Working from Home: Heterogenous Effects on Hours Worked and Wages

Melanie Arntz, Sarra Ben Yahmed & Francesco Berlingieri
ZEW Mannheim

23-24 March 2017

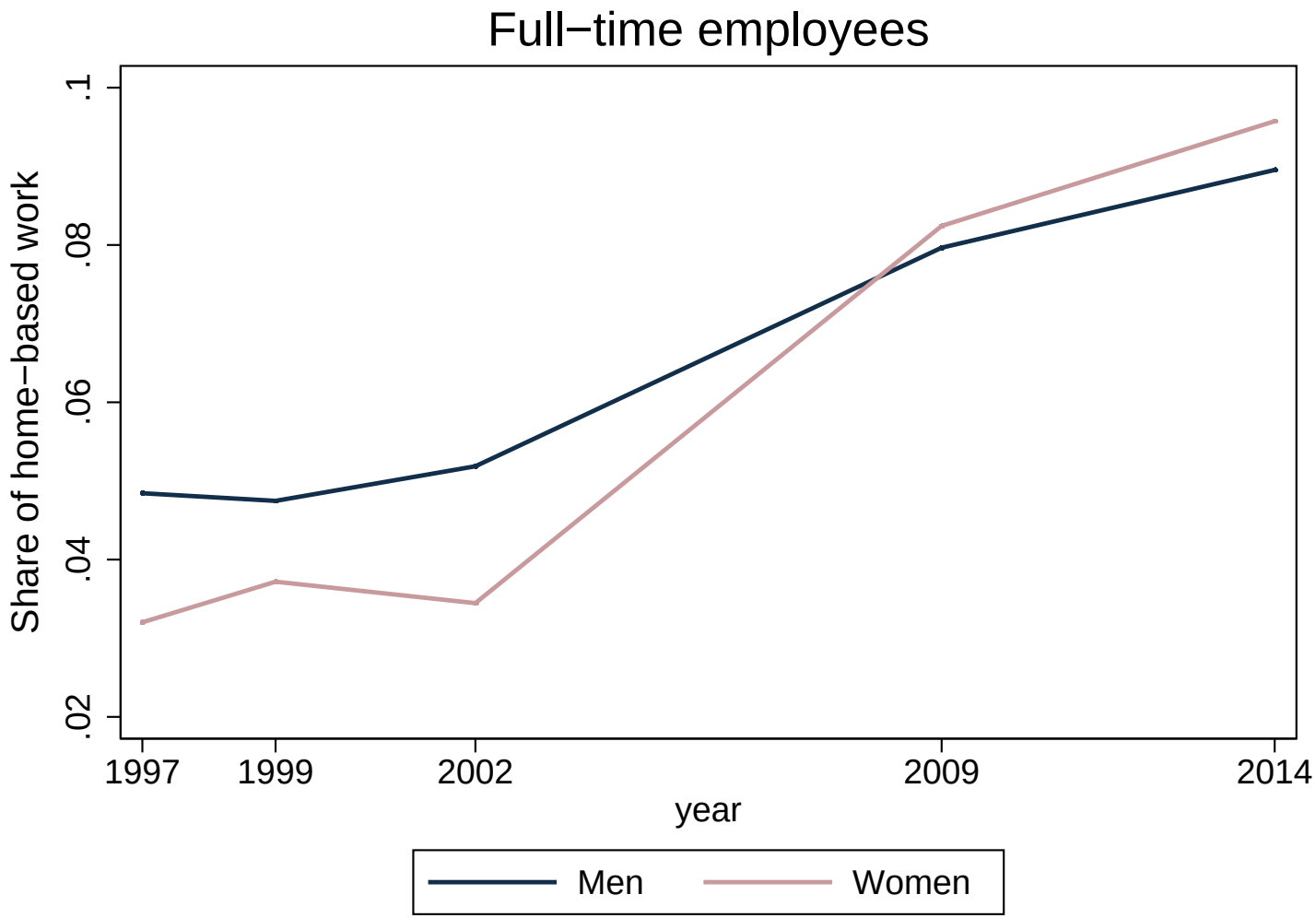
UbiWorkshop

Motivation

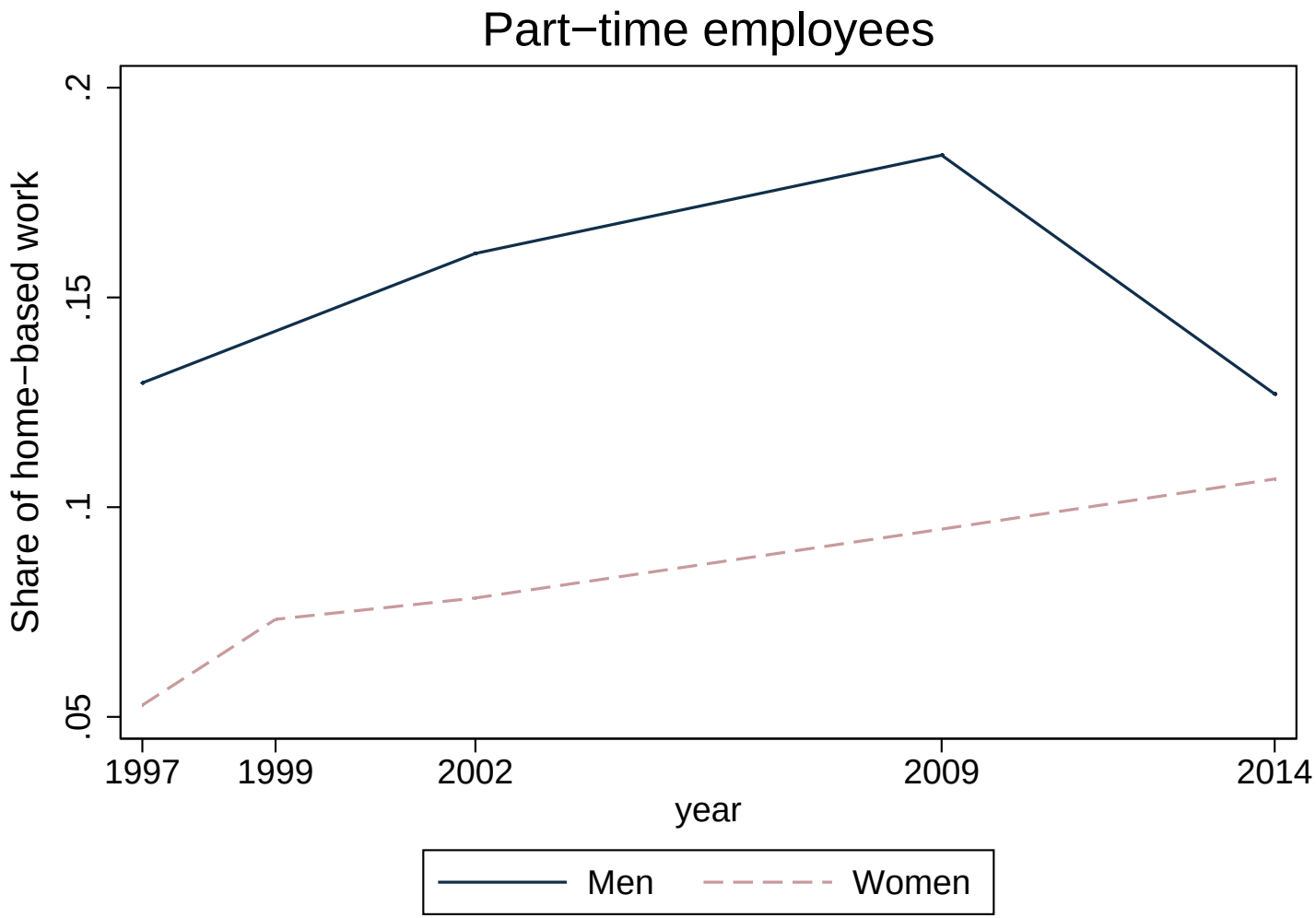
- ICT shock in past 20 years made working from home (WfH) feasible and less costly in many occupations
- Heterogeneous effects on working hours
  - Greater flexibility : changes in *where & when* people work but not necessarily in *how much* they work.
  - \+ Increase working hours because of shorter commute , alleviate time constrains, reduce disutility of work.
  - \+ Chance for parents to better combine family and work
  - – Could be combine with a reduction in working time e.g. for family
- Heterogeneous effects on wages
  - \+ Flexibility increases workers' job commitment.
  - \+ Hours play a key role in gender pay gap cf.Goldin (AER 2014)
  - – Flexibility is costly to employers (coordinations, monitoring)
  - – Importance of face-to-face & signaling.
  - – Compensating wage differentials.
- Little evidence on how WfH changes careers of men & women.

Is WfH a way to combine family and work?

