The Labor Market Returns to Delaying Pregnancy

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Motherhood and Earnings

Women are delaying childbirth at increasing rates

- US: Average age at first birth 27.1 compared to 21.4 in 1970

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Motherhood associated with negative labor market effects

- Earnings losses of around 30%
  (Kleven, Landais & Søgaard, 2019; Kleven, Landais, Posch, Steinhauer & Zweimüller, 2019; Angelov, Johansson & Lindahl, 2016; Datta Gupta & Smith, 2002)
- Challenging to study causal impacts
  (Bronars & Grogger, 1994; Hotz, McElroy, & Sanders, 2005; Miller, 2011; Herr, 2012; Lundborg, Plug & Rasmussen, 2017; Bíró, Dieterle & Steinhauer, 2019; Miller, Wherry & Foster, 2020; Brooks & Zohar, 2020; Gonzáles et al 2021; Bensnes, Huitfeldt & Leuven, 2023)

This paper

Research Questions

1. Does delaying pregnancy mitigate the labor market impacts of motherhood?
2. How does impact vary with circumstances?
    - Age
    - Investment in human capital
    - Pregnancy intentions

Data

- Swedish labor market + prescriptions + medical data

Methodology

- LARC failures

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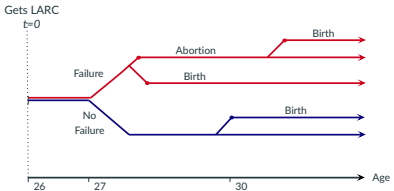
Methodology

- LARC failures

LARC = Long Acting Reversible Contraception
Intrauterine Device/"IUD" or Birth Control Implant

Estimates: Pregnancy vs. Birth

- What is the impact of unplanned pregnancy?
  - Compare women who received LARC at same time, same age
  - Some become pregnant $\longrightarrow$ abortion, birth
  - Those who don't are the counterfactual
- What is the impact of unplanned birth?
- How does it vary with circumstances?



Estimates: Pregnancy vs. Birth

- What is the impact of unplanned birth?
  - Use pregnancy as an instrument for birth
- How does it vary with circumstances?
  - Challenging to answer this by looking at pregnancy impacts!
  - Differences in reduced form arise from
    1. First stage (rate of abortions)
    2. Treatment effect (differences in impact of birth depending on circumstances)
    3. *Future* treatment (dynamic non-compliance)
    4. Different compliers (e.g. other characteristics)

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    2. Treatment effect (differences in impact of birth depending on circumstances)
    3. *Future* treatment (dynamic non-compliance)
    4. Different compliers (e.g. other characteristics)
- Show identification of local average dynamic treatment effects using IV
- Develop dynamic IV-GMM methodology for estimating LATE

Results

- Unplanned pregnancy has large impact on earnings, occupation trajectory
- Women who give birth following unplanned pregnancy have earnings loss 25% 1-7 years later
- More than 20% less likely to be in medium-high skilled occ when child is 5
- Effects are larger for younger women and women enrolled in education
- More muted effects for women who intended to have children

Data: Swedish Administrative Data

- Sample women born in 1965-83
- **Labor market** data (1990-2013) collected and administered by Statistics Sweden (SCB) ("*Statistiska Centralbyrån*")
  - Earnings, paid leave, employment, sector, occupation
  - Level and field of highest completed education
  - Age, civil status, family status, household composition,...
- **Health** data collected and administered by the National Board of Health and Welfare
  - Medical Birth Registry (MFR) from 1973-2012
  - Prescribed Drug Register (LMED) from 2005-2013
  - National Patient Register (NPR)
    - Does not include primary or midwife care

Identifying LARC Failures

- Identified from women who get IUD and implant prescriptions
- Define pregnancies as “unplanned” if occur within 9 months of prescription
    - Observe 355 unplanned LARC pregnancies

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  - Observe 355 unplanned LARC pregnancies
- Concern #1: Measurement Error
  - e.g. Women may not use LARC or have them removed
  - Compare 1-year failure rates including abortions to medical literature (“$\approx 0.5\%$”):
    - IUD: 1,168/308,900 = 0.38%
    - Implant: 392/54,357 = 0.72%
  - Results robust to using different windows

