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WORKING FROM HOME AND COVID-19: THE CHANCES AND RISKS FOR GENDER GAPS

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As the Covid-19 pandemic causes an all-time high share of people to work from home, this disruptive event is likely to have a long-lasting effect on work arrangements. Given existing research on the effects of working from home (WfH) on hours worked and wages, an increased availability of WfH may provide a chance for women to catch up with their male counterparts. Yet, the need to simultaneously care for children during the Covid-19 lockdown may also revive traditional gender roles, potentially counteracting such gains. This expert brief discusses the likely effects of the Covid-19 pandemic on gender gaps in light of recent empirical findings and novel statistics on the heterogeneous structure of work arrangements among couples.

Covid-19 as a shock to working-from-home take-up

The Covid-19 pandemic has disrupted the way many people work. It has notably increased the share of people working from home. This creates an unexpected shock to the share of people working remotely instead of on-site. In 2018, the share of employees working at least regularly from home was around 12% in Germany, above 30% in the Netherlands, Finland, Iceland, Luxembourg and Denmark, and around or below 5% in Greece, Italy, Bulgaria and Romania (Eurostat). These numbers have increased dramatically during the Covid-19 lockdown, although differently across demographic groups. Indeed, since the start of the social distancing measures, many firms have made it possible for their employees to work from home in order to slow down the spread of Covid-19. WfH has long been considered as a means to improve the work-life balance, especially for parents. However, during the lockdown, many parents have to combine paid work and full-time childcare, which is likely to reduce their productivity and the expected benefits of WfH. Nevertheless, parents, and especially mothers, could benefit from an increased availability of WfH arrangements thanks to changes in technology and firm culture in the post-Covid-19 era.

How many jobs can be done from home?

Some recent studies provide estimates of the share of jobs that could be performed from home during the pandemic. For the U.S., Dingel and Nieman (2020) estimate that slightly more than 30% of jobs could be performed from home using the O*Net description of tasks performed on the job for each occupation. Using a similar method, Boeri et al. (2020) estimate this share to be above 30% for the U.K. and Sweden, around 28% for Germany, France, and just below 24% in Italy. We adopt a similar approach but use data on the task composition of jobs in Germany from the BiBB/BAuA Employment Survey.

Teleworkability Index: data and methodology

In order to compute the share of jobs that can be done from home, we draw on the BIBB/BAuA Employment Survey 2018, a representative survey of about 20,000 adult individuals in paid employment in Germany. First, we calculate the share of individuals reporting that their job cannot be done from home for each 3-digit occupation (German Classification of Occupations, KldB 1992). This information is particularly relevant to identify jobs that can be performed only on-site (the *WfH*

extensive margin). Table A1 shows the 5 occupations with the highest and lowest WfH extensive margin index. Second, we make use of detailed information about the tasks performed on the job to calculate the share of tasks that can be done from home at the occupational level. Specifically, we divide 18 tasks into those that can be done from home (teleworkable tasks) and those that cannot (non-teleworkable tasks) as shown in Table A2. For each individual, we first calculate the share of teleworkable tasks, and then aggregate this individual share to the occupational level. This task-based indicator is informative about the intensity of WfH, i.e. about the share of working time that workers can perform from home (*WfH intensive margin*). Table A3 shows the 5 occupations with the highest and lowest WfH intensive margin index.
The final *teleworkability index* combines both the WfH extensive and intensive margin to distinguish jobs that are i) fully teleworkable, ii) partially teleworkable, and iii) not teleworkable (see Appendix for more details).

Based on the computed teleworkability index (see box for details), we find that about 31% of jobs in Germany could be performed from home (Table 1). For another 12% of jobs, a substantial amount of tasks can be performed from home. These jobs could allow, for instance, to work from home 1-2 days per week or to divide the work between on-site and home during a standard workday. Still, more than half of jobs need to be completely carried out on-site. For the education sector, for instance, kindergarten teachers belong to the on-site occupations, school teachers to the occupations that are partially teleworkable and teachers in higher education or adult education are fully teleworkable. The resulting distribution of jobs along the teleworkability dimension varies across demographic groups. Women and parents are slightly overrepresented in jobs that can be (almost) fully done at home. Moreover, employees in fully or partially teleworkable jobs are much more likely to hold a university degree and to work in the public sector.

