Has the Rise of Work-from-Home Reduced the Motherhood Penalty in the Labor Market?

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When women become mothers, they often leave the labor force

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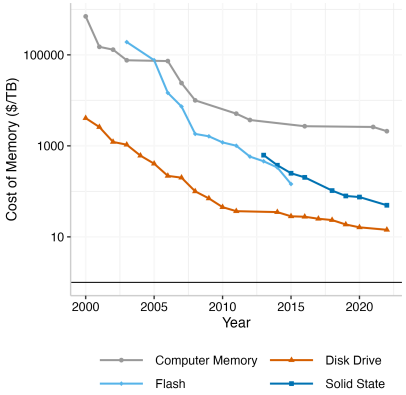
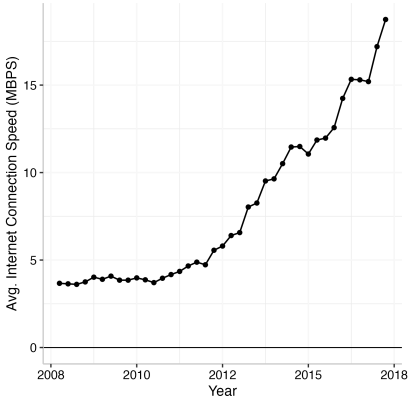
- Traditionally *when* people worked determined whether an occupation was family friendly (e.g., Goldin, '14; Goldin & Katz, '16; Cortes & Pan '19; Bolotnyy & Emanuel, '21)
- Could flexibility over *where* to work also reduce motherhood penalties in the labor market, especially in highly-paid careers?

Technological changes in WFH feasibility

Cheaper Memory



Faster Internet



Have computer-intensive occupations become more conducive to motherhood as they have become increasingly remotable?

This Paper

Question: Does WFH reduce motherhood penalties in the labor market?

Design: Tech changes ↑ WFH pre-COVID for some degree-holders but not others

- Δ WFH in a degree $\rightarrow$ Δ mothers' emp vs. other women's

But why not even more WFH?

- Develop signaling theory of mothers' WFH
  - Pre-COVID WFH signalled low-attachment but post-COVID it may not
- Post COVID-19: faster employment growth for mothers

Contributions to the Literature

1. **Debate about effect of COVID-19 WFH Shock on Mothers**
   - Goldin ('22) argues rise of WFH should be a boon to mothers
   - But unequal child-care (Lyttelton et al., '20; Pabilonia & Vernon, '22)
     - May limit returns to increase in WFH in COVID (Heggeness et al. '21)
   - Study Δ WFH in more stable child-care period (Farooqi, '23)

2. **Puzzle of WFH's rarity pre-COVID** (Mas & Pallais, '20)
   - High WTP & reasonably productive in some settings (Bloom et al., '15; Choudhury et al. '21; Emanuel & Harrington, '23)
   - Argue those who valued it most may have the most to lose from signaling low attachment

Roadmap

1. Data
2. Technological Changes in Feasibility of WFH
3. Targeted Rise of WFH
4. Trend in Mothers' Employment
5. Model
6. COVID-19 Shock

Data Sources

Census & ACS: Up to 2021

- **Primarily WFH:** Asks how the individual *usually got to work last week* with one option of, *worked from home*.
- **College Degree ($\geq$2009):** gives us a measure of whether or not skills are suitable for WFH regardless of whether people are employed
- **Labor market outcomes:** employment, hours, wage/salary income
- **Demographics:** gender, age of children (focus on eldest $<$15)

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American Time Use Survey: Time diaries give us **WFH on that day**

- Spend weekday, workday ($\geq$5 hours) at home
- **Intensive margin:** share of working hours at home in business hours (8am$-$6pm) & non-business hours

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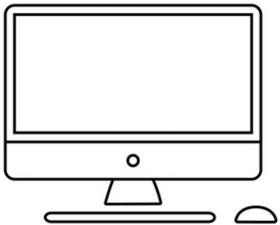
Current Population Survey: Labor market outcomes & dem **up to 2023**

O*Net Occupational Information

Working with Computers



Using computers and computer systems (including hardware and software) to program, write software, set up functions, enter data, or process information.

Communications and Media

Knowledge of media production, communication, and dissemination techniques and methods.

