The Financial Labor Supply Accelerator

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Introduction

- Literature
  - Previous work: Fortin (1995), Del Boca and Lusardi (2003)
  - Our contributions:
    - Intertemporal substitution model with borrowing constraints
    - PSID data – before and after financial changes in early 1980s
- The rest of the talk:
  - Motivating evidence from the PSID
  - The model
  - Quantitative implications of the model
    - Calibration – parameters of high and low equity requirement regimes
    - Impulse responses
    - Regression coefficients from model-generated data.
  - Comparison with additional results from PSID data
- Concluding remarks – macroeconomic implications

- PSID: Households with two adults, head's age $\leq$ 65, top 2 percentiles of dividend and interest income excluded
- Debt: at the time of the interview, around April
- Hours worked: sum of head's and wife's annual hours from previous calendar year
- Mortgage debt deflated by head's hourly wage (and so expressed in hours of work).
- Regress hours worked and mortgage on year dummies, head's age, age^2, school years and race.
- Examine comovement of residuals.

Regressions of Hours Worked on Debt/Wage

	1968–1979	1980–1989	1990–1999	2000–2005
Using Current Wage				
Raw Data	0.091	0.083	0.054	0.040
Filtered Data	0.075	0.067	0.044	0.037
Using Lagged Wage				
Raw Data	0.083	0.084	0.053	
Filtered Data	0.066	0.065	0.042	

The Model

- A partial equilibrium version of Campbell and Hercowitz (2009)
- An impatient infinitely lived household faces a collateral constraint subject to minimum equity requirements.
- Typical features of household loan contracts in the United States – 90% of total household debt
- We use the model to compare regimes with different equity requirements.

The Model – Setup

- Preferences:

$$\mathbb{E}_0 \sum_{t=0}^{\infty} \beta^t \left\{ (1-\theta) \ln C_t + \theta \ln S_t + \omega \ln (1 - N_t) \right\}, \quad 0 < \beta < 1.$$

$\beta R < 1.$

- Budget constraint:

$$C_t = W_t N_t + R A_t + (1 - \delta) S_t - A_{t+1} - S_{t+1}, \quad 0 < \delta < 1 \quad (\Psi_t)$$

- Exogenous wage process:

$$\log W_t = \rho \log W_{t-1} + \varepsilon_t, \quad 0 < \rho \leq 1, \; Var(\varepsilon_t) = \sigma^2$$

- A simple specification of collateral value:

$$V_t = (1 - \pi) S_t, \quad 0 < \pi < 1 \tag{1}$$

- Borrowing constraint:

$$A_{t+1} \geq -V_{t+1} \quad (\Psi_t \Gamma_t)$$

The Model – Setup (cont')

- (1) implies

$$V_{t+1} = (1-\delta) V_t + (1-\pi) (S_{t+1} - (1-\delta) S_t)$$

- We postulate instead:

$$V_{t+1} = (1-\phi) V_t + (1-\pi) (S_{t+1} - (1-\delta) S_t), \qquad (\Psi_t \Xi_t)$$

where $\phi > \delta$

- We also impose that

$$S_{t+1} \geq (1-\delta) S_t, \qquad (\Psi_t \Omega_t)$$

The Model – First-Order Conditions

- Consumption:

$$\Psi_t = \frac{(1-\theta)}{C_t}$$

- Assets:

$$\Gamma_t = 1 - \beta R \mathbb{E}_t \frac{\Psi_{t+1}}{\Psi_t}$$

- Collateral value:

$$\Xi_t = \Gamma_t + \beta (1-\phi) \mathbb{E}_t \frac{\Psi_{t+1}}{\Psi_t} \Xi_{t+1}$$

- Durable goods:

$$1 - \Omega_t - \Xi_t (1-\pi) = \frac{\beta \theta}{(1-\theta)} \frac{C_t}{S_{t+1}} + \beta (1-\delta) \mathbb{E}_t \frac{\Psi_{t+1}}{\Psi_t}$$
$$\times (1 - \Omega_{t+1} - (1-\pi) \Xi_{t+1})$$

- Hours of work:

$$\omega/(1-N_t) = \Psi_t W_t$$

Steady State

- From the Euler equation:

$$\Gamma = 1 - \beta R > 0$$

- Then, from the collateral value condition:

$$\Xi = \frac{\Gamma}{1 - \beta(1 - \phi)} > 0$$

- From the collateral value accumulation equation and the assumption that the borrowing constraint binds:

$$\frac{-A}{S} = \frac{(1 - \pi)\delta}{\phi}$$

- Using these, we can show that when $\pi \downarrow$ or $\phi \downarrow$:

$$-A \uparrow, \quad N \uparrow$$

Financial Factors and Labor Supply

- Assumptions: (1) The borrowing constraint always binds, (2) $\phi = \delta$, (3) Household investment always exceeds zero.

