eWork - Digitization and Working from Home

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Motivation

- Digitization profoundly changes how and where we work
- Not everyone is (can be) a gig worker
- Working from Home (WfH) within a traditional work arrangement is often mentioned as an example of virtual and mobile work that may be facilitated by digital technologies
- Digitization-enabled WfH may potentially affect a large fraction of the workforce and a wide variety of outcomes from productivity to residential choice



Empirical Approach

- Autor et al. (2003): computers primarily complement non-routine interactive tasks that are subject to high costs of coordination and communication
- Broadband availability should only lower the costs of WfH for PC-using occupations
- Consequently, we expect the largest effects on WfH take-up in occupations characterized by high intensity of nonroutine, interactive tasks

Identification:



- WfH by occupations' degree of non-routine interactive task intensity over time Wfh take–up by group in % DSI penetration in % 60 40 20 2015 2010 2005 Bottom tercile
 Middle tercile
 Top tercile
 Middle tercile Sources: GSOEP 1999, 2002, 2009, 2014; BiBB /BAuA 1999; ITU 2019 Notes: DSL penetration = DSL subscriptions for 100 household.
- **First-difference model** to overcome biases that result from unobserved timeinvariant factors that are correlated with both WfH and DSL take-up
- IV—augmented version of Falck et al. (2014) based on
 - predetermined technological peculiarities of the traditional public switched telephone network (PSTN) that affect DSL availability,
 - household's distance to MDF >4.200m
 - telephone infrastructure based on OPAL technology (not compatible with DSL)
- 2. interacted with occupational PC-use/non-routine interactive task intensity.
- 3SLS-to estimate effects of digitization-enabled WfH on outcomes

Data & Sample:

- GSOEP: nationally representative, longitudinal survey of private households
- Sample: age 20-65, no self-employed, no marginally employed, no interns, no
- teaching and religious occupations, no home as main place of work PC-use and non-routine interactive task intensity measures based on 1999 BIBB/BAuA

Employment Survey Table 1: Descriptive statistics by household DSL adoption

	(1)	(2)
	No DSL	DSL
Ν	1311	2651
WfH	0.089	0.187*
Change WfH since 2002	0.027	0.066*
Occupational PC-use intensity	0.506	0.637*
Non-routine interactive task intensity	0.309	0.375*
Residential move since 2002	0.280	0.291
Occupational change since 2002	0.304	0.335
Move to urban since 2002	-0.012	-0.004
Change to parttime since 2002	0.031	0.015
Change children in household since 2002	-0.111	-0.141
Change homeownership since 2002	0.064	0.106*
Female	0.444	0.388*
Age	47.806	46.672*

Source: GSOEP 2002, 2009; BIBB/BAUA 1999. Notes: We assume zero OSS: subscriptions in 2002. Instruments: "threshold at 4,200m" and _OPAL" as in Falck et al. (2014), interacted with occupational PC-use intensity. PC-use is defined as avg. share in 2-digitary of the assume zero OSS: and BIBB/BALA threadown Survey 1999 and merged to individual's 2002 job. 1.2 PC-use = occupations with 0-30% pc use, 2, a PC-use = 70-30%, 3, a PC-use = 70-30%, 4, a PC-use = 90-10%. significant at 1%; ** significant at 5%; * significant at 10%

Conclusions & Outlook

Table 3: 3SLS Results—1st difference models

- Who are the compliers?

Evolution of PC- and Internet use at work Share PC-user - Share Internet-use 60 40 20 200

Sources: BiBB /BAuA 1979, 1986, 1992, 1999, 2006, 2012

Change in WfH and DSL penetration (2002-09)



Main Results

Table 2a: WfH and DSL by occupational PC-use intensity

	Panel/FE		1stDiff/IV		
	(1)	(2)	(3)	(4)	
1.q PC-use × DSL	-0.003	0.001	-0.151	-0.155	
	(0.012)	(0.012)	(0.143)	(0.144)	
2.q PC-use × DSL	0.006	0.009	-0.096	-0.102	
	(0.015)	(0.015)	(0.099)	(0.099)	
3.q PC-use × DSL	0.054***	0.056***	-0.010	-0.009	
	(0.016)	(0.016)	(0.074)	(0.075)	
4.q PC-use × DSL	0.094***	0.094***	0.201**	0.201**	
	(0.023)	(0.023)	(0.085)	(0.086)	
Controls	-	1	- '	1	
Kleibergen-Paap F -statistic			19.951	17.942	
Ν	7924	7924	3962	3962	

