Commitment and the Dynamics of Household Labor Supply

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jointly with

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November 2022

Introduction

- The extent to which individuals commit to their partner for life has important implications
- Large amounts of commitment necessary for:
  - investing in common assets
  - producing goods at home efficiently
  - pooling risk across family members
- Limits to commitment typically:
  - induce investments in private assets
  - prevent spouses from economically exploiting each other
  - ultimately offer a way out from a bad marriage

Broad question

- To what extent do spouses commit to one another?

Repeated interactions

- Consider two or more parties who repeatedly share risk:
  - **village households** who transfer goods or income among them
    e.g. Coate and Ravallion 1993, Kocherlakota 1996, Ligon et al. 2002
  - **workers** who supply labor and **firms** that offer employment
    e.g. Thomas and Worrall 1988, Beaudry and DiNardo 1991
  - **agents** who trade assets
    e.g. Kehoe and Levine 1993, Alvarez and Jermann 2000
  - **spouses** who offer each other intra-household insurance
    e.g. Mazzocco 2007, Lise and Yamada 2019
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- Ability of parties to commit to some future behavior is crucial
- Models involving a dynamic decision process must rely on specific assumptions about commitment
  - behavioral predictions will depend on such assumptions
  - e.g. analyze impact of **targeted cash transfers**: we cannot ignore limitations from spouses' ability to commit

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1. Using a dynamic collective model, characterize household behavior in three commitment alternatives:
   - full commitment (FC)
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4. Nesting & exclusion restrictions from current and historical shocks → **propose test** that, for the first time, separates the three regimes
   - implement test fairly easily in reduced form
   - no need to impose or estimate preferences

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- PSID data over 1999-2019
  - outcome: individual **labor supply** in the household
  - shocks: male & female **wage shocks**
  - additional results: shocks to weight/health

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  - **history matters** in limited commitment $\rightarrow$ shocks that shifted past bargaining power have lasting effects on behavior in a very specific way

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- Results mask heterogeneity in extent of commitment

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1.
Lifecycle household model

Setting

- **Lifecycle collective model**, forward-looking spouses subject to idiosyncratic individual income risk $\rightarrow$ scope for **risk sharing**

- Two spouses subscripted by $j = \{1, 2\}$ get married at $t = 0$
  - each enjoys utility from joint consumption q_t and private leisure l_{jt} (disutility from work hours h_{jt})
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- Couple's sequential budget constraint in period t:

$$(1 + r)a_t + \tau(y_t) = q_t + a_{t+1}$$

  - a_t common assets
  - $\tau(y_t)$ disposable income, where $y_t = \sum_j w_{jt} h_{jt}$
  - w_{jt} (wage) is the price of hours h_{jt}

Full commitment

- Upon marriage, the spouses commit fully to all future allocations of resources between them $\rightarrow$ they commit to a future plan
- At marriage $t = 0$, the spouses solve:

$$\max_{\{q_t, h_{jt}, a_{t+1}\}_0^{\bar{t}}} \mu_1(\Theta_0) \left(\mathbb{E}_0 \sum_{t=0}^{\bar{t}} \beta^t u_1(q_t, h_{1t}) \right) + \mu_2(\Theta_0) \left(\mathbb{E}_0 \sum_{t=0}^{\bar{t}} \beta^t u_2(q_t, h_{2t}) \right)$$

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- $\mu_j(\Theta_0)$ is the **Pareto weight** on each person's preferences at marriage
  - determines ex-ante the allocation of resources between spouses
  - Θ_0 includes variables known or predicted at time of marriage (summarizes information the spouses can contract upon at marriage)

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subject to budget constraint $\forall t$, and

individual rationality (IR) constraints such that value from marriage is at least as high as value of divorce, **for all** $t \geq 1$

$$\mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} u_1(q_\tau, h_{1\tau}) \geq \max_{\{q_{1\tau}, h_{1\tau}, a_{1\tau+1}\}_t^{\bar{t}}} \mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} \widetilde{u}_1(\widetilde{q}_{1\tau}, \widetilde{h}_{1\tau})$$

$$\underbrace{\mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} u_2(q_\tau, h_{2\tau})}_{\text{individual inside value}} \geq \underbrace{\max_{\{q_{2\tau}, h_{2\tau}, a_{2\tau+1}\}_t^{\bar{t}}} \mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} \widetilde{u}_2(\widetilde{q}_{2\tau}, \widetilde{h}_{2\tau})}_{\text{individual outside value}}$$

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$$\underbrace{\mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} u_2(q_\tau, h_{2\tau})}_{\text{individual inside value } V_{jt}(w_{1t}, w_{2t}, a_t, \mu_{jt-1})} \geq \underbrace{\max_{\{q_{2\tau}, h_{2\tau}, a_{2\tau+1}\}_t^{\bar{t}}} \mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} \widetilde{u}_2(\widetilde{q}_{2\tau}, \widetilde{h}_{2\tau})}_{\text{individual outside value } \widetilde{V}_{jt}(w_{jt}, a_t, Z_{jt})}$$

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- Underlying premise: spouses **repeatedly bargain** over marital surplus
- $\mu_j(\Theta_0, W_t, Z_t, a_t)$ determines ex-post allocation of resources between spouses, reflecting prevailing circumstances at t

