Child Penalty amid Declining Fertility: Evidence from Korea

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Motivation

- In developed countries, the bulk of the remaining gender gap in labor market outcomes is attributed to the unequal impacts of parenthood on men and women (e.g., Bertrand et al., 2010; Cortés and Pan, 2020; Goldin, 2021; Kleven et al., 2023)
  - "Child penalty" or "Motherhood penalty": the fall in mother's earnings following childbirth
  - Eliminating the gender pay gap $\approx$ eliminating the child penalty
- There is growing research on how different factors or policies could help reduce the child penalty, and evidence suggests that the child penalty is indeed decreasing (Andresen and Nix, 2022a; Kleven, 2022; Lim and Duletzki, 2023).

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- Fertility is declining in many parts of the world, often accompanied by a rise in childlessness (Hellstrand et al., 2021; Kearney et al., 2021; Sobotka, 2021; Hwang, 2023)
- How will the child penalty evolve when more women choose not to have children?
- Will the child penalty also decline in developed countries with very low fertility?
- More broadly, what is the relationship between the child penalty, fertility, and gender inequality?

Total Fertility Rate

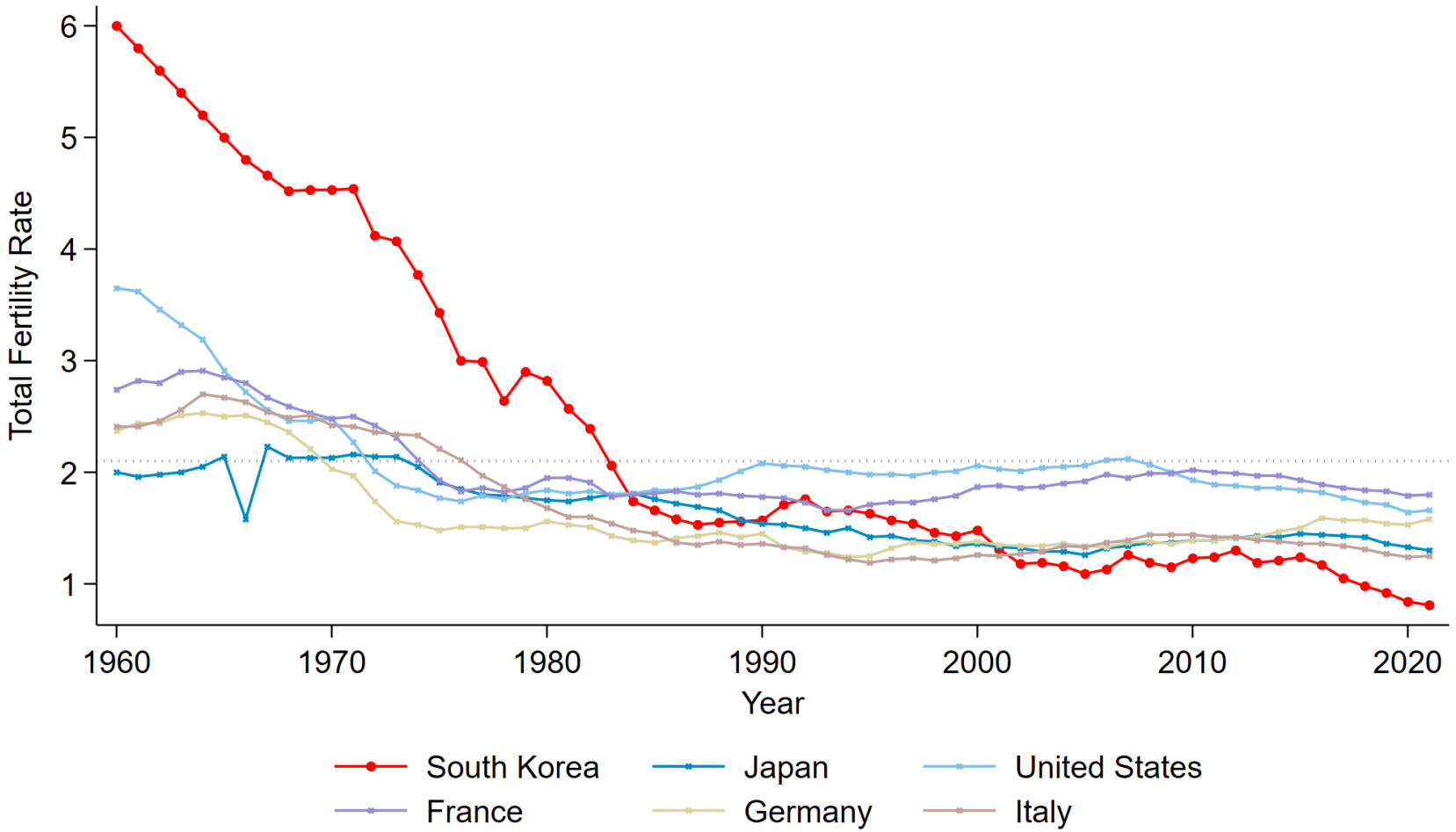
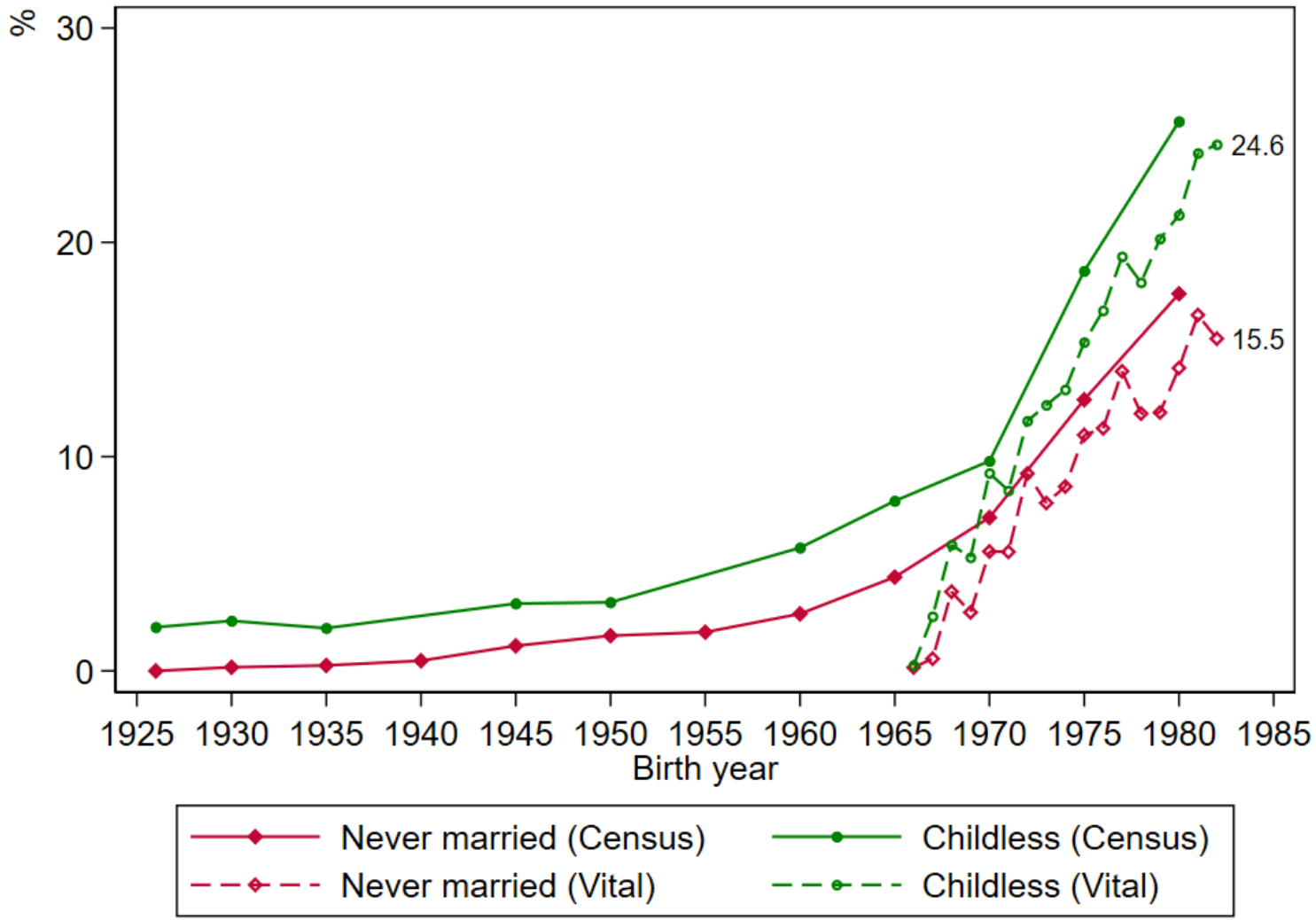


