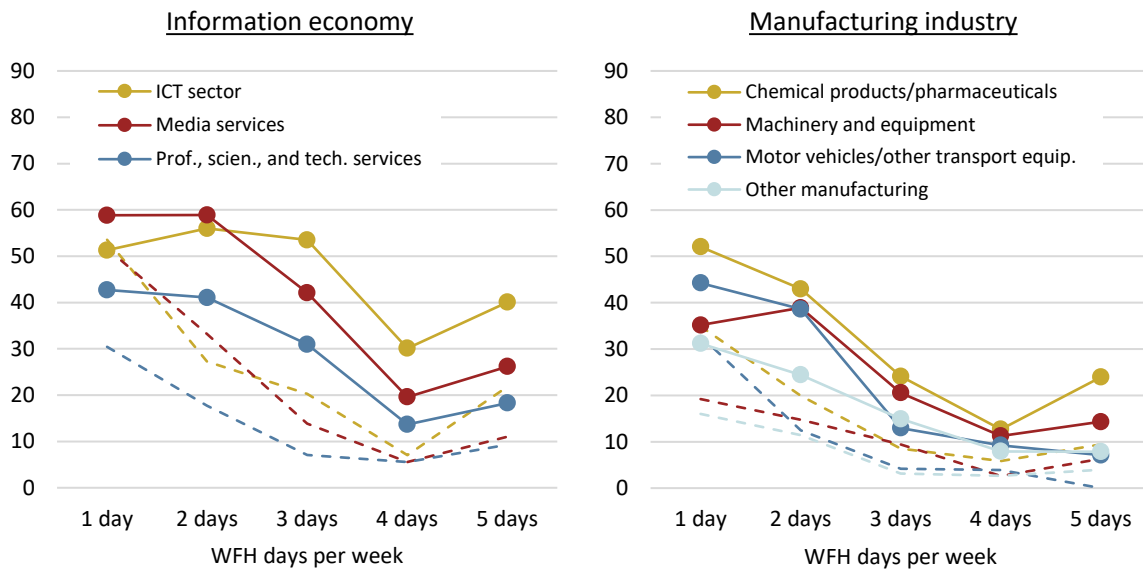
⁵ This finding is in line with the results of a large survey across 25 countries conducted by the OECD (Crisciolo et al., 2021).

Figure 5: Share of firms offering hybrid or fully remote working models, by firm size



Note: The dashed lines show the pre-COVID firm shares and the solid lines show the expected post-COVID firm shares. For the post-COVID period, 85 percent of large firms with 100 or more employees in the information economy expect that at least one of its employees will use 2 WFH days a week. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 6: Share of firms offering hybrid or fully remote working models, by sector



Note: The dashed lines show the pre-COVID firm shares and the solid lines show the expected post-COVID firm shares. For the post-COVID period, 59 percent of firms in the ICT sector expect that at least one of its employees will use 2 WFH days a week. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

3. Share of employees expected to use hybrid or fully remote working models

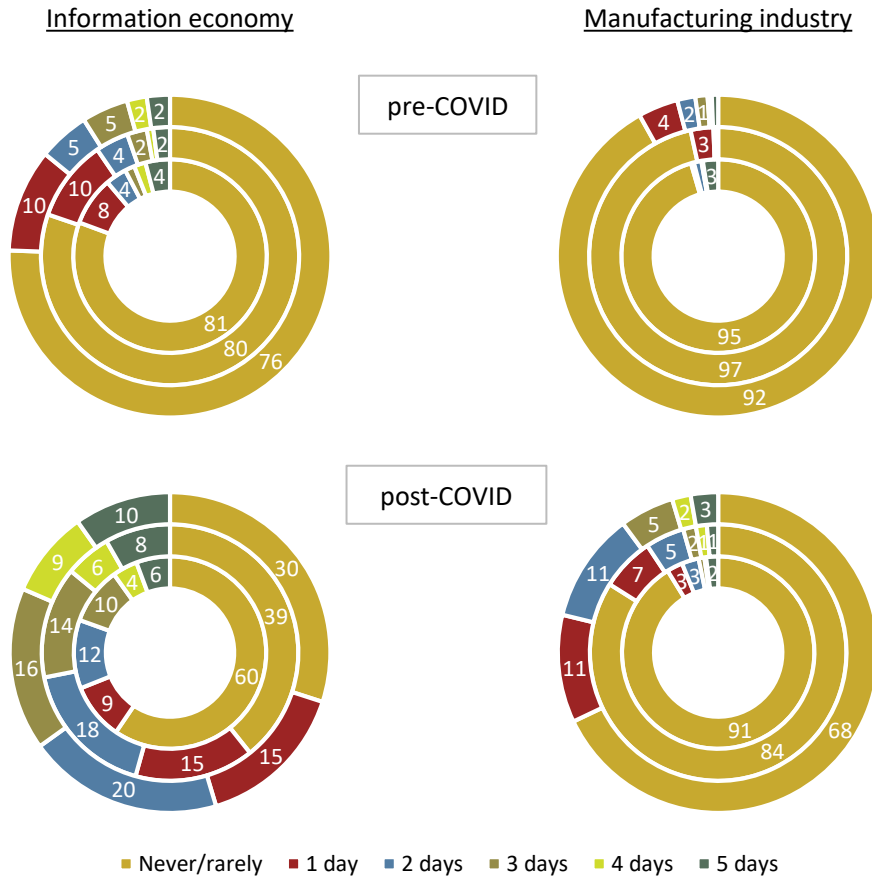
As the results indicate so far, many firms expect to use hybrid models more often in the long run. However, the previous results did not provide information on how many employees will have a part-home, part-office schedule within firms. Therefore, we now provide results on the intensive margin of firms' expected use of hybrid and fully remote working models. Based on the detailed information on employers' expectations, Figure 7 provides evidence on the average share of the firms' workforce that is expected to work in each of the hybrid set-ups after COVID-19. How intensively the various hybrid models are used depends heavily on firm size. On average, large firms in the information economy indicate that their employees will be distributed among the hybrid models as follows: 1 WFH day will probably be used by 15% of the workforce, 2 WFH days by 20%, 3 WFH days by 16%, 4 WFH days by 9%, and 10% of the workforce are expected to work fully remotely. The remaining share of 30% of the workforce in large firms is expected to work fully on firms' premises. On average, half of the workforce of large firms in the information economy is expected to use schedules with 1-3 WFH days. In small firms, this applies to about 30% of the workforce. In the manufacturing industry, firms also plan to make more intensive use of WFH in the future. This is especially true for large firms, where on average about a quarter of the workforce is expected to use 1-3 WFH days. In small firms, it is estimated that only 7% of the workforce will do so.