Table 1 – Potential working arrangement and actual employment status in 2018

	Share of…						
	Employment	working time at home	contractually agreed WfH	Women	parents with children < 13	university graduates	Public sector
Fully teleworkable	30,9	9,0	22,8	38,2	26,2	48,7	27,5
Partially teleworkable	12,0	13,8	15,7	36,4	24,1	55,4	42,1
On-site only	57,1	1,2	3,2	32,4	22,4	8,4	19,7

Notes: All numbers in percentage. BiBB/BAuA 2018 Employment Survey with sampling weights. Employees aged 16-65. The three categories in the left column are based on the teleworkability index described above.

Table 1 also reports the actual share of working time carried out at home by dividing weekly WfH hours by weekly contracted hours. As expected, workers in on-site occupations spend a very low share of their working time at home (1%), while workers in teleworkable jobs work much longer from home. Interestingly, the average time in WfH was higher among the jobs allowing some WfH (14%) than among those allowing full WfH (9%). This is because some of the occupations with the highest share of hours at home are only partially teleworkable, such as school teachers, musicians and religious

workers. However, the untapped potential of WfH is largest for the group of fully teleworkable jobs, especially as regards standard office jobs (Grunau et al., 2020).

Working-from-home take-up for men and women with and without children

While a certain share of jobs might be theoretically suited for WfH given the main tasks that are performed on the job, it is unclear whether employees and employers actually use this opportunity, or whether they keep on working onsite, reduce hours or terminate work contracts. To some extent, these choices are influenced by the need to care for one's children. Before the pandemic, less than 4% of the population in paid employment used to always work from home, while about 11.5% worked from home at least frequently (Table 2 for 2018). Women, and especially mothers of children under the age of 13, were more likely to use WfH arrangements as almost 5% of them worked always from home, and more than 15% did it at least frequently. The use of WfH has increased substantially during the lockdown. Using the SOEP-Cov survey for Germany, Grabka et al. (2020) report that, among individuals that had been employed in 2019, about 35% were working from home fully or as a complement to on-site work in early April 2020. The share of previously employed individuals who were *fully* working from home in the same period was 26% according to a German online survey (Möhring et al., 2020). Women were more likely to be (temporarily) out of work, but also more likely to fully work from home compared to men. Parents were also more likely to work from home as almost 30% of them were working exclusively at home early April. This represents a dramatic increase in full-time WfH compared to 2018. For the U.S., Brynjolfsson et al. (2020) find from an online survey that about 34% of workers have switched to working from home because of the pandemic, while 4.6% have continued to do so. Moreover, von Gaudecker et al. (2020) find that hours worked from home in the Netherlands increased from 12% to 74% of total hours between the pre-Covid-19 period and May 2020. The exposure to working from home has thus been huge.

Table 2 – WfH arrangements and preferences for WfH

		WfH				Not WfH		
		Always	Frequently	Sometimes	Rarely	Would WfH	Would not WfH	WfH not possible
No children under 13	*Women*	4,3	7,1	8,0	6,9	21,2	12,0	40,3
	Men	2,6	6,9	7,8	8,5	17,3	7,7	49,0
With children under 13	*Women*	4,9	10,3	8,8	7,0	25,1	8,9	34,9
	Men	3,3	9,3	11,5	9,3	18,6	6,6	41,4
Average		3,6	7,7	8,5	7,8	19,7	9,2	43,4

Notes: BiBB/BAuA 2018 Employment Survey with sampling weights. Employees aged 16-65.

Long-lasting changes in working practices

Already about 20% of employed people reported that they would like to work from home in 2018. As more firms and employees are now exposed to new ways of working, we expect that the availability and attitudes towards remote working will improve. In 2018, 43% of employees in Germany reported that WfH was not possible in their job (Table 2). Women and parents with young children were less likely to report that it wasn't possible. This pattern is consistent with the demographics of teleworkable jobs (Table 1) and might reflect a selection of parents into WfH-friendly occupations or firms. In the post-Covid-19 era, it is likely that WfH will gain in acceptance and that fewer employees will report WfH as unfeasible because firms have been forced to make necessary adjustments and investments to enable their employees to work from home.

