

# Effect of 20 hours free Early Childhood Education on Women's Labor Market Outcomes

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# Contents

- 1 Introduction
- 2 Background: ECE in NZ
- 3 Analysis and Results

## Policy: 20 hours (free) ECE

- Started in July 2007
- For 3 to 4 year olds, at teacher-led services (not playcentres)
- Up to 6 hours per day, up to 20 hours per week
- Available to all parents, regardless of income or work status
- $\neq$  Working for Families tax credits and childcare assistance, or Work and Income childcare subsidy, for low/middle income families
  
- “encourage regular and intensive participation in quality ECE”, which “builds the lifelong foundations of successful learning”
- “saving families up to \$4500 a year per child”
- Projected cost: \$313m in 2007/08

Unfortunately this was **not** a natural experiment

# Summary of results

Outcome variable: mothers' monthly wages & salaries, **excluding** benefits, paid parental leave

Triple-difference: 3 dimensions of comparison

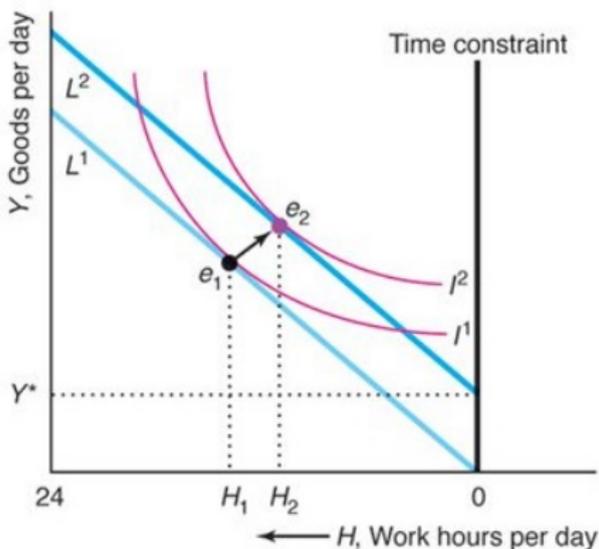
- Same mother pre-pregnancy vs. post-childbirth: removes individual fixed effect
- Eligible vs. non-eligible mothers: removes effect of childbirth
- Contemporaneous mothers vs. non-mothers: removes time fixed effect (e.g. GFC)

Result: earnings ↓ 4-10%, when mothers have their *first* child, biggest reduction when that child is 1-2 y.o.

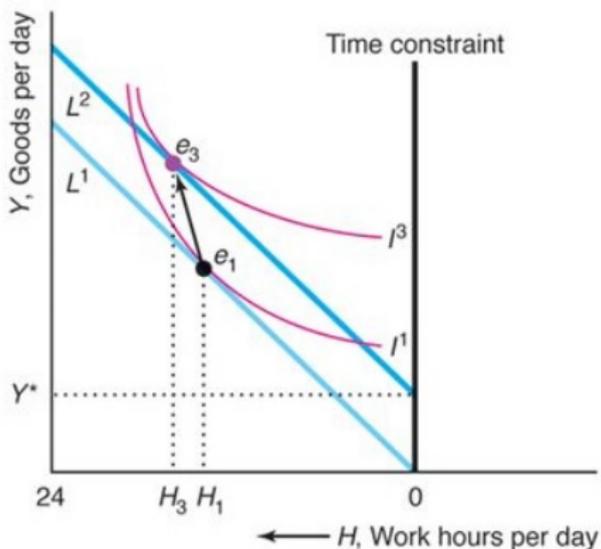
Our interpretation: eligible mothers cut income in anticipation of savings on child care expenditure

# From theory: Leisure can be normal or inferior

(a) Leisure Normal



(b) Leisure Inferior



# Literature on work-family policies

Studies that find effect on mothers' labor market outcomes:

Gibord & Marbot ( <i>Labour Econ.</i> 2015)	France
Haeck, Lefebvre, Merrigan ( <i>Labour Econ.</i> 2015)	Quebec
Bettendorf, Jongen, Muller ( <i>Labour Econ.</i> 2015)	Netherlands
Hardoy & Schone ( <i>Review of Econ. of Household</i> 2015)	Norway
Bauernschuster & Schlotter ( <i>J. Public Econ.</i> 2015)	Germany
Baker, Gruber, Milligan ( <i>JPE</i> 2008)	Quebec
Lefebvre & Merrigan ( <i>J. Labor Econ.</i> 2008)	Quebec
Berlinski & Galiani ( <i>Labour Econ.</i> 2007)	Argentina