Common recursive representation

- Each case is a **dynamic planning problem** (Marcet and Marimon, 2019); we can recast it in a common recursive equation of the form

$$V_t = \max_{q_t, h_{1t}, h_{2t}, a_{t+1}} \mu_{1t} u_1(q_t, h_{1t}) + \mu_{2t} u_2(q_t, h_{2t}) + g_t(a_t) + \beta \mathbb{E}_t V_{t+1} \quad (1)$$

  subject to budget constraint $\forall t$, and

  restrictions on the Pareto weights μ_{jt}

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▸ state space ▸ divorce

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- Our test is based on **policy functions** from (1)
- Applicable **Pareto weight** μ_{jt} in each period, the dynamics of which I will now characterize

▸ state space ▸ divorce

2.
Characterization of behavior

Full commitment

- Pareto weight determined at marriage as function of initial bargaining variables Θ_0 and remains **constant** over time
- Shocks that manifest over time do not change the allocation of resources

$$\mu_{jt} = \mu_j(\Theta_0) \qquad \forall t$$

  - time/state-of-the-world invariance is an implication of first-best efficiency, which full commitment achieves

▸ risk sharing in FC ▸ efficiency in FC

Limited commitment

- Pareto weight **shifts** when, due to shocks, continuation of previous allocation violates individual rationality:

$$\mu_{jt} = \begin{cases} \mu_{jt-1} & \text{with } \mu_{j0} = \mu_j(\Theta_0) \\ & \text{if neither spouse's IR constraint binds at } t \end{cases}$$

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  - this includes past μ_{jt-1} that determines j's share of marital surplus $\Rightarrow$ **history matters!**

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  - positive shock to w_2: female will make partial transfer to male; transfer may be lower if male has not made similar transfers in the past

▸ risk sharing in LC ▸ efficiency in LC

No commitment

- Pareto weight determined in each period **given prevailing information** at the time

$$\mu_{jt} = \mu_j \left(\Theta_0, W_t, Z_t, a_t\right) \qquad \forall t$$

- Weight varies continuously with new information that reveals over time
  - initial variables Θ_0 may influence type of bargaining game the spouses play
- Continuous response to new information is implication of repeated bargaining

▸ risk sharing in NC ▸ efficiency in NC

Nesting of commitment alternatives

- Inspect the Pareto weight in the three cases:

$$\text{FC}: \mu_{jt} = \mu_j\left(\Theta_0\right)$$
$$\text{LC}: \mu_{jt} = \mu_j\left(W_t, Z_t, a_t, \mu_{jt-1}\right)$$
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- Nesting of the **sets of variables** that enter the Pareto weight
- **Current news** (i.e. shocks to w_{1t}, w_{2t}, z_{1t}, z_{2t}) do not matter for FC, matter for NC & LC
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  - FC nested within both non-FC alternatives (Mazzocco 2007)
  - effect of current news on Pareto weight evidence against FC
- **Historical news** (i.e. shocks to w_{1t-s}, w_{2t-s}, z_{1t-s}, z_{2t-s}, $s > 0$) do not matter for FC or NC, matter for LC through μ_{jt-1}
  - NC nested within LC
  - effect of past news on Pareto weight evidence against NC & FC

Characterization of behavior

- The Pareto weight is unobserved but invoking 2nd welfare theorem:
  - variables in μ_{jt} enter **sharing rule** (each spouse's share of total income)

$$\text{FC}: h_{jt} = h_j^*\left(a_t,\ y_t,\ w_{jt}\right)$$

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- Exclusion restrictions on Pareto weight become exclusion restrictions on labor supplies $\rightarrow$ one can formulate testable hypotheses

Characterization of behavior

- **Bargaining effects** must be of the correct sign: theory disciplines how assignable distribution factors change bargaining power
- Let $z_j \in Z_t$ empower spouse j; under LC we must jointly observe that

$$1: \quad \frac{\partial h_{1t}}{\partial z_{1t}} < 0 \quad \text{and} \quad \frac{\partial h_{2t}}{\partial z_{2t}} < 0 \qquad \text{(\textbf{current} shock, own)}$$

$$2: \quad \frac{\partial h_{1t}}{\partial z_{2t}} > 0 \quad \text{and} \quad \frac{\partial h_{2t}}{\partial z_{1t}} > 0 \qquad \text{(\textbf{current} shock, partner's)}$$

$$3: \quad \frac{\partial h_{1t}}{\partial z_{1t-\tau}} < 0 \quad \text{and} \quad \frac{\partial h_{2t}}{\partial z_{2t-\tau}} < 0 \quad \text{for } \tau \geq 1 \qquad \text{(\textbf{past} shocks, own)}$$

$$4: \quad \frac{\partial h_{1t}}{\partial z_{2t-\tau}} > 0 \quad \text{and} \quad \frac{\partial h_{2t}}{\partial z_{1t-\tau}} > 0 \quad \text{for } \tau \geq 1 \qquad \text{(\textbf{past} shocks, partner's)}$$

Characterization of behavior

- **Bargaining effects** must be of the correct sign: theory disciplines how assignable distribution factors change bargaining power
- Let $z_j \in Z_t$ empower spouse j; under LC we must jointly observe that