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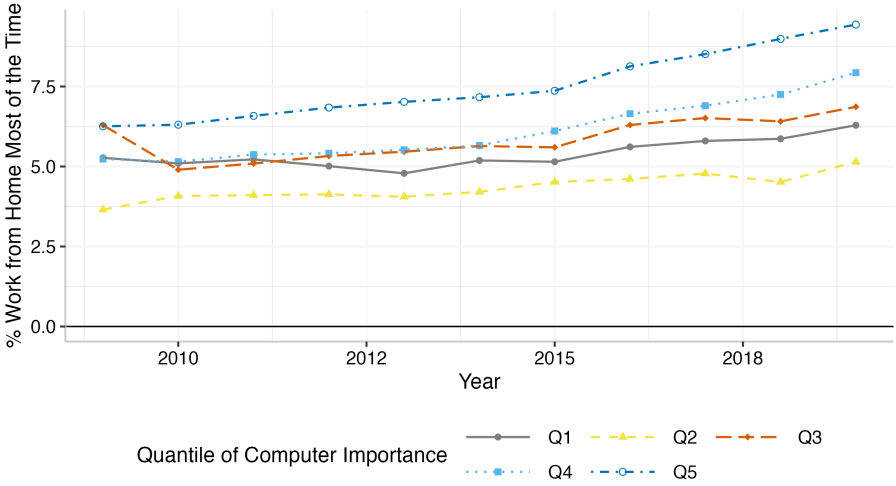
Computers & Δ Work from Home

Similar in ATUS →



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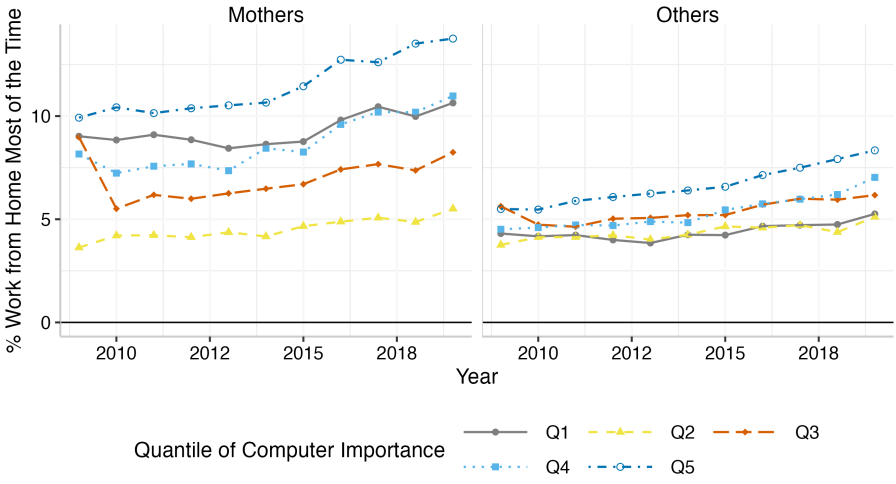
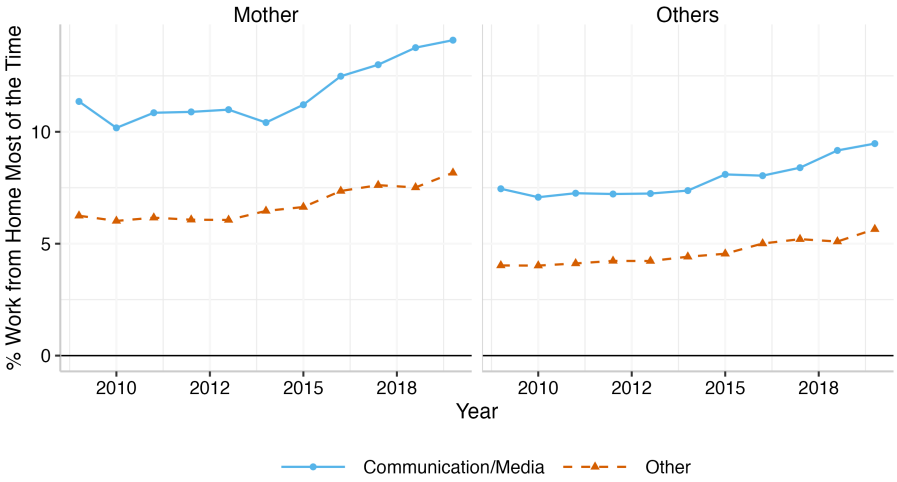