A before-and-after comparison clearly shows the impact of COVID-19 on long-term WFH arrangements in firms. Before the pandemic, an average share of 8% of the workforce in large manufacturing firms had a part-home, part-office schedule. After the pandemic, this share will grow to an average of 32%. In large firms in the information economy, an average of 70% of the workforce is expected to use hybrid or fully remote working models, compared to only 24% before the pandemic.

The previous results have focused on the firms' average share of the workforce using different hybrid models. The following results provide further insights into how the share of the workforce using those models varies across firms. In particular, Figure 8 sheds light on the distribution of the firm-specific shares of the workforce that are expected to work in a given hybrid model. Based on the detailed information indicated by firms, the share of the workforce using a particular WFH model is aggregated into four groups: 1-10% of the workforce, 11-20% of the workforce, 21-50% of the workforce, and 51-100% of the workforce.

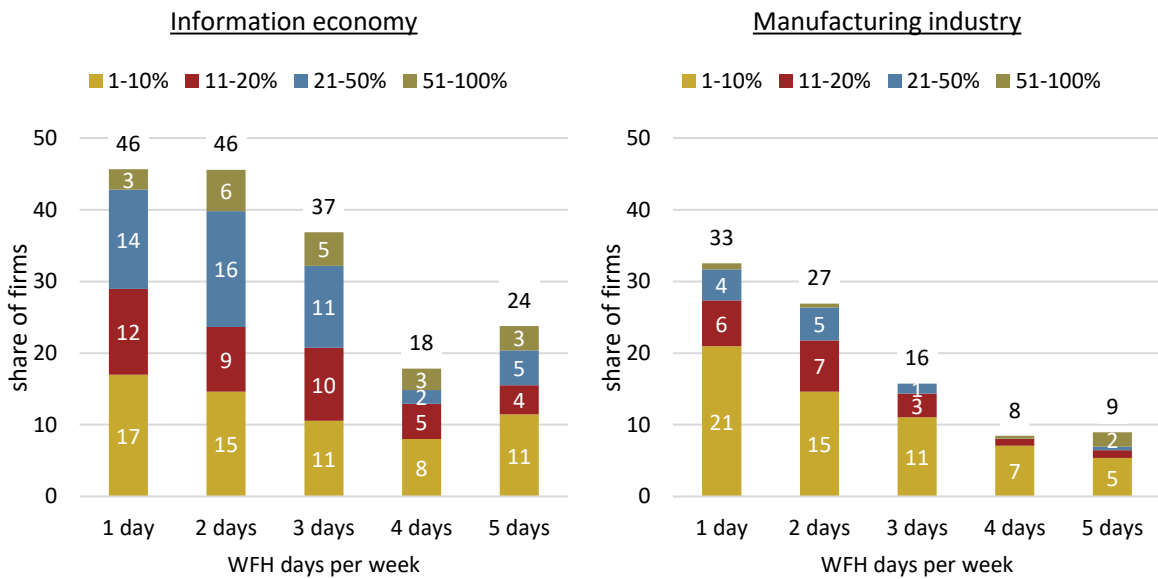
Looking at the hybrid model with 1 WFH day, for instance, 17% of firms in the information economy expect that a share of 1-10% of the workforce is going to use this model. For the same model, 12% of firms expect a share of 11-20%, 14% of firms expect a share of 21-50%, and 3% of firms expect a share of more than 50% of the workforce to use 1 WFH day per week. For the hybrid model with 2 WFH days, the distribution is very similar. Overall, the results indicate that many firms in the information economy expect that a sizeable share of their employees will use hybrid models. This especially holds for schedules with 1-3 WFH days. In contrast, manufacturing firms are more likely to only expect a small share of employees (1-10%) to use the different hybrid models. One prominent reason might be that manufacturing firms have a smaller share of employees with tasks that are feasible for WFH.

Figure 7: Share of the workforce using hybrid or fully remote working models, by firm size



Note: Inner circle: firms with 5-19 employees; Middle circle: firms with 20-99 employees; Outer circle: firms with >= 100 employees. For the post-pandemic period, large firms with 100 or more employees in the information economy expect that 20 percent of their workforce will use 2 WFH days per week on average. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 8: Firms' share of employees expected to use hybrid or fully remote working models post-COVID



Note: 9 percent of firms in the information economy expect that a share of 11-20 percent of their employees will use 2 WFH days per week post-COVID. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

4. Share of firms' overall working time expected to be performed from home

Until now, we presented information on firms' use of different WFH schedules and the share of the workforce expected to use each schedule. In the following, our fine-grained data on both dimensions of WFH intensity are leveraged to approximate the firms' share of overall working time that is performed from home. The underlying assumptions are that a work week consists of 5 days for all employees in a given firm and that the employees' working time is distributed evenly over those 5 days. Based on these assumptions, each day of a work week corresponds to 20% of an employee's working time. Thus, employees using a hybrid model with 2 WFH days will perform approximately 40% of their working time from home. Expanding that approach to all employees of a given firm i , we can approximate the firm's share of overall working time performed from home in the following way:

$$\begin{aligned} & \textit{Working time performed from home}_{it} = \\ & \%WFH_{1it} * 0.2 + \%WFH_{2it} * 0.4 + \%WFH_{3it} * 0.6 + \%WFH_{4it} * 0.8 + \%WFH_{5it} * 1.0 \end{aligned}$$

