Anatomy of Welfare Reform:

Announcement and Implementation Effects

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What

- **Key questions** : "Do economic agents respond to welfare reform **announcements**? Do they adjust their economically salient behavior in response to such announcement? And if so, **does it matter**?"
- **Objectives** :
  - to provide an **economic model** that captures the main behavioral responses
  - **application to a specific case**:
    - check whether a specific group of individuals (single mothers) change their labor market behavior in anticipation of the introduction of a **major tax credit reform in the UK**

Why (1)

Expectations are central to economic analysis. We do postulate that economic agents may **anticipate** (or **respond to announced**) policy changes.

Examples (among many):

- effects of shocks in **government spending** and **taxes** on economic activity (Blanchard and Perotti 2002)
- impact of changes in **corporate income taxes** on firms' dividend and investment policies (Kari, Karikallio and Pirttilä 2008)
- response of **foreign exchange rate quotations** to macroeconomic announcements (Andersen et al. 2003)
- effect of effect of **potential market size** on entry of new drugs and pharmaceutical innovation (Acemoglu and Linn 2003)

Why (2)

- But there is almost no research that has looked at how people respond to **welfare reform**
- Very few examples, e.g.:
  - Attanasio and Rohwedder (2003): **pension reforms** in the UK and their effect on pension wealth and household savings
  - Ashenfelter and Card (2002): how the elimination of **mandatory retirement** affected faculty retirement in US universities
- Yet last 20 years have witnessed a **massive introduction** of welfare reforms around the world
- Not quantifying announcement/anticipation effects may lead to **highly biased** evaluations

How

- Formulate a simple **economic model** of female labor supply with welfare reform and announcement effects explicitly built in
- The model will stress **two mechanisms** through which women respond to the announcement of a reform:
  a. **intertemporal substitution** (frictionless world);
  b. **adjustment costs** (frictions)
- **Solve** and **simulate** the model, and assess the different role of the two mechanisms
- **Estimate** the impact of a UK reform (WFTC) on single mothers' labor supply and childcare utilization decisions in a **reduced form**:
  - allows us to gauge the *presence* and *magnitude* of announcement effects
  - allows us to estimate the *bias* of standard evaluations

Roadmap of the Talk

- Illustration: Simple model of female labor supply
- Simulation results
- Empirical application: Data
- Results
- Conclusion

Model of Female Labor Supply (1)

- Three-period economy in which each woman i chooses whether to work ($y_{it} = 1$) or not ($y_{it} = 0$)
- At any period $t = 1, 2, 3$, each woman chooses y_{it} to maximize:

$$\mathrm{E}\left[\sum_{s=t}^{3} \delta^{s-t}\ U_{is}(c_{is}, y_{is}, X_{is-1})|\Omega_{is}\right], \tag{1}$$

where c_{it}=level of goods consumption; X_{it-1}=number of periods woman i has worked prior to period t (and, wlog, $X_{i0} = 0$); δ=subjective discount factor; $\mathrm{E}[\cdot]$=expectation operator; Ω_{it}=individual's information set at time t (and includes information the woman has on possible implementation of a future policy reform).

- Work experience evolves according to

$$X_{it} = X_{it-1} + y_{it}. \tag{2}$$

Model (2)

- Period-by-period budget constraint (no saving or borrowing):

$$c_{it} = w_{it} y_{it} + N_{it}, \tag{3}$$

where w_{it}=woman i's earnings; N_{it}=exogenous nonlabor income

- Earnings are both endogenous and stochastic:

$$w_{it} = w_0 + \alpha X_{it-1} + \beta d_t \mathrm{I}(t = 3) y_{it} + \epsilon_{it}, \tag{4}$$

where α measures the return to work experience; $\mathrm{I}(z)$=indicator function that is equal to 1 if z occurs and 0 otherwise; ϵ_{it}=technology shock that captures random fluctuations in earnings that are independent of the individual decision process, and assume ϵ_{it} has an identical and independent over time logistic distribution.

Model (3)

- d_t indicates **implementation of welfare reform** that could occur in period 2 or 3; i.e., $d_t = 1$ if the reform is or already has been implemented and $d_t = 0$ if the reform has not been implemented $(t = 2, 3)$
- Given Ω_{it}, women form **beliefs about the likelihood that the reform will be in place in future periods**
- Assume that women in period 1 assign an equal probability to the implementation of a reform in periods 2 and 3, such that $\Pr(d_2 = 1|\Omega_1) = \Pr(d_3 = 1|d_2 = 0, \Omega_1) = \pi_1$
- In period 2, women's beliefs about the likelihood of a reform in the last period is denoted by $\Pr(d_3 = 1|d_2 = 0, \Omega_2) = \pi_2$

Model (4)

- Baseline scenario: **no** additional information is received about likelihood of reform in period 3), $\pi_1 = \pi_2$
- Alternative scenario: there is an **unanticipated** announcement at $t = 2$, which is part of Ω_{i2}, that may increase individuals' beliefs about the likelihood of a reform at $t = 3$, such that $\pi_2 > \pi_1$
- β in (4) captures the benefit of the reform
- Reform gives each woman a **permanent shift in earnings**, provided that the woman works ($y_{it} = 1$). For simplicity, the earnings shift is independent of prior work experience