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- Favorable shocks **improve bargaining power** of recipient spouse, reducing their labor supply and increasing their partner's

Characterization of behavior

wages as distribution factors

- Previous effects not specific to z: the **partner's current wage** and **all past wages** wages are also distribution factors

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- Inspect the policy functions and recall that $W_t = \{w_{jt}, w_{-jt}\}$:

$$\text{FC}: h_{jt} = h_j^*\left(a_t,\ y_t,\ w_{jt},\ \mu_j(\Theta_0)\right)$$

$$\text{NC}: h_{jt} = h_j^*\left(a_t,\ y_t,\ w_{jt},\ \mu_j(\Theta_0, W_t, Z_t, a_t)\right)$$

$$\text{LC}: h_{jt} = h_j^*\Big(\underbrace{a_t,\ y_t,\ w_{jt}}_{\text{non-bargaining state variables}},\ \mu_j(\underbrace{\Theta_0, W_t, Z_t, a_t, W_{t-1}, Z_{t-1}, a_{t-1}, \ldots}_{\text{bargaining state variables}})\Big)$$

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- Conditional on a_t and y_t; the **partner's wage** w_{-jt} and **all past wages** enter state space through Pareto weight
  - appealing because wages easier to observe than conventional distribution factors

3.
Formulation of test and results

Two alternative paths to estimation

- Two alternative paths to estimation of policy functions h_j^*
- **Structural**: fully specify the model, estimate it
  - requires estimation of preferences together with everything else
  - solution and simulation of model very involved
- **Quasi reduced-form**: leave model partially unspecified, estimate linearized first-order conditions for hours h_1 and h_2
  - does not require estimation of preferences
  - implementation in reduced-form, no need for numerical methods
  - **but** ultimately an approximation of policy functions
- We follow second alternative, which entails two distinct steps

Empirical formulation of test

linearized optimality condition

1. Log-linearize **static first-order conditions** for hours h_1 and h_2:
   e.g. Blundell et al. 2016 do similarly in a unitary context

$$\Delta \log h_{jt} \approx b_0 + \boldsymbol{b}_1' \Delta(\text{taste \& wage observables}_t) + \boldsymbol{b}_2'(\text{tax terms}_t) + \underbrace{\gamma_1 \omega_{jt} + \gamma_2 \Delta \log q_t + \gamma_3 \Delta \log a_t + \gamma_4 \Delta \log y_t}_{\text{unitary part}} - \underbrace{\delta_1 \Delta \log \mu_{jt}}_{\text{collective part}}$$

   - unitary part reflects substitution, income, wealth effects
   - ω_{jt} is the shock to $\Delta \log w_{jt}$
   - $\delta_1 > 0$ allows us to sign the bargaining effects
   - parameters are j- and i-specific: depend on hours, earnings, Frisch labor supply elasticity

- Use of static F.O.C. avoids very complicated **Euler equation**

Empirical formulation of test

linearized recursive Pareto weight

2. Log-linearize **general Pareto weight** and substitute recursively
   - suppose $\exists\ z_t \in Z_t, \theta_0 \in \Theta_0$ such that each empowers spouse j

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$$\Delta \log \mu_{jt} \approx \underbrace{\sum_{\tau=0}^{t-1} (e_{\mu_j,\mu_{jL}})^{\tau} e_{\mu_j,z} \Delta \log z_{t-\tau}}_{\text{cumulative growth in Pareto weight due to time-varying distribution factors}} + \underbrace{(e_{\mu_j,\mu_{jL}})^{t} e_{\mu_j,\theta} \theta_0}_{\text{initial bargaining game played by couple upon marriage}}$$

   - all elasticities vary with past levels of distribution factors

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   - all elasticities vary with past levels of distribution factors
   - UNITARY model has $e_{\mu_j,\theta} = e_{\mu_j,z} = e_{\mu_j,\mu_{jL}} = 0$
   - FC has $e_{\mu_j,\theta} > 0$ and $e_{\mu_j,z} = e_{\mu_j,\mu_{jL}} = 0$
   - NC has $e_{\mu_j,\theta} > 0$ and $e_{\mu_j,z} > 0$ and $e_{\mu_j,\mu_{jL}} = 0$
   - LC has $e_{\mu_j,\theta} > 0$ and $e_{\mu_j,z} > 0$ and $e_{\mu_j,\mu_{jL}} > 0$

- Linearization implies smoothness of μ_{jt}, we discuss this in paper

Empirical formulation of test

estimating equation

- Put two parts together $\rightarrow$ estimating equation for **male** & **female** hours
- Baseline options:
  - shocks: male and female wage shocks ω_{1t} and ω_{2t}
  - additional shocks: shocks to weight/health $Z_t = \{z_{1t}, z_{2t}\}$
  - initial distribution factors: $\Theta_0 = \{$*marriage age gap* dummies$\}$

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- Our test is about the **presence of effects** from current & past distribution factors (wage shocks), and the **sign** of such effects
- At first: same parameters across households
  - simplest form of our test, implemented easily via OLS
  - without parameterizing or estimating individual preferences
- Subsequently: estimate parameter **heterogeneity**
  - distribution of bargaining effects across households