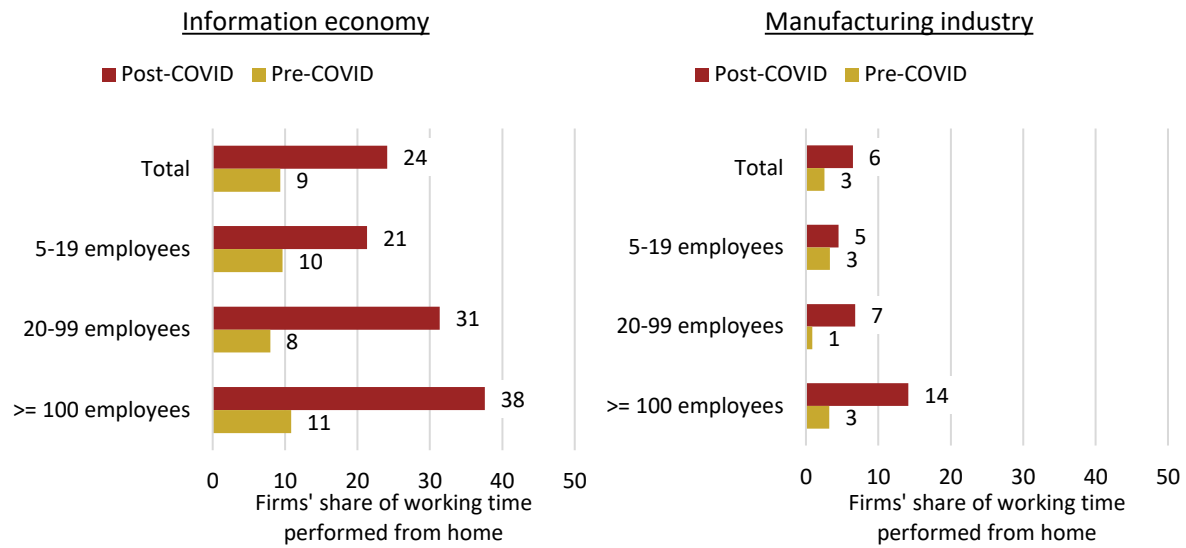
where $\%WFH$ indicates the share of employees in firm i that work in a schedule with 1 to 5 WFH days.⁶ As indicated by t , we are able to estimate the share of working time that has been provided from home before the pandemic as well as the share of working time that is expected to be provided from home after the pandemic.

In the following, we focus on firms' overall working time performed from home as a detailed but concise measure of the intensity of firms' use of WFH. As a starting point, Figure 9 provides results on firms' average share of overall working time performed from home pre-COVID and post-COVID. Among firms in the information economy, an average share of 24% of the firms' overall working time is expected to be performed from home after the pandemic ends. The share of overall working time attributable to WFH increases with firm size. Large firms expect that an average share of 38% of working time will be provided from home. Before the start of the pandemic, only 10% of the firms' working time was attributable to WFH in the information economy on average. In comparison to before the pandemic, the expectations about the share of overall working time performed from home have, thus, increased more than twofold or even nearly fourfold, depending on firm size. Among manufacturing firms, the pre-COVID share of working time performed from home amounted to 3% on average while the post-COVID share is expected to be 6%. Again, larger firms expect a higher share of the working time to be performed from home (14%).

Firms' average share of working time performed from home differs considerably across subsectors. As depicted in Figure 10, ICT service providers expect the highest post-COVID share of working time attributable to WFH (36% on average). Media service providers and most of the knowledge-intensive providers of professional, scientific, and technical services expect a share above 20% of working time to be performed from home. Within the manufacturing industry, the sectors chemical products/pharmaceuticals and machinery/equipment expect a slightly higher share of working time performed from home than the other manufacturing sectors. Overall, the expected share of working time performed from home increased two- or threefold in most subsectors, as compared to the pre-COVID situation.

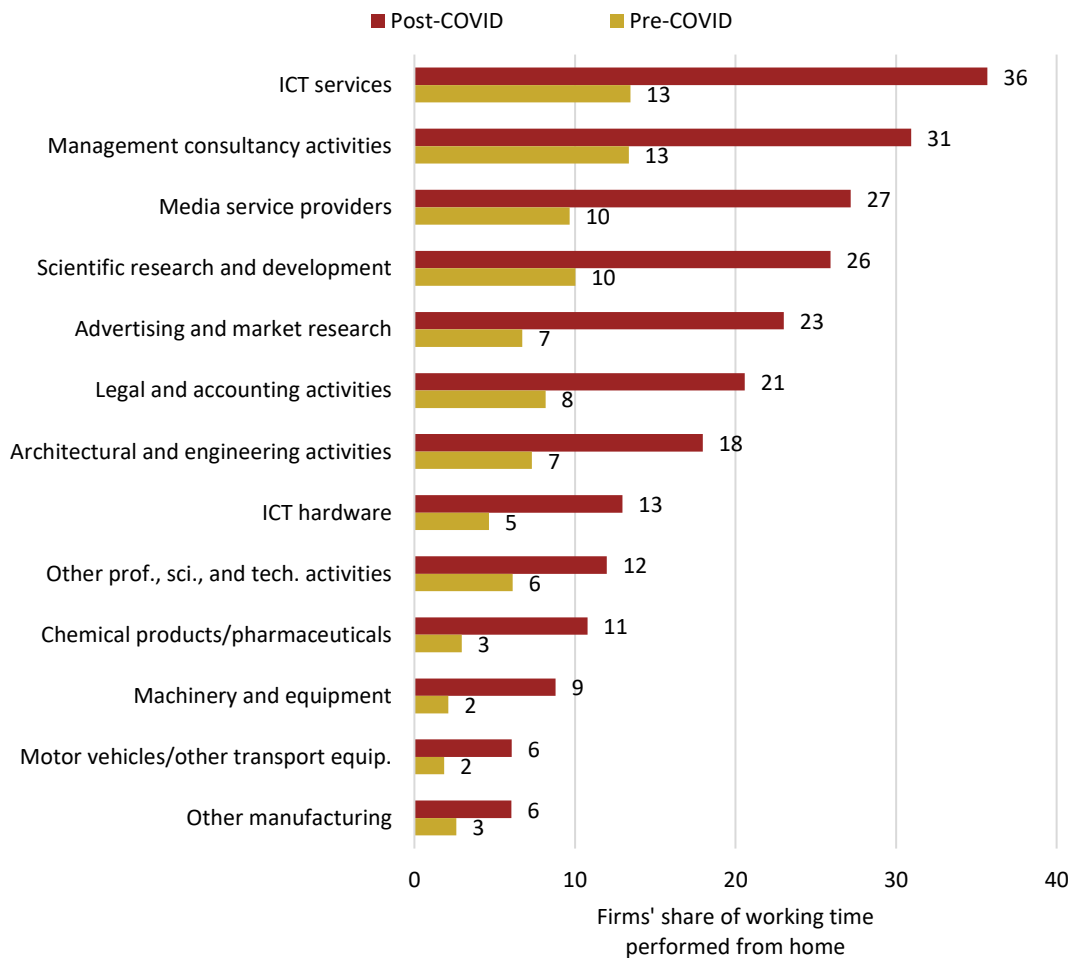
⁶ An exemplary calculation to clarify the approach: A firm states that 50% of its employees never or rarely work from home, 30% use 1 WFH day, 10% use 3 WFH days, and 10% use 5 WFH days per week. The firm's share of overall working time performed from home is then calculated as: $0.3 * 0.2 + 0.1 * 0.6 + 0.1 * 1.0 = 0.22$. Hence, this firm would have an estimated share of working time performed from home of 22%.