Model (5)

- Per period **utility** is linear and additive in consumption:

$$U_{it} = c_{it} + \gamma_1 y_{it} + \gamma_2 X_{it-1} y_{it} + \gamma_3 c_{it} y_{it} \tag{5}$$

- U is decreasing in y_{it} (i.e., $\gamma_1 < 0$) reflecting disutility of work, and increasing in consumption, c_{it}
- If $\gamma_2 \neq 0$, then utility function is **not intertemporally separable**:
  - $\gamma_2 > 0$: **habit formation** in the labor market
  - $\gamma_2 < 0$: increasing current disutility of work with previous work effort or **increasing propensity to substitute nonmarket time in subsequent periods**

Model (6)

- **Labor market frictions**, reflected in the choice set available to women, that is $y_{it} \in J_{it}$, where J_{it} is the work decision choice set available to i in t:
- $J_{it} = \{0\}$ (i.e., no job is available) with probability $(1 - \lambda_t)$ and
- $J_{it} = \{0, 1\}$ (i.e., choice set includes both 'not working' and 'working') with probability λ_t
- Assume that there is no current labor market friction for a woman who worked in the previous period, that is, $\lambda_t(y_{it-1}) = 1$ if $y_{it-1} = 1$, while the arrival rate if currently not working $\lambda_t(0) < 1$.

Solution (1)

- Standard solution method for finite horizon dynamic programs is **backward recursion**
- Just an example ($t = 3$)
- Let $V_{it}(X_{it-1}, \epsilon_{it})$=maximum of expected discounted lifetime utility given X_{it-1} prior periods of employment and a wage draw of ϵ_{it}:

$$V_{it}(X_{it-1}, d, \epsilon_{it}) = \max[V_{it}^1(X_{it-1}, \epsilon_{it}), V_{it}^0(X_{it-1}, \epsilon_{it})], \tag{6}$$

where $V_{it}^1(\cdot)$ and $V_{it}^0(\cdot)$ denote the expected discounted lifetime utilities if the woman i works in t ($y_{it} = 1$) and does not work ($y_{it} = 0$) respectively

Solution (2)

- At $t = 3$, the value functions when $J_{i3} = \{0, 1\}$ are:

$$\begin{aligned} V^1_{i3}(X_{i2}, d_3, \epsilon_{i3}) &= (1+\gamma_3)(\alpha X_{i2} + \beta d_3 + N_{i3} + \epsilon_{i3}) \\ &\quad +\gamma_1 + \gamma_2 X_{i2} \qquad (7) \\ V^0_{i3}(X_{i2}, d_3) &= N_{i3}. \qquad (8) \end{aligned}$$

- Woman works if $V^1_{it}(\cdot) > V^0_{it}(\cdot)$. That is:

$$\begin{aligned} y_{i3} = 1 \quad \text{iff} \quad \epsilon_{i3} &\geq -\alpha X_{i2} - \beta d_3 - \frac{(\gamma_3 N_{i3} + \gamma_1 + \gamma_2 X_{i2})}{1+\gamma_3} \\ &= \epsilon^*_{i3}(X_{i2}, d_3) \qquad (9) \\ y_{i3} = 0 \quad \text{otherwise} \end{aligned}$$

Solution (3)

- Thus, the expected value in period 3 for a woman who **does not face labor market frictions** is

$$\begin{aligned} \mathrm{E}V_{i3}^{\{0,1\}}(X_{i2}, d_3) &= \Pr\big(\epsilon_{i3} > \epsilon_{i3}^*(X_{i2}, d_3)\big)\Big\{(1+\gamma_3)\Big[\alpha X_{i2} \\ &\quad +\beta d_3 + N_{i3} \\ &\quad +\mathrm{E}\big(\epsilon_{i3}|\epsilon_{i3} > \epsilon_{i3}^*(X_{i2}, d_3)\big)\Big] + \gamma_1 + \gamma_2 X_{i2}\Big\} \\ &\quad +\Big[1 - \Pr\big(\epsilon_{i3} > \epsilon_{i3}^*(X_{i2}, d_3)\big)\Big] N_{i3} \qquad (10) \end{aligned}$$

Solution (4)

- When $J_{i3} = \{0\}$, that is, when the woman has **no job available** because of **labor market frictions** , the expected value is:

$$\mathrm{E}V_{i3}^{\{0\}}(X_{i2}, d_3) = N_{i3}. \tag{11}$$

- Combining (10) and (11) yields expected value to each woman in period 3, namely

$$\mathrm{E}V_{i3}(X_{i2}, y_{i2}, d_3) = \lambda_3 \mathrm{E}V_{i3}^{\{0,1\}}(X_{i2}, d_3) + (1 - \lambda_3)\mathrm{E}V_{i3}^{\{0\}}(X_{i2}, d_3). \tag{12}$$

Simulation Results (1)

