Child care costs and stagnating female labor force participation in the US

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SWET 2018
“Basic childcare for Jack and Henry costs more than their mortgage, and almost as much as a year at the University of Minnesota.”

Barack Obama

State of the Union address 2015
Research Question

• Motivation
  • very expensive child care price in the US
    • The mean full-time monthly costs are about $1000
    • The costs seem rising (e.g., Child Care Aware of America)
  • The female labor force participation rate is now decreasing
    (69% in 1985 —> 76% in 2000 —> 73% in 2015)

• Questions
  • the basic trend of child care markets in the US?
  • driving force changing the child care market?
  • implications for female labor supply
  • evaluation of child care market policy?
Summary

- Fact finding: child care price ↑ & hours ↓ since the mid-1990s
- Significant impacts on the female labor supply (about 50% of ↓)

- A puzzle
  - expanding child care subsidies since the mid-1990s
  - positive demand effect —> price ↓, but price ↑ ??
  - *Minnesota* style explanation of the child care subsidy
  - backfire: negative supply side effect
  - many childcare workers are also working mothers. The childcare subsidies might distort their incentives
Outline

1. Facts: childcare market in the U.S.

2. childcare subsidy $\rightarrow$ price $\uparrow$, evidence

3. childcare subsidy $\rightarrow$ price $\uparrow$, simple model and numerical exercise

(optional)

4. price $\uparrow$ $\rightarrow$ household behavior, by life-cycle model

5. another factor: childcare regulation $\rightarrow$ price, by diff-in-diff estimation
The trend of the childcare market

- Two existing studies: Census Bureau reports & Herbst (2015)
  - No estimates on quantity, hours of childcare
  - What I want: $\text{Hourly price} = \frac{\text{childcare expenditure}}{\text{hours}}$

- This paper: hourly price

- Survey of Income and Program Participation (SIPP), child care topical module
  - One survey per a few years, in 1988-2011.
  - About 1000 sample of working mothers with small children
  - Inconsistency between 1994-1997 $\rightarrow$ adjusted
Average real hourly child care price, age < 5

- Questionnaire: “How much did you pay?”
  - consumer (net) price

1. Facts

kindergarten, only age 5 in the US

- Including: daycare, nursery/preschool, family day care, nanny and baby sitter.
- Excluding: kindergarten, before/after school, paid for family/relative
Real mean hourly child care price, age < 5

- Excluding no payment (close to the gross price)
Hourly costs / mother’s hourly wage

1. Facts

- Directly affect’s mother’s labor supply decisions
- U-shape: wage ↑ first —> child care price ↑ next
Mean weekly hours of child care

- Market care: paid care by daycare center or non-relative
- Non-market care: non-paid care by relative and family

- Mean hours, all working mothers, # kids not adjusted
1. Facts

- Reagan tax cuts
- Clinton’s welfare reform
- Child care price ↑ is a puzzle?

Source: Head start fact sheet, Committee on way and means, Green Book, Mitchell (2002), NIEER
The distribution of hourly child care price

1. Facts

- 10th percentile
- 25th percentile
- 50th percentile
- 75th percentile
- 90th percentile

Year:
- 1990
- 1995
- 2000
- 2005
- 2010

2010 dollars

adjustment

10th percentile
25th percentile
50th percentile
75th percentile
90th percentile

12
The distribution of hourly child care price

1. Facts

<table>
<thead>
<tr>
<th>Year</th>
<th>10th percentile</th>
<th>25th percentile</th>
<th>50th percentile</th>
<th>75th percentile</th>
<th>90th percentile</th>
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<tr>
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<td>-0.2</td>
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<td>1995</td>
<td>-0.2</td>
<td>0.0</td>
<td>0.2</td>
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<td>0.2</td>
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<tr>
<td>2005</td>
<td>0.2</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>0.2</td>
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<tr>
<td>2010</td>
<td>0.4</td>
<td>0.6</td>
<td>0.8</td>
<td>1.0</td>
<td>0.4</td>
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</table>
Mean price by family income

1. Facts

<table>
<thead>
<tr>
<th></th>
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<th></th>
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</thead>
<tbody>
<tr>
<td>Top 1/4</td>
<td></td>
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<td></td>
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<tr>
<td>1/4 to 1/2</td>
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<tr>
<td>1/2 to 3/4</td>
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</tr>
<tr>
<td>Bottom 1/4</td>
<td></td>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>
Mean hours of market care by family income

