

DISCUSSION PAPER SERIES

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ABSTRACT

Germany's Capacities to Work from Home

Due to the COVID-19 crisis and the related “social distancing” measures, working from home (WfH) has suddenly become a crucial lever of economic activity. This paper combines survey and administrative data to compute measures for the feasibility of working from home among German employees. Breaking down the data by occupation, region, industry, and employee characteristics, we document considerable variation in the potential to WfH across all dimensions. We find that WfH is feasible for roughly 56 percent of the overall German workforce, while less than half of this potential was exploited in the pre-pandemic economy.

JEL Classification: D24, J22, J24, O33, R12

Keywords: COVID-19, working from home, Germany

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1. Introduction

In the wake of the outbreak of the pandemic COVID-19, citizens in many countries are urged to stay at home and to reduce social contacts to a minimum. The degree to which economic activity is impaired by such social distancing measures largely depends on the capacity of firms to maintain business processes while many employees stay at home. The German industry with the highest share of workers registered for short time work in March 2020 was “Accommodation and Food Service Activities”, one of the industries with the least scope for remote work. Conversely, the share of short-time work in the industry with the highest calculated capacity to work from home, “Financial and Insurance Activities”, is close to zero.¹ At the individual level, the possibility to carry out work remotely can reduce the risk of exposure to both the disease and the economic shock associated with governmental actions against the pandemic.

In this paper we provide an estimate of the overall capacity of German employees to work from home (WfH) and document how the feasibility of remote work varies across occupations, industries and regions in Germany. We investigate which groups of employees are particularly vulnerable to the consequences of COVID-19 shutdowns, due to the fact that their jobs cannot be performed remotely. Finally, we identify work activities and job features that are most closely correlated with the feasibility of WfH.

Up until the COVID-19 pandemic outbreak, Germany’s share of employees who work from home “sometimes” or “usually” was below the European average (Figure 1). In European countries in which remote work is most common, such as Sweden or the Netherlands, the proportion of employees working at least partially from home is about three times higher than in Germany. This disparity is arguably driven not only by cross-country heterogeneity in industry composition and technical viability, but also by cultural differences. Whatever the reason, in the course of the COVID-19 crisis, such hurdles to WfH will be quickly dismantled wherever possible. The policy-relevant questions now are: How many jobs can possibly be

¹<https://statistik.arbeitsagentur.de/Statistikdaten/Detail/202003/iiia7/kurzarbeit/kurzarbeit-d-0-202003-xlsx.xlsx>.

performed at home? How does the capacity to WfH vary across industries and regions? What groups of employees are particularly vulnerable as they lack the possibility to work from home?

Figure 1 about here

We find that roughly 56 percent of all jobs in the current German economy can plausibly be performed at home. In comparison, Dingel and Neiman (2020) and Del Rio-Chanona et al. (2020) calculate the WfH potential to be about 37 percent and 43 percent in the U.S. economy. In contrast to these studies, which base their measure on plausibility judgements, we compute a measure for WfH feasibility that relies on employees' own assessment concerning the feasibility to perform their jobs from home.

2. Data and Empirical Approach

Our measure for WfH feasibility builds on survey information from 17,160 employees (aged 18-65) from the 2018 wave of the BIBB/BAuA Employment Survey. More precisely, we suppose that a job cannot be performed at home if the respondent indicates that WfH is “not possible” even if the employer were to grant the option.²

We subsequently aggregate this information (population weighted) to the occupation level using the 2-digit German Classification of Occupations (KldB 2010). We then combine this measure with administrative data from the Federal Employment Agency (BA) on occupational employment counts in the current German economy overall, by sector, and by county.

Similar to other studies, our results represent upper bound estimates for the actual WfH potential for two reasons: First, our measure cannot account for the fact that some jobs cannot entirely be performed at home. Second, to the extent that relocating work to peoples' homes is associated with costs (e.g. requirements for new technical equipment or decline in workers' productivity), a notable portion of the WfH capacity might not be exploited in equilibrium.

²The survey question reads “If your company would allow you to work at home temporarily, would you accept this offer?”—*Yes; No; Is not possible with my work.*

3. Results

We find that overall, roughly 56 percent of jobs in the current German economy can plausibly be performed at home. Figure 2 reports the capacity to WfH as well as the share of employees actually working from home (frequently or occasionally) overall and broken down by industry. Industries are displayed in descending order according to their contribution to GDP. The figure shows that in the pre-pandemic German economy less than half of the overall WfH capacity was exploited.

Figure 2 about here

Moreover, there is a considerable variation in WfH potential across industries. Sectoral WfH capacity ranges between 37 and almost 90 percent. The magnitude of a sector's "untapped WfH capacity" provides information about the potential adjustment costs in a sector that would occur in order to exploit the full WfH capacity. For example, while almost 90 percent of employees in "Financial and Insurance Activities" could in fact work from home, only 38 percent did so in 2018. Hence, the number of employees working remotely would have to more than double to exploit the full WfH potential in this industry, which might put a strain on corporate IT systems. Table A2 in the Appendix reports the results for each industry at the 2-digit NACE level.