▸ data ▸ descriptives ▸ estimating equations ▸ wage shocks ▸ measurement error

Results

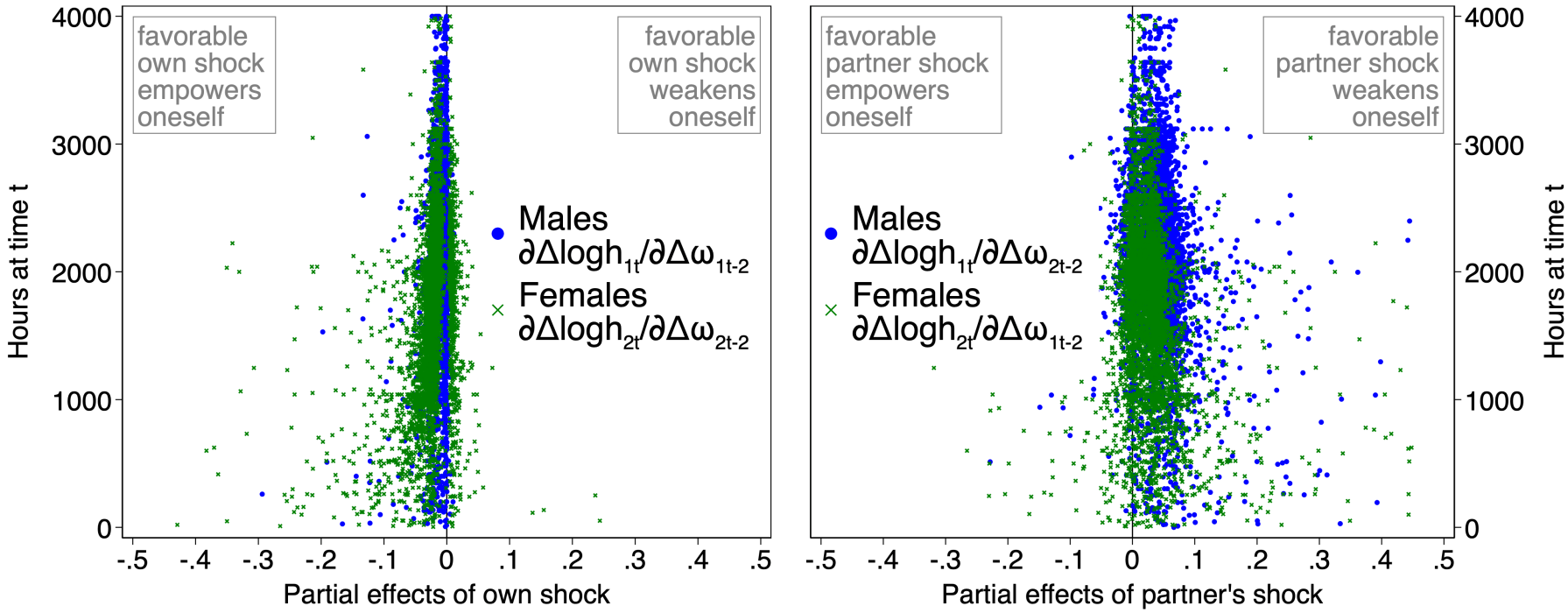
Commitment test – summary of reduced form results

				≥ 3 periods (current & past shocks)		≥ 4 periods (current, past, & older shocks)	
Dependent variable: $\Delta \log h_{jt}$	FC	NC	LC	(1) Male $j=1$	(2) Female $j=2$	(3) Male $j=1$	(4) Female $j=2$
A. Current wage shocks (t)							
$\beta_{j[\omega_{jt}]}$	.	.	.	−30.678	−10.277	−34.754	−16.000
				(10.658)	(3.517)	(19.947)	(12.844)
$\beta_{j[\omega_{-jt}]}$	0	+	+	52.833	−2.553	39.378	−11.346
				(26.151)	(6.244)	(30.974)	(18.726)
B. Past wage shocks ($t-1$)							
$\beta_{j[\omega_{jt-1}]}$	0	0	−	−13.855	−7.338	−11.014	−5.027
				(5.283)	(3.442)	(10.113)	(10.308)
$\beta_{j[\omega_{-jt-1}]}$	0	0	+	41.039	6.017	29.492	−6.920
				(20.351)	(7.115)	(34.603)	(17.087)
C. Older wage shocks ($t-2$)							
$\beta_{j[\omega_{jt-2}]}$	0	0	−			−32.734	−9.642
						(16.698)	(6.756)
$\beta_{j[\omega_{-jt-2}]}$	0	0	+			2.413	24.651
						(28.807)	(15.101)
p value for $\mathcal{H}_0^{FC}$				0.000	0.000	0.001	0.000
p value for $\mathcal{H}_0^{NC}$				0.001	0.000	0.001	0.000
Observations				8,513		6,028	

- Effects of wages consistent with **limited commitment**:
  - past shocks **reduce own** labor supply and **increase the partner's**
  - current shocks increase the **partner's** labor supply

Heterogeneity across households

bargaining effects of $t-2$ shocks



- These partial effects are elasticities of hours to wages
- Bargaining effects mostly in $[0.0 - \pm 0.1]$:
  10% wage shift $\rightarrow$ up to $\pm 1\%$ hours shift **due to bargaining**