# Literature on work-family policies (cont'd)

Studies that find **no** effect on mothers' labor market outcomes:

Havnes & Mogstad ( <i>J. Public Econ.</i> 2011)	Norway
Schone ( <i>Review of Econ. of Household</i> 2005)	Norway
Michalopoulos, Lundquist, Castells (2010 report)	Cook County, IL
Lundin, Mork, Ockert ( <i>Labour Econ.</i> 2008)	Sweden
Berger & Black ( <i>REStud</i> 1992)	Kentucky

## 3 studies in Quebec

\$5 slots per day, per child. Program phased in 1997-2000 by age, in descending order. Gradual increase in spaces in same period

Baker, Gruber, Milligan (*JPE* 2008)

- Uses NLSCY, waves 1-2 vs. waves 4-5
- Maternal labour force participation increases significantly

Lefebvre & Merrigan (*J. Labor Econ.* 2008)

- Uses Longitudinal Survey of Labour and Income Dynamics
- Participation: ↑ 13% in 2002
- Annual hours worked: ↑ 22% in 2002

Haeck, Lefebvre, Merrigan (*Labour Econ.* 2015)

- Uses NLSCY 1994-2008 (8 waves); compares before vs. after; rest of Canada as control
- Large positive significant effect on labour force participation of mothers with children 1-4 y.o., especially new mothers

## 3 different studies in Norway

Havnes & Mogstad (*J. Public Econ.* 2011)

- 1975 Kindergarten Act to quadruple number of child care places
- New subsidized child care mostly crowds out informal arrangements  $\Rightarrow$  significant net cost to subsidies

Schone (*Review of Econ. of Household* 2005)

- 1999 “cash-for-care” (flat-rate, tax-free, not tied to previous earnings) for parents of child 12-36 mo who do not use publicly subsidized day care

Hardoy & Schone (*Review of Econ. of Household* 2015)

- 2003 Child Care Centre Agreement: price cap full-time child care slot (2250 NOK  $\approx$  530 NZD in 2006); largest price reduction
- Big capacity increase: all municipalities required to offer slots to children 1-5 y.o.
- Result: mothers' labor supply increases by 5%