1. Facts

- Top 1/4
- 1/4 to 1/2
- 1/2 to 3/4
- Bottom 1/4

Year


2010 dollars

Adjustment
Mean hours of family/relative care by family income

1. Facts

Year:
- 1990
- 1995
- 2000
- 2005
- 2010

2010 dollars adjustment:
- Top 1/4
- 1/4 to 1/2
- 1/2 to 3/4
- Bottom 1/4

Graph showing mean hours of family/relative care by family income, with adjustments for years 1990 to 2010.
Puzzle? child care subsidy ↑

- Puzzle?
  - ECON 101: subsidy → consumer price ↓ & quantity ↑
  - US child care market: consumer price ↑ & quantity ↓

- Two types of child care
  - Center-based: preschool, nursery school, daycare center
  - Home-based: family daycare home, nanny, baby sitter

- Main fact: Home-based childcare supply ↓
Two types of market child care in the US

<table>
<thead>
<tr>
<th>Place</th>
<th>Center-Based</th>
<th>Home-Based</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>school-style facility</td>
<td>consumer or provider’s home</td>
</tr>
<tr>
<td>Examples</td>
<td>Daycare center, Nursery school, Preschool, Head start</td>
<td>Family daycare home (83%), Baby sitter, Nanny</td>
</tr>
<tr>
<td>Number of workers, 1990</td>
<td>303,975</td>
<td>503,327</td>
</tr>
<tr>
<td>Market share, 1990 (hours by consumer)</td>
<td>51%</td>
<td>49%</td>
</tr>
<tr>
<td>Hourly wage, 1990 (price level adjusted to 2010)</td>
<td>$7.4</td>
<td>$5.5</td>
</tr>
<tr>
<td>% of mothers, 1990 (youngest kid’s &lt; 5)</td>
<td>17%</td>
<td>34% (13% in all work mom)</td>
</tr>
</tbody>
</table>

Dara source: IPUMS census 1990
• Decline only in home-based care
• Increase in hourly price
child care subsidy as a negative supply shock

- A mother, $8 potential wage in office work, $3 child care price

**Home-based care, no subsidy**

- Office work: net wage: $5 = 8 - 3

**with childcare subsidies**

- Subsidised child care: $0
- Office work: net wage: $8 = 8 - 0

**Overall child care price↑**

2. supply shock?
Worker side 1: labor supply

Center–based

Data source is CPS. child status is classified by having kids age lower than 18

Home–based

2. supply shock?
Worker side 2: wage

- wage gap between center and home
  - home-based worker’s advantage on no child care payment
  - The advantage disappears by subsidy —> the gap also shrank

2. supply shock?
Worker side 3: wage growth by region

- Public Use Microdata Area (PUMA): 543 divisions of US
- More moms in home-based —> higher wage growth
- General equilibrium —> higher growth also in center-based sector

2. supply shock?

Home–based worker's wage

Center–based worker's wage
Price↑, other factors?

- Oaxaca decomposition, 1993 vs. 2010
- The increase in the increase in the hourly price child care.
- about 75% still remain unexplained.

2. supply shock?
Hours↓, other factors?

- Oaxaca decomposition: 1993 vs. 2010
- The decline in the weekly hours of marker child care.
- It even predicts an *increase in hours*
Simple model and numerical exercise

- Question: why supply effects dominate demand ones?

- Type A mothers: office work or non-employment

\[
\max_{n \in \{0,1\}} c - \delta n \quad \text{s.t. } c = (w - [1 - \tau(w)]p)n
\]

\[
n_A(w) = \begin{cases} 
1 & \text{if } w - [1 - \tau(w)]p > \delta \\
0 & \text{otherwise} 
\end{cases}
\]

- Type B mothers: office work or home-based child care
  - work anyway —> care only wage
  - home-based child care: care \( z \) children and her own kid

\[
n_B(w) = \begin{cases} 
1 & \text{if } w - [1 - \tau(w)]p > pz \\
0 & \text{otherwise} 
\end{cases}
\]
Partial equilibrium with linear subsidy

- **Equilibrium condition**

\[
\theta \int n_A(w) dF_A(w) + (1 - \theta) \int n_B(w) dF_B(w)
\]

\[
= (1 - \theta) z \int [1 - n_B(w)] dF_B(w) + \Theta
\]

- \(\theta\) is population of Type A
- \(\Theta\) is fixed child care supply by the other child care workers

- **Case 1**: Linear subsidy: \(\tau(w) = \tau\) for all \(w\)