▸ time t shocks ▸ time $t-1$ shocks ▸ shocks to weight/health

Conclusions

- Characterize behavior in three alternative modes of commitment: full, limited, and no commitment
- We establish:
  - **current** and **historical shocks** affect behavior differently in each mode
  - nesting of sets of variables that matter for resource sharing in each case
- We propose test that separates, for the first time, all three alternatives
  - using the PSID, we strongly **reject full** and **no commitment**
  - strong **evidence for limited commitment**, albeit with large heterogeneity
- Test applicable to broader settings of risk-sharing

Appendix

Relation to literature

Three distinct literatures:

1. **Household behavior, in particular its intertemporal aspects**
   Apps & Rees 1988; Chiappori 1988; 1992; Cherchye et al. 2007; Bourguignon et al. 2009; Mazzocco 2007; Voena 2015; Chiappori and Mazzocco 2017; Fernández and Wong 2017; Low et al. 2018; Lise and Yamada 2019; Foerster 2020; Blasutto and Kozlov 2021; Reynoso 2022

2. **Commitment and contracts, in macro and development**
   Thomas and Worrall 1988; Beaudry and DiNardo 1991; Chari and Kehoe 1993; Coate and Ravallion 1993; Kehoe and Levine 1993; Kocherlakota 1996; Fafchamps 1999; Alvarez and Jermann 2000; Attanasio and Ríos-Rull 2000; Ligon et al. 2002; Mazzocco 2007; Dubois et al. 2008; Adams et al. 2014

3. **Labor, response of labor supply to wages**
   Lundberg 1985; Hyslop 2001; Blundell et al. 2008; Bellou and Kaymak 2012; Blundell et al. 2016; Wu and Krueger 2021

Relation to literature

contribution related to literature #1

- Articles select a priori the commitment technology available to agents: their conclusions are conditional on that choice
- By contrast, we take a step back and **test** for the extent of commitment in married couples
- Closest papers to ours: seminal Mazzocco 2007
  - tests for **full** against **non-full** commitment, based on role of current news
- We propose test that **distinguishes between all three** alternatives based on joint role of current and historical information
  - our test is not only about presence of effects from current & past news
  - unlike Mazzocco 2007, our test is also about the sign of such effects that is strictly disciplined by theory

Relation to literature

contribution related to literature #2

- Large macro and development literatures that characterize transfers without commitment
- Mazzocco 2007; Adams et al. 2014 do similarly in a household context without, however, considering all three regimes we consider here
- By contrast, we **contrast all three regimes** for the first time
  - we show that behavior exhibits distinctive features in each case
  - we clarify the common confusion that no and limited commitment can be modeled in an interchangeable way

Relation to literature

contribution related to literature #3

- Labor economics literature on the labor supply response to wages, particularly to the partner's wages (**added worker**)
- We focus not only on responses to current wages, but also on **dynamic responses** to spousal wages multiple periods in the past
- Our empirical exercise can thus be seen as: one that investigates the **dynamic effects** of current and past wages on family labor supply

Outside option in limited commitment

- Reflects how a spouse may fare in life outside current relationship
  - precise form depends on specific assumptions about that situation
  - e.g. divorce, divorce with future cooperation over children, etc.

- Consider **divorce**; outside option is present value of future expected utility of a divorced person (Voena 2015):

$$\widetilde{V}_{jt}(\Omega_{jt}) = \max_{\{q_{j\tau}, h_{j\tau}, a_{j\tau+1}\}_{\tau=t,\ldots,\bar{t}}, \omega_{j\tau} \in \Omega_{j\tau}} \mathbb{E}_t \sum_{\tau=t}^{\bar{t}} \beta^{\tau-t} \widetilde{u}_j(q_{j\tau}, h_{j\tau})$$

$$\text{subject to } (1+r)a_{j\tau} + \tau(w_{j\tau}h_{j\tau}; \psi_\tau) = q_{j\tau} + a_{j\tau+1}, \ \forall \tau, \omega_{j\tau}$$

$$\text{and } a_{1t} + a_{2t} = a_t$$

- $\widetilde{u}_j$ may include stochastic elements that reflect in reduced form:
  - utility flow from possible future remarriage
  - grieving following breakup
  - other relevant marital preferences shifts

State space

- All commitment cases obey the common recursive equation of the form

$$V_t = \max_{q_t, h_{1t}, h_{2t}, A_{t+1}} \mu_{1t} u_1(q_t, h_{1t}) + \mu_{2t} u_2(q_t, h_{2t}) + g_t(a_t) + \beta \mathbb{E}_t V_{t+1}$$

subject to budget constraint $\forall t$, and

restrictions on the Pareto weights μ_{jt}

- Value functions:

$$\begin{aligned} V_t &\equiv V_t(X_t, W_t, a_t, \Theta_0) && \text{in Full commitment} \\ V_t &\equiv V_t(X_t, W_t, a_t, Z_t, \mu_{t-1}) && \text{in Limited commitment} \\ V_t &\equiv V_t(X_t, W_t, a_t, \Theta_0, Z_t) && \text{in No commitment} \end{aligned}$$

where

  - X_t contingent states (exogenous state variables)
  - $W_t = \{w_{1t}, w_{2t}\}$ male and female wages (exogenous state variables)
  - a_t assets (endogenous state variable)
  - Θ_0 initial distribution factors
  - Z_t stochastic distribution factors
  - $\mu_{t-1} = (\mu_{1t-1}, \mu_{2t-1})'$ the past Pareto weight