Communication/Media & Δ Work from Home

Similar in ATUS →



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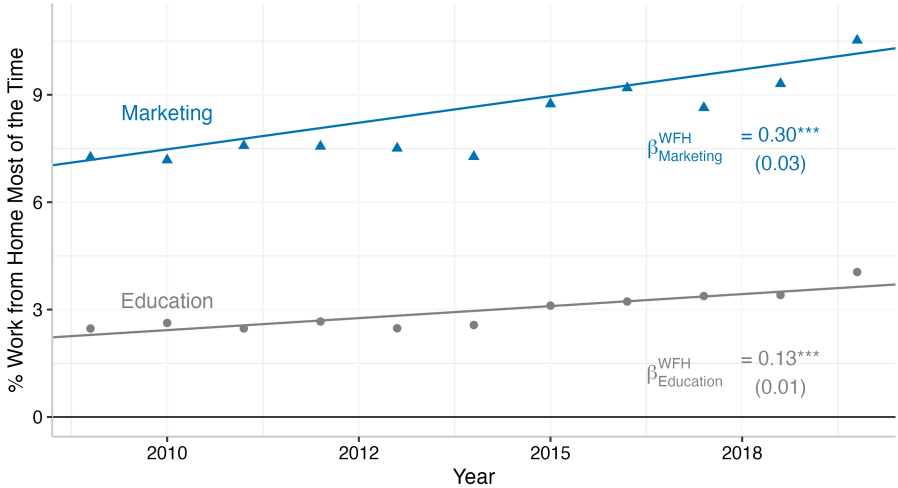
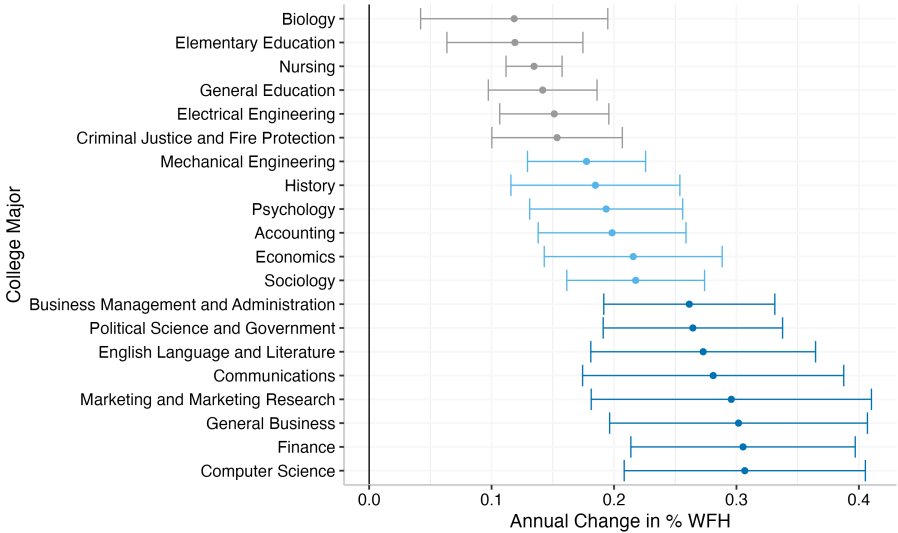
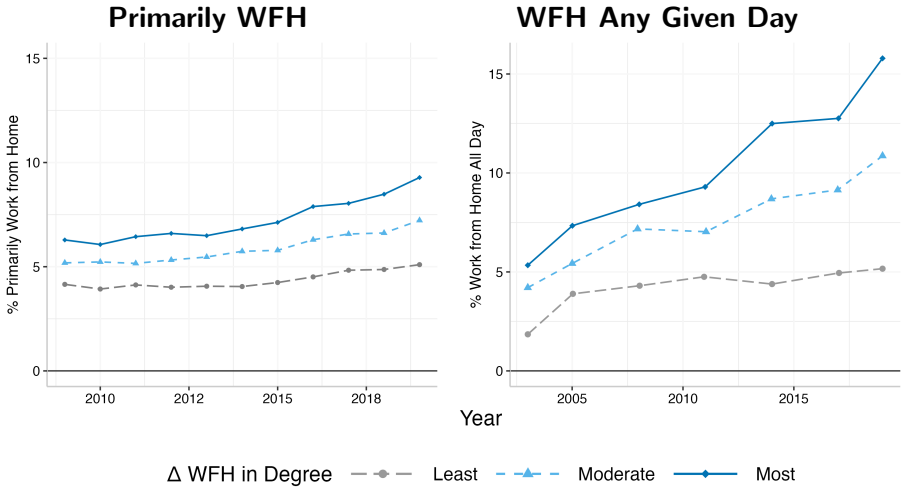
Trend in WFH Varied by Major