Figure 3 depicts the geographic distribution of WfH capacity across German counties. The map reveals a clear divide between East and West and between urban and rural regions. While on average 59 percent of employees in West Germany (including Berlin) can perform their job from home, in East Germany (excluding Berlin) only 50 percent of employees can do so. Even more striking are the urban-rural differences in WfH capacity: WfH capacity amounts to roughly 65 percent in cities with 500,000 inhabitants or more, versus on average 53 percent in the rest of the country.

Figure 3 about here

The breakdown of WfH capacity by employees' education, income, gender, and domestic childcare duties is displayed in Figure 4. It is striking that the feasibility of WfH increases strongly with higher education qualification and income.

Women exhibit an about 9 percentage points higher WfH capacity than men, mainly due to women’s larger untapped WfH capacity. Within gender groups, employees with young children (below age 11) in the household show a 3-4 percentage point higher WfH capacity than employees without such domestic childcare duties.

Figure 4 about here

Figure 5 displays our measure for WfH feasibility at occupation level in descending order by WfH capacity. Table A1 in the Appendix reports the corresponding numbers. At the top of the WfH-feasibility distribution range occupations in computer science and ICT as well as occupations in advertising and marketing. Examples for jobs with rather low WfH capacity are drivers and operators of vehicles and transport equipment or occupations in the field of interior construction.

Figure 5 about here

In addition to the calculation of the WfH capacity in the overall German economy, we use our measure for WfH feasibility at the employee level to identify job tasks and characteristics that are most correlated with WfH feasibility. This exercise may be helpful to calculate WfH capacity in circumstances in which an employer-based assessment is unavailable or to validate previous efforts to calculate WfH feasibility based on idiosyncratic subjective judgements at the task level. To this end, we regress the available information on job tasks on employee’s assessment of WfH feasibility in a simple logit model. Average marginal effects from this model are reported in Figure 6. We find that the top-3 job characteristics that are significantly positively associated with the feasibility of working from home are “Using computers, the internet or e-mail processing”, “Developing, researching, constructing” and “Working in seated position”. In contrast, the features “Working standing up”, “Transporting, storing, shipping” and “Nursing, caring, healing” are significantly negatively correlated with WfH feasibility.

Figure 6 about here

4. Discussion and Conclusion

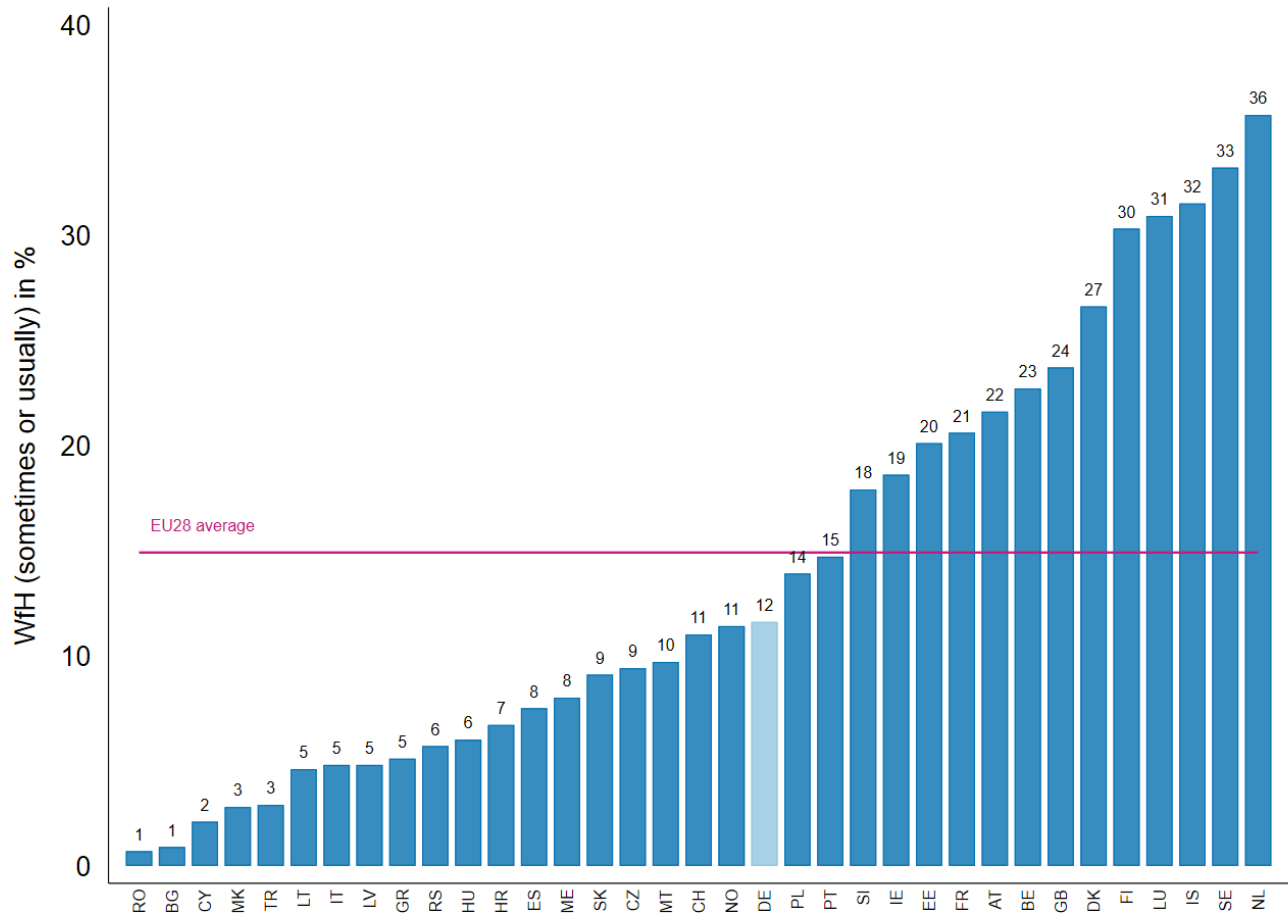
Due to emergency confinement measures in the current COVID-19 crisis, employees' capacity to work from home has become an important instrument for firms to prevent business failure. Hence, our estimate of the overall capacity to work from home among German employees is highly relevant for researchers and policy-makers attempting to predict economic activity during the COVID-19 shutdowns. Additionally, the breakdown of WfH capacity by industries and counties can be helpful in directing assistance to the most deprived industries and regions as well as to evaluate where a selective and gradual exit from economic shutdown is most/least urgent. Once public health considerations are taken into account, one might argue that those industries and regions displaying high WfH capacities should have lower priority when reducing restrictions.