As for preferences, in 2018, women and parents with young children were more likely to express the wish to work from home. These preferences might evolve depending on their experience during the lockdown. Bloom et al. (2015) study the effects of an experiment that randomly allocated call-centre employees to home or the office. At the end of the experiment, employees were given the choice over where to work, and those who were more productive at home switched to WfH. This highlights the benefits of learning and selection effects when being exposed to new ways of working. It is thus likely that people for whom WfH worked well will adopt WfH on a more regular basis even after the lockdown. As day care centres and schools are closed, households with and without young children are likely to differ in their WfH experience.

Working from home and childcare during the lockdown

The closure of schools and day-care centres represents a big challenge for parents who not only have to care for their children, but also need to ensure a minimum level of home-schooling. About 22% of households in Germany had at least one child in 2018 (Eurostat). This proportion was higher in all other EU Member States, the highest being recorded in Ireland (39%), Cyprus, Poland and Slovakia and Romania (above 35%). The ability to be productive at home will depend on the employment situation of both partners and on the number and age of the children. Mothers might encounter more difficulties to work effectively from home given that they usually provide the larger share of childcare at home. In 2018, German couples with at least one child below 13 years had a very unequal division of tasks within the households. Even if both parents were in paid employment (full or part-time), mothers devoted almost three times as many hours on childcare during a weekday as their male counterparts ($5^{1/2}$ hours vs. 2 hours on average).[1] Moreover, mothers spent more than one additional hour, or almost twice as long as fathers, on housework during a weekday.

Is the division of tasks within the household likely to be affected during the pandemic? The answer depends on whether fathers are more likely than mothers to reduce their working hours and spend more time at home because of the lockdown. In fact, when the father works from home at least once

[1] Data from the 2014 wave of the SOEP for couples with at least one child under 16 years old.

a week but the mother works onsite only, the time spent on childcare is less unequal and housekeeping is equalised between the two partners. In order to get some ideas about the likely impact of the lockdown on the intra-household division of tasks, we document the mix of parents' employment statuses in Germany as has been done by Alon et al. (2020) for the US.

Table 3 shows that, in households with children under 13 years old, mothers are more likely to be out of paid employment (almost 20%) compared to fathers (5%); these figures include workers in sectors that had to close for several weeks because of the lockdown (see list in Table A5). Hence, for 28% of households the mother has more flexibility and is likely to spend even more time on household tasks. About 24% of parents live together and have a similar employment status. In these households, women are likely to keep on providing more time at home than their partner as mothers work fewer contractual hours than fathers in 85% of couples, and earn lower hourly wages in more than 60% of couples (SOEP 2018). In fact, a recent survey among German employees suggests that the pandemic tends to revive traditional role models (Kohlrausch and Zucco 2020). Compared to pre-Covid-19, on average, it is mainly mothers that have reduced working hours and increased the time spend on childcare while corresponding adjustments among fathers turn out to be much smaller.

Table 3 - Job composition in households with children under 13 years old

		Father's employment status					*Single mother*	Total
		Essential job	Work on-site only	Some WfH possible	Fully WfH possible	Not in paid work		
Mother's status	Essential	11.25	**10.12**	**3.29**	**10.36**	**1.68**	3.42	40.12
	on-site	2.31	2.87	**0.40**	**0.91**	**0.06**	2.14	8.68
	some WfH	1.70	1.68	0.66	**0.69**	**0.65**	0.45	5.83
	fully WfH	4.29	5.71	1.41	8.01	**1.20**	2.85	23.47
	Not in paid work	2.84	8.23	2.22	1.76	1.49	3.73	20.27
Single father		0.72	0.33	0.08	0.47	0.01		1.63
Total		23.12	28.93	8.06	22.20	5.11	12.59	100 / 100

Notes: The German Socio-economic Panel 2018 gives the employment composition within households. The list of essential jobs provided by the State of Berlin is matched to the individual data using 3-digit occupation and 2-digit industry codes. WfH possibility is defined using the description of tasks and the share of employees reporting that their job cannot be done from home in 3-digit occupations from the BiBB/BAuA 2018 Employment Survey. We do not report statistics for same sex couples with children as they are very rare. Code available upon request.