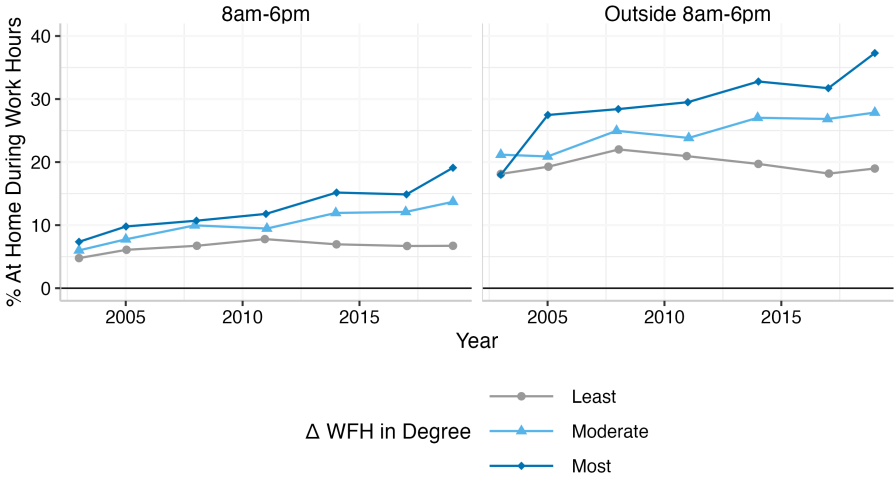
Change in WFH by College Major Before COVID-19



WFH Primarily vs. Any Given Day



Intensive Margin of WFH



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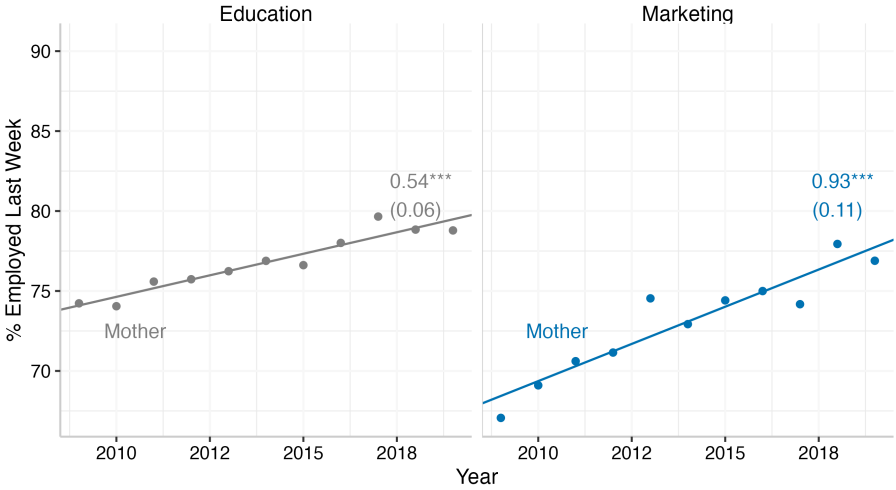
Degree-Specific Changes in Mothers' Employment