Our results document which groups of employees are most vulnerable to the consequences of COVID-19 shutdowns, due to the fact that their jobs cannot be performed from home. We find disproportionately high levels of vulnerability for the low-skilled and low-wage earners. Gender differences are less stark but indicate higher WfH capacity for women and for employees with young children in the household. To some extent, women with small children might hence be temporarily sheltered from income losses due to COVID-19 restrictions. However, these employees are also more likely to be affected by increased stress levels due to the necessity to reconcile work and childcare, especially if their partners do not have the possibility to work from home.

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- Dingel, J. and B. Neiman (2020). How Many Jobs Can be Done at Home? NBER Working Paper No. 26948.

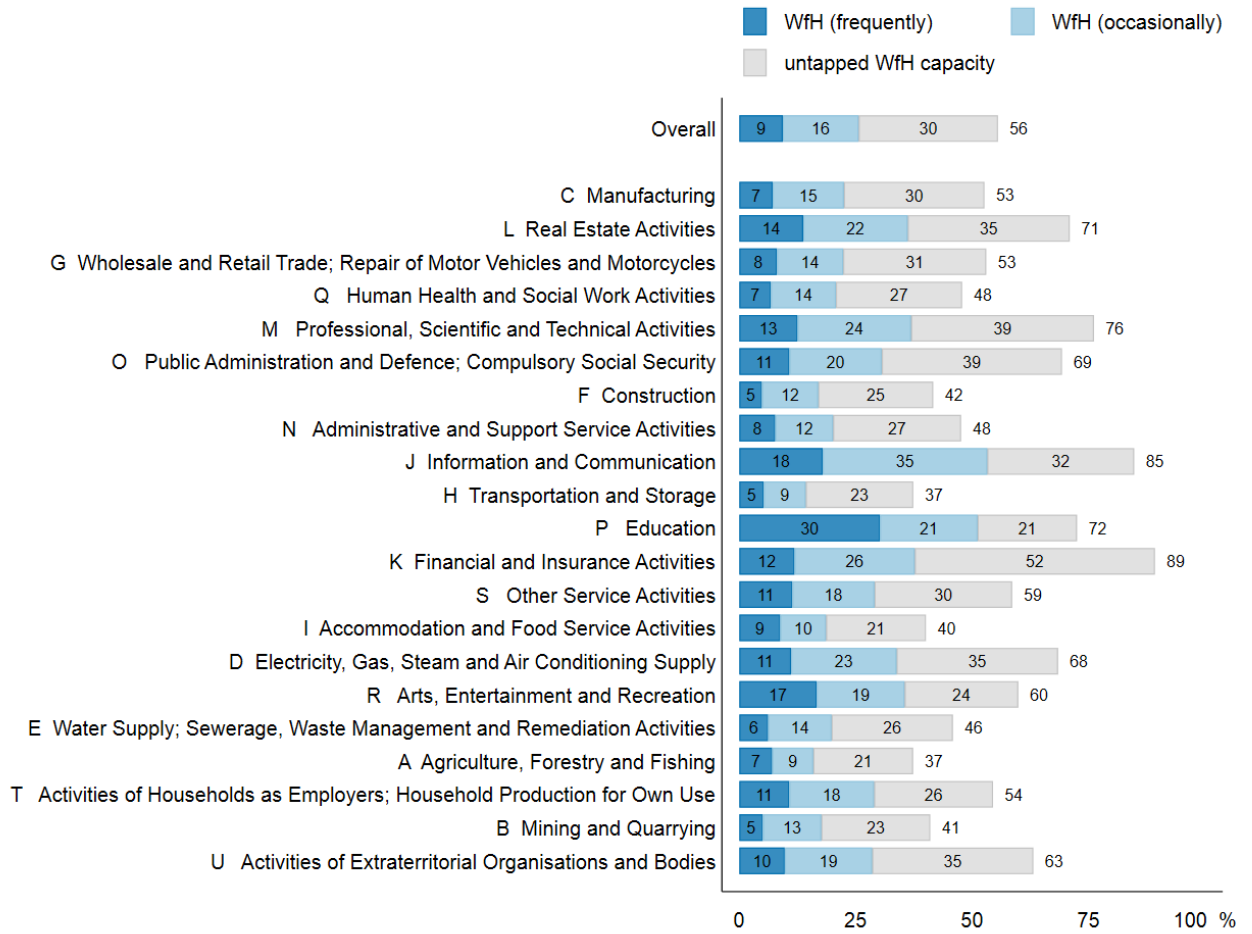
Figure 1: Working from Home (WfH) across Europe, 2018