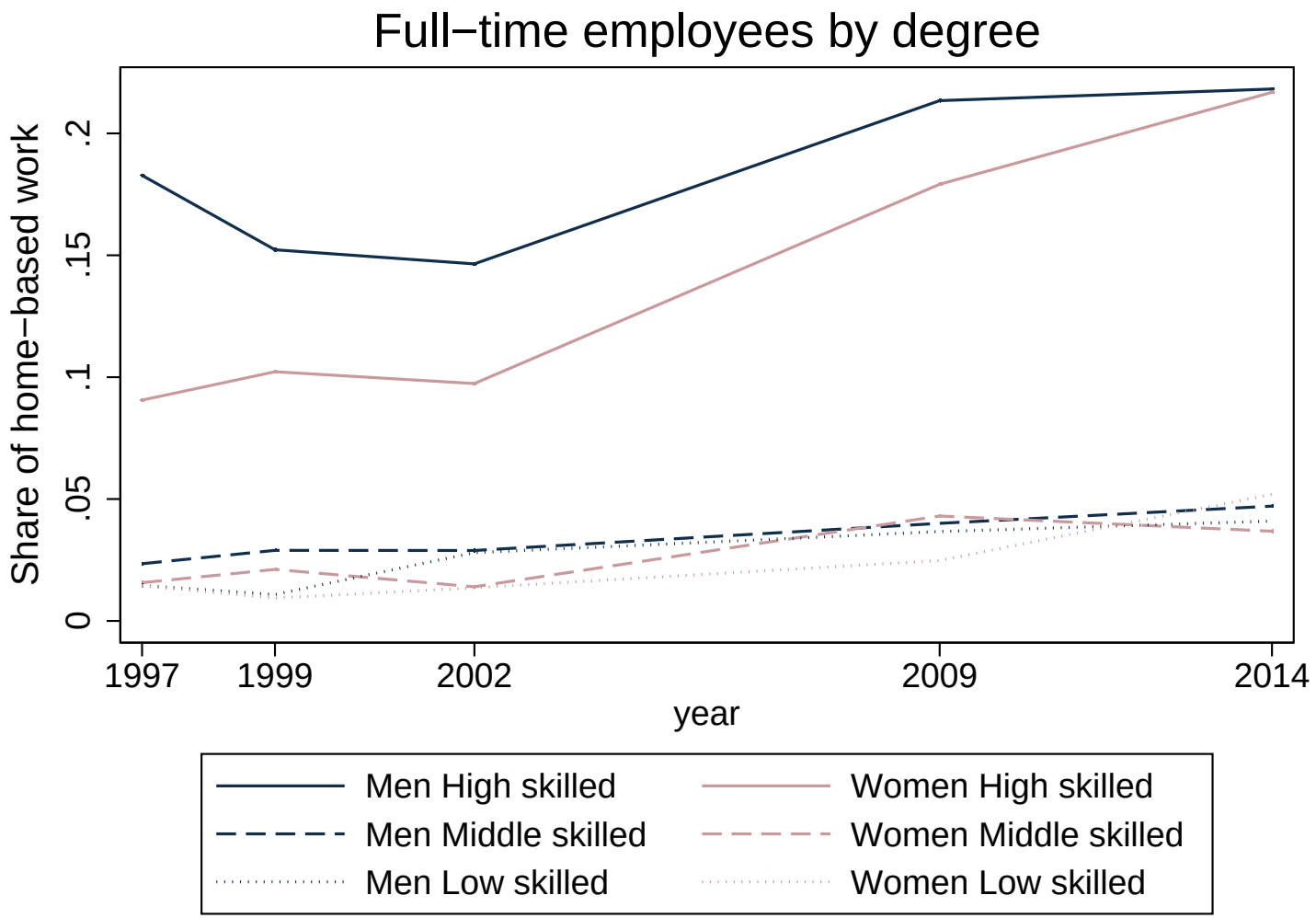
Gender differences in WfH have declined since the late 1990s



Gender differences in WfH have declined since the late 1990s



High-skilled workers account for the increase in WfH



Literature on Working from Home

Scarce evidence on labour supply

- Glass and Noonan (2012): WfH mainly used in high wage positions and increases overtime hours, no gender differences.
- Dettling (2012): access to broadband internet increases female labour force attachment - possibly because of telework and shorter commutes.

Contradicting evidence of WfH on wages

- Glass (2004) and Glass and Noonan (2012) find negative effects but no stronger penaly for women or mothetrs.
- Weeden (2005), Leslie et al. (2012) find positive effects.
- Oettinger (2011): wage penalty attached to full-HBW has decreased over time.

Related work on flexibility in working arrangements & family friendly policies

- ...

