

# Effects of Parental Leave Policies on Fertility and Work

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Workshop on Gender Wage Gap

# Introduction

## Mandated Parental Leave Across Countries

	Job Protection (JP)	Replacement Rate (RR) of Cash Benefit
Japan & Canada	1 year	50%
USA	1/4 Year	0%
Germany	3 years	60%

Source: OECD (2014)

## Research Question

- How would women's labour supply behavior change if PL is expanded?

# Objective: Ex Ante Evaluation of PL Expansion

## Background

- Japanese Prime Minister Abe proposed PL Expansion
  - April 19, 2012
  - Increase women's employment (74.3% for age 25-34).
  - Raise the fertility rate (1.410)

## Proposed PL Expansion

- JP: 1 Yr → 3 Yrs
- RR remains at 50%

# Objective: Ex Ante Evaluation of PL Expansion

## Structural Estimation

- Dynamic discrete choice model
  - 4 employment choices
  - 2 fertility choices
- Counterfactual simulations for ex ante policy evaluation.

## Limitation

- No demand side analysis.

# Literature: Structural Models of Female LFP

## Dynamic Discrete Choice Framework

- Eckstein and Wolpin (1989), van der Klaauw (1996), Altug and Miller (1998), Francesconi (2002), Gayle and Miller (2006), Sheran (2007), Keane and Wolpin (2007, 2010), Adda, Dustmann, and Stevens (2011), Mukhopadhyay (2012)

## Job Search Model

- Lalive, Schlosser, Steinhauer, and Zweimüller (2014)

## This Paper

- PL is incorporated into DDC framework.
- Endogenous fertility.
- Combine 3 methods to accelerate computation.

# Literature: Reduced-Form Approach to Effects of PL

## Related Papers

- Ruhm (1998), Baum (2003), Baker and Milligan (2008), Asai (2012), Lalive and Zweimüller (2009), Schönberg and Ludsteck (2011), Lalive, Schlosser, Steinhauer, and Zweimüller (2014)

## This Paper

- Policy effects vary across cohorts.
- Younger cohorts respond to a policy change **before** childbearing.

# Preview of the Main Results

	Job Protection	Cash Benefit
(1)	0	0%
(2)	1	0%
(3)	1	50%
(4)	3	50%

- (1)→(2)
  - Large employment and small fertility effects.
- (2)→(3)
  - Small employment and no fertility effects.
- (3)→(4)
  - Small employment and no fertility effects.
- For all policy changes, effects are stronger on younger cohort.

# Outline

- Data / Descriptive statistics
- Model
- Estimates
- Counterfactual simulations



## Japan Panel Survey of Consumers

- 4 cohorts
- 1993-2010

### Sample

- 1,566 non self-employed married women
- Observed for 9 years on average.

# Employment Transitions Probabilities (%)

	Choice in t			
	Home	Reg	Non-Reg	PL
Choice in t-1				
Home	88	1	11	0
Reg	6	82	5	7
Non-Reg	11	4	84	1
PL	9	67	14	10

- Only 1% of those at home enter the regular sector.
- 11% of those at home enter the non-regular sector.

# Setup

## Dynamic Discrete Choice Model

- Married women maximize the PV of lifetime utility
- 4 employment  $\times$  2 fertility choices
- Retire at age 70

## Unobserved Heterogeneity

- Own and husband's skills
- Preference for work
- Preference for child

# Structural Dynamic Discrete Choice Model

## Bellman Equation

$$V(S_{it}, \varepsilon_{it}) = \max_{j \in \{h, r, n, l\}, f \in \{0, 1\}} U_j^f(S_{it}) + \varepsilon_{j, it}^f + \beta E[V(S_{it+1}, \varepsilon_{it+1}) | S_{it}, j, f]$$

- $V(\cdot, \cdot)$ : value function
- $S_{it}$ : set of state variables
- $\varepsilon_{it}$ : choice-specific preference shocks
  - Generalized extreme value distribution
- $j \in \{h, r, n, l\}$ : employment choices
- $f \in \{0, 1\}$ : fertility choices
- $\beta$ : discount factor

# Structural Dynamic Discrete Choice Model

## Instantaneous Utility

- Utility from consumption

$$\text{Consumption} = \text{Own Earnings} + \\ \text{Husband's Earnings} + \\ \text{PL Cash Benefit}$$

- Non-pecuniary utility from children (conception)
- Non-pecuniary utility from an employment choice.