Figure: Total Fertility Rate in Selected Developed Countries

Notes. Data from (OECD, 2024). The dotted horizontal line represents the replacement level fertility of 2.1 children per woman.

Childlessness Rate at Age 40 by Cohort



From 1976 to 1985 cohort, childlessness rate by age 37 nearly doubled from 19% to 35%

This Paper

- We study changes in the child penalty and its mechanisms in the country with the world's lowest fertility rate, South Korea.
  - Recent cohorts of women, born 1976–1985
  - Event-study framework around first childbirth (Kleven et al., 2019a)
  - Administrative data from National Health Insurance System, 2002–2020

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  - Recent cohorts of women, born 1976–1985
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  - Administrative data from National Health Insurance System, 2002–2020
- The first study to examine selection into motherhood as a potential mechanism for the change in the child penalty within a country
- Provide insight into the reason for the very low fertility rate in Korea and its relationship with the gender pay gap fertility

Literature

- Labor market trajectories of specific groups of highly-educated professionals: MBAs (Bertrand et al., 2010), lawyers (Azmat and Ferrer, 2017)
- Recent studies using event study based on timing of first childbirth to estimate the child penalty (Cortés and Pan, 2020)
  - Change over time in the child penalty and its share in the gender pay gap: Denmark (Kleven et al., 2019a), U.S. (Kleven, 2022), Norway (Andresen and Nix, 2022a)
  - Potential channels of the child penalty: biology, comparative advantage, gender norms (Angelov et al., 2016; Andresen and Nix, 2022b; Kleven, 2022)
  - Policies reducing the child penalty: paternity leave (Andresen and Nix, 2022a), public childcare (Lim and Duletzki, 2023), flexible work arrangements (Harrington and Kahn, 2023)
  - International comparison of child penalty (Kleven et al., 2019b, 2023)
- More broadly, relationship between female labor supply and fertility in high-income countries (Feyrer et al., 2008; Doepke et al., 2023)
- Studies which specifically try to explain low fertility in Korea (Hwang, 2016; Myong et al., 2021; Kim et al., 2021)

Data

National Health Insurance System (NHIS) data, 2002—2020

- Covers all residents in South Korea (about 50 million)
- Eligibility database: age, sex, residence, employment status, earnings
- Employer information: firm size, industry classification outcome
- Medical records database: hospital visits, procedure codes birth
- Household database: household head, household members, relationship codes

Sample Construction

Women

- Women born between 1976–1985 who have first childbirth between 2005–2015
  - Balanced panel; three years before and five years after first childbirth
  - Compare cohorts 1976–80 and 1981–85
- Age restriction: first childbirth between ages 25–34
  - Due to data period, observable age at first childbirth differs by cohort
  - Reweight the 1976–80 sample to match the age at first childbirth distribution of the 1981–85 sample distribution

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Men

- Registered as the woman's husband at the month of first childbirth
- Only 2% of births in Korea occur outside of marriage