However, mothers are also more likely to hold an essential job (40%) than fathers (23%) which reverts the traditional role models (see Table A4 for list of essential jobs). In more than 25% of households, the mother works in a sector that has to continue operating while the father does not. In another 4 % of households, the mother has less flexibility than the father (on-site vs. WfH; work on-site or at home

vs. out of work). Hence, in about 30% of households[2] the Covid-19 shock is likely to induce shifts in the intra-household allocation of tasks from mothers to fathers.

What will be the medium-term consequences of the increase in remote working?

Given the recent exposure to WfH and preferences for this work arrangement, it is likely that the share of people working remotely remains high even after social distancing rules are alleviated and schools open again. Both theory and empirics suggest that the possibility to work from home increases labour supply at the intensive margin, especially among mothers (see Arntz et al., 2019, for a review and new results for Germany). In addition, experiments at the firm level show that WfH may increase worker productivity (Bloom et al., 2015; Angelici and Profeta, 2020). In fact, the need to organize remote work on a grand scale during the Corona pandemic is likely to establish new and highly productive forms of remote work that may even substitute for certain on-site activities or business meetings. The costs and benefits of WfH are likely to be re-evaluated in light of the current experiences. In this case, pre-Covid-19 findings on the effects of WfH on hourly wages may change. So far, the evidence shows that WfH comes with a wage premium only if it increases contractual hours, as has been shown for fathers in Arntz et al (2019). For mothers, until now, similar benefits are restricted to those who simultaneously change employer. Conversely, WfH may even bring a penalty if it is used to do overtime only, despite potential signalling and productivity effects. With new work organisations and a broader adoption of digital technologies, productivity at home is likely to increase. Thus, overtime done from home is more likely to be associated with positive wage compensation in the future.

Even if workers, especially women with young children, value flexible work arrangements (Mas and Pallais, 2017; Angelici and Profeta, 2020), WfH may generate new sources of conflict and stress at home (Song and Gao, 2019). Arntz et al. (2019) find that, in Germany, employees without children under the age 16 who start WfH do an extra hour per week of unpaid overtime and still report higher job satisfaction. On the other hand, parents with young children increase their contracted working hours and report no significant change in job and life satisfaction.

Conclusion

Overall, the effects of WfH arrangements depend a lot on the presence of dependent children, and the current situation is likely to exacerbate these differences. For parents, WfH during the lockdown may result in a negative experience with a potential increase in conflicts between work and family needs. However, after childcare facilities and school open again, parents could fully benefit from a higher availability of WfH arrangements as the required technology has been adopted and firm culture has changed. Based on the findings of Arntz et al. (2019) for Germany, more WfH opportunities could help reduce gender gaps in hours worked and wages in the labour market. These gains might even be larger after the lockdown for two reasons. First, WfH is likely to be seen less as a means to accommodate

[2] Summing up all cases where the mother has less work flexibility than the father, in bold in the table.

private needs, and more as a means to organize certain types of tasks efficiently in a way that is beneficial to the firm. Second, the intra-household reallocation of tasks during the lockdown may have long-lasting effects which will benefit women in households where the father previously increased the time spent on childcare and housework. However, for a substantial share of households, the lockdown may strengthen or even revive traditional gender roles, hence potentially inducing negative effects for women's future career prospects. Digging deeper into the heterogeneous impact of Covid-19 on female and male labour market outcomes will thus be an important path for future research.

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Appendix

1. WfH feasibility of jobs

Table A1 shows the 5 occupations with the highest and lowest share of workers reporting that WfH is *not* possible in their job. Occupations for which it is not possible to work from home are in the manufacturing and construction sectors, in particular low –qualifications jobs such as brick layers, but also in the transport sector, such as drivers, or in the health sector, such as nurses. Conversely, the jobs with the lowest share of employees reporting WfH is not possible are mostly high-skill jobs in the IT, marketing or consultancy sectors. This information has been employed by Alipour et al. (2020) who directly use the share of workers reporting WfH is not possible to infer the share of jobs that are teleworkable. They find a higher share of teleworkable jobs and interpret it as an upper bound estimates. We depart from their method as we intend to identify jobs that can be fully done from home and those that can be done partially from home. We do so by using additional information on tasks performed on the job.