Figure 9: Firms' average share of working time performed from home, by firm size



Note: Among firms in the information economy, an average of 24 percent of their working time is expected to be performed from home after the pandemic. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 10: Firms' average share of working time performed from home, by subsector

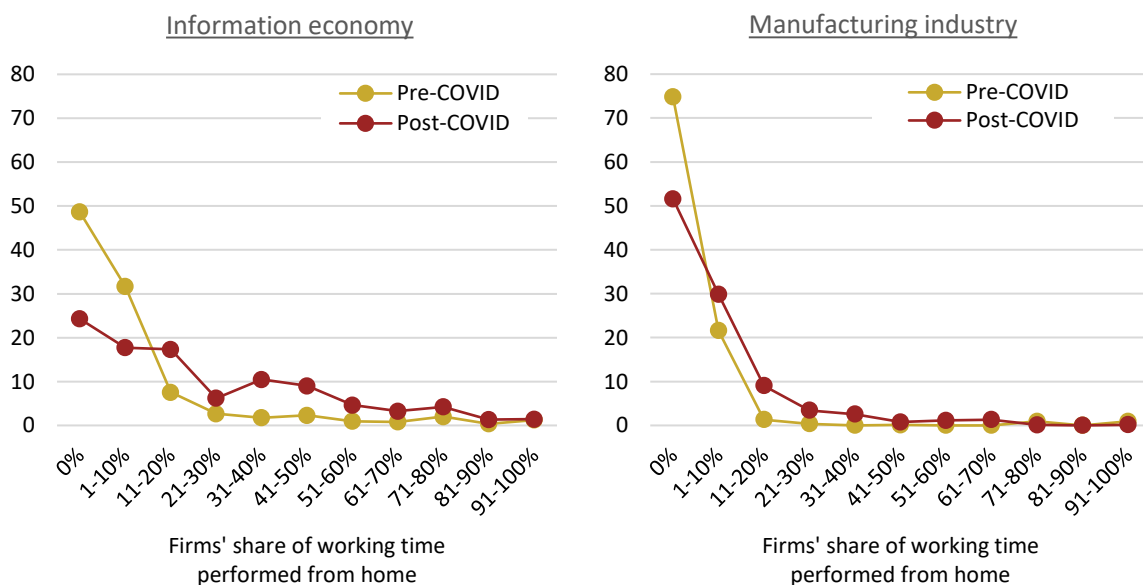


Note: Among ICT services firms, an average of 36 percent of the working time is expected to be performed from home after the pandemic ends. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

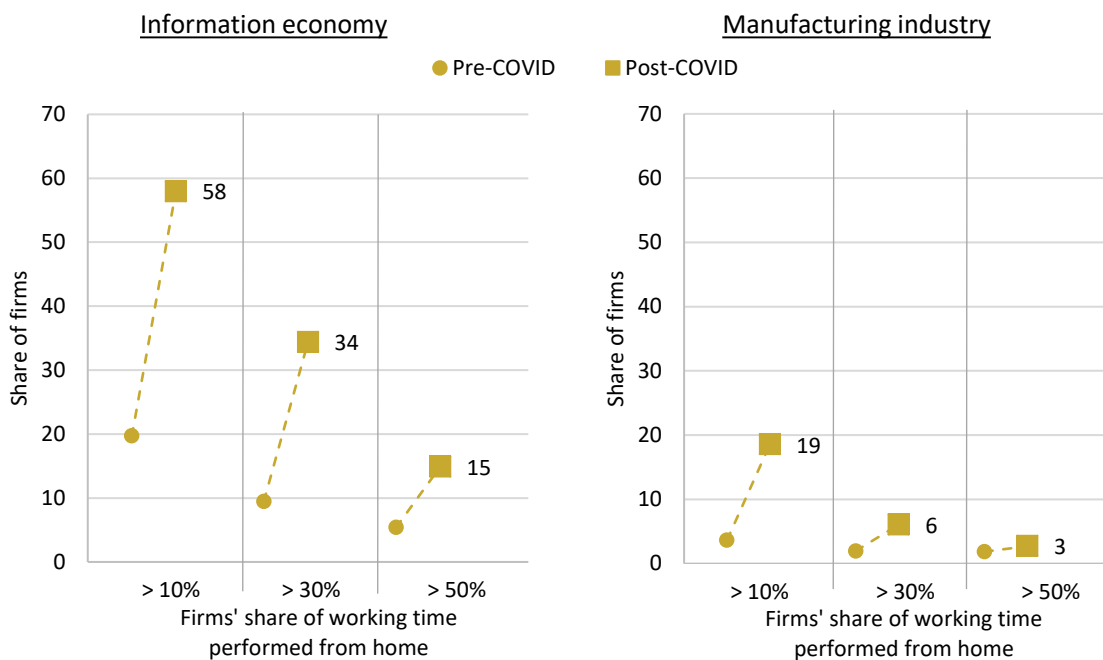
In addition to focusing on the average shares, we now provide results on the question of how the share of working time performed from home varies across firms. Therefore, Figure 11 provides additional insights on the distribution of the pre-COVID shares and post-COVID shares of firms' working time performed from home. Before the pandemic, the vast majority of firms haven't had any working time performed from home or only a very small fraction of up to 10% performed from home. In both sectors, however, the pandemic has led to a noticeable shift towards higher shares of working time performed from home. In the manufacturing sector, this shift is mostly concentrated on shares from 1-30% of the working time. For firms in the information economy, the bunching around 0-10% of the working time is considerably reduced while the shift towards WFH is present for shares between 11% and 80% of the working time. Therefore, the rise in the firms' average share of working time performed from home is not driven by a few firms with an extreme increase in WFH but rather by a general shift in WFH intensity within many firms. Notably, the post-COVID distribution of the expected working time performed from home among manufacturing firms strongly resembles the pre-COVID distribution among firms in the information economy.

Based on the distributions for the information economy and manufacturing industry, Figure 12 indicates the respective share of firms in which more than 10%, 30%, or 50% of working time will be performed from home. Prior to the pandemic, in only 10% of firms in the information economy, a share of more than 30% of overall working time was performed from home. After the pandemic, however, 34% of firms will have more than 30% of their working time performed from home. Moreover, 15% of firms expect that more than half of their working time will be provided from home after the pandemic, while this was the case for only 5% of firms prior to the pandemic. Among manufacturing firms, only a few firms expect that more than 30% or even 50% of the working time will be performed from home post-COVID. However, 19% of firms expect that more than 10% of working time will be provided from home after the pandemic (in comparison to only 4% of firms pre-COVID).