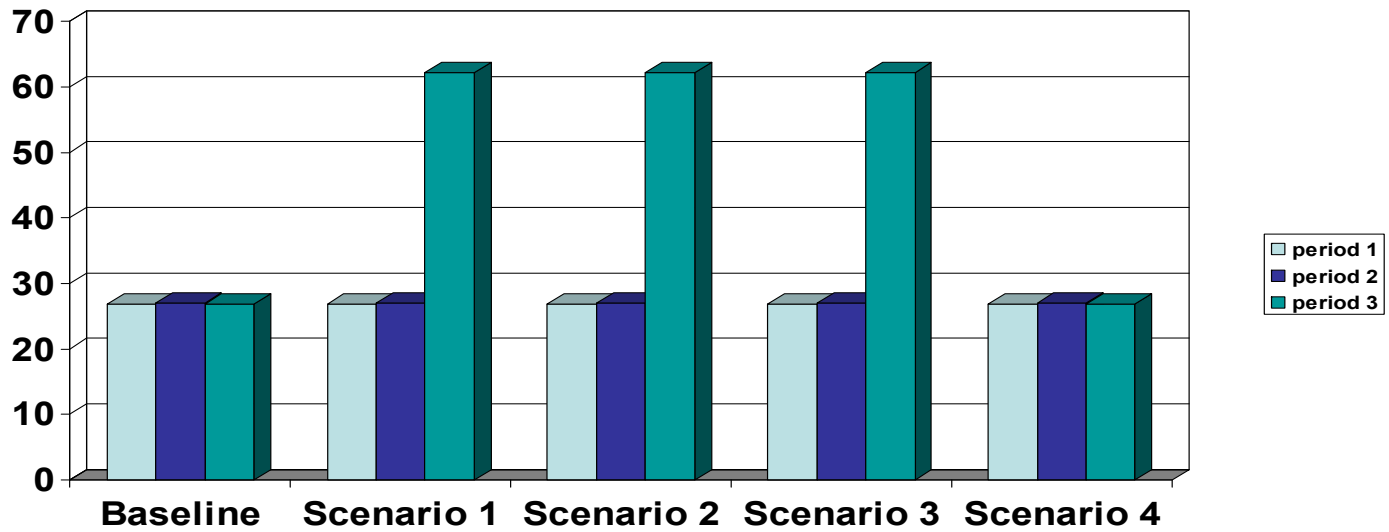
- Simulate choice decisions of 1 million women, under **3 different alternative specifications**. Set $\delta = 0.9$, $w_0 = 1$, $\alpha = 0$, $\beta = 1$, $\gamma_1 = \gamma_3 = 0$
  - Case 1: no labor market (search) frictions ($\lambda(0) = 1$), utility is separable ($\gamma_2 = 0$)
  - Case 2: no intertemporal substitution ($\gamma_2 = 0$), but labor market frictions ($\lambda(0) = 0.5$)
  - Case 3: no frictions ($\lambda(0) = 1$), but intertemporal substitution ($\gamma_2 = -1.5$, i.e., disutility of work depends on past work decisions)

Simulation Results (2)

- For each case, consider **5 different scenarios**:
  - Baseline scenario: $\pi_1 = \pi_2 = 0$, women do not envisage possibility of reform
  - Scenario 1: $\pi_1 = \pi_2 = 0$: no pre-implementation announcement and the reform is completely unanticipated; $d_3 = 1$: reform implemented at $t = 3$
  - Scenario 2: $\pi_1 = 0$: no expectation of a future reform in period 1, $\pi_1 = 1$: implementation of the reform is announced in period 2; $d_3 = 1$: reform implemented at $t = 3$
  - Scenario 3: $\pi_1 = 0.5$: 50-percent chance to introduction of reform implemented in either 2 or 3; $\pi_2 = 1$, implementation of the reform in period 3 is announced in period 2; $d_3 = 1$: reform implemented at $t = 3$
  - Scenario 4: $\pi_1 = 0$; $\pi_1 = 1$: announcement of a completely unanticipated reform at $t = 2$, but $d_3 = 0$: the reform fails to materialize

Simulation Results (3)

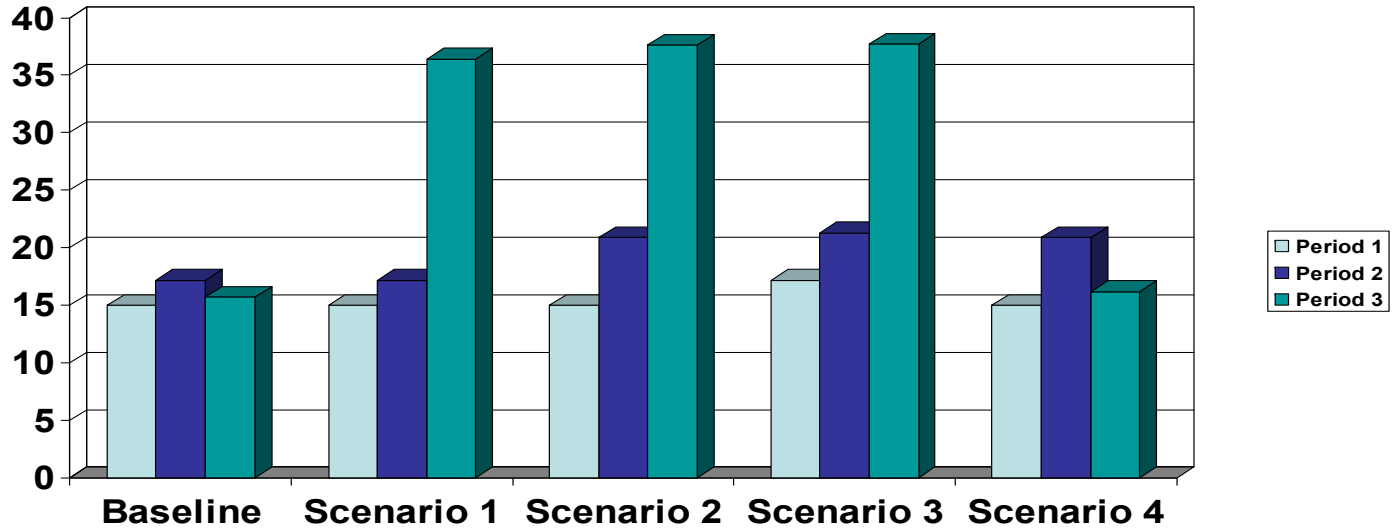
Fig 1. Trends in Employment Rates
No frictions and no intertemporal substitution