Table A1: Five occupations with highest and lowest WfH extensive margin index

Occupation	share of workers reporting WfH not possible in job
Bricklayers	0.87
Nursing assistants	0.82
Motor vehicle drivers	0.81
Railway engine drivers	0.81
Machinists	0.81
Marketing experts	0.02
Data processing advisors	0.01
Data processing specialists	0.01
Business consultants	0.00
Data processing organisers	0.00

Notes: We only report occupations with more than 30 observations.

To complement the *WfH extensive margin index* discussed above, we use information on tasks performed on the job which are useful information for at least two reasons: i) people may report that they cannot WfH because the technology has not been implemented in their firm although they could if the technology was adopted ii) people may report that they work from home or would like to do so but only perform few of their tasks remotely which implies that they are not in the full-time WfH category. Table A2 shows what tasks are non-teleworkable, such as "manufacturing, producing goods and commodities", and what tasks are teleworkable, such as "gathering information, researching, documenting".

Table A2- List of tasks by teleworkability

Non-teleworkable tasks	**Other, potentially teleworkable, tasks**
Manufacturing, producing goods and commodities	Providing advice and information
Measuring, testing, quality control	Advertising, Marketing, Public Relations, PR

Monitoring, control of machines, plants, technical processes	Organizing, planning and preparing work processes
Repairing, renovating	Developing, researching, constructing
Transporting, storing, shipping	Gathering information, researching, documenting
Entertaining, accommodating, preparing food	Working with computers
Nursing, caring, healing	Use of the Internet or e-mail processing
Protecting, guarding, monitoring, regulating traffic	Purchasing, procuring, selling
Cleaning, waste disposal, recycling	

Notes: The group of tasks "Training, instructing, teaching, education" is excluded from the list, since it may be partly but not fully teleworkable.

Table A3 shows that the 5 occupations with the lowest share of teleworkable tasks are either jobs in the manufacturing sector that require special machineries, or service jobs with frequent contact to clients, such as waiters. On the contrary, the occupations with the largest share of teleworkable tasks are office jobs with computer use, such as bookkeepers, office clerks, consultants, architects and lawyers. Note that both indexes are based on data for 2018, and thus abstracts from the very recent adoption of new digital technologies allowing virtual meetings, virtual training, improved data access and process implementation from home.

Table A3: Five occupations with highest and lowest intensive margin index

Occupation	Share of tasks possibly done from home
Legal representatives, advisors	0.81
Sales and distribution	0.80
Business consultants	0.78
Architects	0.78
Accountants	0.77
Other housekeeping attendants	0.35
Carpenters	0.35
Machinery, container cleaners	0.35
Bricklayer, furnace and chimney builder	0.35
Machinists	0.33

Notes: We only report occupations with more than 30 observations.

The final teleworkability index defines an occupation as teleworkable if more than 2/3 of the tasks can be done from home and less than 20% of individuals in the occupation report that WfH is not possible. An occupation is non-teleworkable if more than one third of individuals report that WfH is not possible in the job or if more than half of the tasks are non-teleworkable. In the other occupations, WfH is feasible for part of the job, but on-site work is also necessary. Note that the WfH extensive margin index is important mainly to identify on-site jobs, while the intensive margin index affects mainly the distinction between jobs that allow only some WfH and those can be mainly done from home. In fact, using only one index would change the classification only for 29 out of 342 occupations or 2% of jobs.

Still, using both indexes allows for a more precise classification, especially when dealing with occupations with a small number of observation in the data.

2. Essential jobs and closed businesses

For the classification of essential occupations we follow the list published by the state of Berlin (see Table A4). In many cases, only very specific employees qualify as "system-relevant". For instance, while we classify the staff in childcare facilities as essential, kindergarten were offering only a reduced "emergency" care during the shut-down and not all workers in childcare have been working during this time. Our classification based on the 3-digit occupational codes and 2-digit industry codes is thus likely to overestimate the number of workers in essential jobs.