Figure 11: Distribution of firms' share of working time performed from home



Note: For the post-COVID period, 9 percent of firms in the information economy expect that a share of 41-50 percent of their working time will be performed from home. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

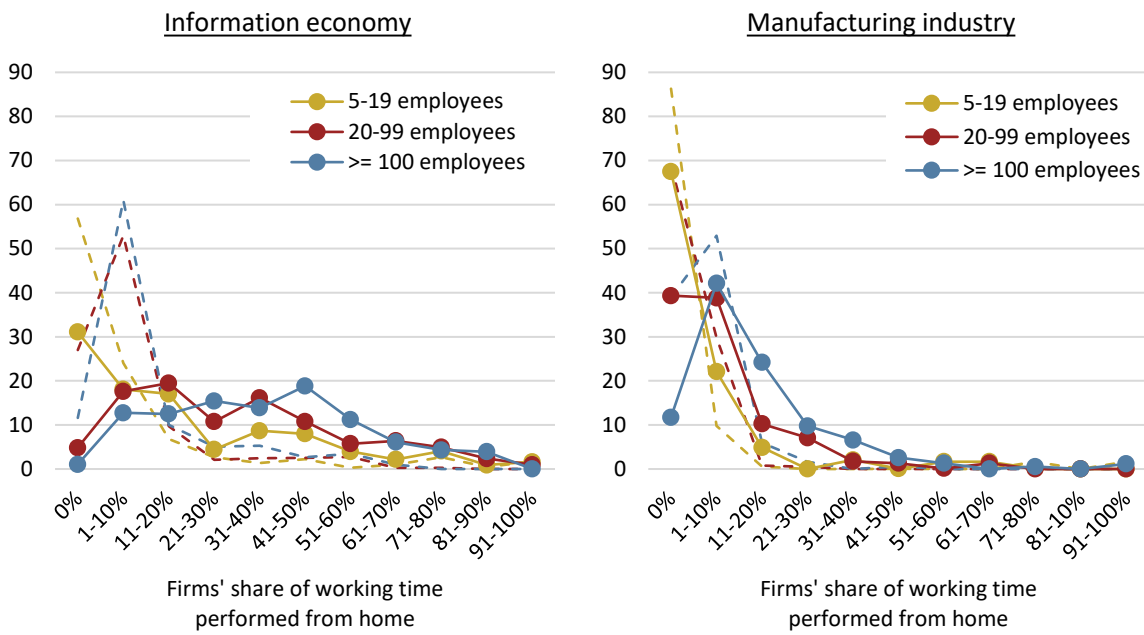
Figure 12: Share of firms in which more than 10%, 30%, or 50% of working time is performed from home

Note: For the post-COVID period, 34 percent of firms in the information economy expect that a share of more than 30 percent of their overall working time will be performed from home. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

The distribution of firms' share of overall working time performed from home differs in relation to firm size. Larger firms are more likely to expect a stronger transition towards more working time being provided from home (Figure 13). Nevertheless, for all firm sizes, the post-COVID distributions (solid lines) are noticeably shifted towards higher shares of WFH as compared to the pre-COVID distributions (dashed lines). To make the differences across firm sizes more salient, Figure 14 indicates the respective share of firms in which more than 10%, 30%, or 50% of working time is performed from home. In the information economy, 58% of large firms expect that more than 30% of their working time will be performed from home post-COVID (in comparison to 12% of firms pre-COVID). In contrast, only a share of 29% of small firms expects the same intensity of WFH use (in comparison to 10% of firms pre-COVID). Moreover, 26% of large firms and 13% of small firms expect that more than half of their working time will be shifted to WFH after COVID-19 (in comparison to 4% and 6% of firms pre-COVID). In the manufacturing industry, the shift towards WFH is mostly concentrated on lower shares of working time performed from home. While 46% of large manufacturing firms expect that more than 10% of working time will be provided from home after the pandemic, this holds for only 10% of small firms (in comparison to 8% and 4% of firms pre-COVID). A share of more than 30% WFH is expected by 12% of large and 6% of small firms (pre-COVID shares were 1% and 3%). Finally, the share of firms expecting that more than half of the working time will be provided from home remains relatively unchanged for all firm sizes and stands at 3%.

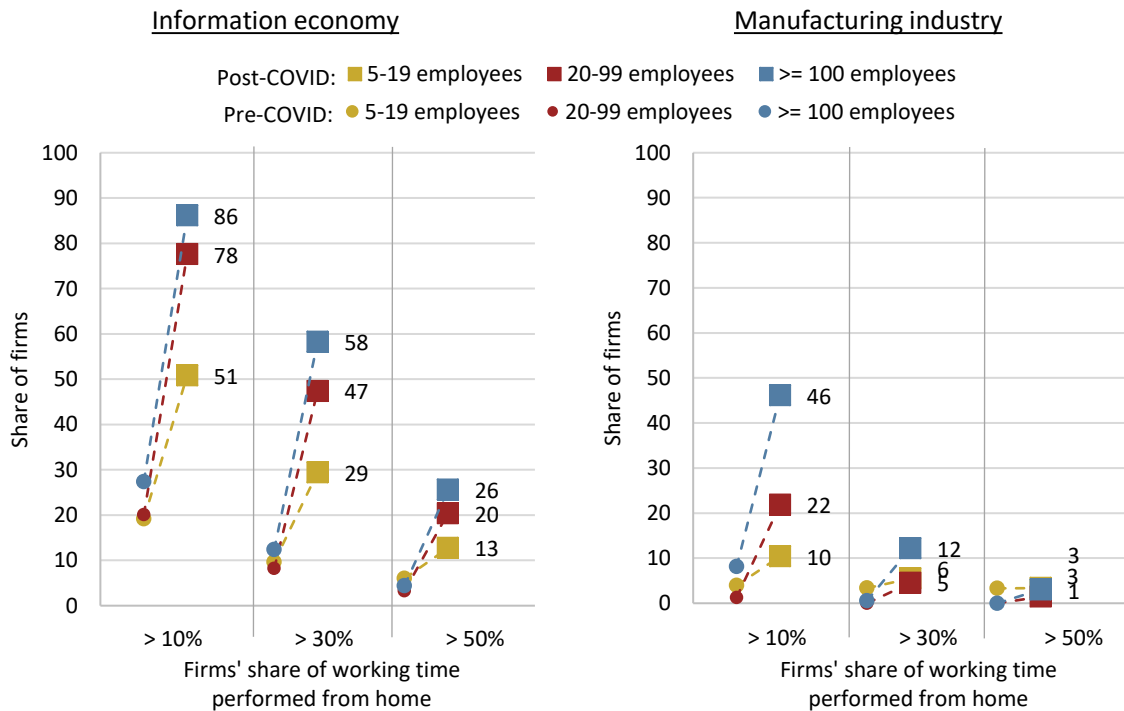
As shown in Figure 15, the shift from lower to higher shares of working time performed from home is prevalent in every surveyed sector. However, the intensity of the shift and the post-COVID expectations vary substantially across sectors. Across the sectors of the manufacturing industry, the shift to WFH is relatively similar and far less pronounced than in the information economy. In the ICT sector, roughly 30% of firms expect that more than half of their working time will be performed from home post-COVID (in comparison to 7% of firms pre-COVID). This is by far the highest share of firms expecting such a high WFH intensity, followed by media services (13%) and providers of professional, scientific, and technical services (10%).