# Contents

1 Introduction

2 Background: ECE in NZ

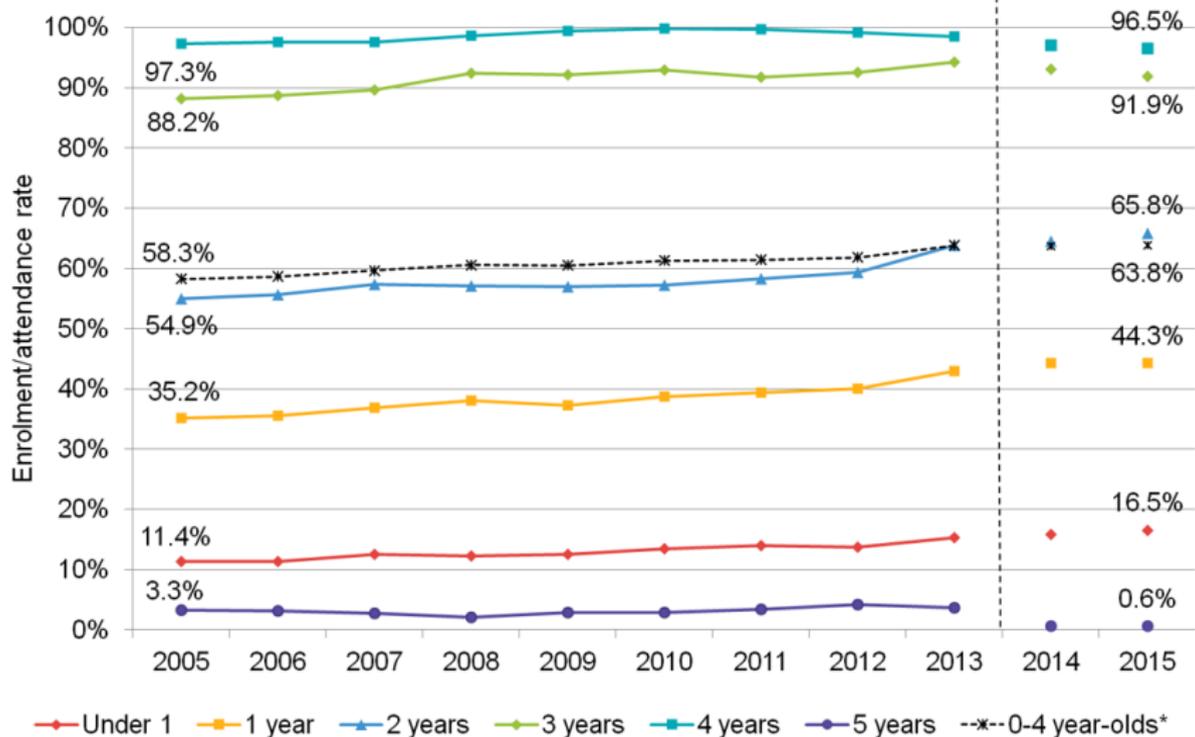
3 Analysis and Results

# Statistics New Zealand's IDI

Unfortunately, IDI's data on ECE starts in 2008

If we *had* ECE data pre-policy, we could trace changes in enrollment by cohort, and correlate that with mothers' labor market outcomes

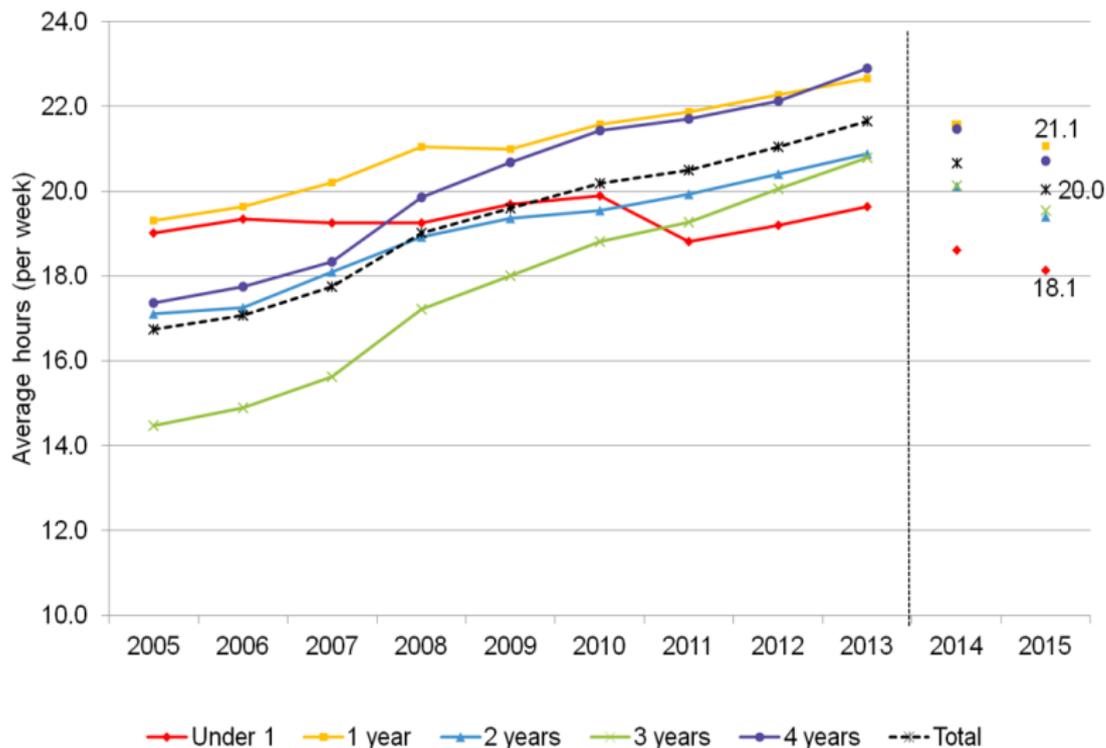
Figure 1.9: Enrolment/attendance rates, by age of child, 2005-2015



http:

[//www.educationcounts.govt.nz/statistics/early-childhood-education/annual-ecce-summary-reports](http://www.educationcounts.govt.nz/statistics/early-childhood-education/annual-ecce-summary-reports)

Figure 1.23: Average number of hours per week of child enrolment/attendance



http://www.educationcounts.govt.nz/statistics/early-childhood-education/annual-ece-summary-reports

# Contents

1 Introduction

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# Methodology

Difference-in-differences (DD) & Triple-Difference (DDD): Both common; depends on how many dimensions of control you need / are available

DD usually sufficient if policy gives natural experiment

Both are usually estimated by regression, as coefficient of interaction between dummy variables

In our case, DD (comparing mothers vs. non-mothers, pre- vs. post-childbirth) gives the **motherhood wage penalty**

Thus, our DDD estimator tells us how the policy changes the **motherhood wage penalty**

# Study population

Time frame:

- Treatment: mothers who give birth between July 04 and June 06
- Control: mothers who give birth between July 00 and June 02

~ 200,000 mothers

We focus on mothers who:

- have **one or two** children (~ 70% mothers)
- give birth within 20-55 age range
- have non-missing ethnicity and education
- have pre- and post-periods within IDI time frame
- work (mostly) continuously from  $t = -21$  to  $t = -12$  pre-childbirth
- do not have extreme income (>\$15,000)

~ 45,000 mothers

# Naming: 5 groups of mothers

group	first child eligible?	second child eligible?
1N	×	—
1E	✓	—
2NN	×	×
2NE	×	✓
2EE	✓	✓

We do 3 separate sets of analysis:

- 1N vs. 1E: treatment is the only child
- 2NN vs. 2NE: treatment is the last child (out of 2)
- 2NE vs. 2EE: treatment is the first child (out of 2)

# Summary statistics

Group	1N	1E	2NN	2NE	2EE
Age at first childbirth	32.63 (5.33)	32.72 (5.81)	30.59 (4.25)	29.78 (4.43)	30.16 (4.69)
Age at second childbirth	– –	– –	32.38 (4.28)	33.40 (4.29)	33.16 (4.52)
Edu: below HS	.109	.089	.068	.074	.063
Edu: HS	.640	.606	.654	.634	.578
Edu: University	.211	.259	.247	.257	.317
Edu: Post-Grad	.041	.046	.030	.034	.041
Ethnicity: European	.823	.758	.905	.891	.862
Ethnicity: Asian	.075	.133	.038	.050	.077
Ethnicity: Maori	.057	.057	.034	.035	.037
Ethnicity: Pacific	.044	.052	.023	.024	.024
Unique individuals	7,218	6,120	3,405	12,300	15,873

# Matching non-mothers

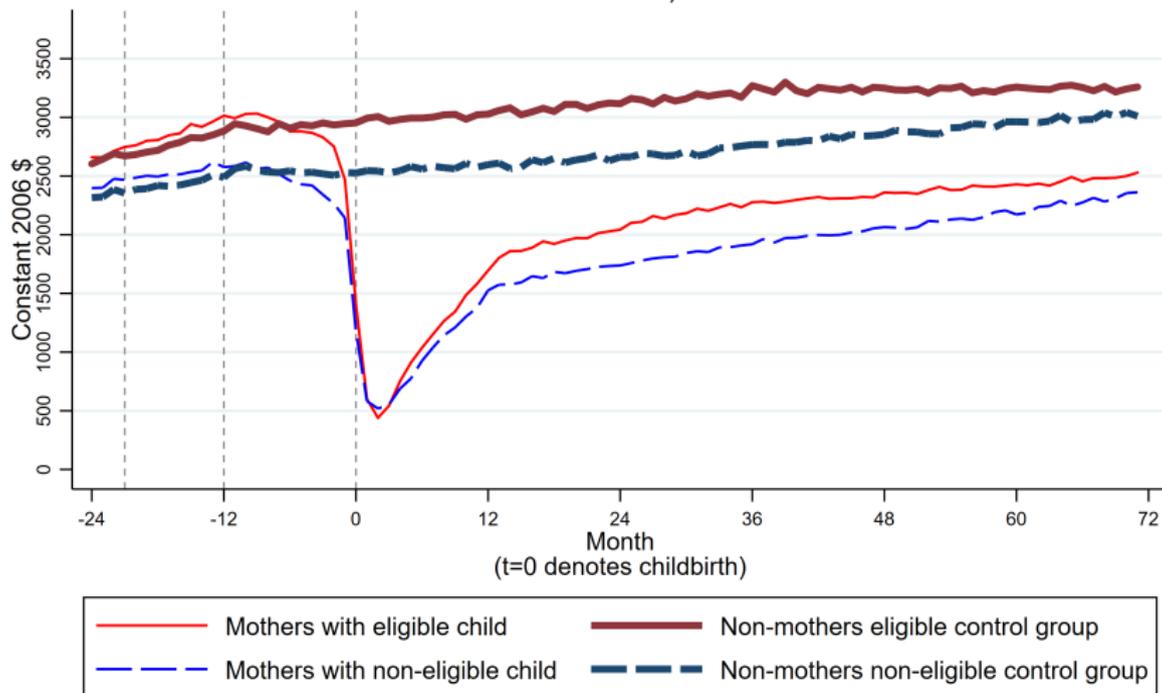
The group of living women in NZ is much bigger than the group of mothers in our study population. Who to use?