- **Proposition**: subsidy rate \(\tau \uparrow\), \((1-\tau)p \downarrow\) and supply \(\uparrow\)

- demand effect > supply effect (as usual)
Partial equilibrium with mean-tested subsidy

• **Case 2:** Mean-tested subsidy:

• **Proposition:** $s \uparrow$ reduces the child care supply if

$$
\tau(w) = \begin{cases} 
1 & \text{if } w \leq s \\
0 & \text{if } w > s 
\end{cases}
$$

$$
\frac{f_B(s)}{f_A(s)} \quad \frac{f_A(p + d)}{zf_A(pz) + (1 + z)f_B((1 + z)p)}
$$

- **direct effect** $s \uparrow$
  - # Type B leave child care
  - # Type A start working

- **indirect effect** $p \uparrow$
  - # Type A quit jobs
  - # Type B start child care

• **Corollary:** If $f_A(w), f_B(w)$ follow uniform distributions, child care supply $\uparrow$

• **Heterogeneity** may be necessary to cause the backfire
  - Non-linear subsidy
  - Non-uniform wage distribution
Numerical exercises

- Model parameters are matched to CPS 1985-1995 data
  - $f_A(w), f_B(w)$ following log-normal by wage distribution
    - $f_B(w)$: home-based child care “last year” and changed jobs
    - selection corrected by simulation
  - $\delta, \theta, z, \Theta$ by other moments: emp rate, CC price, CC wage, HB share.
3. Model

Fraction of Type A women who receive subsidy

Fraction of Type B women who receive subsidy

18% eligibility in 2010
3. Model

Gross hourly price of child care

Employment rate of Type A

18% eligibility in 2010
Numerical exercise

- Numerical Exercises
  - If subsidy cutoff is low
  - only potential childcare workers are eligible
  - less childcare supply —> high price —> low employment rate
  - Quantitatively consistent with the actual policy

- If the government used the same amount of money in different way?
  - linear subsidy to consumers: Emp rate: 46.3%, Net price: $2.49
  - linear subsidy to home-based: Emp rate: 48.0%, Net price: $2.07
Brief summary: Life-cycle model

- Question: price ↑, then labor supply? child care allocation?
- price ↑ as exogenous shock —> household response
- Life-cycle decision model of married couples:
  - wife’s full-time or part-time labor supply
  - child care arrangement: market vs. grandma care
- Simulation: calibration with 1990 data & add price ↑ in 2010
  - Capture more than half deviation from trends in maternal labor supply
  - Human capital loss —> labor supply ↓ in later life
  - Almost fully captures child care arrangement shifts.
Brief summary: Regulation

- Child care development Fund (CCDF) —→ regulation ↑
- Less than half of home-based care were licensed
- CCDF —→ license ↑ in home-based
  - required for operation and subsidy
  - regulation agency’s budget ↑
- DDD estimation
  - time difference
  - state-level difference in licensed family daycare ↑
  - Home-based vs.Center-based Difference
- Result: Explains 4%↑ in child care price (wage)

wrap up!
Other factors?

- Quality Improvement?
  - Possible, but maybe a minor factor
  - If so, why hours of market child care decreased?

- Monopoly power in child care industry?
  - Herfindahl index has dropped down
  - Share of franchised providers have been constant at 4%

- Culture?
  - Tiger mom effect?
  - Unclear factor. Observed factor first.

wrap up!
Conclusion

• Research question: why female labor in the US ↓?

• New facts: rising child care price and decreasing its hours.

• Why child care costs ↑?
  • child care subsidies for low-income families
  • also for working mothers in home-based childcare
  • They send kids to subsidized care and change jobs
  • childcare supply ↓, unexpected subsidy’s backfire

• Policy implication: encourage home-based child care supply

• Future research:
  • Quality adjustment?
  • Rich quantitative model and policy exercise
Price ↑ —> household behavior? Life-cycle model

• Question: price ↑, then labor supply? child care allocation?