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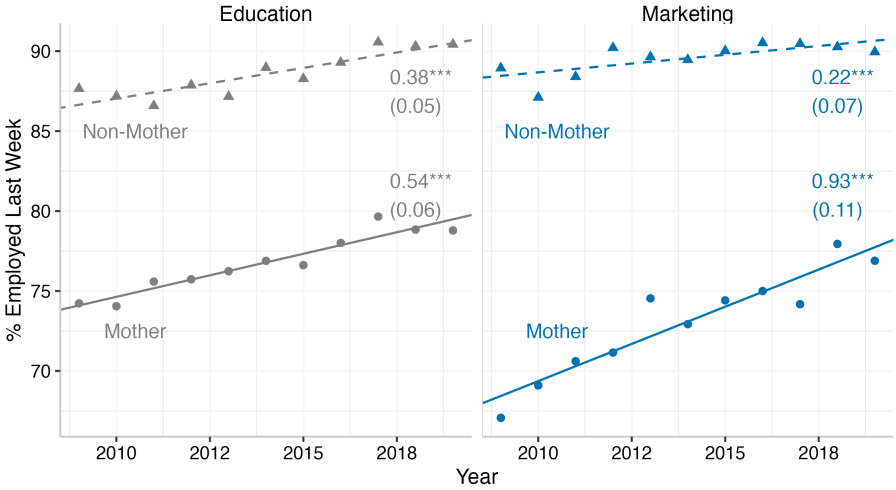

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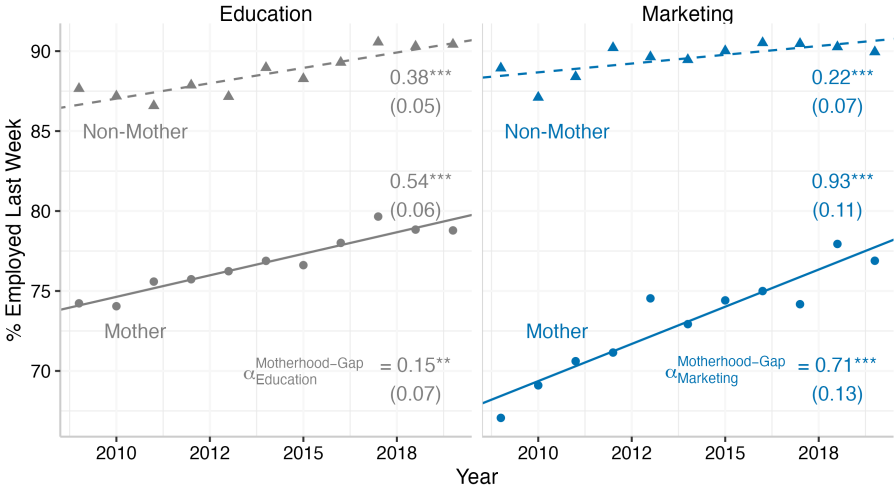
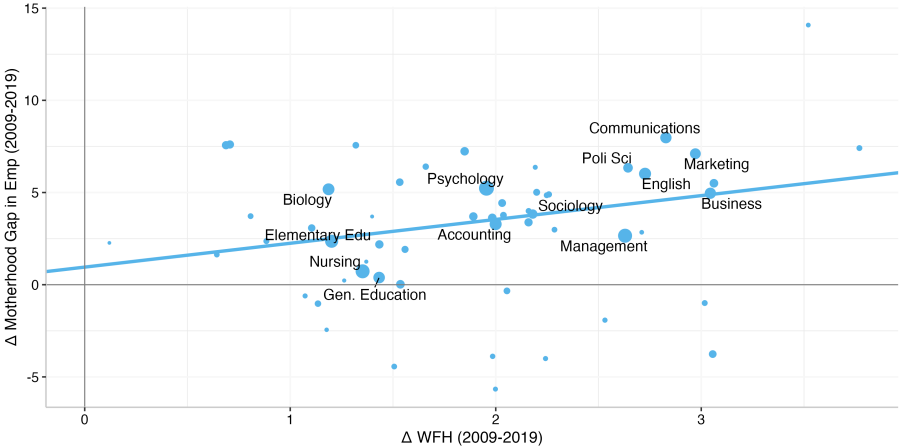


Strong Link Between Δ WFH & Δ Motherhood Penalty



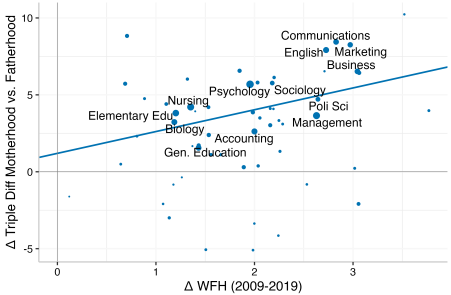
Strong Link Between Δ WFH & Δ Motherhood Penalty