δ=0.9, α=0, β=1,w_o=1,γ_1=γ_3=0, $\boldsymbol{\lambda(0)=1, \gamma_2=0}$. Baseline: π_1=π_2=0 & no reform;
scenario 1: π_1=π_2=0 & reform in period 3; scenario 2: π_1=0, π_2=1 & reform in period 3;
scenario 3: π_1=0.5, π_2=1 & reform in period 3; scenario 4: π_1=0, π_2=1 & no reform in period 3;

Simulation Results (4)

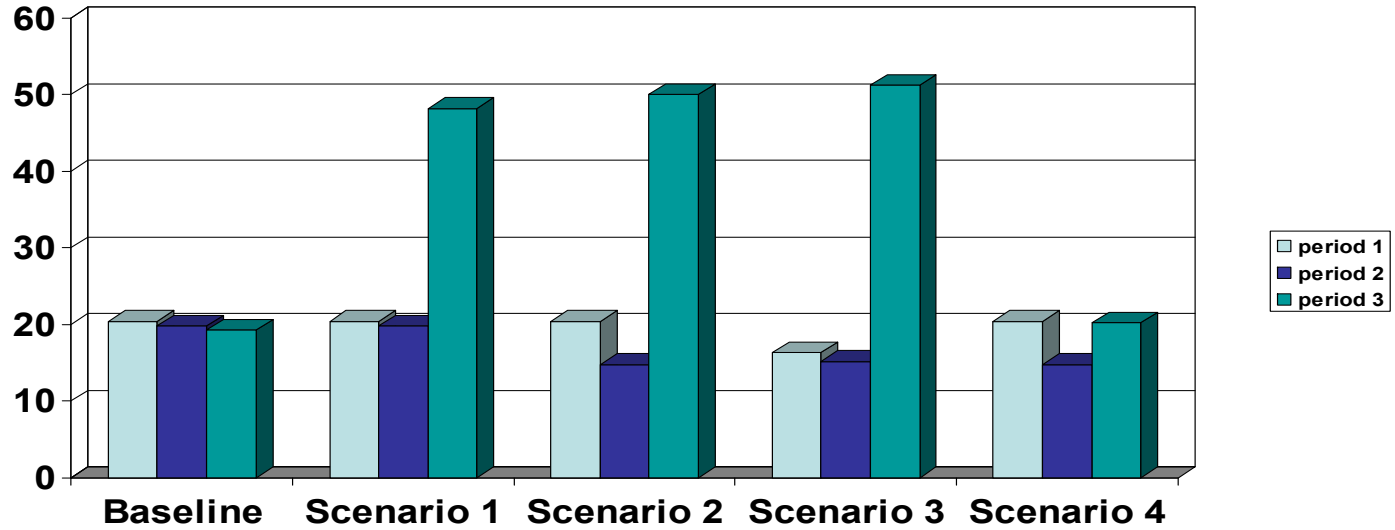
Fig 2. Trends in Employment Rates
Frictions - no intertemporal substitution



δ=0.9, α=0, β=1,w_o=1,γ_1=γ_3=0, **λ(0)=0.5, γ_2=0**. Baseline: π_1=π_2=0 & no reform;
scenario 1: π_1=π_2=0 & reform in period 3; scenario 2: π_1=0, π_2=1 & reform in period 3;
scenario 3: π_1=0.5, π_2=1 & reform in period 3; scenario 4: π_1=0, π_2=1 & no reform in period 3;

Simulation Results (5)

Fig 3. Trends in Employment Rates
No frictions - intertemporal substitution



δ=0.9, α=0, β=1,w_o=1,γ_1=γ_3=0, **λ(0)=1, γ2=-1.5**. Baseline: π_1=π_2=0 & no reform;
scenario 1: π_1=π_2=0 & reform in period 3; scenario 2: π_1=0, π_2=1 & reform in period 3;
scenario 3: π_1=0.5, π_2=1 & reform in period 3; scenario 4: π_1=0, π_2=1 & no reform in period 3;