Divorce

- In all three commitment modes, we can let divorce occur optimally, e.g. when total marital surplus becomes less than sum of singles' surplus

$$V_t < \widetilde{V}_{1t} + \widetilde{V}_{2t}$$

- Different assumptions exist in the literature regarding **allocation of assets** upon divorce and spouses' **post-divorce welfare**
  - a detailed analysis of these developments outside scope of model
- These elements are orthogonal to our main point, i.e. the type of variables that may affect spousal behavior at date t
  - dynamics of Pareto weights *during marriage* for each possible commitment mode remain as described in paper
  - whatever one assumes on nature & determinants of divorce
  - these dynamics generate the restrictions on household behavior that we have described

Risk sharing in the household

- Full commitment
  - the **ratio of hours marginal utilities** is conditionally fixed over time $\rightarrow$ full risk pooling between spouses

$$\frac{\partial u_1/\partial h_1}{\partial u_2/\partial h_2} = \frac{w_1}{w_2} \times \frac{\mu_2\left(\Theta_0\right)}{\mu_1\left(\Theta_0\right)}$$

- Limited commitment
  - ratio fixed over time unless a spouse hits their participation constraint $\rightarrow$ second-best risk pooling

$$\frac{\partial u_1/\partial h_1}{\partial u_2/\partial h_2} = \frac{w_1}{w_2} \times \frac{\mu_{2t-1} + \nu_{2t}}{\mu_{1t-1} + \nu_{1t}}$$

- No commitment
  - ratio fluctuates over time $\rightarrow$ the spouses are unable to insure one another

$$\frac{\partial u_1/\partial h_1}{\partial u_2/\partial h_2} = \frac{w_1}{w_2} \times \frac{\mu_2\left(\Theta_0, W_t, Z_t, a_t\right)}{\mu_1\left(\Theta_0, W_t, Z_t, a_t\right)}$$

Efficiency

- Full commitment
  - ✓ **ex-post** efficiency → choices maximize weighted sum of utilities
  - ✓ **ex-ante first-best** efficiency → full risk pooling between spouses
- Limited commitment
  - ✓ **ex-post** efficiency
  - ✻ **ex-ante second-best** efficiency → constrained risk sharing
- No commitment
  - ✓ **ex-post** efficiency
  - ✘ **ex-ante inefficiency** → spouses unable to commit to transfers across periods or states of the world, hampers ability to share risk

Data

- Data from the **Panel Study of Income Dynamics** over 1999-2019
  - we need min. 3 periods of data $\rightarrow$ permits one lag of Pareto weight
  - often we use 4 periods of data $\rightarrow$ permits two lags of Pareto weight
  - data on hours, wages, consumption, wealth
- Main **selection**: ages 21-65; both partners work for pay
  - 91.6% of married men and 80.1% of married women work for pay
  - 13,955 household$\times$year observations

Descriptive statistics

	Male $j = 1$		Female $j = 2$	
	mean	st.dev.	mean	st.dev.
Labor market outcomes				
Earnings (annual, in $1000)	81.74	91.65	47.84	40.25
Hours (annual)	2,231	609	1,758	660
Hours (annual) growth $\Delta \log h_{jt}$	-0.02	0.40	-0.00	0.61
Hourly wage	36.95	37.97	27.32	24.32
Hourly wage growth $\Delta \log w_{jt}$	0.03	0.53	0.04	0.50
Demographics				
Age	43.76	10.46	42.11	10.39
% college education	0.70	0.46	0.77	0.42
BMI	27.80	4.57	24.91	5.49
BMI growth $\Delta \log BMI_{jt}$	0.01	0.07	0.01	0.09

	Household	
	mean	st.dev.
Consumption (annual, in $1000)	45.08	25.84
Wealth (annual, in $1000)	416.99	1,269.68
Number of children	1.00	1.10
Age gap at marriage (male-female)	1.65	4.04
Survey waves per household	5.62	2.50
Observations [households $\times$ waves]	13,955	

Notes: The table reports averages and standard deviations of key variables in the baseline estimation sample. All monetary amounts are expressed in 2018 dollars.