Research questions

1. How does WfH affect working hours and wages in the German labour market?

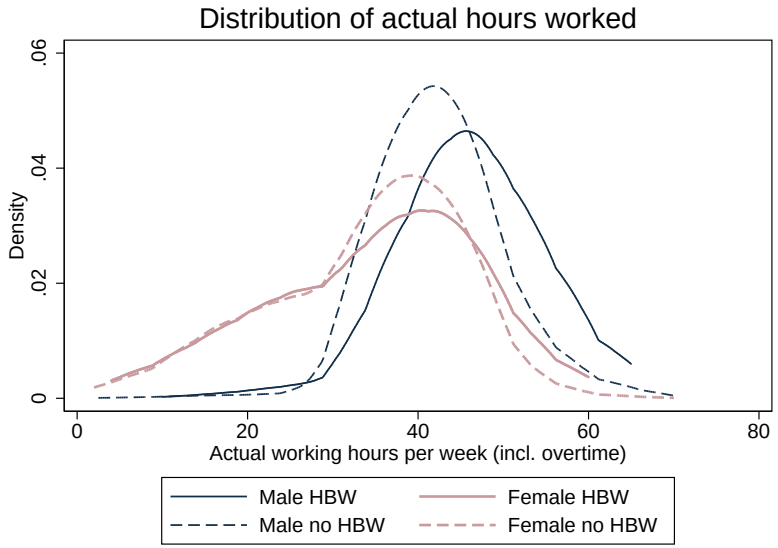
2. Does it have different effects across gender, parenthood, skill levels and full-time vs. part-time ?

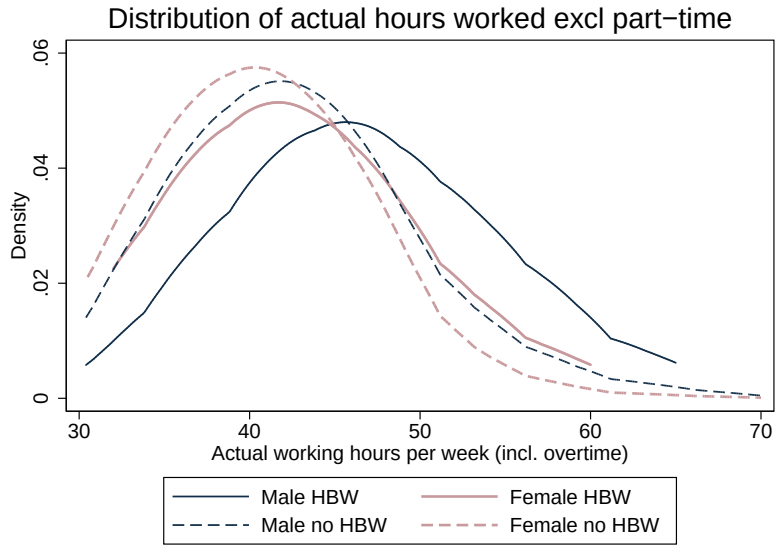
Data: GSOEP 1997, 1999, 2002, 2009 and 2014 waves

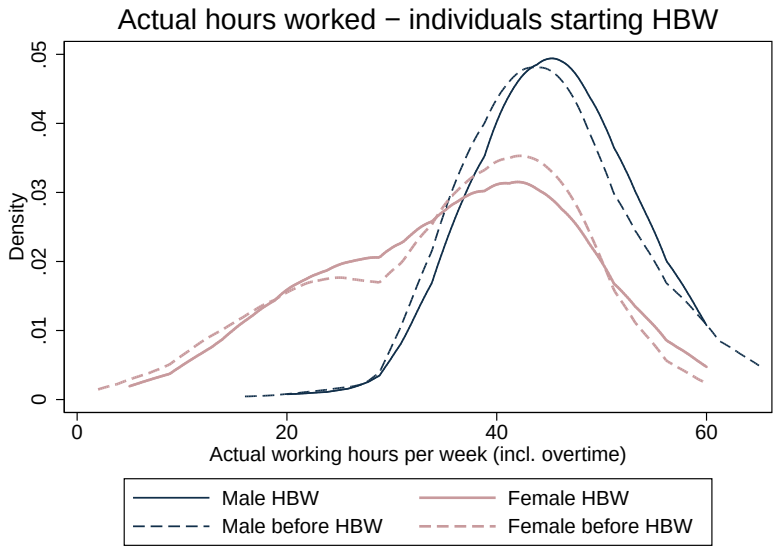
- Main sample: about 24,000 individuals
  - Unbalanced panel: 2 to 5 waves per person
  - Exclude self-employed and in education/training
  - Sub-sample of ca. 18,000 full-time workers