# Utility From Consumption

## Utility

- $u(C_{it}, d_{r,it}, d_{n,it}, n_{it})$ 
  - $C_{it}$ : consumption
  - $d_{r,it}$ : work in regular sector
  - $d_{n,it}$ : work in non-regular sector
  - $n_{it}$ : # of children

## Budget Constraint

$$C_{it} = \text{Own Earnings} + \\ \text{Husband's Earnings} + \\ \text{PL Cash Benefit}$$

# Three Income Sources

## (1) Own Labor Earnings

- Sector-specific earnings function
- Sector-specific experiences
- Years at home & lagged empl. sector
- Time effects
- Unobserved skills

# Three Income Sources

## (2) Husband's Labor Earnings

- Flexible function of state variables
- Unobserved skills



# Three Income Sources

## (3) Cash Benefit of Parental Leave

- Eligibility
  - ① Worked last year
  - ② Child is age 0
- $(\text{Repl. Rate}) \times \min[\text{Earnings} - \text{Bonus}, 5112000]$

Year	Repl Rate
1993-1995	0
1995-2000	25
2001-2006	40
2007-	50

# Non-Pecuniary Utility From Work

## Utility Function is Sector-Specific

- Regular
- Non-Regular

## Utility Depends On

- Age of youngest child (0, 1, 2, 3-5, 6-11, 12+)
- Number of children
- Lagged employment status
- Time effect
- Unobserved heterogeneity

# Take-Up of Parental Leave

- Those who wish to take a PL need to discuss the arrangement of work while they are on leave and when they come back.
- Employers and co-workers may discourage from PL take-up.
- Legal entitlement may lower this “cost” of PL take-up
- Cannot separately apply for job protection and cash benefit.
- Only those who are expected to return to work can receive cash benefit.

# Non-Pecuniary Utility Cost for PL Take-Up

## Utility Depends On

- Legal coverage

	Reg	Non-Reg
1993-2004	X	
2005-	X	X

- Employment sector
- Age of youngest child

Note: Unavailable if not worked last year or child is older than 2.

# Utility From Children (Conception)

## Utility Depends On

- Age of youngest child
- Number of children
- Current employment choice

## Fecundity

- Decreases from age 30.
- Infecund from age 45 on.

# Unobserved Heterogeneity

## Finite Mixture

- Individual is one of  $K$  types.
  - Own and husband's skills
  - Preference for work
  - Preference for child

## Type Probability

- Probability that individual  $i$  is type  $k$  is modeled by multinomial logit.
  - 1st observed choice.
  - State variables in the 1st observation.
  - Education.

# Estimation Algorithm

## **Nested Pseudo Likelihood Algorithm**

- Kasahara and Shimotsu (2011)

## **Sieve Approximation of Value Function**

- Arcidiacono, Bayer, Bugni, and James (2013)

## **Expectation-Maximization Algorithm**

- Arcidiacono and Jones (2003)

# Estimates: Non-Pecuniary Utility of Work

	Regular		Non-Regular	
	Estimates	S.E.	Estimates	S.E.
Kid's Age = 0	-1.231	0.185	-1.199	0.171
Kid's Age = 1	-0.389	0.121	-0.281	0.083
Kid's Age = 2	-0.027	0.109	-0.224	0.073
Kid's Age = 3-5	-0.185	0.089	-0.117	0.052
Kid's Age = 6-11	-0.095	0.077	-0.062	0.052
Kid's Age $\geq 12$	-0.039	0.080	-0.003	0.059
2 Children	0.070	0.045	0.078	0.023
3+ Children	0.021	0.043	0.059	0.025
home in $t-1$	-2.185	0.262	-1.197	0.144
reg in $t-1$			-0.599	0.100
non-reg in $t-1$	-1.080	0.140		

- High cost when child is age 0 (less so from age 1 on).
- High entry costs (more so in reg. sector).