Estimating equations

$$\Delta \log h_{jt} = \Big\{ b_{j[0]} + \mathbf{b}'_{j[\Delta\xi_{jt}]}\Delta\boldsymbol{\xi}_{jt} + \mathbf{b}'_{j[x^w_{jt}]}\mathbf{x}^w_{jt}$$

$$+ \beta_{j[w_{jt}]}\omega_{jt} + \beta_{j[w_{-jt}]}\omega_{-jt} + \sum_{\tau=1}^{t-1}\beta_{j[w_{jt-\tau}]}\omega_{jt-\tau} + \sum_{\tau=1}^{t-1}\beta_{j[w_{-jt-\tau}]}\omega_{-jt-\tau}$$

$$+ \sum_{\tau=0}^{t-1}\beta_{j[bmi_{jt-\tau}]}\Delta\log BMI_{jt-\tau} + \sum_{\tau=0}^{t-1}\beta_{j[bmi_{-jt-\tau}]}\Delta\log BMI_{-jt-\tau}$$

$$+ \beta_{j[young_j]}\mathbf{1}[age_j << age_{-j}] + \beta_{j[young_{-j}]}\mathbf{1}[age_j >> age_{-j}]$$

$$+ b_{j[\Delta y_t]}\Delta\log y_t + b_{j[\Delta a_t]}\Delta\log a_t + b_{j[y_{t-1}]}\log y_{t-1} + b_{j[a_{t-1}]}\log a_{t-1}$$

$$+ b_{j[\Delta y_{-jt}]}s_{-jt-1}\Delta\log y_{-jt} + b_{j[\Delta q_t]}q_{t-1}\Delta\log q_t + \sum_{\tau=1}^{t-1}\beta_{j[\Delta a_{t-\tau}]}\Delta\log a_{t-\tau}\Big\}$$

for $j = \{1, 2\}$

Wage dynamics

- We treat **wage shocks** as exogenous eg. Blundell et al. 2016, etc.
  - difficulty in instrumenting for wages
  - estimating equations include as distinct regressors many otherwise potential instruments (for example, historical shocks)
- We do not directly observe **shocks**, so we must estimate them
- We resort to a reduced-form Mincer-style specification to account for the deterministic profile of wages (a function of $\mathbf{x}_{jt}^{w}$):

$$\Delta \log w_{jt} = \boldsymbol{\pi}_{j}^{w\prime} \mathbf{x}_{jt}^{w} + \omega_{jt}$$

  where ω_{jt} is the applicable wage shock at time t
  e.g. Meghir & Pistaferri 2004; Blundell et al. 2016; Guvenen 2007; Browning et al. 2010
- No restrictions on dynamics governing **stochastic component** ω_{jt}

Measurement error

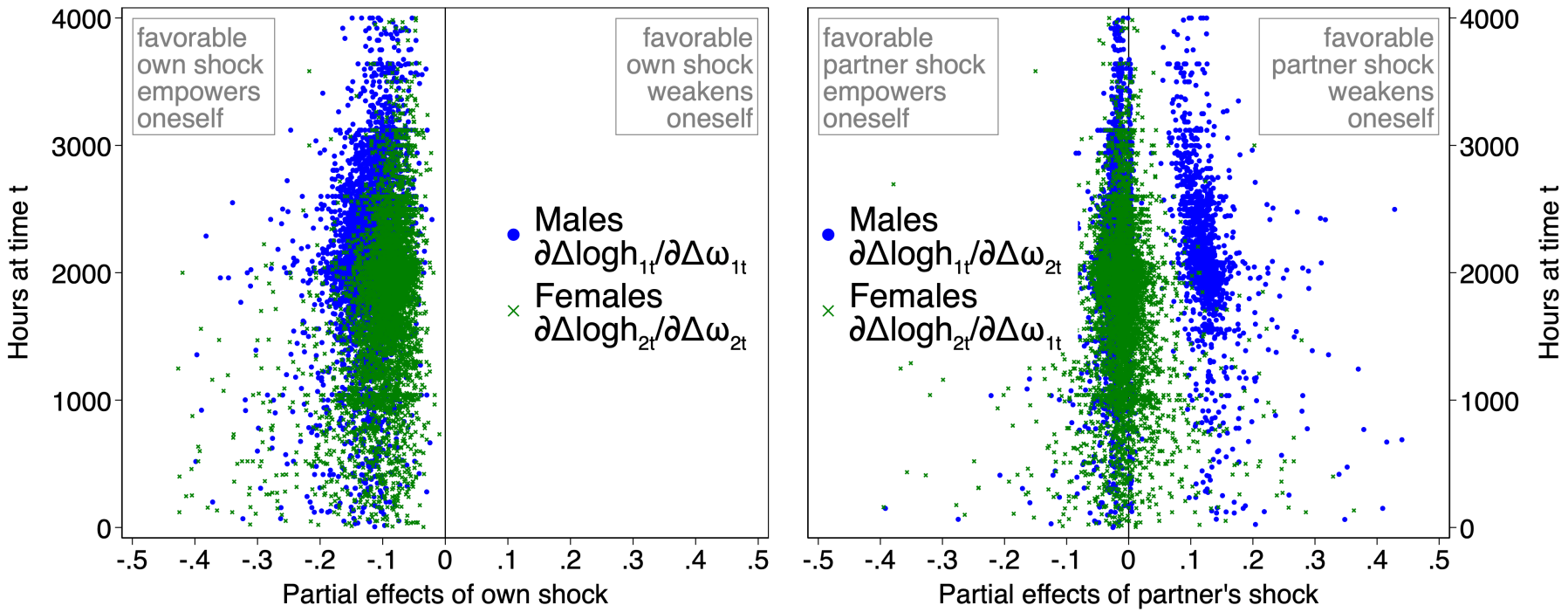
- Let observed hours and wages be subject to **measurement error**

$$\begin{aligned}
\Delta h^{o}_{jt} &= \Delta h_{jt} + \Delta e^{h_j}_{t} \\
\Delta w^{o}_{jt-\tau} &= \Delta w_{jt-\tau} + \Delta e^{w_j}_{t-\tau} \\
\Delta w^{o}_{-jt-\tau} &= \Delta w_{-jt-\tau} + \Delta e^{w_{-j}}_{t-\tau}, \text{ for } \tau \in \{0,1,2\}
\end{aligned}$$