LARC Failures as Quasi-random variation

- Concern #2: Failures are more likely when more fertile, more intercourse
  - Results robust to matching additionally on, e.g., civil status and education
  - Also robust to adding rich HH composition and labor market controls
  - Balance after matching women based on age and year of prescription:

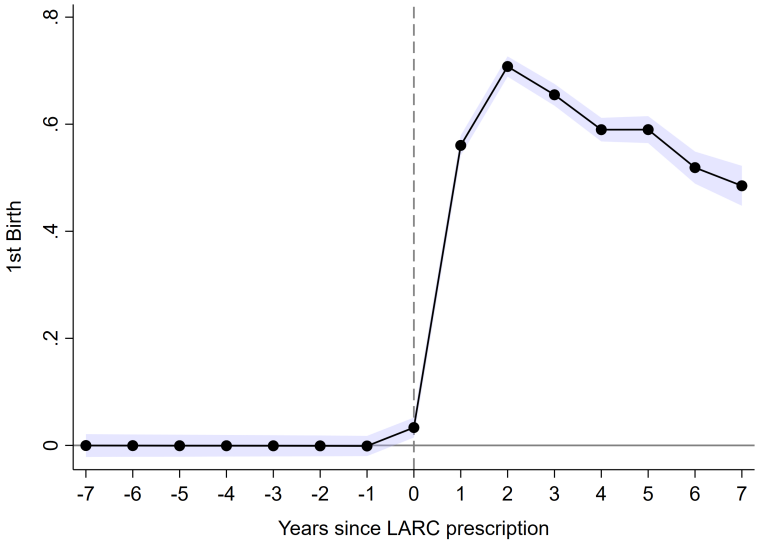
	Unplanned Pregnancy	No Unplanned Pregnancy	p-value diff.
Earnings Including Paid Leave (1000s)	161.609	157.600	0.597
Fraction of Full-time Employment	82.843	82.248	0.673
Employed	0.642	0.658	0.540
Occupation Requiring Medium or High Skills	0.220	0.236	0.517
High School	0.434	0.409	0.339
College Degree or Higher	0.317	0.358	0.098
Married	0.223	0.132	0.000
Observations	341	27,507	

Estimation of Impact of Pregnancy (Reduced Form)

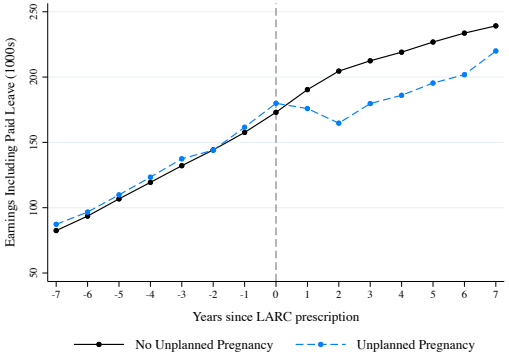
$$Y_{is} = \sum_{t=-7}^{7} \alpha_t^{LARC} \mathbf{1}\left[t = s - year_i\right] UnplannedPregnancy_i + \sum_{t=-7}^{7} \sum_{y} \sum_{j} \delta_{tyj}^{LARC} \mathbf{1}\left[t = s - year_i\right] \mathbf{1}\left[y = year_i\right] \mathbf{1}\left[j = age_{i,year_i}\right] + \varepsilon_{is} \quad (1)$$

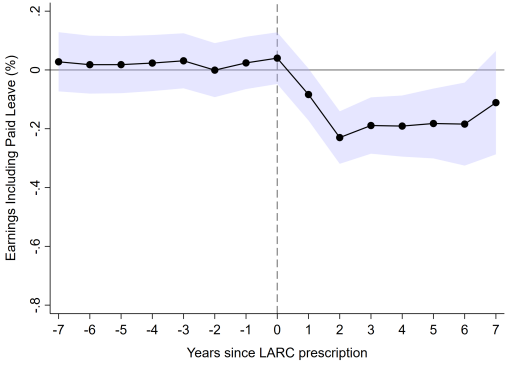
- Y_{is} is the outcome of interest (e.g., labor market earnings) in year s for woman i
- s calendar year; $year_i$ year of LARC for woman i; t year relative to $year_i$ for i
- α_t^{LARC} is the parameter of interest: difference in outcome for women who had unplanned pregnancy vs. not, matching on prescription year and age