Table A4: List of essential occupations

Occupation	**Description**
Police	
Firefighters	
Bundeswehr	
Humanitarian organisations	e.g. Johanniter, Malteser, DRK, THW, voluntary firefighers, emergency pastoral care, emergency hotlines, etc.
Law enforcement	Staff essential for maintaining the functioning of courts and law enforcement agencies.
Crisis team members	
System-relevant workers at airports	
System-relevant staff in public institutions and in public authorities of the Federal Government, federal states, regional authorities, subordinate public entities, etc. Public support organisations and emergency Services.	Emergency services in youth support and child protection. Emergency dwelling, stationary and partly stationary emergency institutions. Day care centers (kindergartens), legal guardians, mobile socio-educational support. Staff in refugee asylums. District administration, e.g. youth welfare office, health office, office of public order, "Bürgeramt". Federal printing office. Deutsche Rentenversicherung (German public pension insurance). Lawyers. Chamber of industry and commerce (IHK). Associations of statutory health insurance registered doctors (Kassenärtzliche Vereinigung). Staff in health insurance. Teachers, pedagogical and non-pedagogical staff for exams and exam-relevant classes, regular classes and opening of schools. Teachers and professors using interactive classes for university students and staff necessary to maintain basic essential services at universities. Messe Berlin. Job offices
System-relevant staff in public transportation	Drivers, cleaning staff, security staff, and members of control units. NOT: cab drivers
System-relevant members in energy Provision	Gas stations, electricity supply, workers in system-relevant energy and power plants, network maintenance workers

System-relevant staff in water upply	Provision of drinking water, sewerage disposal, laboratories, maintenance of water facilities
System-relevant staff in healthcare sector	Hospital staff, trainees and apprentices. Students in the healthcare and care sector. Staff in laboratories and pharmacies. Medical practices, incl. psychotherapists, psychiatrics, psychologists, speech and occupational therapists. midwives suppliers of life-sustaining medical products (producers of medical products and of drugs) private patient transport
System-relevant staff in care sector	both inpatient and outpatient care, including cleaning, kitchen, . . .
Support of disabled people	Workshops for disabled people, staff in inpatient/outpatient care
Staff securing emergency care in schools and childcare kitas	Childcare (Kita): pedagogical staff, cleaning staff, kitchen staff School: pedagogical and non-pedagogical staff such as nursery school teachers, supervisors, teachers, janitors, heads of administration, school secretaries
Other system-relevant staff in critical infrastructure and basic supply	Basic supply: supply with groceries including grocery stores, bakeries, confectioners, tobacco shops, beverage stores, night-shops, drug stores, production facilities, wholesale and retail sector Deutsche Post. Media: news and information incl. TV, radio, internet; journalists, retailers and logistics for production, e.g. printers. Finance: banks, investment bank, Landesbanken, monetary transport. ICT: Data and computer centres, security of transmission networks, telecommunication services (e.g. Telekom, Vodafone, etc.) Other: veterinaries, animal caretakers, animal food shops, pest control, security firms, German army, fault clearance services (e.g. elevators, gas, electricity, water), undertakers, staff at graveyards, pastoral care of all confessions, secretaries in trade unions.

Note: List of essential jobs based on the Senatsverwaltung für Bildung, Jugend und Familie in Berlin as of April 22, 2020. There is no list available on the national level. Every German federal state has its own list on syste-relevant jobs, but the definitions of system-relevant occupations are comparable. Berlin publishes the most detailed list.

In Table 2 in the main text, we consider that individuals are out of paid work if they work in businesses and facilities that have been closed for at least six weeks in March and April 2020. The list of these businesses is provided in Table A5.

Table A5: Closed businesses and facilities between 16 March and May 4, 2020.

Shops *except* shops essential to secure basic supply (e.g. supermarkets, beverage stores, butchers, bakeries…)
Restaurants, cafés
Hotels, pensions
Services in body care (e.g. hairdressers, cosmetics, tattoo studios and massage practices…)
Sports and leisure facilities (e.g. sport centres, swimming pools…)
Bars and Clubs
(Trade) fairs
Community colleges, music schools and other public and private education centres other than schools
Driving schools
Amusement parks and other leisure activities (outside and inside)
Casinos, bookmakers
Brothels
Theatres, concert halls and opera houses

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