Summary of Simulation Results (1)

No frictions and **no intertemporal substitution** (Figure 1):

- Employment rates are **constant** before the reform, while there is a **large increase** in period 3 with introduction of the reform (true also when we allow for anticipation and announcement of the reform in period 2)
- Women are **not** forward looking

Frictions , and **no intertemporal substitution** (Figure 2):

- Employment rates are **lower** (lower job arrival rate, due to frictions)
- Gains from working in the first two periods as it guarantees the option to work in the subsequent period
- Both **anticipation** of a possible reform and **announcement** in period 2 lead to an **increase in employment rates** in the **pre-implementation** periods

Summary of Simulation Results (2)

No frictions, and **intertemporal substitution** (disutility of work increasing with work experience) (Figure 3):

- Employment rates **decline** over time before the last period
- If there is **announcement** of an unanticipated reform to be implemented in period 3, then employment rates in the same period 2 **fall**, in anticipation of the higher earnings and employment rates in period 3
- Notice also that anticipation of a possible future reform leads to a **lower employment rates** in period 1

Application

- Use the introduction of the Working Families' Tax Credit (**WFTC**) in the UK in October 1999
- Analyze the response of **single mothers** in terms of **labor supply** and **childcare utilization**
- Ample room for **announcement effects**:
  - November 1997: with the Pre-Budget Statement, the Government announced that a new tax credit for working families would be one fundamental element of its welfare-to-work strategy
  - March 1998: Budget speech set out the main features of the new WFTC, which was to replace Family Credit in October 1999

Data Sources

- **British Household Panel Study 1991–2002**
  - Longitudinal, (relatively) small sample
  - Estimating sample: Almost 3,500 unmarried non-cohabiting women who are at least 16 and were born after 1941 (thus aged at most 60 in 2002) [excludes long-term sick and disabled, and those in full-time education in any given year], for a total of 15,260 person-wave observations (about 2,000 single childless and 1,500 single mothers)
- **Family Resources Survey 1995–2002**
  - Cross sectional, large sample
  - Estimating sample: Approx. 63,000 single women (aged 16+ and less than 60), about 48,000 single childless and 28,000 single mothers

Reduced-Form Analysis

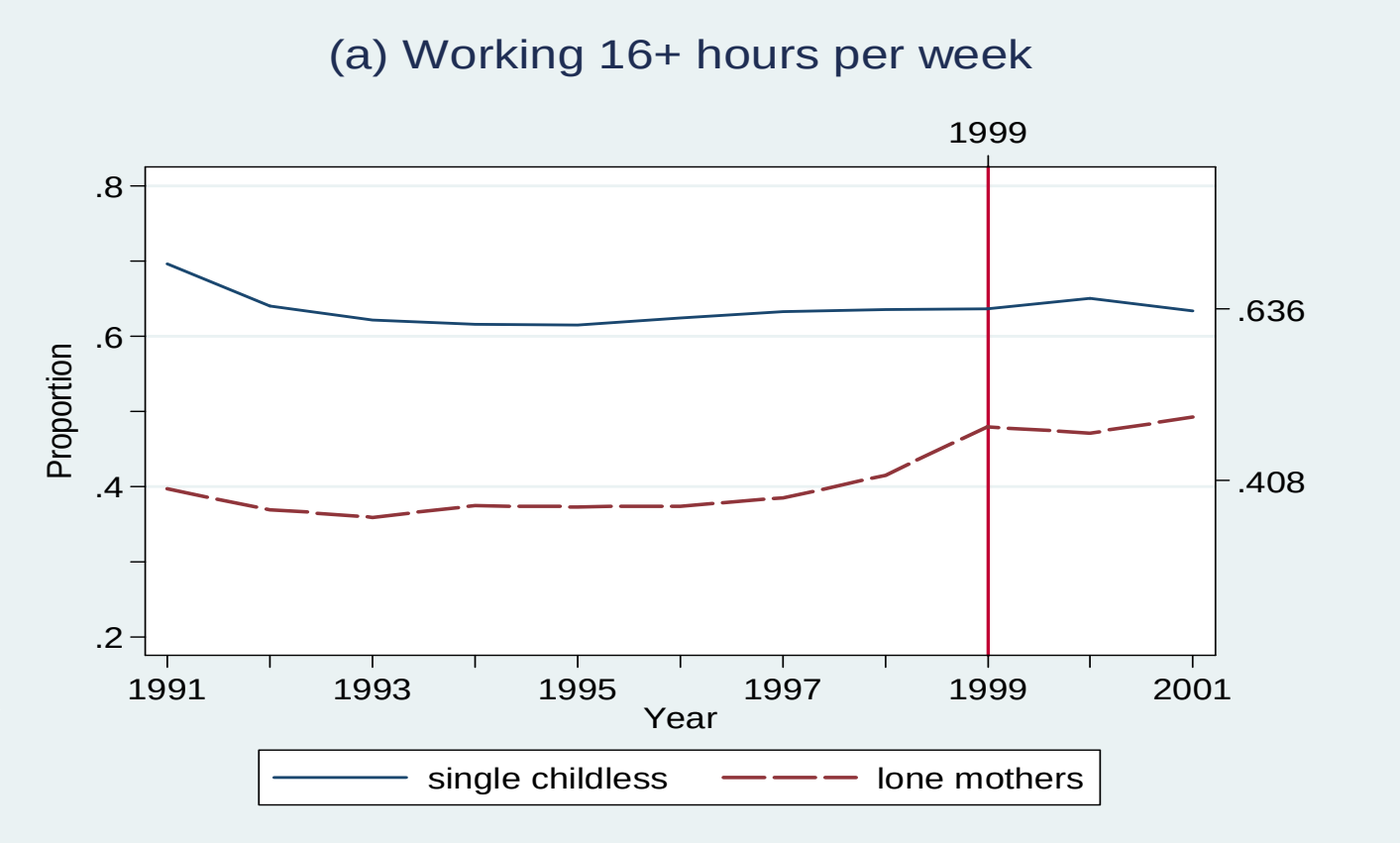
- Estimate reduced-form DDD regressions of the form:

$$\begin{aligned} O_{it} &= a_1 + a_2\ell_{it} + (a_{31} + a_{32}\ell_{it})t + [a_{41} + a_{42}(t-s)]\,\mathrm{I}(t \geq s) \\ &\quad + b\ell_{it}\mathrm{I}(t \geq s) + b_0\ell_{i\tau}\mathrm{I}(\tau = 1998) \\ &\quad + \mathbf{W}'_{it}\vartheta + \mu_i + \varepsilon_{it}, \end{aligned} \tag{13}$$

- $s = 1999$
- b = treatment effect (i.e., the WFCT effect)
- b_0 = anticipation effect
- (13) allows for different trends for control and treatment group
- (13) allows for common non-WFTC related policy effect in 1999 (and after) both through change in intercept and slope
- includes fixed effects (μ_i), and allows for compositional changes over time (subscript t) and **W** variables
- except for inclusion of regressors, (13) is similar to DDD approach

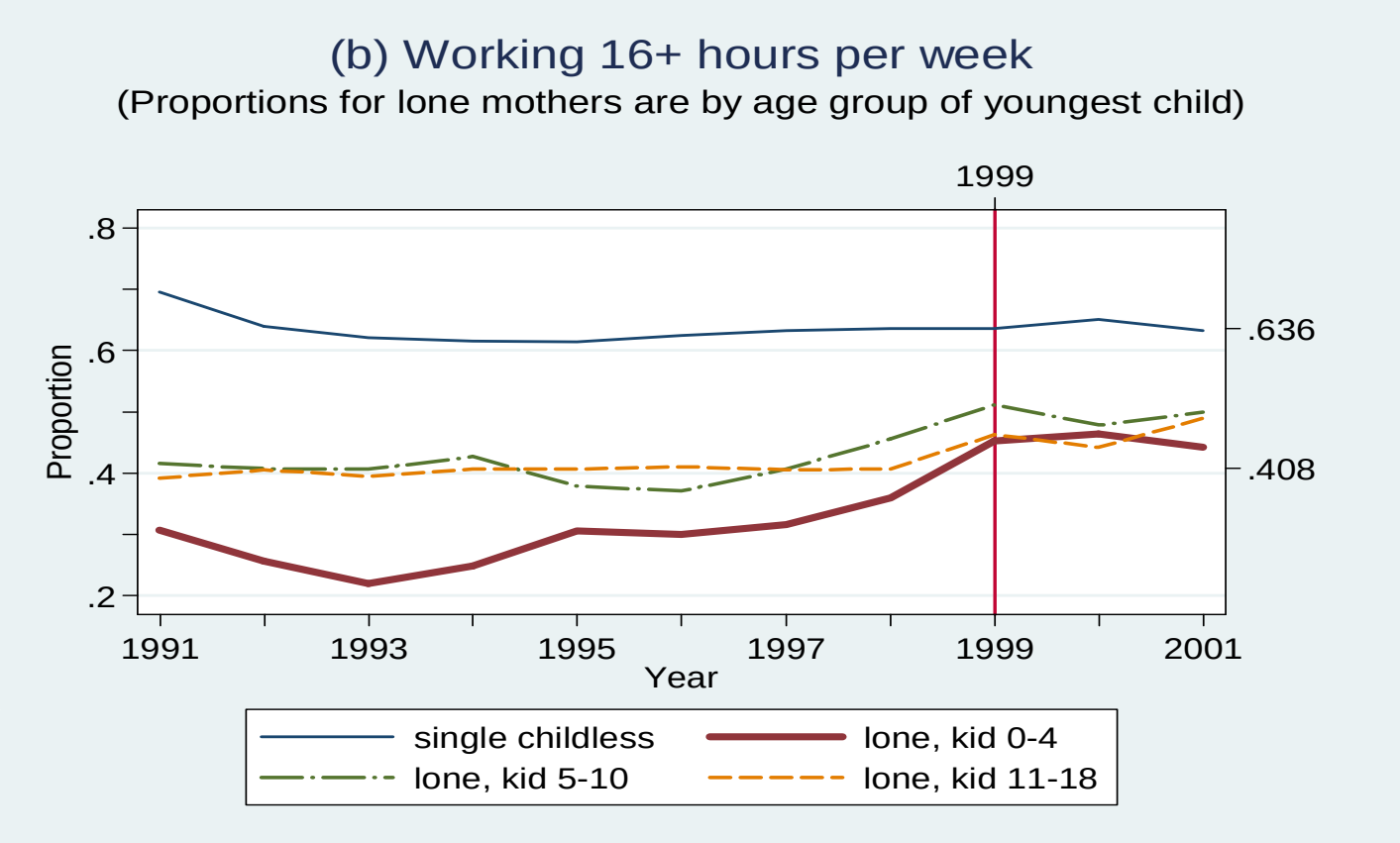
Graphical Overview of WFTC on Employment (1)