Source: European labour force survey (EU-LFS) 2018, own calculation.

Notes: Red line = EU28 average (14.9 percent).

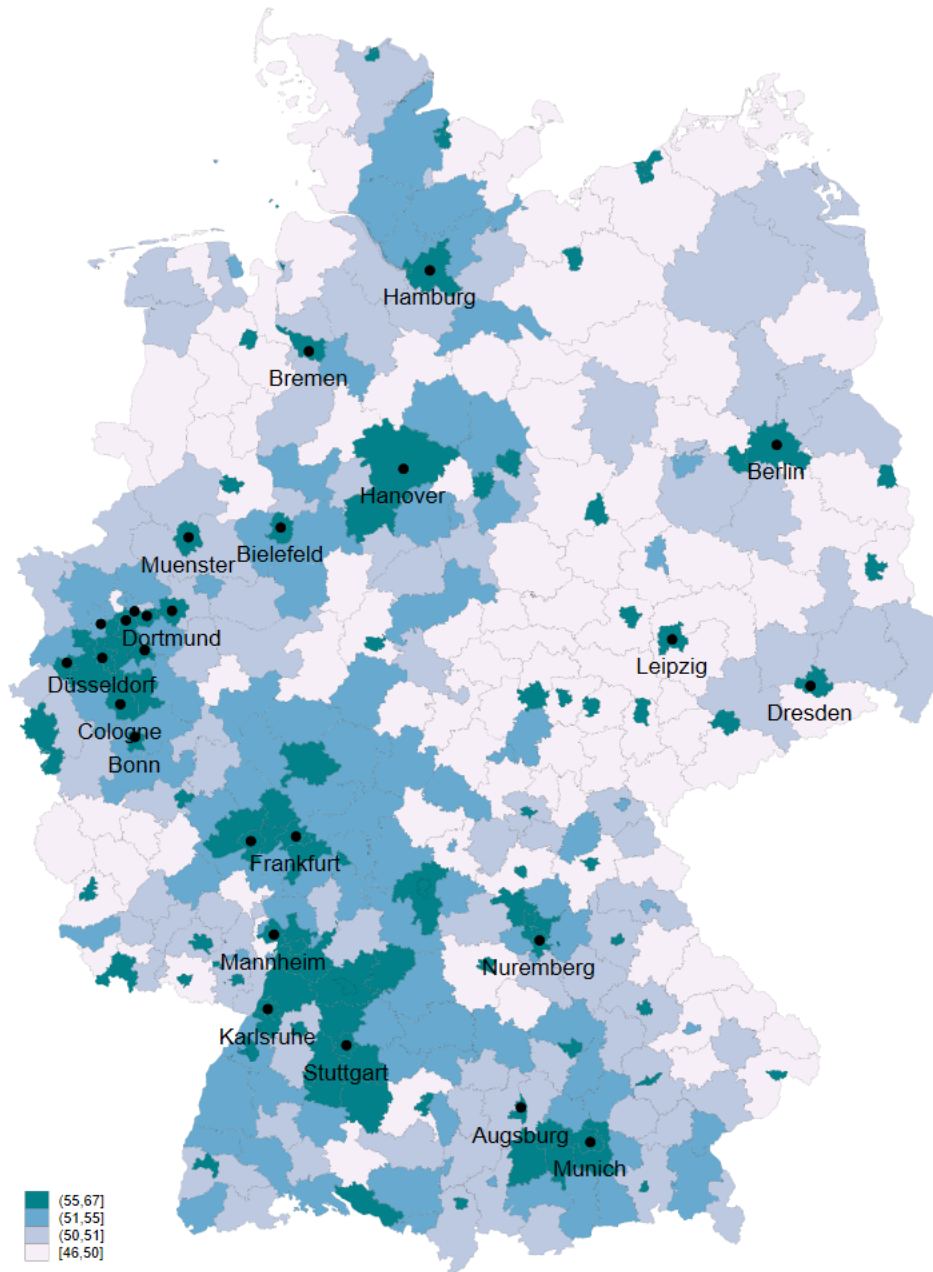
Figure 2: Capacity to Work from Home (WfH) by Industry, Germany



Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.