# Estimates: Non-Pecuniary Utility of Taking PL

	Estimates	S.E.
Kid's Age = 0 & Reg. in $t - 1$ (***)	-0.242	0.171
Kid's Age = 0 & Non-Reg. in $t - 1$ & $t < 2005$	-1.028	0.210
Kid's Age = 0 & Non-Reg. in $t - 1$ & $t \geq 2005$ (***)	-0.559	0.144
Kid's Age = 1-2 & Reg. in $t - 1$	-0.829	0.431
Kid's Age = 1-2 & Non-Reg. in $t - 1$	-1.287	2.162

Note: (\*\*\*) indicates legal entitlement.

- Legal entitlement reduces the disutility cost.
- The disutility cost is lower if
  - Employed in the regular sector
  - Child is age 0

# Setup of Policy Simulations

- 10,000 married women start decision making from age 25.
- Initial conditions at age 25 are drawn from the data.
- Policy is fixed at age 25.

# Policies Simulated

	Job Protection	Cash Benefit
(1)	0	0%
(2)	1	0%
(3)	1	50%
(4)	3	50%

Note: Both reg and non-reg sectors are covered.

# Setup for Simulating Job Protection

	Estimates	S.E.
(1) Kid's Age = 0 & Reg. in $t-1$ (***)	-0.242	0.171
(2) Kid's Age = 0 & Non-Reg. in $t-1$ & $t < 2005$	-1.028	0.210
(3) Kid's Age = 0 & Non-Reg. in $t-1$ & $t \geq 2005$ (***)	-0.559	0.144
(4) Kid's Age = 1-2 & Reg. in $t-1$	-0.829	0.431
(5) Kid's Age = 1-2 & Non-Reg. in $t-1$	-1.287	2.162

## Job Protection (1 Year)

	Parameter Value for Simulation
Kid's Age = 0 & Reg. in $t-1$	no change
Kid's Age = 0 & Non-Reg. in $t-1$	no change
Kid's Age = 1-2 & Reg. in $t-1$	no change
Kid's Age = 1-2 & Non-Reg. in $t-1$	no change

# Setup for Simulating Job Protection

	Estimates	S.E.
(1) Kid's Age = 0 & Reg. in $t-1$ (***)	-0.242	0.171
(2) Kid's Age = 0 & Non-Reg. in $t-1$ & $t < 2005$	-1.028	0.210
(3) Kid's Age = 0 & Non-Reg. in $t-1$ & $t \geq 2005$ (***)	-0.559	0.144
(4) Kid's Age = 1-2 & Reg. in $t-1$	-0.829	0.431
(5) Kid's Age = 1-2 & Non-Reg. in $t-1$	-1.287	2.162

## Job Protection (0 Year)

	Parameter Value for Simulation
Kid's Age = 0 & Reg. in $t-1$	(4)
Kid's Age = 0 & Non-Reg. in $t-1$	no change
Kid's Age = 1-2 & Reg. in $t-1$	no change
Kid's Age = 1-2 & Non-Reg. in $t-1$	no change

# Setup for Simulating Job Protection

	Estimates	S.E.
(1) Kid's Age = 0 & Reg. in $t-1$ (***)	-0.242	0.171
(2) Kid's Age = 0 & Non-Reg. in $t-1$ & $t < 2005$	-1.028	0.210
(3) Kid's Age = 0 & Non-Reg. in $t-1$ & $t \geq 2005$ (***)	-0.559	0.144
(4) Kid's Age = 1-2 & Reg. in $t-1$	-0.829	0.431
(5) Kid's Age = 1-2 & Non-Reg. in $t-1$	-1.287	2.162