$\Rightarrow$ 594,491 couples in the 1976–80 cohort, 536,384 couples in the 1981–85 cohort

summ

Estimation Strategy

- Event-study approach to estimate child penalties around the birth of the first child ($t = 0$) as in Kleven et al. (2019a)

$$Y_{ism}^{g} = \sum_{j \neq -12} \alpha_j^g \cdot I[j = t] + \sum_k \beta_k^g \cdot I[k = age_{is}] + \sum_y \gamma_y^g \cdot I[y = s] + \nu_{ism}^g$$

$$i : individual,\ s : calendar\ year,\ m : calendar\ month,\ g : group$$

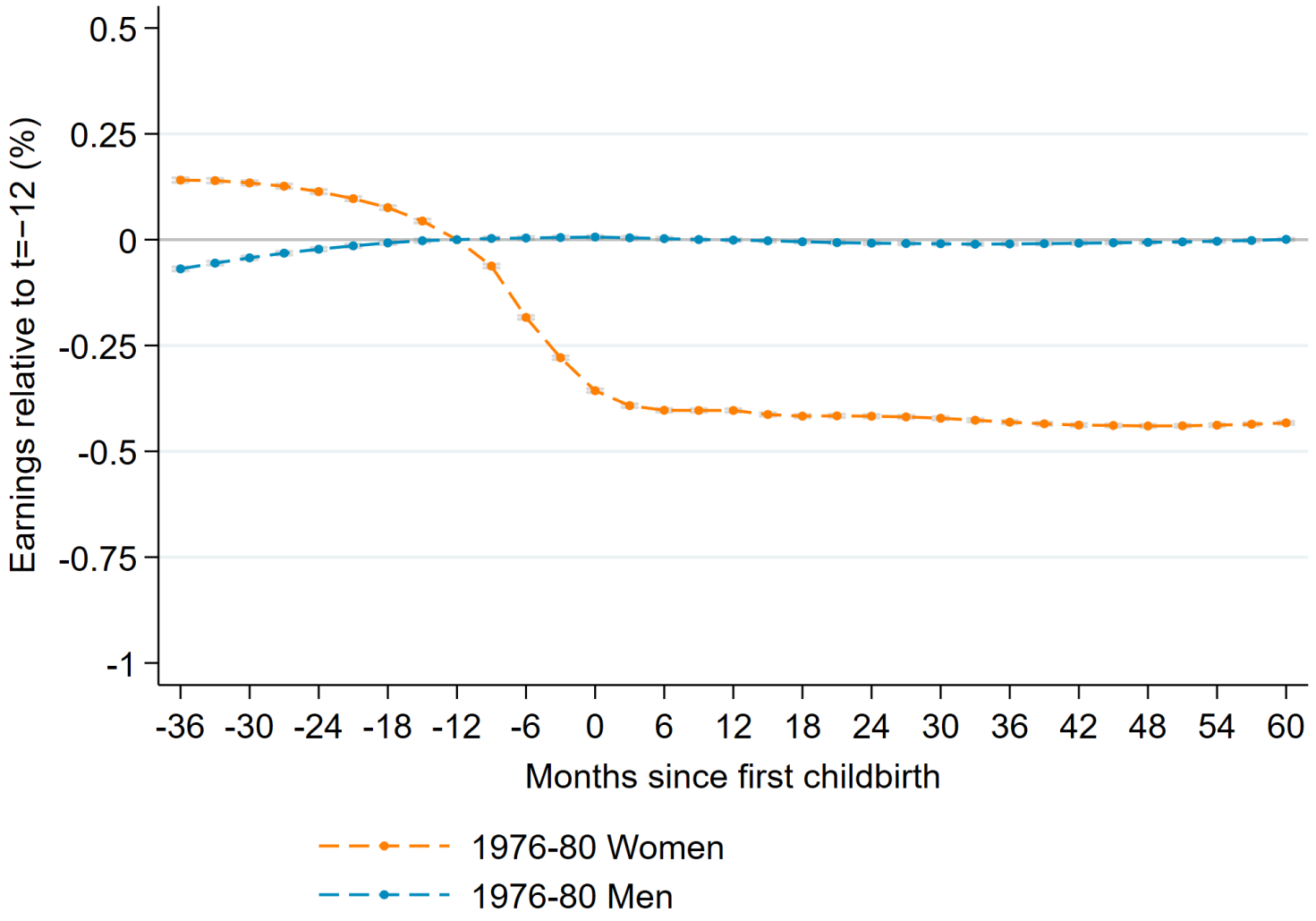
  - $I[j = t]$: dummy for event time t (omitted base period $t = -12$)
  - Include full set of age and year dummies to control for lifecycle and time trends