Figure 13: Distribution of firms' share of working time performed from home, by firm size

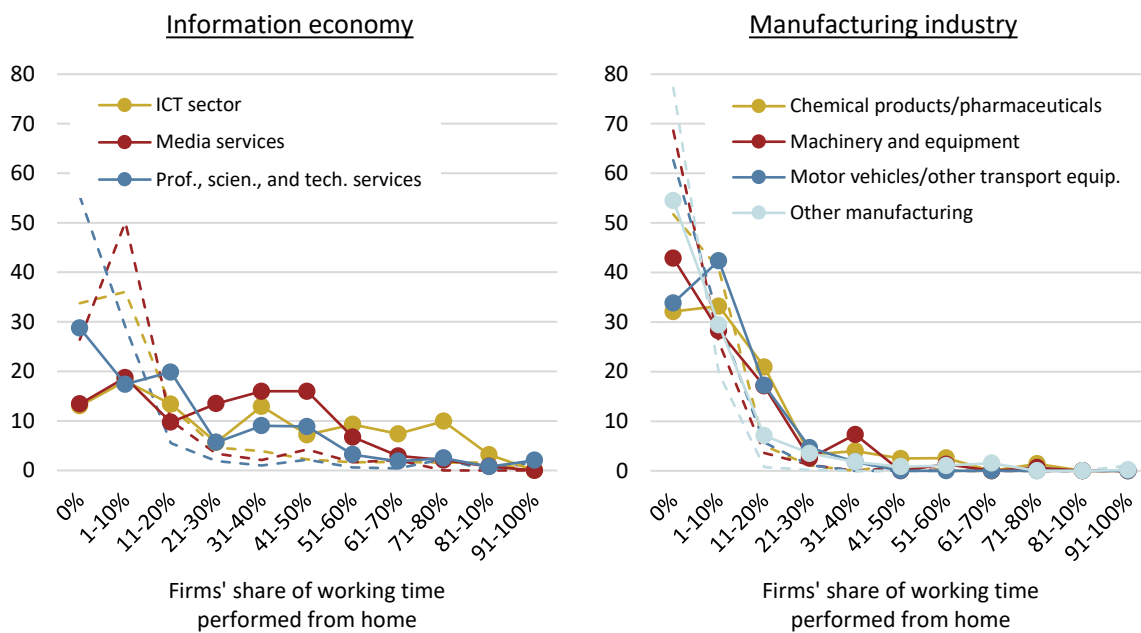


Note: The dashed lines show the pre-COVID firm shares and the solid lines show the expected post-COVID firm shares. For the post-COVID period, 19 percent of firms in the information economy with 100 or more employees expect that a share of 41-50 percent of their working time will be performed from home. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 14: Share of firms in which more than 10%, 30%, or 50% of working time is performed from home, by firm size



Note: For the post-COVID period, 58 percent of large firms in the information economy expect that a share of more than 30 percent of their overall working time will be performed from home. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

Figure 15: Distribution of firms' share of working time performed from home, by subsector

Note: The dashed lines show the pre-COVID firm shares and the solid lines show the expected post-COVID firm shares. For the post-COVID period, 10 percent of firms in the ICT sector expect that a share of 71-80 percent of their working time will be performed from home. Source: ZEW Business Survey in the Information Economy, December 2021/January 2022.

5. Implications of a persistent shift towards WFH

The implications of a persistent shift towards WFH can be far-reaching, carrying consequences in an array of fields. On the one hand, the increasing workplace flexibility granted by WFH has the potential to alleviate structural inequalities along several economic and social dimensions, such as work-life balance. On the other hand, the change also comes with the risk of exacerbating pre-existing inequalities in the labour market (Bonacini et al., 2021; Stantcheva, 2022). Reaping the benefits of the changing organisation of work while reducing its risks for vulnerable groups might call for targeted policy measures in different areas. Among other things, the need for policy interventions and their required design will depend on the intensity of the shift towards WFH among different groups of workers, firms, or regions.

The potential to raise productivity is widely discussed as a major benefit of more workplace flexibility (e.g. Barrero et al., 2021a, 2021c; Criscuolo et al., 2021). Mechanisms for a positive association between WFH and productivity might include higher job satisfaction and motivation leading to higher worker effort, fewer distractions facilitating a more focused way of working, or that employees can use private information to work when their personal productivity is at its peak. Moreover, firm-level productivity might be positively affected by allowing firms to tap from a broader pool of geographically distant talents or by exploiting workplace flexibility as a non-pecuniary incentive to attract and retain high-skilled workers. In addition, savings from reduced needs for office space or business travels could be used for investments and innovation activities. However, these benefits have to be balanced with the potential costs of an overly intensive use of WFH, e.g. impaired communication and knowledge flows among employees (Gibbs et al., forthcoming; Yang et al., 2022). Therefore, management practices have to adapt to the new challenges to facilitate a beneficial use of WFH arrangements. Those practices, for instance, might have to encourage a sufficient degree of in-person or online interaction by a coordination of schedules. Moreover, firms might need to

adapt investment decisions as well, focusing on investments in new technologies and employees' skills fostering efficient remote work. As several studies imply, a majority of workers and firms express a positive judgment of the productivity of WFH during the pandemic (e.g. Aksoy et al., forthcoming). As a result, workers and firms alike often perceive the general effect of WFH on productivity more optimistically than they would have expected before the pandemic.