• price ↑ as exogenous shock —> household response

• Life-cycle decision model of married couples:
  • wife’s full-time or part-time labor supply
  • child care arrangement: market vs. grandma care

• Simulation: calibration with 1990 data & add price ↑ in 2010
  • Capture more than half deviation from trends in maternal labor supply
  • Human capital loss —> labor supply ↓ in later life
  • Almost fully captures child care arrangement shifts.
Life-cycle models of female labor supply

<table>
<thead>
<tr>
<th>Papers</th>
<th>Saving</th>
<th>Human Capital</th>
<th>Intensive Margin</th>
<th>Non-market child care</th>
<th>Fertility</th>
<th>Marriage Divorce</th>
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<tbody>
<tr>
<td>Attanasio et al. (2008)</td>
<td>YES</td>
<td>YES</td>
<td></td>
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<tr>
<td>Eckstein &amp; Lifshitz (2011)</td>
<td></td>
<td>YES</td>
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<tr>
<td>Fernandez &amp; Wong (2014)</td>
<td>YES</td>
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<td></td>
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<tr>
<td>Bick (2016)</td>
<td>YES</td>
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<tr>
<td>Guner et al. (unpublished)</td>
<td>YES</td>
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<td>YES</td>
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<tr>
<td>My paper</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td></td>
</tr>
</tbody>
</table>

- My paper focuses more on child care and labor supply decision
Life-cycle model

One period = 5 year

- **work periods**
- **Retired**

25

Child care when kid < 5

Options: not work, market care, non-market care

- Heterogeneity: husband & Wife human capital: $h^m_i, h^f_i$

- Non-wage heterogeneity:

  - Timing of child bearing: two children in 1st period (25-29), or in 2nd period (30-34)
  
- Non-market care availability: $\theta$ couples have access
Life-cycle model: Retired periods (age 65-80)

\[
V_t(a_t) = \max_{c_t} \log \left( \frac{c_t}{\psi_t} \right) + \beta V_{t+1}(a_{t+1})
\]

s.t. \[ c_t + \frac{a_{t+1}}{1 + r} = a_t \]

\[ a_t \geq -\bar{a}(t) \]

• Both husband and wife are retired
• \( \psi \) is OECD adjustment factor for family size
• natural borrowing limit on asset
Life-cycle model: working periods (age 25-64) without childcare

\[ V_t^z(h^m_t, h^f_t, a_t) = \max_{c_t, n_t} \log \left( \frac{c_t}{\psi_{t, z}} \right) + d(t, z) \frac{(1 - n_t)^{1-1/\gamma}}{1 - 1/\gamma} \]

\[ \quad + \beta V_{t+1}^z(h^m_{t+1}, h^f_{t+1}, a_{t+1}) \]

s.t. \[ n_t \in \{0, 0.2, 0.4\} \]
\[ c_t + \frac{a_t+1}{1 + r} = (1 - \tau)[0.4wh^m_t + wh^f_t n] + a_t \]
\[ a_t \geq -\bar{a}(t) \]

Human capital accumulation

- wife’s labor supply: not-work, part-time, full-time
- husband always works in full-time
- \(d(t, z)\) depends on child status, (0-4, 5-14, no child)
Life-cycle model: human capital accumulation

• Husband
  \[ \ln h^m_{t+1} = \ln h^m_t + g_{t+1} + v^m_{t+1} \]

• Wife
  \[ \ln h^f_{t+1} = \ln h^f_t + \mathcal{I}(n_t > 0)g_{t+1} - \mu(n_t)\delta + v^f_{t+1} \]

• Human capital depreciation
  \[ \mu(n_t) = \begin{cases} 
  0 & \text{if } n_t = 0.4 \\
  \bar{\mu} & \text{if } n_t = 0.2 \\
  1 & \text{if } n_t = 0 
\end{cases} \] (full-time work)
  \[ \begin{cases} 
  0 & \text{if } n_t = 0.2 \\
  \bar{\mu} & \text{if } n_t = 0.4 \\
  1 & \text{if } n_t = 0 
\end{cases} \] (part-time work)
  \[ \begin{cases} 
  0 & \text{if } n_t = 0 \\
  \bar{\mu} & \text{if } n_t = 0.2 \\
  1 & \text{if } n_t = 0.4 
\end{cases} \] (non-employment)

• Permanent shock
  \[ \begin{bmatrix} v^m_t \\ v^f_t \end{bmatrix} \sim N \left( \begin{bmatrix} -\sigma^2/2 \\ -\sigma^2/2 \end{bmatrix}, \begin{bmatrix} \sigma^2 & \sigma^2 \rho \\ \sigma^2 \rho & \sigma^2 \end{bmatrix} \right) \]
Life-cycle model: childcare period (age 25-29 or 30-34)

\[
V^z_t(h^m_t, h^f_t, a_t) = \max_{c_t, n_t, x_t, y_t} \log(c_t/\psi_t) + d(t, z) \frac{(1 - n_t)^{1 - 1/\gamma}}{1 - 1/\gamma} - d_y y_t + \beta V_{t+1}(h^m_{t+1}, h^f_{t+1}, a_{t+1})
\]

s.t. \( n_t, x_t, y_t \in \{0, 0.2, 0.4\} \)

\[
n_t = x_t + y_t
\]

\[
c_t + \frac{a_{t+1}}{1 + r} = (1 - \tau)[0.4wh^m_t + wh^f_t n] - px_t + a_t
\]

\[
a_t \geq -\bar{a}(t)
\]