	Δ Motherhood Gap in Employment (2009-2019)				
	(1)	(2)	(3)	(4)	(5)
Δ WFH	1.29***	1.33**	1.50***	1.35**	1.35**
	(0.49)	(0.52)	(0.52)	(0.56)	(0.56)
Δ Hours		0.16	0.64	0.63	1.20
		(0.67)	(0.72)	(0.72)	(0.80)
Δ % Advanced Degree			−0.22	−0.23*	−0.22
			(0.13)	(0.13)	(0.13)
Δ Income ($1,000s)				0.08	0.10
				(0.11)	(0.11)
Δ % Female in Degree					0.26
					(0.16)
Constant	0.10	0.09	0.13	0.14	0.12
	(0.10)	(0.11)	(0.11)	(0.11)	(0.11)
Observations	75	75	75	75	75
R^2	0.09	0.09	0.12	0.13	0.16

Weighted to put more weight on larger majors for women.

Robustness

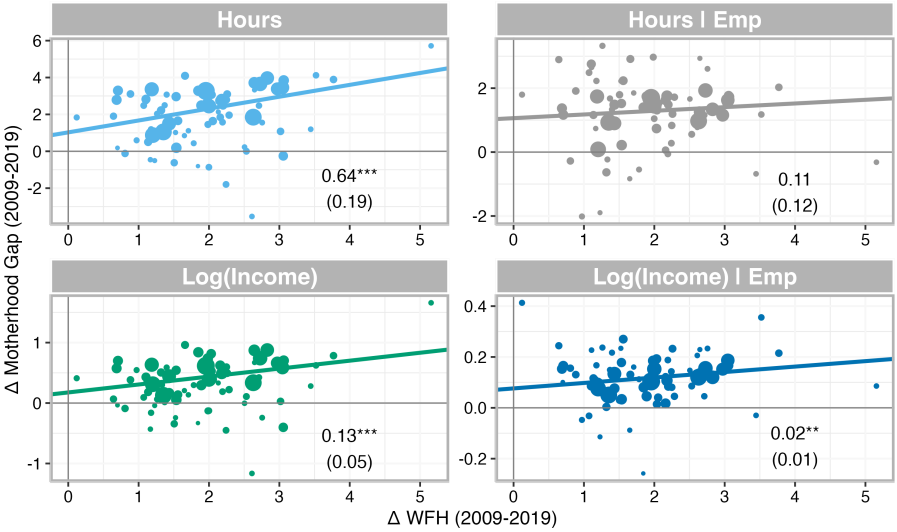
1. Compute the change in WFH only using the sample of men →
2. Similar results with triple difference with fathers



3. Null for married vs. single women with no children →
4. Bit bigger for mothers with eldest under 5 (rather than 15) →
5. Residualize employment rates by mothers' characteristics →

Δ Motherhood Gap in Other Economic Outcomes

Table →



Roadmap

Model: Signaling role of WFH

Motivating Question: If WFH is so valuable for mothers, why weren't more mothers using WFH more before COVID-19?

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Separating Equilibrium pre-COVID: High-attachment mothers work on-site, low-attachment mothers WFH or drop out

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Separating Equilibrium pre-COVID: High-attachment mothers work on-site, low-attachment mothers WFH or drop out

Pooling post-COVID? Without WFH fixed costs, both high- & low-attachment mothers may choose WFH & firms may invest in them

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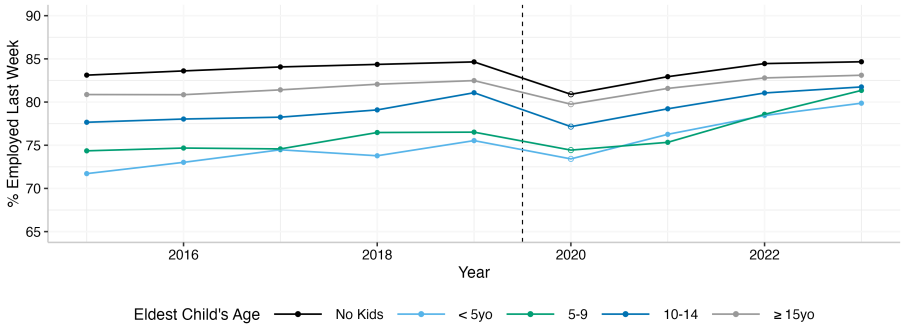
Faster Recovery for College-Educated Mothers