Previous studies show that the use of flexible work arrangements is strongly associated with firm size (e.g. Criscuolo et al., 2021). As the present report highlights, this holds for the use of WFH before the pandemic as well as for the expectations for the future use after the pandemic has ended. In addition, WFH arrangements are much more prevalent among specific sectors, e.g. knowledge-intensive services sectors, in comparison to other sectors, such as the manufacturing industry. One driving force for this sector heterogeneity seems to be that sectors with high WFH feasibility tend to employ a larger share of better educated and highly-skilled workers whose job tasks can more often be performed remotely. Those sectors and job tasks also tend to generally pay higher wages. Therefore, across these aforementioned dimensions in the labour market, inequalities already exist when it comes to WFH. An additional widespread adoption of WFH might exacerbate those pre-existing inequalities. For instance, if a positive shift in WFH feasibility would be associated with an increase in average labour income due to positive productivity effects, the potential benefits might not be evenly distributed among sectors, firms, or workers (Bonacini et al., 2021; Etheridge et al., 2020). At the individual level, the shift towards WFH holds the potential to further increase the polarisation and the inequalities between high-income, high-skilled professionals and low-skilled workers. At the firm level, more productive and larger firms with higher management quality, past experiences with WFH arrangements, and higher-skilled employees might be more able to reap the productivity potential of WFH. Consequently, this may further increase the existing gap between highly productive and less productive firms (Criscuolo et al., 2021; Syverson, 2011).

Facilitating a reduction of gender gaps in the labour market is another potential benefit of more workplace flexibility (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. In addition, by saving time on daily commutes and being able to shift working times throughout the day WFH might enable mothers to work longer hours (Arntz et al., 2022; Dettling, 2017). As a consequence, this mechanism might lead to a narrowing of the gender gap in earnings. However, whether WFH might actually alleviate pre-existing gender differences seems to crucially depend on the way parents are going to organise their childcare and household responsibilities in the long run. If mothers provide a much larger share of childcare than fathers, this will constrain their ability to work at all or to work longer hours, even if they are allowed to perform their job tasks from home. In fact, evidence for different countries suggests that even among couples who both worked from home during the COVID-19 pandemic mothers have spent substantially more time on childcare (Adams-Prassl et al., 2020; Alon et al. forthcoming). The unequal division of the burden of childcare between mothers and fathers, in turn, can have detrimental effects on women's productivity which might have long-lasting consequences. Therefore, exploiting the potential of WFH arrangements to reduce gender gaps hinges on a shift in social norms such that mothers and fathers make a more equal use of the additional flexibility granted by the future organisation of work.

Increased workplace flexibility is deemed to have substantial implications for cities, real estate markets, and the geographic concentration of economic activity (Ramani and Bloom, 2021; Criscuolo et al., 2021; Ozimek, 2022). Especially for high-skilled workers, the importance of workplace proximity as a determinant of residential decisions might fade when there is less need for commuting. In contrast, less-educated service workers face greater mobility constraints and are expected to suffer from their dependence on the decreasing local demand for personal services in cities (Althoff et al., 2022; Autor and Reynolds, 2020). Therefore,

WFH will have long-lasting implications for local labour markets and regional disparities. The quality of home internet access is an important issue for policies in this context. As Barrero et al. (2021c) show for the US, universal internet access is a focal determinant of productivity and resilience during pandemic times. Geographical differences in the quality of internet access can, thus, contribute to rising regional disparities. Therefore, policy measures targeted at the provision of high-speed internet might help to prevent that workplace flexibility reinforces regional inequalities.

6. Conclusion

This report provides detailed insights into how firms in Germany plan to organise work in the future. As many firms expect an increase in workplace flexibility, the COVID-19 pandemic seems to have induced a massive and lasting shift towards WFH. In contrast to many other studies, the present report focuses on firms' perception of WFH rather than on the workers' perspective. One important reason for this approach is that firms could create a bottleneck for the further diffusion of flexible working arrangements in the labour market if they would disregard the widespread preference for WFH among most workers. However, as our detailed survey results on the intensity of the expected use of WFH suggest, firms seem to have incentives to re-optimize working arrangements. Potential mechanisms might include an improved perception of the productivity effects of WFH, the opportunity to tap from a broader pool of geographically distant talents, or to exploit workplace flexibility as a non-pecuniary incentive to attract and retain high-skilled workers. Our results highlight differences in the pre-COVID and post-COVID share of WFH usage between smaller and larger firms and between knowledge-intensive services sectors and the physical labour intensive manufacturing industry. However, across all firm sizes and sectors covered by our survey, a substantial share of firms expect to use flexible working arrangements more intensively along two dimensions: Firstly, firms increasingly introduced WFH arrangements granting higher workplace flexibility, i.e. a higher number of WFH days per week. Secondly, firms started to allow an increasing share of employees to make use of these newly adopted and more flexible hybrid or fully remote working models. As a result of the more flexible hybrid models in place and the higher share of employees able to use these schedules, an increasing share of firms' overall working time is expected to be performed from home. On average, a share of 24% of the overall working time of firms in the knowledge-intensive information economy is expected to be performed from home (in comparison to a 9% share pre-COVID). For the manufacturing industry, the share of the overall working time performed from home is expected to rise from 3% before the pandemic to 6% after the pandemic. The most common hybrid models firms in both sectors plan to use in the long run allow for 1 to 3 WFH days per week. This intermediate level of WFH intensity seems to appropriately balance the potential benefits, e.g. less commuting and fewer distractions at home, with the potential caveats, e.g. impaired communication and knowledge flows among co-workers. In this way, such schedules allow employees to use WFH days for quiet and thoughtful work, while in-office days can be used for meetings and collaborations. Fully exploiting the manifold potentials of increasing workplace flexibility, while counterbalancing the aggravation of inequalities, might call for complementary adjustments in managerial practices within firms and targeted policy measures.