Figure 4. Working 16 or More Hours per Week – Single Childless Women and Lone Mothers (BHPS sample)



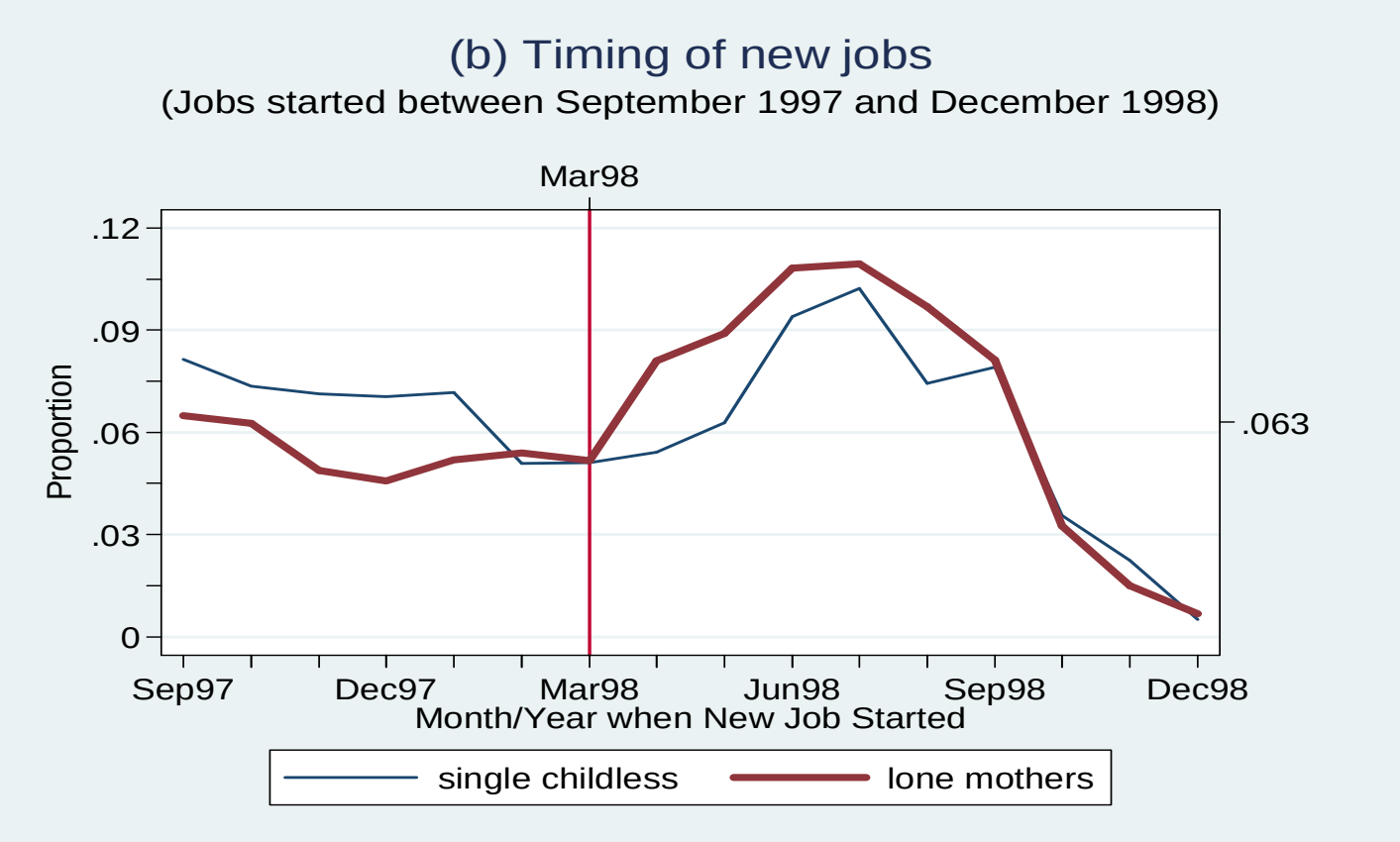
Graphical Overview of WFTC on Employment (2)

Figure 4. Working 16 or More Hours per Week – Single Childless Women and Lone Mothers (BHPS sample)



Graphical Overview of WFTC on Employment (3)

Figure 5. Timing of New Jobs between 1997 and 1998 (BHPS sample)



WFTC Treatment and Announcement Effects (1)