Solution: Each mother is matched to a non-mother with:

- identical birth year and month
- identical ethnicity (first ethnicity identified in census)
- identical education attainment (4 discrete levels)
- smallest squared difference in pre-pregnancy earnings  
( $-21 \leq t \leq -12$ )

Matching is done with replacement

## Average Monthly Earnings Mothers of one child, and Controls



Include instances of zero earnings

# Earnings summary

group	$-24 \leq t < 0$	$0 \leq t < 12$	$12 \leq t < 72$	unique
1N mothers	2479.26	940.88	1970.78	7,218
1N non-mothers	2478.83	2560.58	2803.57	6,810
1E mothers	2850.03	1043.14	2246.67	6,120
1E non-mothers	2827.84	2995.62	3193.26	5,793

group	$-24 \leq t_1 < 0$	$0 \leq t_1 \text{ \& } t_2 < 0$	$0 \leq t_2 < 12$	$12 \leq t_2 < 72$	unique
2NN mothers	3024.69	1053.67	630.64	1463.50	3,405
2NN non-mothers	3009.42	3046.60	3067.89	3339.63	3,258
2NE mothers	2916.45	1529.02	784.01	1658.3	12,300
2NE non-mothers	2845.72	2888.29	3234.28	3508.07	10,509
2EE mothers	3014.80	1569.26	789.75	1796.09	15,873
2EE non-mothers	2924.65	3089.44	3359.38	3545.04	13,050

# Regression set-up

Time period definitions:

- “Before”:  $t = -21$  to  $-12$  (10 months)
- “After”: year when treatment child is 1/2/3/4/5 y.o.
- discard the volatile period  $-11 \leq t \leq 11$

Outcome variable: monthly total wages & salaries

RHS variables:

- age; ethnicities; education;  $t$  fixed effects; unemployment rate
- $Eligible \times Post \times Mother$ : DDD estimator

# Regression results: DDD estimator

Groups 1N, 1E, matched non-mothers:

<i>Post period:</i>	<i>t=12-23</i>	<i>t=24-35</i>	<i>t=36-47</i>	<i>t=48-59</i>	<i>t=60-71</i>	<i>t=12-71</i>
DDD	-189.33*** (41.12)	-123.61** (44.78)	-122.81* (48.23)	-66.27 (49.66)	-66.17 (50.87)	-113.64** (42.20)

Groups 2NN, 2NE, matched non-mothers:

<i>Post period:</i>	<i>t=12-23</i>	<i>t=24-35</i>	<i>t=36-47</i>	<i>t=48-59</i>	<i>t=60-71</i>	<i>t=12-71</i>
DDD	76.81 (58.50)	44.76 (62.31)	-30.76 (65.91)	5.70 (70.72)	-116.33 (78.89)	-10.09 (59.68)

Groups 2NE, 2EE, matched non-mothers:

<i>Post period:</i>	<i>t=12-23</i>	<i>t=24-35</i>	<i>t=36-47</i>	<i>t=48-59</i>	<i>t=60-71</i>	<i>t=12-71</i>
DDD	-264.95*** (32.68)	-299.76*** (35.63)	-108.95** (37.35)	7.64 (39.04)	90.59* (40.28)	-115.09*** (33.21)

## Regression results: summary

Groups 1N-1E and 2NE-2EE: negative and significant when treatment child is 1/2/3 y.o.; magnitude decreases over time

Most mothers seem to value non-work hours more than extra cash, especially in early years of motherhood

Effect size is 4-10% pre-pregnancy income; smaller than average ECE monthly expenditure

Not much significance in 2NN-2NE: varied effect when treatment is second child, due to different time gaps between 2 children

Now we further break down analyses of 1N-1E and 2NE-2EE by pre-pregnancy **income quintiles**

# DDD by quintile: 1N, 1E, non-mothers

	<i>t</i> =12-23	<i>t</i> =24-35	<i>t</i> =36-47	<i>t</i> =48-59	<i>t</i> =60-71	<i>t</i> =12-71
Quintile 1	-38.11 (64.83)	38.77 (72.70)	61.48 (78.38)	68.30 (82.17)	70.57 (86.82)	40.20 (69.04)
Quintile 2	-212.88** (65.45)	-152.30* (72.16)	-87.37 (78.51)	-57.18 (82.56)	-55.46 (86.18)	-113.04 (68.79)
Quintile 3	-251.09*** (67.36)	-197.34** (73.02)	-177.51* (78.35)	-80.99 (82.86)	-83.17 (84.58)	-158.02* (68.50)
Quintile 4	-322.66*** (80.45)	-221.97* (88.52)	-260.30** (93.35)	-216.86* (97.89)	-203.73* (99.72)	-245.10** (81.56)
Quintile 5	-125.12 (132.57)	-88.41 (144.47)	-153.43 (157.99)	-47.81 (159.76)	-62.28 (162.09)	-95.41 (134.19)

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

# DDD by quintile: 2NE, 2EE, non-mothers

	<i>t</i> =12-23	<i>t</i> =24-35	<i>t</i> =36-47	<i>t</i> =48-59	<i>t</i> =60-71	<i>t</i> =12-71
Quintile 1	39.58 (49.23)	11.00 (53.69)	94.06 (57.89)	180.72** (61.89)	206.19** (66.06)	106.31* (51.16)
Quintile 2	-186.08*** (44.48)	-214.19*** (49.30)	-110.68* (52.20)	-14.39 (55.70)	27.64 (57.08)	-99.54* (45.36)
Quintile 3	-138.42** (48.01)	-203.11*** (51.35)	-31.52 (54.54)	33.92 (57.76)	54.72 (59.40)	-56.88 (46.84)
Quintile 4	-465.92*** (63.64)	-480.60*** (68.11)	-279.95*** (72.30)	-173.07* (76.83)	25.48 (79.31)	-274.81*** (63.19)
Quintile 5	-580.99*** (106.82)	-618.90*** (113.66)	-223.67 (118.68)	3.98 (127.02)	131.83 (132.21)	-257.55* (105.10)

\*  $p < 0.05$ , \*\*  $p < 0.01$ , \*\*\*  $p < 0.001$

## Quintile results: summary

### Mothers of 1 child:

- Quintile 1: no significant earnings reduction (cannot afford to work less?)
- Quintiles 2-4: same result as aggregate
- Quintile 5: no significant earnings reduction (opportunity cost of lost income too high?)

### Mothers of 2 children; treatment is first child:

- Quintile 1: significant earnings  $\uparrow$  when treatment child is 4-5 y.o. (First child already in ECE; second child probably born. If policy induces more hours of ECE enrolled than otherwise, this probably allows mothers to work more.)
- Quintile 2-5: same result as aggregate

# Policy Caveats

Government not responsible for provision  $\Rightarrow$  Shortage of licensed services, especially in early years

Difficult to estimate how much the policy actually reduces out-of-pocket expense. Service providers allowed to:

- require minimum of 7 hours / day or 21 hours / week, charging high fee for last hour
- ask for donations, optional charge, recovery fee, etc.

The word “free” soon taken out of policy name