7. Literature

- Adams-Prassl, A., T. Boneva, M. Golin, and C. Rauh (2020). "Inequality in the Impact of the Coronavirus Shock: Evidence from Real Time Surveys." *Journal of Public Economics* 189: 104245.
- Aksoy, C. G., J. Barrero, N. Bloom, S. Davis, M. Dolls, and P. Zarate (forthcoming). "Working from Home Around the World". *Brookings Papers on Economic Activity*.
- Alipour, J. V., O. Falck, and S. Schüller (2020). "Germany's Capacity to Work from Home". *CESifo Working Paper*, No. 8227.
- Angelici, M. and P. Profeta (2020). "Smart-Working: Work Flexibility without Constraints". *CESifo Working Paper*, No. 8165.
- Alon, T., S. Coskun, M. Doepke, D. Koll and M. Tertilt (forthcoming). "From Mancession to Shecession: Women's Employment in Regular and Pandemic Recessions". *36th NBER Macroeconomics Annual*, University of Chicago Press.
- Althoff, L., F. Eckert, S. Ganapati and C. Walsh (2022). „The geography of remote work". *Regional Science and Urban Economics*, 93.
- Arntz, M., S. Ben Yahmed and F. Berlingieri (2022). "Working from Home, Hours Worked and Wages: Heterogeneity by gender and parenthood". *Labour Economics*, 76, 102169.
- Autor, D., and E. Reynolds (2020). "The nature of work after the COVID crisis: Too few low-wage jobs". *The Hamilton Project*, Brookings.
- Barrero, J. M., N. Bloom, and S. J. Davis (2020). "COVID-19 Is Also a Reallocation Shock". *Brookings Papers on Economic Activity*, Summer 2020, 329–371.
- Barrero, J. M., N. Bloom, and S. J. Davis (2021a). "Why Working from Home Will Stick". *NBER Working Paper*, No. 28731.
- Barrero, J. M., N. Bloom, and S. J. Davis (2021b). "Let me work from home, or I will find another job". *VoxEU.org*, 27 July.
- Barrero, J. M., N. Bloom, and S. J. Davis (2021c). "Internet Access and its Implications for Productivity, Inequality, and Resilience," in *Rebuilding the Post-Pandemic Economy*, ed. Melissa S. Kearney and Amy Ganz (Washington D.C.: Aspen Institute Press).
- Bloom, N., J. Liang, J. Roberts, and Z. J. Ying (2015). "Does Working from Home Work? Evidence from a Chinese Experiment". *Quarterly Journal of Economics*, 130(1), 165–218.
- Bonacini, L., G. Gallo and S. Scicchitano (2021). "Working from home and income inequality: risks of a 'new normal' with COVID-19". *Journal of population economics*, 34(1), 303-360.
- Brynjolfsson, E., J. J. Horton, A. Ozimek, D. Rock, G. Sharma, and H. TuYe (2020). "COVID-19 and Remote Work: An Early Look at US Data". *NBER Working Paper*, No. 27344.
- Choudhury, P., C. Foroughi, and B. Zepp Larson (2021). "Work-from-anywhere: The Productivity Effects of Geographic Flexibility". *Strategic Management Journal*, 42(4), 655–683.
- Criscuolo, C., P. Gal, L. Leidecker, F. Losma, and G. Nicoletti (2021) "The role of telework for productivity during and post-COVID-19: Results from an OECD survey among managers and workers", *OECD Productivity Working Papers*, 2021-31, OECD Publishing, Paris.

- Demmelhuber, K., R. Dirnberger, F. Englmaier, F. Leiss, S. Möhrle, and A. Peichl (2021). "Coronakrise: Krisenmanagement und Zukunftsstrategien von Unternehmen". ifo Schnelldienst, 74(3), 33–37.
- Dettling, L.J. (2017). "Broadband in the labor market: the impact of residential high-speed internet on married women's labor force participation". *Industrial and Labor Relations Review*, 70 (2), 451–482.
- Dingel, J. I. and B. Neiman (2020). "How Many Jobs can be Done at Home?". *Journal of Public Economics*, 189, 104235.
- Etheridge, B., L. Tang, and Y. Wang (2020). "Worker Productivity During Lockdown and Working from Home: Evidence from Self-reports". *Covid Economics*, 52, 118–151
- Erdsieck, D. (2021), *Working From Home During COVID-19 and Beyond: Survey Evidence From Employers*, ZEW Discussion Paper No. 21-051, Mannheim.
- Eurofound (2020). "Living, Working and COVID-19: First Findings – April 2020". Dublin.
- Gibbs, M., F. Mengel and C. Siemroth (2022). „Work from Home & Productivity: Evidence from Personnel & Analytics Data on IT Professionals". *Journal of Political Economy Microeconomics*.
- Goldin, C. (2014). "A Grand Gender Convergence: Its Last Chapter". *American Economic Review* 104(4), 1091–119.
- Gupta, A., V. Mittal, J. Peeters, S. Van Nieuwerburgh (2021). "Flattening the curve: pandemic-induced re-valuation of urban real estate." *Journal of Financial Economics*.
- Irlacher, M. and M. Koch (2021). "Working from Home, Wages, and Regional Inequality in the Light of COVID-19". *Jahrbücher für Nationalökonomie und Statistik* 241 (3).
- Mas, A. and A. Pallais (2017). "Valuing alternative work arrangements". *American Economic Review* 107(12): 3722–59.
- Mondragon, J. and J. Wieland (2022). "Housing Demand and Remote Work." NBER Working Paper 30041.
- Ramani, A., and N. Bloom (2021). "The Donut effect of COVID-19 on cities". NBER Working Paper, No. 28876).
- Stantcheva, S. (2022). "Inequalities in the times of a pandemic". *Economic Policy*, 37(109), 5-41.
- Syverson, C. (2011). "What Determines Productivity?". *Journal of Economic Literature*, 49 (2): 326-65,
- Teodorovicz, T., R. Sadun, A. L. Kun, and O. Shaer (2021). "Working from Home during COVID-19: Evidence from Time-Use Studies". Harvard Business School Working Paper, No. 21-094.
- Ozimek, A. (2021). "Future Workforce Report 2021: How Remote Work is Changing Businesses Forever". Upwork. Retrieved from <https://www.upwork.com/research/future-workforce-report>.
- Ozimek, A. (2022). "The New Geography of Remote Work". Retrieved from https://adamozimek.com/admin/pdf/EconReport_RemoteWorkersnotheMove2_Feb2022.pdf
- Viete, S. and D. Erdsieck (2020). "Mobile Information Technologies and Firm Performance: The Role of Employee Autonomy". *Information Economics and Policy* Volume 51, June 2020.
- Yang, L., D. Holtz, S. Jaffe, S. Suri, S. Sinha, J. Weston, C. Joyce, N. Shah, K. Sherman, B. Hecht and J. Teevan (2021). "The effects of remote work on collaboration among information workers," *Nature: Human Behaviour*.

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