Human capital accumulation

- market child care \( x_t \) requires monetary cost \( px_t \)
- non-market child care (care by relative/family) incurs utility costs \( d_y y_t \)
Calibration, rough summary

- Data: IPUMS Census 1990.
- It is cross-section data. A steady state is assumed.
- Human capital accumulation parameters
  - directly calculated from wage data by generation
  - depreciation & his-wife correlation are from existing studies
- Preference parameters and non-market care availability $^\theta$
  - 7 parameters --> 7 moments.
## Calibration, parameters to match moments

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Explanation</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>$d_n^1$</td>
<td>leisure with kids &lt;5</td>
<td>0.3</td>
</tr>
<tr>
<td>$d_n^2$</td>
<td>leisure with kids 5-14</td>
<td>0.52</td>
</tr>
<tr>
<td>$d_n^3$</td>
<td>leisure without kids</td>
<td>0.26</td>
</tr>
<tr>
<td>$\gamma$</td>
<td>Frisch elasticity</td>
<td>0.64</td>
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<tr>
<td>$d_y$</td>
<td>disutility by non-market child care</td>
<td>0.3</td>
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<tr>
<td>$\theta$</td>
<td>fraction, accessible to non-market child care</td>
<td>0.31</td>
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<tr>
<td>$\mu$</td>
<td>Human capital depreciation, part-time job</td>
<td>0.37</td>
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<table>
<thead>
<tr>
<th>Moment</th>
<th>Data</th>
<th>Simulation</th>
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<tbody>
<tr>
<td>LFPR, married women with kids &lt;5</td>
<td>0.656</td>
<td>0.666</td>
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<tr>
<td>LFPR, married women with kids 5-14</td>
<td>0.74</td>
<td>0.715</td>
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<tr>
<td>LFPR, married women without kids &lt;5</td>
<td>0.71</td>
<td>0.7</td>
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<tr>
<td>Fraction of part-time, with kids 0-14</td>
<td>0.206</td>
<td>0.18</td>
</tr>
<tr>
<td>Fraction of part-time, without kids</td>
<td>0.139</td>
<td>0.118</td>
</tr>
<tr>
<td>Non-Market child care share, income &gt; median</td>
<td>0.406</td>
<td>0.38</td>
</tr>
<tr>
<td>Non-Market child care share, income &lt; median</td>
<td>0.503</td>
<td>0.529</td>
</tr>
</tbody>
</table>
Main results

- Shock: child care costs ↑ by 32% between 1990-2010
- Comparison to each variable’s deviation from the trend
  - Extrapolation by logistic function — data in 2010
  - Trend: if all the other factors are keep growing?

### Main results

<table>
<thead>
<tr>
<th></th>
<th>Labor Force Particip.</th>
<th>Particip. kid&lt;5</th>
<th>Particip. kid,5-14</th>
<th>Particip. no kids</th>
<th>Hours Worked</th>
<th>Non-market care</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Change in Simulation</strong></td>
<td>-0.054</td>
<td>-0.129</td>
<td>-0.046</td>
<td>-0.043</td>
<td>-2.38</td>
<td>0.152</td>
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<tr>
<td><strong>Deviation from Trend</strong></td>
<td>-0.090</td>
<td>-0.177</td>
<td>-0.086</td>
<td>-0.050</td>
<td>-7.28</td>
<td>0.210</td>
</tr>
</tbody>
</table>

- Direct effect
- Human capital depreciation
- Part time ↑ in model, ↓ in data

4. Life-cycle
One more factor: regulation

- Child care development Fund (CCDF) —> regulation ↑
- Less than half of home-based care were licensed
- CCDF —> license ↑ in home-based
  - required for operation and subsidy
  - regulation agency’s budget ↑
- Diff-Diff-Diff estimation
  - time difference
  - state-level difference in licensed family daycare ↑
  - Home-based vs. Center-based Difference
- Result: Explains 4%↑ in child care price (wage)
## Wage and labor supply before/after CCDF