Impact of Pregnancy on Childbirth



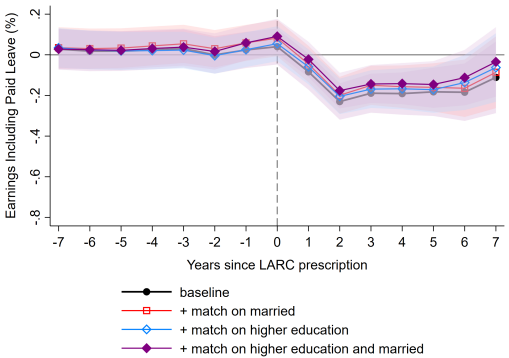
Impact of Pregnancy on Earnings





Robustness of Reduced Form Results

- **Match additionally on civil status, education**
- Add controls
- Married vs. unmarried (partner shocks)
- Window robustness
- Panel balance



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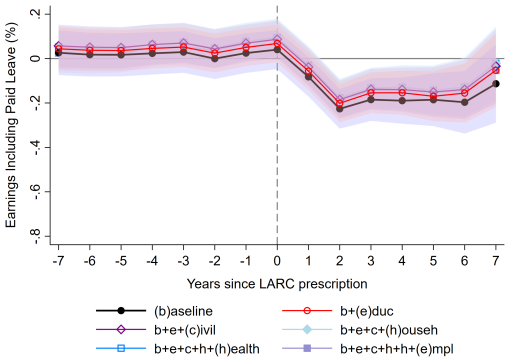

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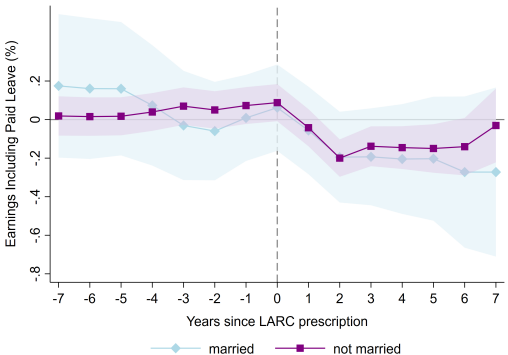

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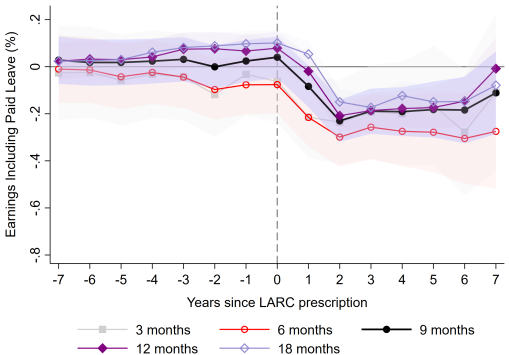

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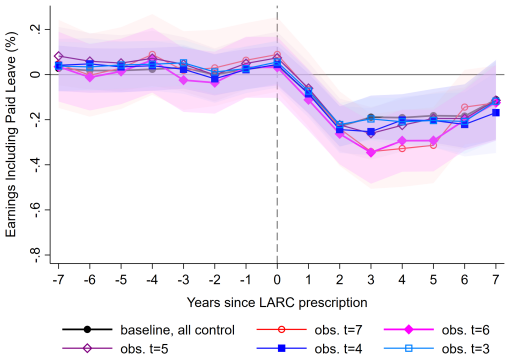
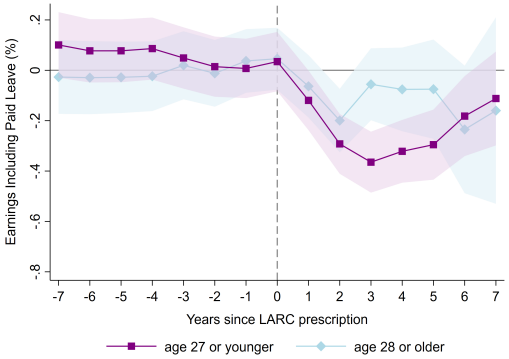
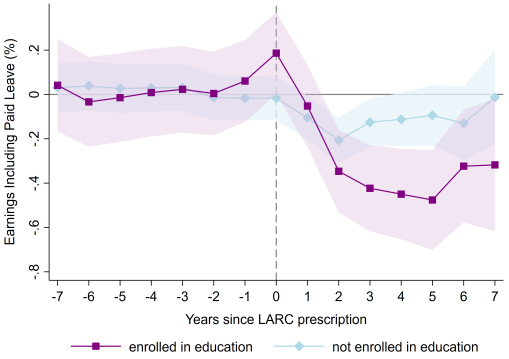