Conclusion

- Technological changes $\rightarrow \uparrow$ WFH in some college degrees but not others
  - Mothers were particularly likely to use the resulting locational flexibility
  - Δ WFH in college degree between 2009 and 2019 is strongly predictive of Δ Employment of mothers versus other women
- If WFH is so valuable for mothers, why weren't more mothers fully remote before COVID?
  - Develop signaling model of attachment
  - COVID could change the equilibrium & allow mothers to use WFH more fully

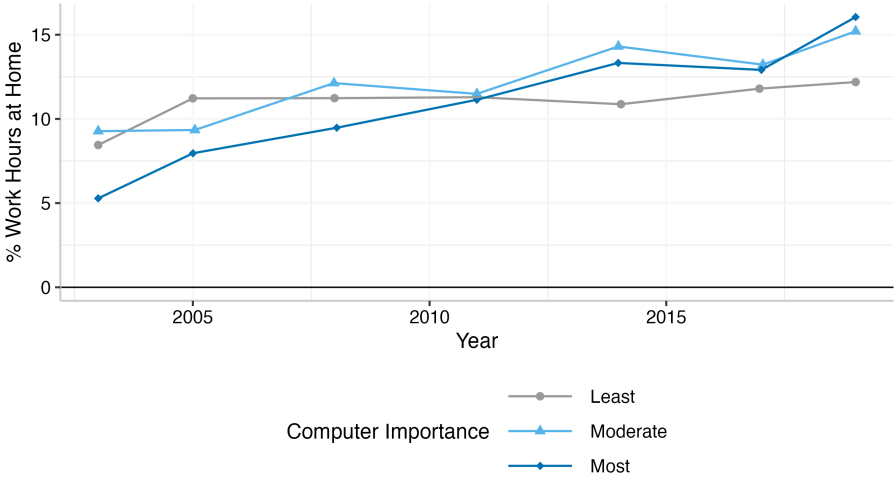
Thank You

Feedback very much welcome!

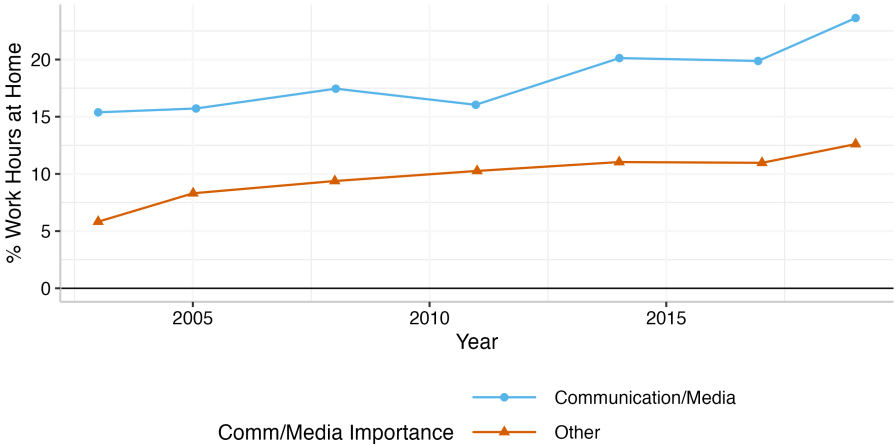
Roadmap

7 Appendix

Computers & Δ Work from Home in ATUS ←



Communications & Δ Work from Home in ATUS



Computing Δ WFH for Men ←

	Δ Motherhood Gap in Employment (2009-2019)				
	(1)	(2)	(3)	(4)	(5)
Δ WFH for Men	1.09***	1.09**	1.09**	0.95**	1.24***
	(0.41)	(0.43)	(0.42)	(0.46)	(0.46)
Δ Hours		0.05	0.32	0.34	1.26
		(0.65)	(0.70)	(0.70)	(0.79)
Δ % Advanced Degree			−0.15	−0.17	−0.14
			(0.13)	(0.13)	(0.13)
Δ Income ($1,000s)				0.09	0.10
				(0.11)	(0.10)
Δ % Female in Degree					0.38**
					(0.17)
Constant	0.19**	0.19**	0.23***	0.24***	0.17*
	(0.07)	(0.07)	(0.08)	(0.08)	(0.09)
Observations	75	75	75	75	75
R^2	0.09	0.09	0.10	0.11	0.18