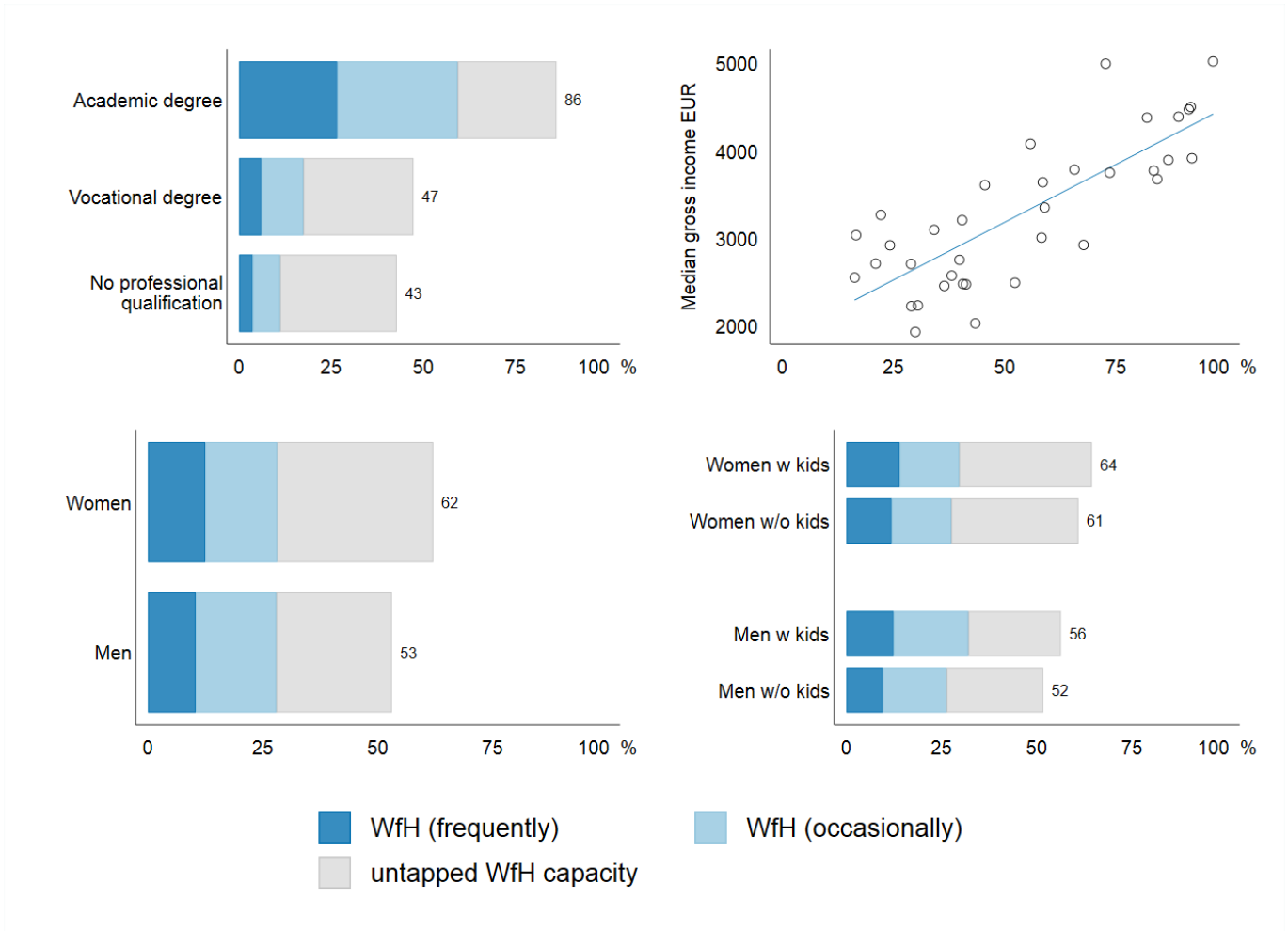
Notes: Displayed in descending order of industries' share of GDP. Industries defined according to the Statistical Classification of Economic Activities in the European Community (NACE).

Figure 3: Percentage of employees who could work from home, Germany



Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.
Notes: Black dots represent cities >250,000 residents.