- Convert level effects ($\hat{\alpha}_t{}^g$) into percentage effects (P_t^g) by calculating

$$P_t^g \equiv \frac{\hat{\alpha}_t{}^g}{E[\tilde{Y}_{ism}^g | t]}$$

  - where $\tilde{Y}_{ism}^g \equiv \hat{\beta}_{age_{is}}^g + \hat{\gamma}_s^g$, predicted outcome absent children ytilde
  - P_t^g: the effect of children as a percentage of the no-child counterfactual as predicted by age and year

Child Penalty in Earnings



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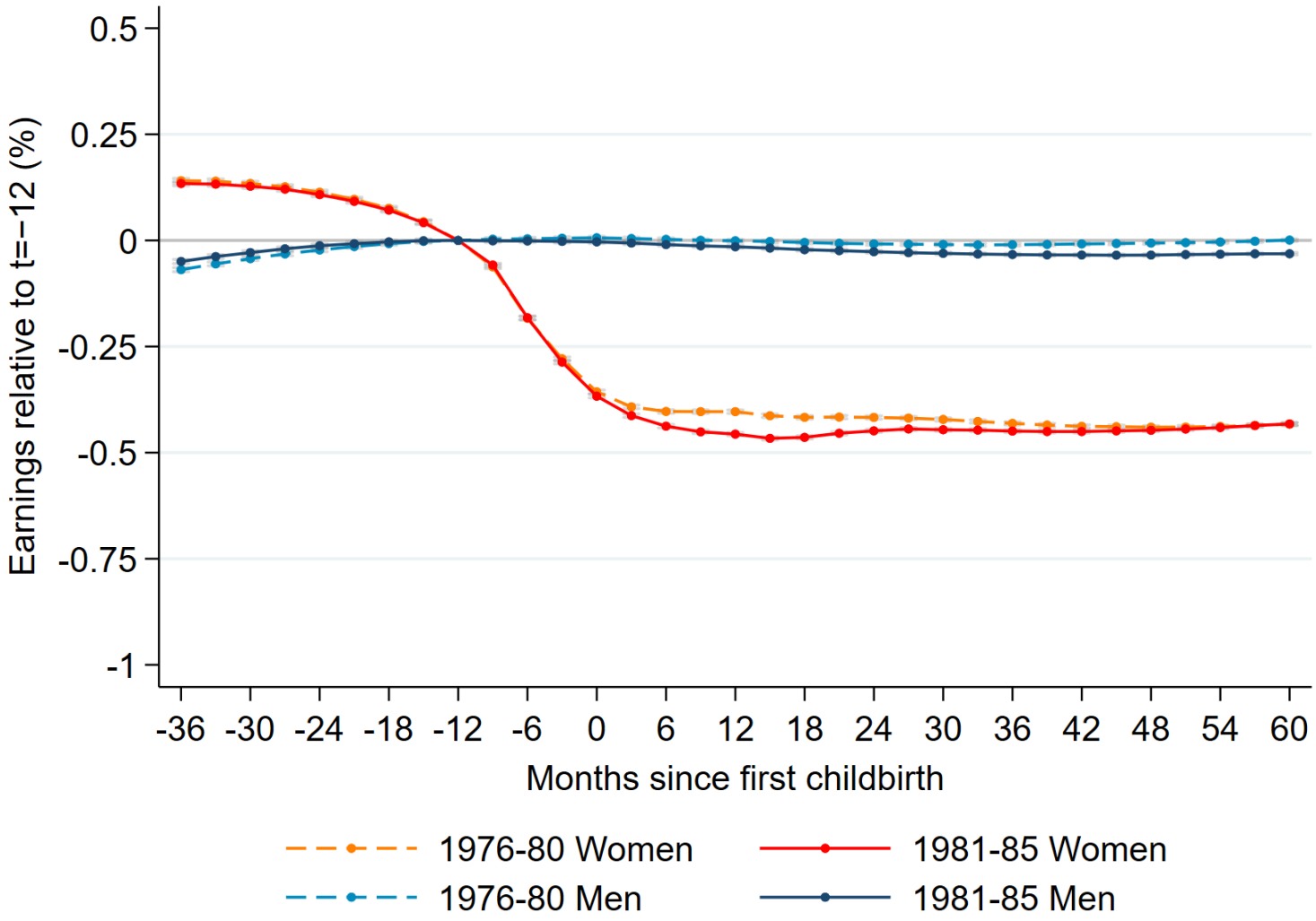
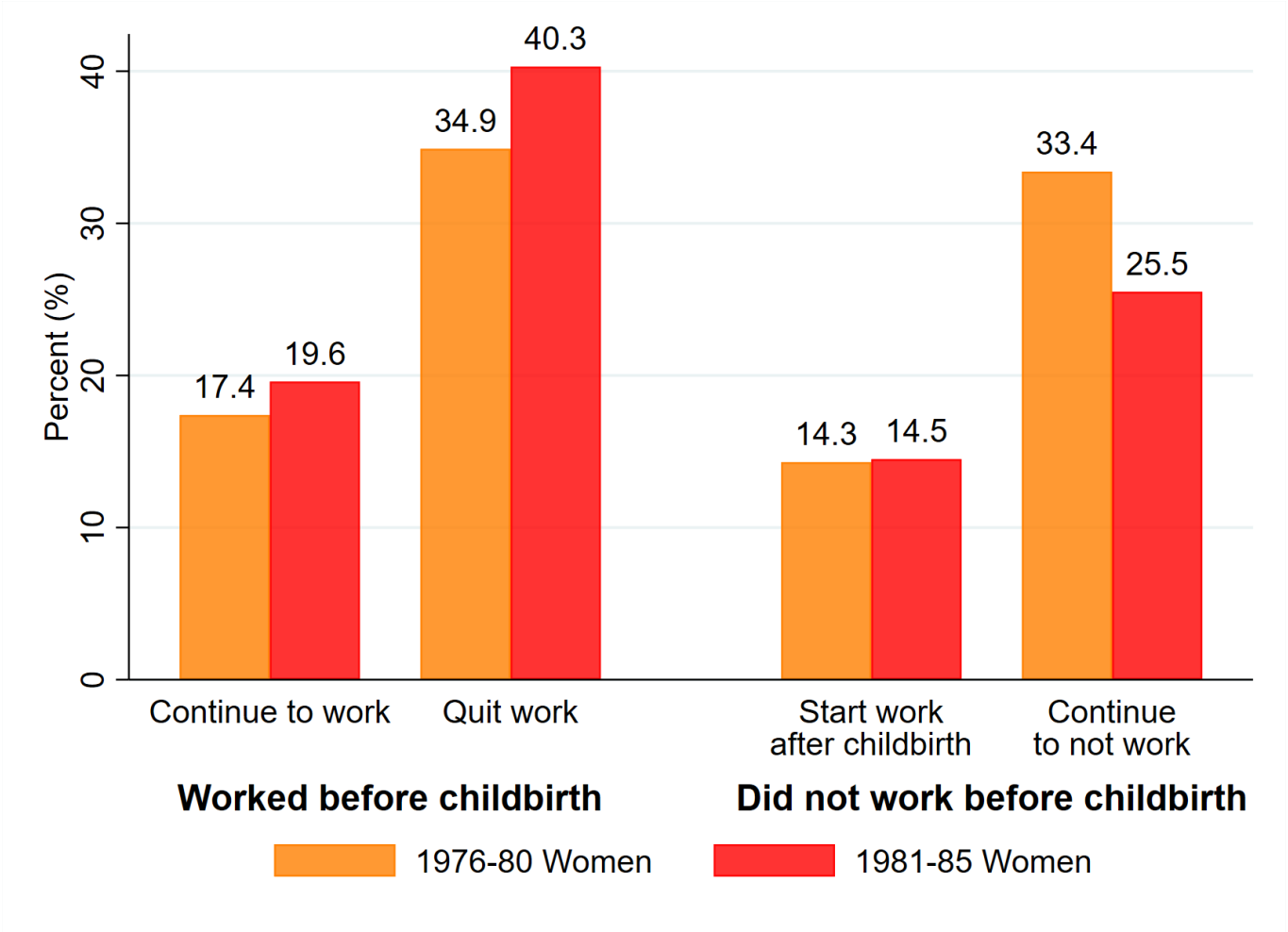