## Job Protection (3 Years)

	Parameter Value for Simulation
Kid's Age = 0 & Reg. in $t-1$	no change
Kid's Age = 0 & Non-Reg. in $t-1$	no change
Kid's Age = 1-2 & Reg. in $t-1$	(1)
Kid's Age = 1-2 & Non-Reg. in $t-1$	(3)

# Employment Effects of Job Protection (0→1 Yr)

Age	30	35	40	45
<b>Employed</b>				
No PL	0.281	0.432	0.592	0.670
1-Yr JP + 0%	0.338	0.477	0.626	0.700
<b>Work in Reg</b>				
No PL	0.085	0.087	0.110	0.117
1-Yr JP + 0%	0.120	0.125	0.143	0.146
<b>Work in Non-Reg</b>				
No PL	0.190	0.343	0.482	0.553
1-Yr JP + 0%	0.194	0.346	0.481	0.553
<b>PL</b>				
No PL	0.006	0.002	0.000	0.000
1-Yr JP + 0%	0.024	0.006	0.002	0.001
<b>Earnings (10,000 USD)</b>				
No PL	0.393	0.503	0.732	0.911
1-Yr JP + 0%	0.510	0.687	0.926	1.110

# Fertility Effects of Job Protection (0→1 Yr)

Age	30	35	40	45
<b>Conception</b>				
No PL	0.135	0.032	0.005	0.000
1-Yr JP + 0%	0.137	0.032	0.005	0.000
<b>No. of Children</b>				
No PL	1.740	2.142	2.224	2.241
1-Yr JP + 0%	1.759	2.164	2.245	2.262
<b>Childless Rate</b>				
No PL	0.098	0.040	0.031	0.029
1-Yr JP + 0%	0.088	0.032	0.024	0.022



## Summary: Effects of Job Protection(JP: 0→1 Yr)

- Sizable employment effects (3-6% pt for age 30-45)
- Effects concentrate in the regular sector.
- Lasting effects, particularly on earnings.
- Small fertility effects.

# Employment Effects of Cash Benefits (RR: 0→50%)

Age	30	35	40	45
<b>Employed</b>				
1-Yr PL + 0%	0.338	0.477	0.626	0.700
1-Yr PL + 50%	0.350	0.486	0.633	0.704
<b>Work in Reg</b>				
1-Yr PL + 0%	0.120	0.125	0.143	0.146
1-Yr PL + 50%	0.126	0.133	0.149	0.150
<b>Work in Non-Reg</b>				
1-Yr PL + 0%	0.194	0.346	0.481	0.553
1-Yr PL + 50%	0.197	0.346	0.482	0.553
<b>PL</b>				
1-Yr PL + 0%	0.024	0.006	0.002	0.001
1-Yr PL + 50%	0.027	0.007	0.002	0.001
<b>Earnings</b>				
1-Yr PL + 0%	0.510	0.687	0.926	1.110
1-Yr PL + 50%	0.530	0.720	0.962	1.139

# Fertility Effects of Cash Benefits (RR: 0→50%)

Age	30	35	40	45
<b>Conception</b>				
1-Yr PL + 0%	0.137	0.032	0.005	0.000
1-Yr PL + 50%	0.137	0.032	0.006	0.000
<b>No. of Children</b>				
1-Yr PL + 0%	1.759	2.164	2.245	2.262
1-Yr PL + 50%	1.762	2.168	2.249	2.266
<b>Childless Rate</b>				
1-Yr PL + 0%	0.088	0.032	0.024	0.022
1-Yr PL + 50%	0.087	0.031	0.023	0.021

## Summary: Effects of Cash Benefits (RR: 0→50%)

- Small employment effects (1% pt).
- Almost no fertility effects.
- Effects are small, because it changes the income for one year only.
- In contrast, job protection can affect the income for several years.