Heterogeneity





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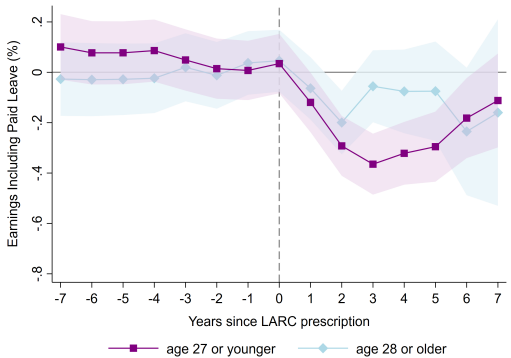

- Are all older women having children sooner?
- Are they more likely to get an abortion?
- Or is this heterogeneous effect of children?

IV Strategy for Identifying Impact of Birth

- Goal: Estimate (dynamic) LATE$_\tau$
- Assumptions when instrumenting birth (T_{it}) with $Z_i \equiv UnplannedPregnancy_i$
  1. **Relevance**: Z_i affects birth in first period
  2. **Independence**: Conditional on T_{i1}: Outcomes (Y_{it}) and future fertility decisions ($T_{i,t>1}$) $\perp$ of Z_i
  3. **Exclusion Restr:** Z_i does not directly affect outcomes or future fertility decisions
     - e.g. abortions of unplanned pregnancies do not affect outcomes
  4. **Monotonicity:**
  5. **No anticipation:** Pre-treatment Y_{it} do not vary by timing of future treatment
- Notation: s calendar year; t year relative to $year_i$; τ years since 1st childbirth

Identifying Impact of Birth in First Year

- The first year is simply the static IV setting
- Wald (1940) estimator is the average treatment effect for first-period compliers

$$\text{Wald}_{t=1} \equiv \frac{E[Y_{i1}|Z=1] - E[Y_{i1}|Z=0]}{P[T_{i1}=1|Z=1] - P[T_{i1}=1|Z=0]} = \text{LATE}_{\tau=1}$$

Identifying the *Dynamic* Impact of Birth

- Compliance refers to the first year after the LARC
  - BUT first-year compliers with $Z = 0$ may have children in later years
- Wald estimator for second year after LARC identifies

$$\begin{aligned}\text{Wald}_{t=2} &\equiv \frac{E[Y_{i2}|Z=1] - E[Y_{i2}|Z=0]}{P[T_{i1}=1|Z=1] - P[T_{i1}=1|Z=0]} \\ &= \text{LATE}_{\tau=2} - [LATE_{\tau=1}|T_{i2}=1]\, P[T_{i2}=1|\text{compliers}]\end{aligned}$$

- Need two assumptions to identify $\text{LATE}_{\tau=2}$ using period 1 estimate:
  1. $[LATE_{\tau=1}|T_{i2}=1] = LATE_{\tau=1}$
  2. $P[T_{i2}=1|\text{compliers}] = P[T_{i2}=1|\text{compliers} + \text{never takers}]$
- Need similar assumptions to identify later impacts ($\text{LATE}_{\tau>2}$)

Estimating the Dynamic Impact of Birth via IV-GMM

- Our baseline dynamic IV-GMM estimator is

$$g_{it}^{1}(\theta) \quad = \quad Z_i \left(Y_{it} - \sum_{\tau=0}^{T} \rho_\tau \mathbf{1}[\tau = t - t_i^b] \right)$$

where $\rho_\tau = \text{LATE}_\tau$

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- Our IV-GMM approach allows for heterogeneous impacts

- Important: later births are not unplanned!