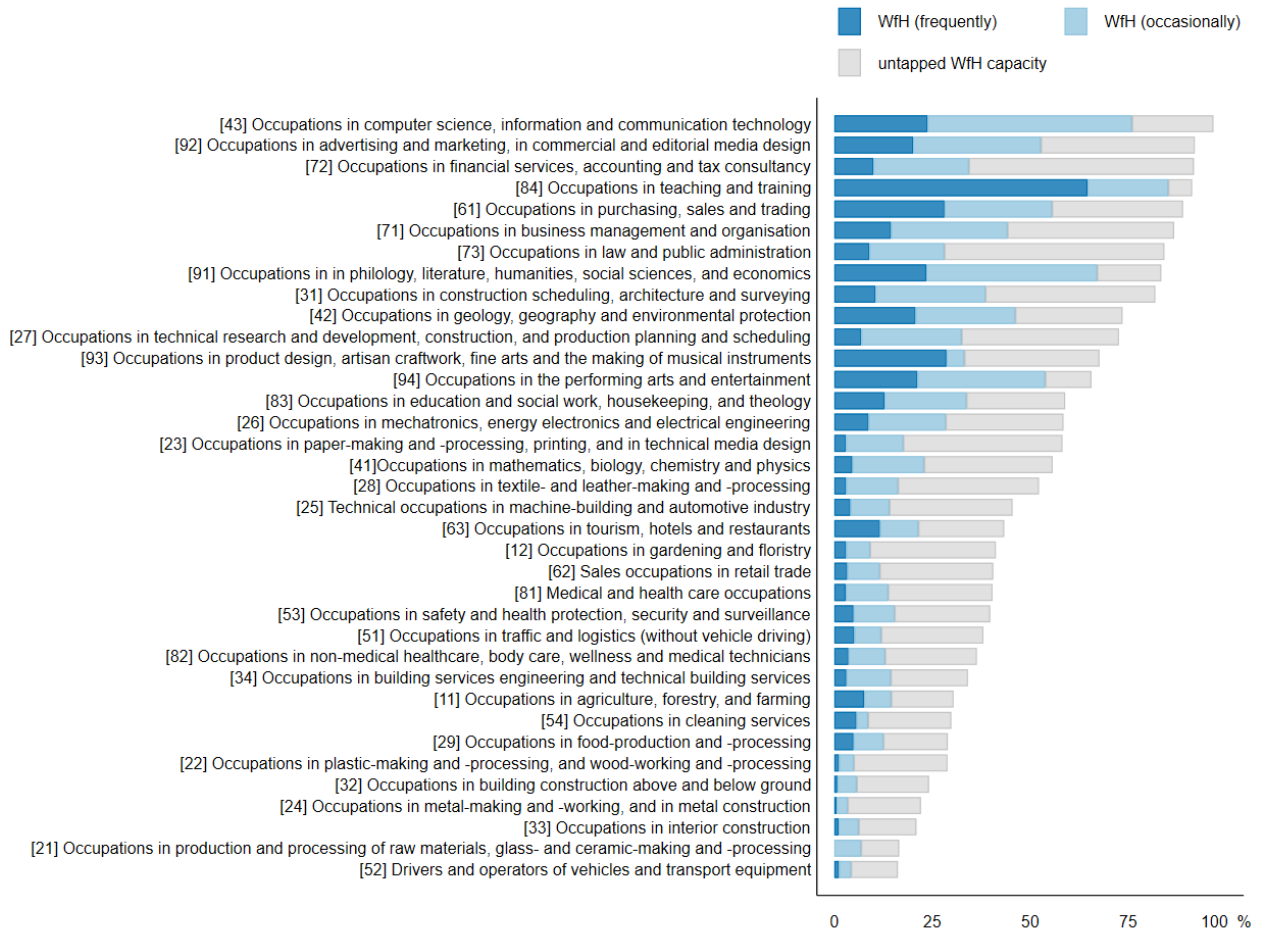
Figure 4: Capacity to Work from Home by Education, Income, Gender and Domestic Childcare Duties



Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.