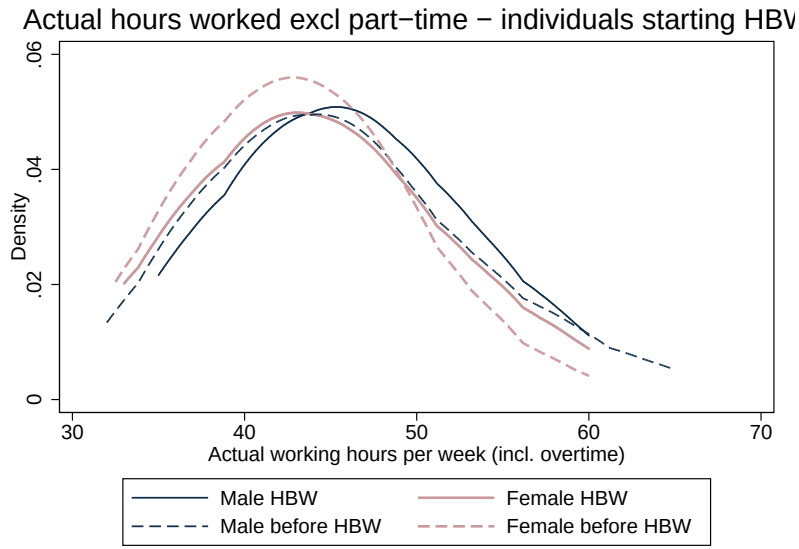
- Main variables
  - Working from home: dummy variable if working from home at least once a month
  - Overtime and contractually agreed weekly working hours
  - Hourly wages: self-reported monthly gross income divided by monthly working hours; real wages (CPI, base year 2010)

Distributions of actual hours by WfH status









Empirical strategy: main equation

- We follow individuals over time & control for individual fixed-effects ☺
- $Y_{it} = \alpha + \beta_1 WfH_{it} + \beta_2 Female_i + \beta_3 WfH_{it} \times Female_i + X'_{it}\lambda + \theta_t + \theta_{tf} + \theta_o + \theta_{of} + \theta_i + \mu_{it}$
  - where Y_{it} is the number of actual weekly hours worked or log hourly wage of individual i at time t
  - WfH_{it} is a dummy variable indicating whether individual i works from home in year t
  - X_{it} is a vector of individual time-varying characteristics
  - θ_t and θ_{tf} are gender-specific year fixed-effects
  - θ_o and θ_{of} are gender-specific occupation fixed-effects

Effect of WfH on contracted and overtime hours, full-time employees

	Contracted hours			Overtime hours		
	POLS	FE	FE	POLS	FE	FE
	(1)	(2)	(3)	(4)	(5)	(6)
WfH	0.162	0.188**	0.151*	2.561***	0.721***	0.527**
	(0.112)	(0.092)	(0.091)	(0.269)	(0.270)	(0.262)
WfH×Female	0.137	-0.103	-0.050	-0.422	0.781	0.860*
	(0.184)	(0.196)	(0.193)	(0.446)	(0.488)	(0.481)
Demographic controls	✓	✓	✓	✓	✓	✓
Job controls	✓	✓	✓	✓	✓	✓
Occupation fixed effects	✓	×	✓	✓	×	✓
Occupational status FE	✓	×	✓	✓	×	✓
Observations	18340	18340	18340	18340	18340	18340
R-squared	0.175	0.026	0.053	0.180	0.014	0.048

Note: Standard errors are clustered at the individual level, $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Effect of WfH on hourly and monthly wages, full-time employees

	Hourly wages				Monthly wages			
	POLS All (1)	FE All (2)	FE All (3)	FE Overtime (4)	POLS All (5)	FE All (6)	FE All (7)	FE All (Overtime)
WfH	0.022*	0.030**	0.026**	0.031**	0.187***	0.041***	0.041***	0.039***
	(0.013)	(0.012)	(0.012)	(0.014)	(0.015)	(0.012)	(0.012)	(0.014)
WfH×Female	-0.003	-0.048**	-0.052**	-0.081**	-0.021	-0.035	-0.035	-0.046*
	(0.026)	(0.023)	(0.023)	(0.031)	(0.022)	(0.022)	(0.022)	(0.029)
Demographic controls	✓	✓	✓	✓	✓	✓	✓	✓
Job controls	✓	✓	✓	✓	✓	✓	✓	✓
Occupation fixed effects	✓	×	✓	✓	✓	×	✓	✓
Occupational status FE	✓	×	✓	✓	✓	×	✓	✓
Observations	18340	18340	18340	8,771	18340	18340	18340	8,771
R-squared	0.586	0.152	0.179	0.253	0.474	0.201	0.201	0.279