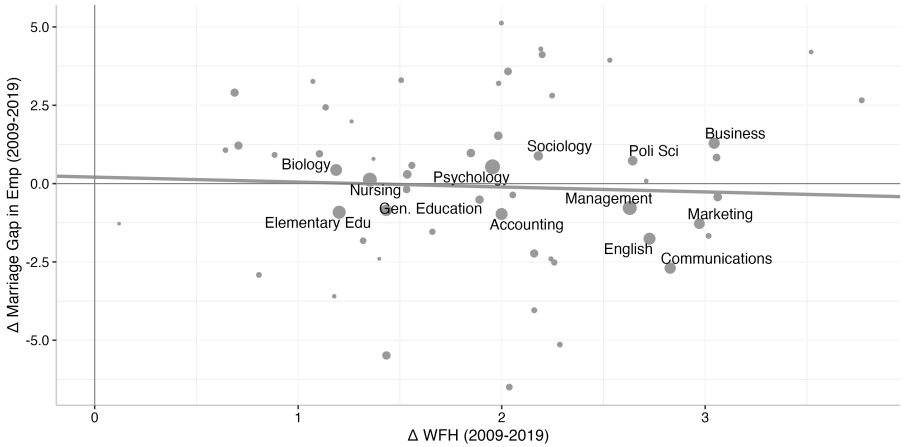
Weighted to put more weight on larger majors for women.

Residualizing by Mothers' Characteristics ←

	Δ Motherhood Gap in Employment (2009-2019)		
	(1)	(2)	(3)
Δ WFH	1.45***	1.09**	0.95**
	(0.47)	(0.47)	(0.47)
Constant	0.06	0.15	0.12
	(0.10)	(0.10)	(0.10)
Residualized	x	Age x Year FE	Full Controls
Observations	75	75	75
R^2	0.11	0.07	0.05

Weighted to put more weight on majors where changes can be estimated more precisely.

Null for married versus single without kids ←



Alternative Outcomes ←

	Δ Motherhood Gap (2009-2019)					
	Employment	Hours	Hours — Emp	Log(Income)	Log(Income) — Emp	In School
	(1)	(2)	(3)	(4)	(5)	(6)
Δ WFH	1.29***	0.64***	0.11	0.13***	0.02**	0.85**
	(0.49)	(0.19)	(0.12)	(0.05)	(0.01)	(0.41)
Δ Hours	0.10	0.10**	0.11***	0.02*	0.01***	−0.05
	(0.10)	(0.04)	(0.02)	(0.01)	(0.002)	(0.09)
Observations	75	75	75	75	75	75
R^2	0.09	0.14	0.01	0.09	0.05	0.05

Weighted to put more weight on majors with more women.

Mothers with Eldest under 5 ←

	Δ Motherhood (<5yo) Gap in Employment (2009-2019)				
	(1)	(2)	(3)	(4)	(5)
Δ WFH	1.26*	1.52**	1.76**	1.49*	1.50*
	(0.66)	(0.70)	(0.70)	(0.75)	(0.75)
Δ Hours		0.98	1.70*	1.68*	2.25**
		(0.90)	(0.97)	(0.97)	(1.08)
Δ % Advanced Degree			−0.33*	−0.35*	−0.33*
			(0.18)	(0.18)	(0.18)
Δ Income (1,000s)				0.14	0.17
				(0.14)	(0.14)
Δ % Female in Degree					0.27
					(0.22)
Constant	0.06	0.03	0.09	0.12	0.10
	(0.14)	(0.14)	(0.14)	(0.15)	(0.15)
Observations	75	75	75	75	75
R^2	0.05	0.06	0.10	0.12	0.14

Weighted to put more weight on larger majors for women.