- Use IVF success as an instrument for impact of "planned" birth

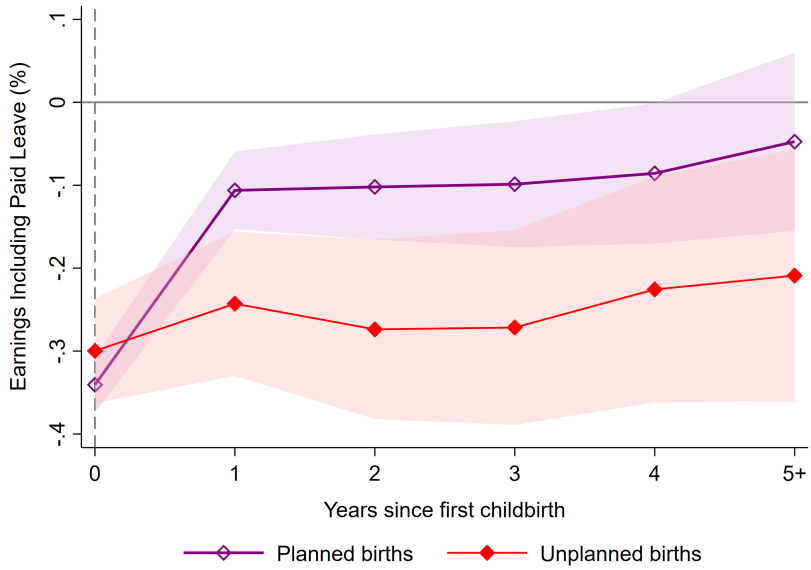
Estimating the Dynamic Impact of Birth via IV-GMM

- Our joint LARC-IVF IV-GMM estimator is

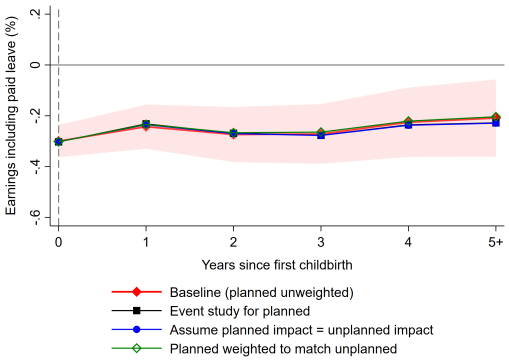
$$g_{it}^2(\theta) = \begin{cases} Z_i^p \left(Y_{it} - \sum_{\tau=0}^{T} \rho_\tau^p \mathbf{1}[\tau = t - t_i^b, b_i = p] \right) \\ Z_i^u \left(Y_{it} - \sum_{\tau=0}^{T} \rho_\tau^u \mathbf{1}[\tau = t - t_i^b, b_i = u] - \sum_{\tau=0}^{T} \rho_\tau^p \mathbf{1}[\tau = t - t_i^b, b_i = p] \right) \end{cases}$$

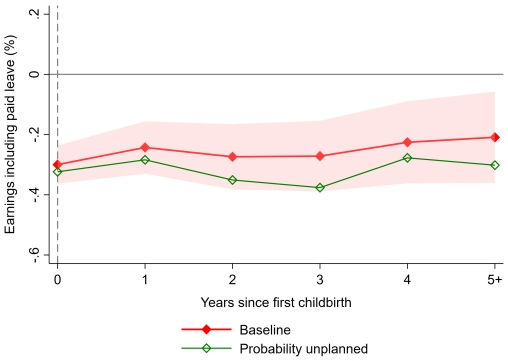
where p is “planned” (IVF) and u is “unplanned” (LARC)