Note: Standard errors are clustered at the individual level, $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Effect of WfH on job satisfaction, full-time employees

	Job satisfaction	
	OLS	FE
	(1)	(2)
WfH	0.184**	0.157*
	(0.078)	(0.092)
WfH×Female	-0.287**	-0.120
	(0.142)	(0.185)
Demographic controls	Yes	Yes
Job controls	Yes	Yes
Occupation fixed effects	Yes	Yes
Occupational status FE	Yes	Yes
Observations	18245	18245
R-squared	0.041	0.043

Results - Interpretations

- WfH is used by FT workers to increase working hours, especially overtime hours
- Women working FT increase more their actual hours than men
- ... but are not compensated for it contrary to men, especially when they do overtime hours.

- Why?
  1. Employers perceive lower productivity for women than men WfH Statistical discrimination
  2. Weaker bargaining position for women
  3. Compensating wage differentials if the reasons for WfH differ across men and women

WfH on hours and wages by parenthood, full-time employees

Role of children among mothers

- Mothers and women without children younger than 16 have the same WfH hour-premium: about 1.4 hours per week.
- The hourly wage penalty associated with WfH is significant only for women without children younger than 16.

Mothers and fathers

- The effect of WfH on parents' hours does not differ strongly across men and women.
- Mothers doing HBW earn less than fathers doing HBW but the results are marginally significant.
- The penalty associated with being a woman WfH is stronger among childless workers

No bias due to selection into work

- Selection into work is endogenous and differs across gender.
  - Sample of working women is smaller and probably not randomly so.
  - HBW is a choice variable and may be correlated with individual heterogeneity
  - Panel data with individual FE eliminates selection bias due to the time-invariant unobserved individual heterogeneity

Effect of home-based work controlling for selection, all employees

	Overtime hours			Hourly wages		
	FE	CRE	CRE	FE	CRE	CRE
	(1)	(2)	(3)	(4)	(5)	(6)
WfH	0.697**	0.697**	0.722***	0.022*	0.022*	0.022*
	(0.274)	(0.275)	(0.275)	(0.013)	(0.013)	(0.013)
WfH×Female	0.372	0.372	0.374	-0.059***	-0.059***	-0.059***
	(0.400)	(0.402)	(0.402)	(0.022)	(0.022)	(0.022)
Correction for selection	No	No	Yes	No	No	Yes
Observations	21,967	21,967	21,967	21,967	21,967	2,1967

Note: Standard errors in parentheses, $*p < 0.10$, $**p < 0.05$, $***p < 0.01$. Control variables included are gender-specific year fixed effects, gender-specific demographic controls (age, age squared, migration background, marital status, children), gender-specific human capital controls (highest degree and actual work experience), job characteristics (tenure, tenure squared, public sector dummy, firm size), macro-regions, urban area, gender-specific occupation fixed effects (95 occupation dummies) and gender-specific occupational status fixed effects (15 occupation dummies).

Effect of home-based work controlling for selection, full-time employees

	Overtime hours			Wages		
	FE	CRE	CRE	FE	CRE	CRE
	(1)	(2)	(3)	(4)	(5)	(6)
WfH	0.591**	0.591**	0.591**	0.027**	0.027**	0.028**
	(0.276)	(0.278)	(0.278)	(0.013)	(0.013)	(0.013)
WfH×Female	0.850	0.850	0.843	-0.037	-0.037	-0.038
	(0.524)	(0.528)	(0.528)	(0.023)	(0.024)	(0.024)
Correction for selection	No	No	Yes	No	No	Yes
Observations	16,906	16,906	16,906	16,906	16,906	16,906

Note: Standard errors are clustered at the individual level, $*p < 0.10$, $**p < 0.05$, $***p < 0.01$.

Take-away

- Individuals increase their overtime hours when starting WfH
  - stronger for women among full-time workers, but not among female part-timers.
  - stronger among individuals without children.

- BUT WfH pays off only for men in terms of wages and job satisfaction.

Thank you for your attention!