# Employment Effects of Job Protection (1→3 Yr)

Age	30	35	40	45
<b>Employed</b>				
1-Yr JP + 50%	0.350	0.486	0.633	0.704
3-Yr JP + 50%	0.378	0.512	0.645	0.711
<b>Work in Reg</b>				
1-Yr JP + 50%	0.126	0.133	0.149	0.150
3-Yr JP + 50%	0.130	0.141	0.155	0.153
<b>Work in Non-Reg</b>				
1-Yr JP + 50%	0.197	0.346	0.482	0.553
3-Yr JP + 50%	0.201	0.350	0.485	0.556
<b>PL</b>				
1-Yr JP + 50%	0.027	0.007	0.002	0.001
3-Yr JP + 50%	0.047	0.020	0.004	0.001
<b>Earnings</b>				
1-Yr JP + 50%	0.530	0.720	0.962	1.139
3-Yr JP + 50%	0.526	0.735	0.987	1.154

# Fertility Effects of Job Protection (1→3 Yr)

Age	30	35	40	45
<b>Conception</b>				
1-Yr JP + 50%	0.137	0.032	0.006	0.000
3-Yr JP + 50%	0.139	0.034	0.006	0.000
<b>No. of Children</b>				
1-Yr JP + 50%	1.762	2.168	2.249	2.266
3-Yr JP + 50%	1.766	2.184	2.270	2.287
<b>Childless Rate</b>				
1-Yr JP + 50%	0.087	0.031	0.023	0.021
3-Yr JP + 50%	0.084	0.031	0.023	0.021

## Summary: Effects of Job Protection(1→3 Yr)

- Modest effects on employment rate up to 3% pt for 30's
- Largely from more PL takers.
- Little effects on work, earnings, and fertility.

# Why Wouldn't 3-Year PL Increase Employment?

## Non-Pecuniary Utility from Work

	Regular		Non-Regular	
	Estimates	S.E.	Estimates	S.E.
Kid's Age = 0	-1.231	0.185	-1.199	0.171
Kid's Age = 1	-0.389	0.121	-0.281	0.083
Kid's Age = 2	-0.027	0.109	-0.224	0.073
Kid's Age = 3-5	-0.185	0.089	-0.117	0.052
Kid's Age = 6-11	-0.095	0.077	-0.062	0.052
Kid's Age $\geq$ 12	-0.039	0.080	-0.003	0.059

- Cost of LFP substantially drops from age 1 on.



# Policy Effects Vary Across Cohorts

- DID/RDD papers look at mothers who give a birth immediately after a policy change.
- Younger women w/o a child also respond to this policy change.
- Employment paths are different across cohorts.

# Setup of Policy Simulations

## Simulated Individuals

- 10,000 married women age 25-30 w/o children.

## Timing of Events

- Simulation begins from  $t = -5$ .
- Childbearing in  $t = 0$ .
- Policy change
  - OLD:  $t = 0$ .
  - YOUNG:  $t = -5$ .

# Effects Stronger on Younger Cohort

## Employment Rate

	Years Since Childbearing									
	-3	-2	-1	0	1	2	3	5	10	
<b>No PL</b>	0.57	0.52	0.38	0.10	0.12	0.15	0.19	0.25	0.36	
<b>1-Yr JP + 0% RR</b>										
Old	0.57	0.52	0.38	0.19	0.20	0.22	0.25	0.31	0.41	
Young	0.60	0.56	0.47	0.25	0.26	0.28	0.30	0.35	0.45	
Young - Old	0.03	0.04	0.09	0.06	0.06	0.06	0.05	0.04	0.04	

# Conclusion

## Methodological Contributions

- Modeling employment and fertility decisions under PL.
- Combined 3 algorithms to accelerate computation.

## Main Empirical Findings

- Extension of JP
  - 0→1 Yr: large effects on employment
  - 1→3 Yrs: small effects on employment
- Raise of RR
  - 0→50%: small effects on employment
- Effects on fertility are small.
- Policy effects on younger cohorts are stronger.

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