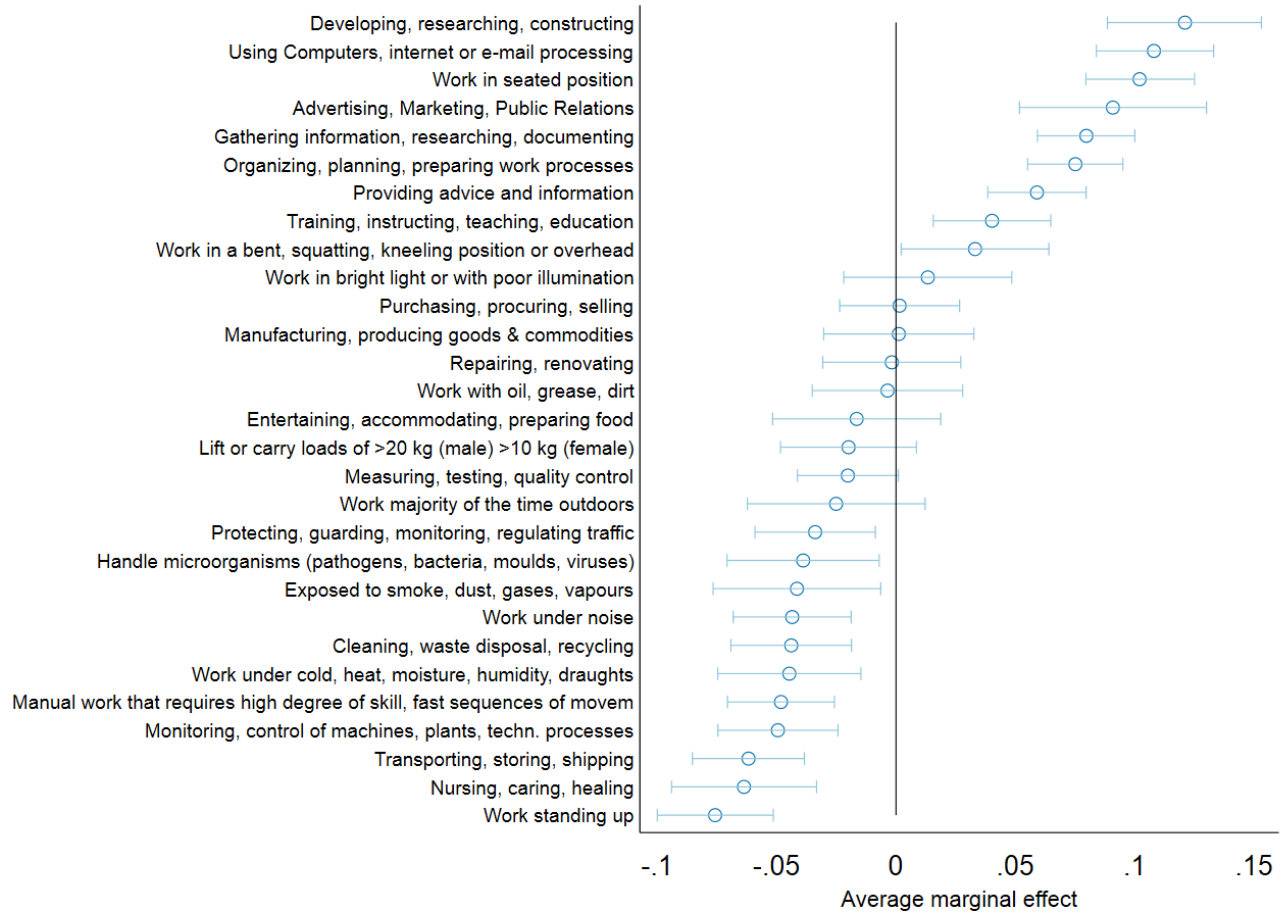
Notes: “With kids” defined as employees with at least one child below the age of 11 living in the household. Statistics by gender, childcare duties, and education based on weighted employee-level survey information. Statistics by income additionally employ occupational-level BA information on median gross monthly income.

Figure 5: Capacity to Work from Home (WfH) by Occupation, Germany



Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.
 Notes: Occupations defined according to the German Classification of Occupations 2010 (KldB 2010).

Figure 6: Tasks and Capacity to Work from Home (WfH), Employee-Level



Sources: BIBB/BAuA Employment Survey 2018, own calculations.

Notes: Figure reports average marginal effects from a logistic regression at the individual level. The dependent variable equals zero if the respondent indicates that working from home is “not possible” in her job, and one otherwise. Explanatory variables are coded as one if the respondent indicates that a given task or working condition is frequent, and zero otherwise. $N = 16,892$. Estimation uses robust standard errors and population weights. Confidence intervals at the 95% level. Pseudo R-squared = .24.

Appendix

Table A1: Capacity to Work from Home by Occupation, Germany

	WfH Capacity (%)
11 Occupations in agriculture, forestry, and farming	30.44
12 Occupations in gardening and floristry	41.25
21 Occupations in production and processing of raw materials, glass/ceramic-making/processing	16.56
22 Occupations in plastic-making and -processing, and wood-working and -processing	28.91
23 Occupations in paper-making and -processing, printing, and in technical media design	58.23
24 Occupations in metal-making and -working, and in metal construction	22.13
25 Technical occupations in machine-building and automotive industry	45.50
26 Occupations in mechatronics, energy electronics and electrical engineering	58.49
27 Occupations in technical R&D, construction, and production planning and scheduling	72.65
28 Occupations in textile- and leather-making and -processing	52.26
29 Occupations in food-production and -processing	28.97
31 Occupations in construction scheduling, architecture and surveying	81.92
32 Occupations in building construction above and below ground	24.17
33 Occupations in interior construction	20.96
34 Occupations in building services engineering and technical building services	34.12
41 Occupations in mathematics, biology, chemistry and physics	55.74
42 Occupations in geology, geography and environmental protection	73.57
43 Occupations in computer science, information and communication technology	96.77
51 Occupations in traffic and logistics (without vehicle driving)	38.06
52 Drivers and operators of vehicles and transport equipment	16.24
53 Occupations in safety and health protection, security and surveillance	39.79
54 Occupations in cleaning services	29.88
61 Occupations in purchasing, sales and trading	89.00
62 Sales occupations in retail trade	40.58
63 Occupations in tourism, hotels and restaurants	43.36
71 Occupations in business management and organisation	86.72
72 Occupations in financial services, accounting and tax consultancy	91.76
73 Occupations in law and public administration	84.23
81 Medical and health care occupations	40.39
82 Occupations in non-medical healthcare, body care, wellness and medical technicians	36.38
83 Occupations in education and social work, housekeeping, and theology	58.92
84 Occupations in teaching and training	91.32
91 Occupations in in philology, literature, humanities, social sciences, and economics	83.45
92 Occupations in advertising and marketing, in commercial and editorial media design	92.02
93 Occupations in product design, artisan craftwork, fine arts, making of musical instruments	67.68
94 Occupations in the performing arts and entertainment	65.63

Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.