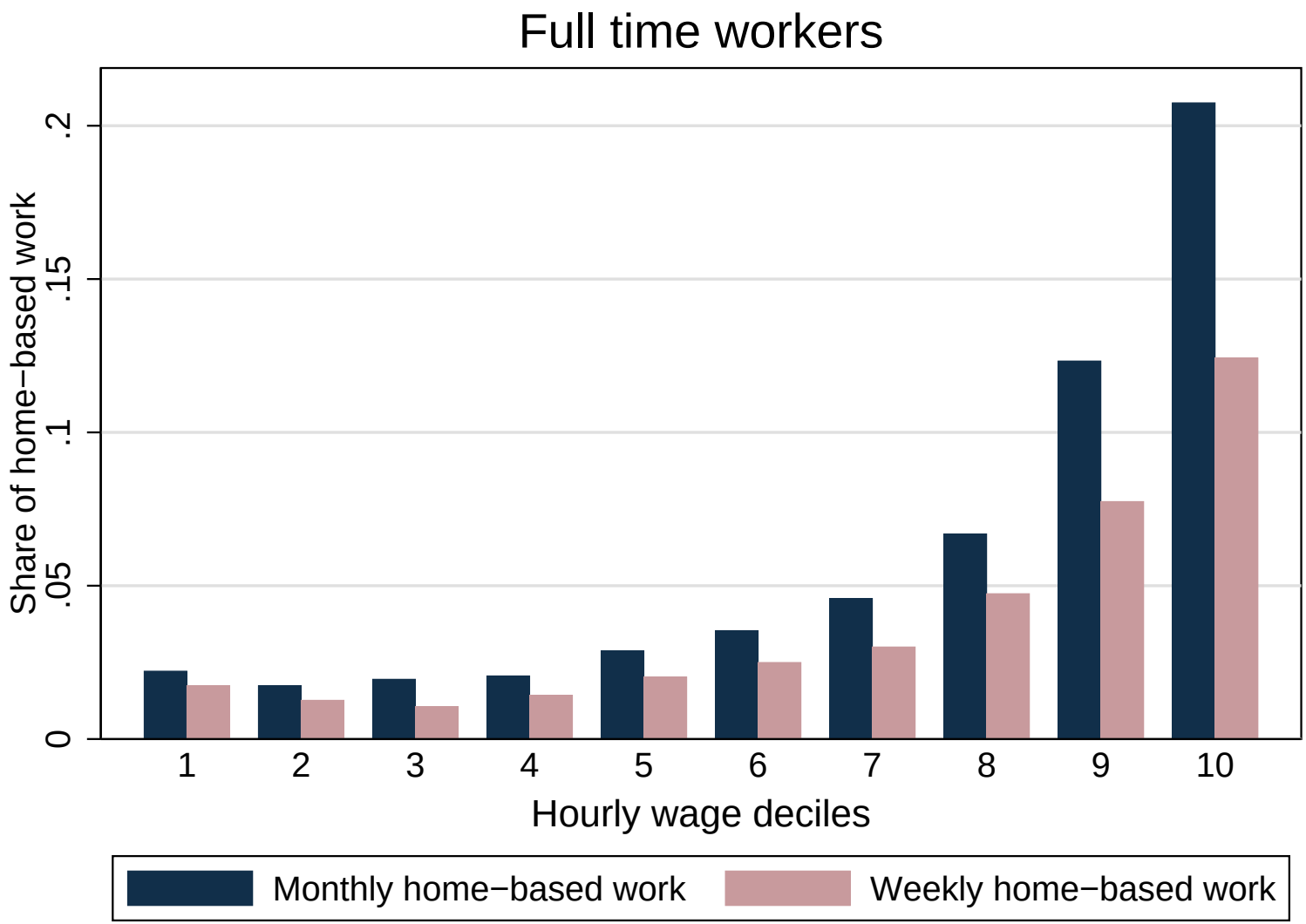
Comments and suggestions are very welcome!