  - measurement error e^{h_j}, e^{w_j}, $e^{w_{-j}}$, e^{y_j}; latter is error in earnings
  - error independent of true variable & serially uncorrelated
  - wages are earnings over hours $\Rightarrow$ so $e^{w_j} = e^{y_j} - e^{h_j}$
- Effects of **partner's wage**:
  - error biases effect towards zero (full commitment)
  - nevertheless, we strongly reject zero effects in our data!
- Effects of **own wage**:
  - bias from measurement error is ambiguous
- With measurement error, the test should thus be based on cross-effects rather than own effects

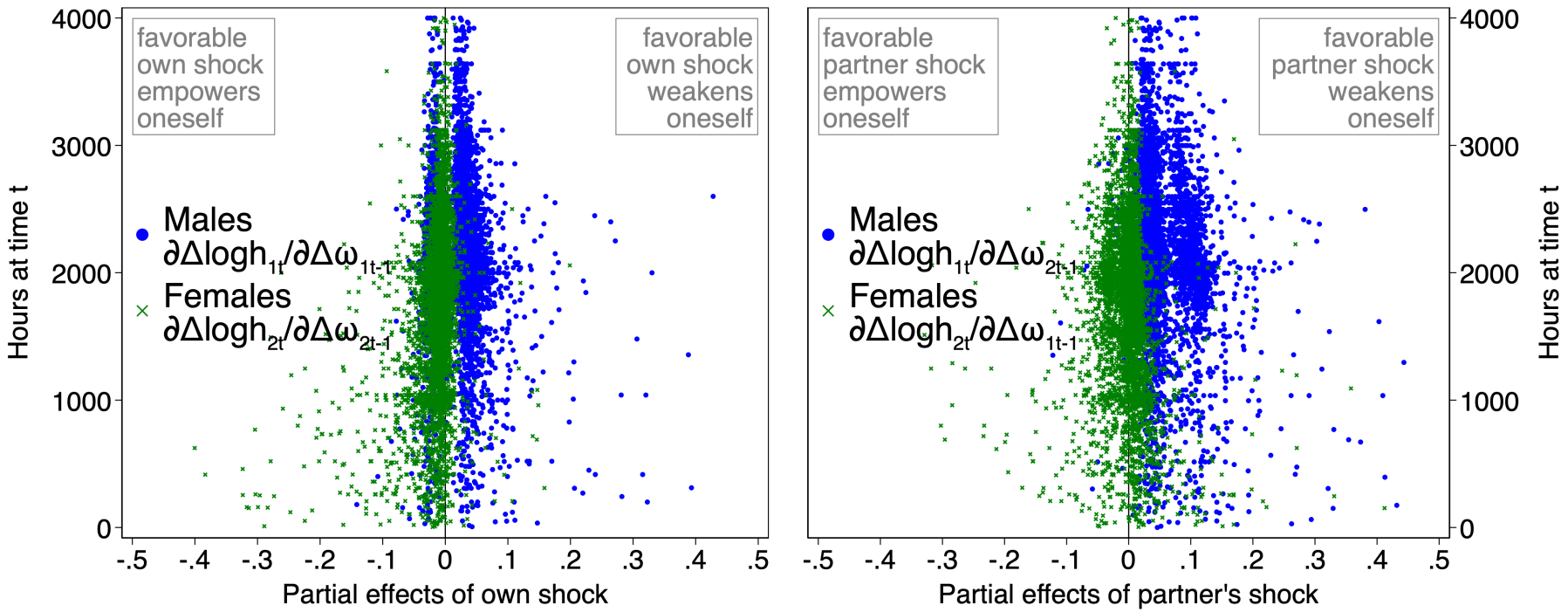
Results: heterogeneity over past hours, earnings, wages

bargaining effects of t shocks



Results: heterogeneity over past hours, earnings, wages

bargaining effects of $t-1$ shocks



Results: shocks to weight/health

- We re-estimate the model introducing additional distribution factors
  - we explore changes in BMI over time and across spouses

$$Z_t = \{\Delta \text{BMI}_{1t}, \Delta \text{BMI}_{2t}\}$$

  - we introduce Z_t **in addition to** wage shocks
- Summary of results:
  1. bargaining effects of wages unchanged from baseline
  2. bargaining effects of BMI in line with limited commitment
     - an increase in one's *past* BMI increases his/her hours
     - opposite effects on the spouse
     - as if it weakens one's Pareto weight because that person became relatively less attractive
- Critique of BMI:
  - reflects endogenous choices
    - but unclear why *past* BMI affects current labor supply
    - beyond effect on current BMI that we explicitly control for
  - affects labor supply directly
    - direct effect typically negative, opposite of what we find here