Notes: Occupations defined according to the German Classification of Occupations 2010 (KldB 2010), 2-digit.

Table A2: Capacity to Work from Home by Sector (2-digit), Germany

	WfH Capacity (%)
1 Crop and animal production, hunting and related service activities	37.15
2 Forestry and logging	39.10
3 Fishing and aquaculture	37.61
5 Mining of coal and lignite	39.38
6 Extraction of crude petroleum and natural gas	53.13
7 Mining of metal ores	39.27
8 Other mining and quarrying	39.01
9 Mining support service activities	46.06
10 Manufacture of food products	41.83
11 Manufacture of beverages	49.41
12 Manufacture of tobacco products	54.56
13 Manufacture of textiles	57.91
14 Manufacture of wearing apparel	65.42
15 Manufacture of leather and related products	57.80
16 Manufacture of wood and of products of wood and cork, except furniture	42.82
17 Manufacture of paper and paper products	58.59
18 Printing and reproduction of recorded media	63.42
19 Manufacture of coke and refined petroleum products	61.24
20 Manufacture of chemicals and chemical products	60.79
21 Manufacture of basic pharmaceutical products and pharmaceutical preparations	62.59
22 Manufacture of rubber and plastic products	48.28
23 Manufacture of other non-metallic mineral products	43.61
24 Manufacture of basic metals	43.36
25 Manufacture of fabricated metal products, except machinery and equipment	43.33
26 Manufacture of computer, electronic and optical products	64.73
27 Manufacture of electrical equipment	61.29
28 Manufacture of machinery and equipment n.e.c.	55.36
29 Manufacture of motor vehicles, trailers and semi-trailers	55.12
30 Manufacture of other transport equipment	57.57
31 Manufacture of furniture	45.58
32 Other manufacturing	54.29
33 Repair and installation of machinery and equipment	55.64
35 Electricity, gas, steam and air conditioning supply	68.43
36 Water collection, treatment and supply	58.83
37 Sewerage	50.21
38 Waste collection, treatment and disposal activities; materials recovery	42.31
39 Remediation activities and other waste management services	48.08

Continued on next page

Table A2: cont'd

	WfH Capacity (%)
41 Construction of buildings	40.68
42 Civil engineering	38.22
43 Specialised construction activities	42.39
45 Wholesale and retail trade and repair of motor vehicles and motorcycles	52.10
46 Wholesale trade, except of motor vehicles and motorcycles	64.06
47 Retail trade, except of motor vehicles and motorcycles	46.84
49 Land transport and transport via pipelines	29.85
50 Water transport	49.46
51 Air transport	43.04
52 Warehousing and support activities for transportation	42.73
53 Postal and courier activities	38.54
55 Accommodation	42.77
56 Food and beverage service activities	38.98
58 Publishing activities	83.62
59 Motion picture, video and television programme production, sound recording, music publishing	69.84
60 Programming and broadcasting activities	79.77
61 Telecommunications	73.49
62 Computer programming, consultancy and related activities	87.43
63 Information service activities	82.17
64 Financial service activities, except insurance and pension funding	89.43
65 Insurance, reinsurance and pension funding, except compulsory social security	89.55
66 Activities auxiliary to financial services and insurance activities	88.21
68 Real estate activities	70.93
69 Legal and accounting activities	87.59
70 Activities of head offices; management consultancy activities	76.53
71 Architectural and engineering activities; technical testing and analysis	70.69
72 Scientific research and development	70.56
73 Advertising and market research	78.08
74 Other professional, scientific and technical activities	70.79
75 Veterinary activities	43.62
77 Rental and leasing activities	59.98
78 Employment activities	44.37
79 Travel agency, tour operator and other reservation service and related activities	55.64
80 Security and investigation activities	42.63
81 Services to buildings and landscape activities	38.15
82 Office administrative, office support and other business support activities	71.86
84 Public administration and defence; compulsory social security	69.26
85 Education	72.49
86 Human health activities	45.77
87 Residential care activities	47.59
88 Social work activities without accommodation	52.48

Continued on next page

Table A2: cont'd

	WfH Capacity (%)
90 Creative, arts and entertainment activities	63.51
91 Libraries, archives, museums and other cultural activities	65.94
92 Gambling and betting activities	47.74
93 Sports activities and amusement and recreation activities	61.61
94 Activities of membership organisations	69.98
95 Repair of computers and personal and household goods	59.55
96 Other personal service activities	41.76
97 Activities of households as employers of domestic personnel	54.68
98 Undifferentiated goods- and services-producing activities of private households for own use	40.62
99 Activities of extraterritorial organisations and bodies	63.11

Sources: BIBB/BAuA Employment Survey 2018, Employment Statistics of the Federal Employment Agency (BA) 2019, own calculations.