- Child penalty at +12 months increased from 40.3% to 45.6%

Potential Mechanisms

- Heterogeneity hetero
- Family policies
  - expansion of public childcare
  - larger cash subsidies
  - expansion of paid parental leave take-up
- Selection
  - women who are better financially prepared to have children
  - women who have relatively strong family-oriented preferences

Composition of Mothers by Work Status pre/post Childbirth



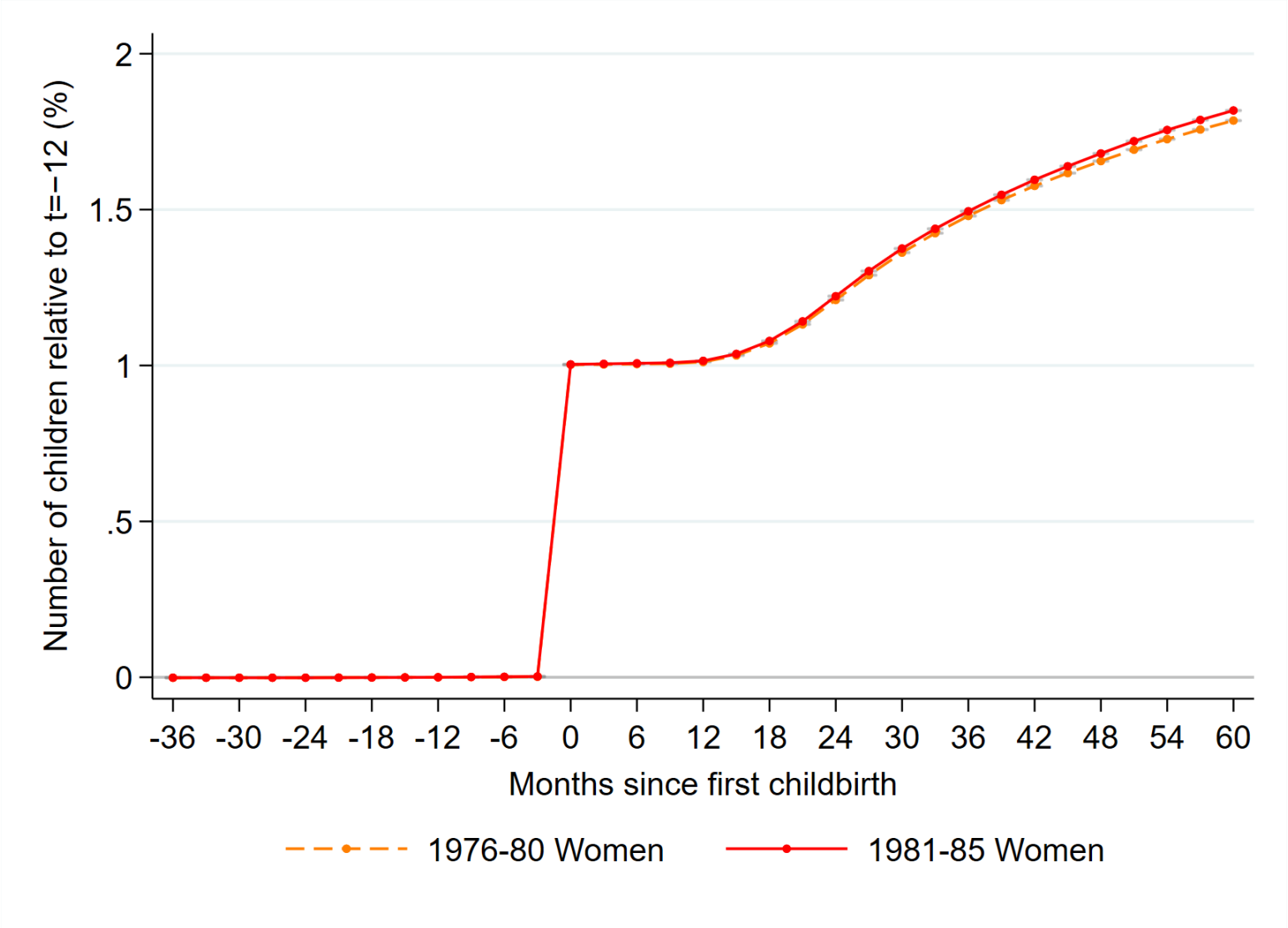
- "Quit work": if worked at $t = -12$, but not employed for at least one month afterwards until $t = +50$