Summary statistics by HBW status

	Female				Male			
	HBW	no HBW	difference (t-stat.)		HBW	no HBW	difference (t-stat.)	
Panel A: Outcome variables								
Contracted working hours per week	29.90	31.67	-1.77***	(-4.85)	38.38	38.65	-0.27**	(-1.97)
Overtime hours per week	5.14	2.29	2.84***	(20.74)	7.78	3.75	4.03***	(23.22)
Works less than 30 hours per week	0.50	0.39	0.12***	(6.27)	0.07	0.02	0.05***	(8.01)
Gross hourly real wages	20.60	14.04	6.56***	(28.56)	24.62	17.15	7.47***	(28.73)
Gross monthly real wages	2793.55	1973.29	820.26***	(20.72)	4254.15	2955.63	1298.52***	(29.53)
Panel B: Main explanatory variables								
Tertiary education degree	0.64	0.20	0.44***	(28.67)	0.60	0.18	0.42***	(29.73)
Vocational degree	0.32	0.66	-0.34***	(-19.20)	0.35	0.70	-0.35***	(-20.72)
Married (or living with partner)	0.83	0.78	0.05***	(3.18)	0.88	0.80	0.07***	(5.03)
Age	45.10	42.64	2.46***	(6.40)	45.01	42.53	2.48***	(6.69)
Migration background	0.13	0.19	-0.06***	(-4.41)	0.12	0.22	-0.10***	(-6.42)
Child aged 6-12	0.29	0.25	0.04**	(2.51)	0.26	0.24	0.03*	(1.77)
Child aged 3-5	0.08	0.05	0.04***	(4.70)	0.08	0.07	0.01	(1.36)
Child aged 1-3	0.04	0.02	0.01**	(2.44)	0.06	0.08	-0.01	(-1.39)
Civil servant	0.57	0.35	0.22***	(12.17)	0.37	0.23	0.14***	(9.10)
Firm tenure (years)	13.07	10.64	2.43***	(6.90)	13.11	12.66	0.44	(1.17)
Work experience (years)	20.02	18.82	1.20***	(3.18)	20.72	20.77	-0.05	(-0.12)
Large firm (>200 empl.)	0.40	0.37	0.03	(1.48)	0.51	0.42	0.09***	(4.92)
Small firm (<20 empl.)	0.20	0.21	-0.01	(-0.51)	0.09	0.14	-0.05***	(-3.88)
Urban region	0.68	0.66	0.02	(1.37)	0.74	0.66	0.08***	(4.84)
Observations	492	8276			575	9535		

Other control variables: age and tenure squared, regional dummies, part time work experience

HBW done more often in better paid jobs



WfH on hours by parenthood, full-time employees

	Full-time employees only			
	Without young children		With and without young children	
	Contracted	Overtime	Contracted	Overtime
	(1)	(2)	(3)	(4)
WfH	0.135	0.106	0.142	0.326
	(0.130)	(0.369)	(0.119)	(0.322)
WfH×Female	-0.213	1.430**	-0.013	1.064*
	(0.244)	(0.647)	(0.223)	(0.562)
Children under 16			0.008	-0.064
			(0.076)	(0.140)
WfH×Children			0.024	0.455
			(0.158)	(0.432)
Female×Children			-0.429***	-0.454**
			(0.125)	(0.203)
WfH×Female×Children			-0.102	-0.438
			(0.349)	(0.823)
Observations	11971	11971	18340	18340

Effect of WfH on hourly and monthly wages, full-time employees

	Full-time employees only					
	Without young children		With and without children			
	Hourly wage	Monthly wage	Hourly wage	Hourly wage	Monthly wage	Monthly wage
	(1)	(2)	(3)	(4)	(5)	(6)
WfH	0.020	0.027	0.037**	0.032*	0.052***	0.043***
	(0.020)	(0.019)	(0.016)	(0.016)	(0.016)	(0.016)
WfH*Female	-0.052*	-0.028	-0.064**	-0.067**	-0.044*	-0.045*
	(0.030)	(0.029)	(0.027)	(0.027)	(0.026)	(0.026)
Children under 16			0.019***	0.016**	0.018***	0.015**
			(0.007)	(0.007)	(0.007)	(0.006)
WfH*Children			-0.017	-0.014	-0.005	-0.004
			(0.021)	(0.021)	(0.021)	(0.020)
Female*Children			-0.016	-0.011	-0.038***	-0.033***
			(0.013)	(0.012)	(0.012)	(0.012)
WfH*Female*Children			0.048	0.046	0.036	0.037
			(0.044)	(0.044)	(0.043)	(0.043)
Occupation fixed effects	Yes	Yes	No	Yes	No	Yes
Occupational status FE	Yes	Yes	No	Yes	No	Yes
Observations	11971	11971	18340	18340	18340	18340

Selection correction model

- To correct for endogenous selection due to *time-varying* unobserved individual heterogeneity
  - Control function approach

$$y_{it} = X_{it}\beta + \alpha_i + \epsilon_{it} \qquad (1)$$

$$s_{it} = 1\left[z_{it}\gamma + \mu_i + u_{it} > 0\right] \qquad (2)$$

  - 1st-step: estimate (2) to construct λ_{it}
  - 2nd-step: estimate (1) with $\hat{\lambda}_{it}$ as additional regressor

    cf. Wooldridge (1995), Fernandez-Val and Vella (2011)