Table 2b: WfH and DSL by non-routine interactive task intensity

	Panel/FE		1stDiff/IV		
	(1)	(2)	(3)	(4)	
1.q interactive × DSL	-0.006	-0.003	-0.148	-0.149	
	(0.013)	(0.013)	(0.143)	(0.142)	
2.q interactive × DSL	0.007	0.009	-0.018	-0.019	
	(0.013)	(0.013)	(0.097)	(0.096)	
3.q interactive × DSL	0.060***	0.061***	-0.062	-0.063	
	(0.019)	(0.019)	(0.086)	(0.086)	
4.q interactive × DSL	0.094***	0.094***	0.170**	0.170**	
	(0.021)	(0.021)	(0.073)	(0.073)	
Controls	-	\checkmark	-	\checkmark	
Kleibergen-Paap F -statistic			21.783	20.016	
N	7024	7924	2062	2062	

Source: GSOEP 2002, 2009; BIBB(BAuA 1999. Notes: We assume zero DSS: subscriptions in 2002. Instruments: "threshold at 4,200m" and "OPAL" as in Faick occupational PC-use intensity. Standard errors clustered on the household level. Controls: gender, age, pai homeownership, children in hh, urban. PC-use (non-routine interactive task intensity) defined as avg. share P tasks) in 2-digt occupation based on BIBB(BAuA Enployment Turvy 1599 and merged to individual's 2002 job. 0-30% pc use, 2,4 PC-use = 30-70%, 3,4 PC-use = 70-90%, 4,4 PC-use = 90-100%. Liniteractive = 0-20% nonroutine and "OPAL" as in Falck et al. (2014), ractive = 20-40%, 3.q interactive = 40-50%, 4.q = 50-6 significant at 1%; ** significant at 5%; * significant at

Effect magnitude:

In non-routine interactive /PC-use intensive occupations, DSL adoption between 2002 and 2009 increased WfH by ~17-20 ppts (2002 mean: 24%).

	job	occupation	distance	hourly	contractua	ıl life	job
	change	change	to work	gross wage	hours	satisfaction	satisfaction
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
1.q PC-use × WfH	-0.127	2.516*	27.081	29.915	-3.165	-22.020***	-9.183
	(0.577)	(1.353)	(115.764)	(25.868)	(20.141)	(4.986)	(6.602)
2.q PC-use × WfH	0.041	0.118	-51.152	16.488	0.370	-11.020***	-4.394
	(0.340)	(0.799)	(111.709)	(10.442)	(8.193)	(2.997)	(3.874)
3.q PC-use × WfH	0.029	0.551	-60.273	16.694**	1.511	-5.628***	-0.988
	(0.206)	(0.486)	(54.975)	(7.218)	(5.590)	(1.859)	(2.366)
4.q PC-use × WfH	0.118	0.192	-21.684	12.548***	0.592	-1.848**	-0.049
	(0.083)	(0.196)	(21.842)	(3.447)	(2.674)	(0.741)	(0.951)
Ν	3962	3962	3557	3592	3592	3949	3927

What happens beyond the broadband

- introduction phase? Develop novel instrument to examine years of broadband speed upgrade since 2009
 - Explore additional datasets (e.g. PAIRFAM,
- German Microcensus, time use survey)

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Next:

Intensive vs. extensive margin

Mechanisms: demand- or supply-side effect?

Here:

Exploiting the historical variation in the preexisting telephone infrastructure, we show that DSL availability significantly increased WfH in non-routine interactive (PC-use intensive) occupations.

Source: GSOEP 2009; BIBB/BAuA 1999. Notes: * Statistically different from no-dsl mean at the 5 percent confide