Selection into Motherhood

- Did selection into motherhood change across cohorts?
- Regress the probability of becoming a mother by age 37 on baseline characteristics ($t = -12$)
  - 1985 cohort is 37 years old in 2022
- Childless women sample:
  - Among all women who did not give childbirth until age 37, draw a random sample by 1:1 matching based on woman's birth year
  - Assign the baseline year of the mother to the matched childless woman

	Dependent variable: mother by age 37			
Baseline characteristics ($t = -12$)	**(1)**	**(2)**	**(3)**	**(4)**
Intercept	0.5096***	0.5099***	0.5005***	0.5009***
	(0.0044)	(0.0044)	(0.0061)	(0.0061)
81-85 cohort	-0.0081***	-0.0074***	0.0120	0.0130
	(0.0007)	(0.0007)	(0.0087)	(0.0087)
Employee	0.0821***	0.0804***	0.0737***	0.0719***
	(0.0011)	(0.0011)	(0.0016)	(0.0016)
Employee * monthly earnings (1,000 USD)	0.1420***	0.0958***	0.1215***	0.0786***
	(0.0037)	(0.0040)	(0.0053)	(0.0057)
Employee * firm size ≥ 300		0.0140***		0.0097***
		(0.0011)		(0.0015)
Employee * public		0.0899***		0.0887***
		(0.0016)		(0.0022)
81-85 cohort * employee			0.0176***	0.0178***
			(0.0022)	(0.0022)
81-85 cohort * employee * monthly earnings (1,000 USD)			0.0439***	0.0377***
			(0.0075)	(0.0081)
81-85 cohort * employee * firm size ≥ 300				0.0075***
				(0.0021)
81-85 cohort * employee * public				0.0051
				(0.0033)
Control for age	Y	Y	Y	Y
Control for region	Y	Y	Y	Y
N	2,261,750	2,261,750	2,261,750	2,261,750

Total Number of Children



- Conditional on having the first child, total number of children by fifth year increased from 1.78 to 1.82

Concluding Remarks

- Child penalty in women's earnings in the short-run *increased* from 40% in the 1976–80 cohort to 46% in the 1981–85 cohort in Korea.
- Changing selection into motherhood?
- Women who are better financially prepared are more likely to have children in the 1981–85 cohort compared to the 1976–80 cohort.
- However, they are not more likely to maintain their employment after childbirth
  - incompatibility between "greedy jobs" and family (Goldin, 2021)
  - income effects
  - family-oriented preferences
- The child penalty need not decrease over time across high-income countries
- The child penalty and the broader gender pay gap may even diverge with rising childlessness, depending on the selection process into motherhood.

Thank you!

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