Impact of Birth on Earnings

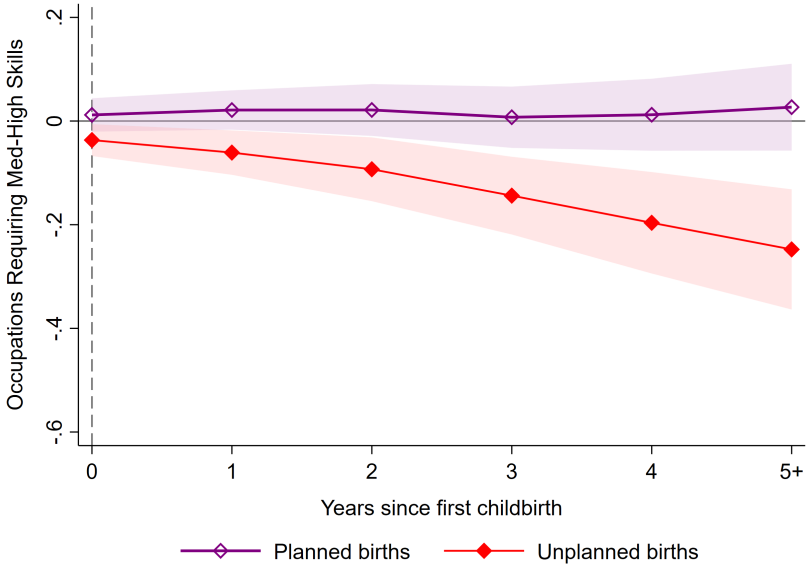


Robustness: Impact of Birth on Earnings

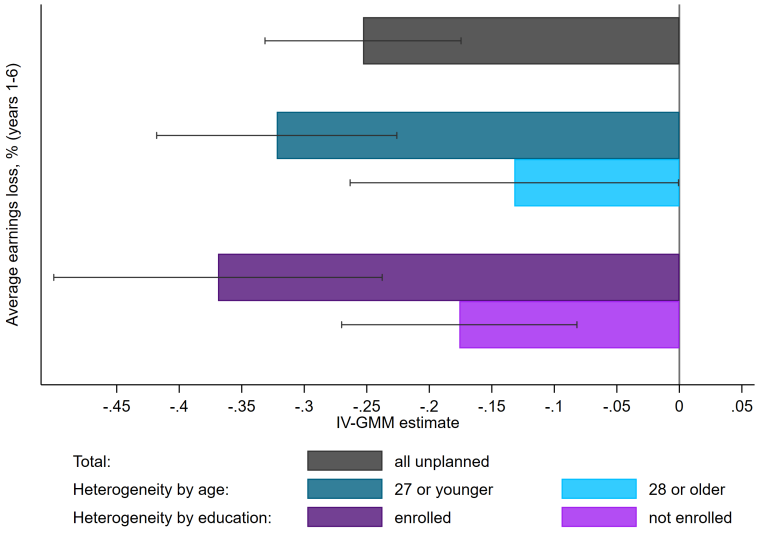




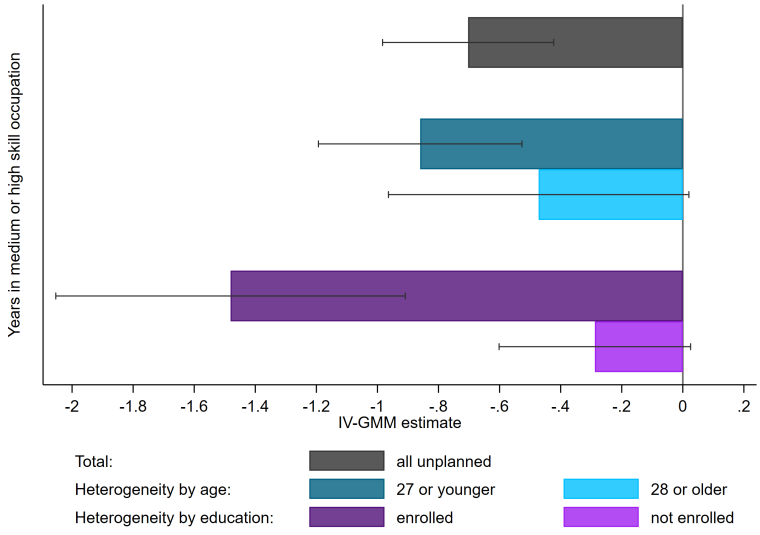
Impact of Birth on Occupation



Earnings Effect Heterogeneity



Occupation Effect Heterogeneity



Summary and Conclusions

- Unplanned pregnancy associated with large earnings impacts
- Impact of unplanned birth is around 25%
  - Short-term: $\downarrow$ non-employment, $\downarrow$ probability of promotion
  - By four years after birth, employment and the probability of a promotion recover
  - Med/long term: occupational trajectories $\downarrow$

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- Impacts are larger for women enrolled in education, younger women
- Timing important, delay mitigates impact of children on careers