Outcome: Working 16 or more hours per week

	BHPS (N=15,260)	**BHPS** (N=15,260)	**FRS** (N=76,886)	**FRS** (N=76,886)
OLS				
Treatment	**0.051**	**0.060**	**0.033**	**0.040**
	(0.016)	(0.018)	(0.008)	(0.011)
Announcement		**0.029**		0.018
		(0.014)		(0.016)
FE				
Treatment	**0.049**	**0.059**		
	(0.018)	(0.019)		
Announcement		0.027		
		(0.015)		

WFTC Treatment and Announcement Effects (2)

Other Outcomes: OLS estimates

	BHPS	BHPS	FRS	FRS
Full time employment				
Treatment	**0.045**	**0.054**	**0.030**	**0.039**
	(0.017)	(0.017)	(0.009)	(0.012)
Announcement		**0.026**		**0.019**
		(0.013)		(0.009)
Employment				
Treatment	**0.056**	**0.061**	**0.052**	**0.058**
	(0.017)	(0.020)	(0.020)	(0.021)
Announcement		0.017		0.016
		(0.014)		(0.012)
Hours of work (including zeros)				
Treatment	**3.32**	**4.60**	**3.58**	**4.21**
	(0.73)	(0.93)	(0.27)	(0.28)
Announcement		**2.41**		**1.91**
		(0.75)		(0.29)

WFTC Treatment and Announcement Effects (3)

Eligible Employment by Age of Youngest Child and Number of Children — BHPS , FE estimates

	Specification (i)	Specification (ii)	
	Treatment	Treatment	Announcement
One child aged 0–4	**0.085**	**0.096**	**0.038**
	(0.024)	(0.026)	(0.017)
One child aged 5–10	**0.070**	**0.084**	**0.029**
	(0.031)	(0.024)	(0.013)
One child aged 11–18	0.032	0.028	0.011
	(0.022)	(0.023)	(0.023)
Two children or more,	0.038	**0.043**	0.016
youngest 0–4	(0.021)	(0.020)	(0.018)
Two children or more,	0.020	0.019	0.010
youngest 5–10	(0.024)	(0.024)	(0.019)
Two children or more,	0.009	0.011	–0.002
youngest 11–18	(0.033)	(0.032)	(0.025)

	BHPS (N=5,616)		**FRS** (N=35,469)	
Paid childcare utilization				
Treatment	**0.031**	**0.031**	**0.019**	**0.021**
	(0.010)	(0.011)	(0.004)	(0.004)
Announcement		–0.004		–0.007
		(0.011)		(0.007)
Childcare use by child's age and number of children				
Treatment				
One child aged 0–4	**0.047**	**0.044**	**0.032**	**0.035**
	(0.010)	(0.013)	(0.038)	(0.010)
One child aged 5-10	**0.038**	**0.041**	**0.028**	**0.028**
	(0.009)	(0.016)	(0.007)	(0.009)
Two children or more,	0.013	0.011	0.003	0.005
youngest 0–4	(0.019)	(0.017)	(0.006)	(0.012)
Announcement				
One child aged 0–4		0.003		–0.003
		(0.010)		(0.014)
One child aged 5-10		0.002		–0.001
		(0.015)		(0.006)
Two children or more,		–0.006		–0.010
youngest 0–4		(0.013)		(0.009)

WFTC Treatment and Announcement Effects (5)

Eligible Employment Transitions (BHPS)

	Persistence probability		Entry probability	
Treatment	**0.058**	**0.070**	**0.035**	**0.054**
	(0.028)	(0.033)	(0.015)	(0.023)
Announcement		**0.024**		**0.022**
		(0.008)		(0.010)
N	6,478	6,478	5,429	5,429

Summary of WFTC Results (1)

- Strong evidence of an **announcement** effect of WFTC:
  - **Large** and **positive** in the case of **employment** outcomes
  - robust across outcomes and across data sources
  - Treatment effect estimates that ignore announcement effects are **biased downward**, between 15% and 35%
  - If announcement effect is considered part of the reform, then **downward bias** is cumulatively **huge**, and of the order of 60%–75%
  - Results are consistent with story based on **labor market frictions** rather than that based on intertemporal substitution
- **Absent** in the case of **formal childcare** utilization:
  - Women had to pay for formal childcare but would have not received government transfers to cover such cost before the actual introduction of WFTC

Conclusions

- Our analysis stresses the importance of performing welfare evaluations with the notion that agents are **forward looking**
- When this is the case, the announcement of a reform may have effects on behavior **even before** the **introduction** of the reform
  - Example of **WFTC** provides strong and convincing evidence of announcement effects
  - Neglecting such effects may lead to **highly biased treatment effect estimates** along many important margins
- If agents are forward looking and we allow for anticipation effects, not only the implementation of a reform but also the **absence of a reform** can affect behavior

Conclusions (2)

What next?

- Analyze **other examples** , e.g., EITC in the United States and document the extent of anticipation/announcement effects
- Pick one specific example (e.g., WFTC) and estimate a **structural model** to:
  - improve understand the interaction between labor market imperfections (frictions) and lone mothers' behavior (before as well as after the reform); and
  - be able to simulate alternative changes to the WFTC program