<table>
<thead>
<tr>
<th></th>
<th>1990</th>
<th>2000</th>
<th>log diff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Real Wage, Center-Based</td>
<td>7.67</td>
<td>8.19</td>
<td>0.06</td>
</tr>
<tr>
<td>Real Wage, Family Daycare</td>
<td>5.34</td>
<td>6.85</td>
<td>0.24</td>
</tr>
<tr>
<td># Center-Based Providers</td>
<td>86,212 (in 1991)</td>
<td>106,246</td>
<td>0.20</td>
</tr>
<tr>
<td># All Family Daycare Home (only reporting income to IRS)</td>
<td>524,381 (in 1992)</td>
<td>559,639</td>
<td>0.06</td>
</tr>
<tr>
<td># Licensed Family Daycare Home</td>
<td>220,867</td>
<td>304,958</td>
<td>0.32</td>
</tr>
</tbody>
</table>
Effect of licensing: Diff-in-Diff-in-Diff estimation

- **Licensed** family daycare $\uparrow$ $\rightarrow$ wage
- DDD estimation
  - time difference
  - state-level difference in # licensed family daycare
  - “Family Daycare — Center” Difference
Effect of licensing: Diff-in-Diff-in-Diff estimation

\[
\log(W_{it}) = \beta_0 + \beta_1 X_{ijt} + \beta_2 \tau_t + \beta_3 \delta_j + \beta_4 T_i \\
+ \beta_5 (\tau_t \times \delta_j) + \beta_6 (\delta_j \times T_i) + \beta_7 (T_i \times \tau_t) + \beta_8 (\tau_t \times \delta_j \times T_i)
\]

- Subscripts, \(i\) : individual, \(j\) : states, \(t\) : year (1990 or 2000)
- \(W_{it}\) : hourly wage (in baseline)
- \(X_{ijt}\) : individual characteristics
  (age, marital status, part-time, education, race)
- \(\tau_t\) : fixed year effect (dummy, \(\tau_t = 1\) if year is 2000)
- \(\delta_j\) : percentage increase in licensed (FCC) providers in each state
- \(T_i\) : treatment dummy (1 if FCC worker, 0 if other CC workers)
Effect of licensing: Diff-in-Diff-in-Diff estimation

- Why DDD?
  - To control the child care demand effect: e.g., child care demand↑, wage↑, provider↑
- Why not each component of regulation?
  - too many. # licensed providers summarize them.
- Why wage instead of price?
  - childcare is labor intensive
  - small sample size in SIPP.
- Why compare 1990 and 2000?
  - large sample in census
Effect of licensing: Diff-in-Diff-in-Diff estimation

- Baseline case: $\beta_8 = 0.045$ with 5% significant level

- Quantitative effects
  - 8% ↓ in center/home wage difference
  - 3% ↑ in home-based childcare workers’ wage

- Robustness
  - # per kid
  - control = all female workers
  - annual income, full-time workers
  - DD
### Effect of licensing: Diff-in-Diff-in-Diff estimation

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$W_{it}$</td>
<td>Hourly Wage</td>
<td>Hourly Wage</td>
<td>Hourly Wage</td>
<td>Annual income</td>
<td>Hourly Wage</td>
</tr>
<tr>
<td>Sample</td>
<td>CC workers</td>
<td>CC workers</td>
<td>all female workers</td>
<td>Full-time CC workers</td>
<td>FCC workers</td>
</tr>
<tr>
<td>Method</td>
<td>DDD</td>
<td>DDD</td>
<td>DDD</td>
<td>DDD</td>
<td>DD</td>
</tr>
<tr>
<td>$\beta_8$</td>
<td>0.045**</td>
<td>0.045**</td>
<td>0.032***</td>
<td>0.070**</td>
<td>0.058***</td>
</tr>
<tr>
<td></td>
<td>(0.022)</td>
<td>(0.019)</td>
<td>(0.011)</td>
<td>(0.033)</td>
<td>(0.019)</td>
</tr>
<tr>
<td>Note</td>
<td>Baseline</td>
<td>The level difference in FCC provider per child</td>
<td>The control group is all the other female workers</td>
<td>Hours of work per week is more than 35, Weeks of work per year is more than 50.</td>
<td>Diff-in-diff with only FCC workers</td>
</tr>
</tbody>
</table>

**significant levels:**

- *** 1%
- ** 5%
- * 10 %