$$-A_{t+1} = (1 - \pi) S_{t+1}$$

$$C_t + \pi S_{t+1} = W_t N_t + R\left(\pi - \frac{R - 1 + \delta}{R}\right) S_t \qquad (2)$$

$$\pi = \frac{\beta\theta}{(1 - \theta)}\frac{C_t}{S_{t+1}} + \beta\frac{C_t}{C_{t+1}}R\left(\pi - \frac{R - 1 + \delta}{R}\right) \qquad (3)$$

- $W_t \uparrow$ and $\pi = (R - 1 + \delta)/R$
  - (2), (3) and $1 - N_t = \omega/(1 - \theta) \times (C_t/W_t) \Rightarrow C_t$ and S_{t+1} move proportionally to $W_t \Rightarrow N_t$ constant
- $W_t \uparrow$ and $\pi > (R - 1 + \delta)/R$
  - C_t and S_{t+1} adjust gradually
  - $\Rightarrow W_t/C_t \uparrow \Rightarrow N_t \uparrow$

Quantitative Implications of the Model

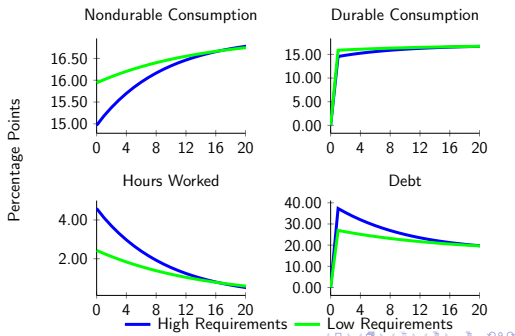- Calibration
- Impulse responses
- Regressions using the model's data

Calibration

- Length of the period: one year
- Adopted from Campbell & Hercowitz (2009). Durable goods are housing and vehicles

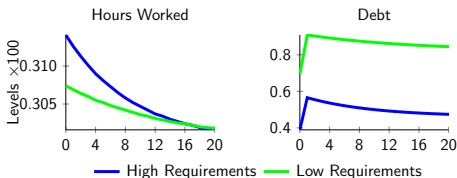|	π	ϕ	δ	θ	β	R	ω
High Equity Req.	0.16	0.126	0.04	0.37	1/1.06	1.04	1.93
Low Equity Req.	0.11	0.074					

- Calibration of the wage process based on Meghir and Pistaferri (2004). Variance and serial correlation of labor income growth: 0.0613 and -0.118. We set $\rho = 1$, $\sigma = 0.17$.

Impulse Responses

Nondurable Consumption

Durable Consumption

Hours Worked

Debt

Percentage Points

— High Requirements — Low Requirements

Impulse Responses
Absolute Changes

Hours Worked

Debt

Levels ×100

— High Requirements — Low Requirements

Regressions Using the Model's Data

- Simulation of panel for each regime
- PSID
  1969-1997: 5.75 observations per household
  1984-1997: 5.36
  Model's sample size: 6 years $\times$ 2000 households

Regression Coefficients of Hours Worked on Debt – Model	
High Equity Requirements	0.112
Low Equity Requirements	0.075

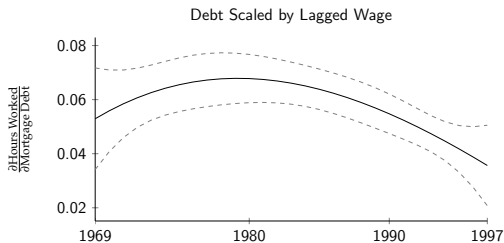## Comparison with the Evidence

- Estimate regression coefficients of annual hours worked on mortgage debt with PSID data
- Data:

N_t	total annual hours (sum of head's and wife's)
W_t	head's real hourly wage (yearly average)
B_{t+1}	real mortgage balance at the time of interview $t + 1$

  - Control variables: year dummies, head's age, age squared, schooling groups, and race dummies
  - Period 1968-2005, debt deflated by current wage,
  - Period 1969-1997, debt deflated by lagged wage. (Nominal variables deflated by consumption price index from NIPA.)

- We do not impose, ex-ante, sample periods to match the theoretical regimes – year-specific coefficients

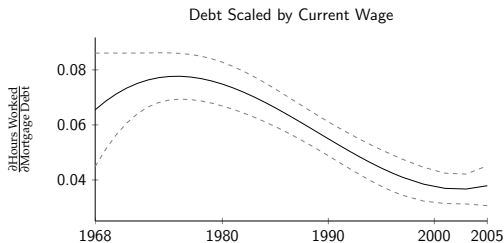## Estimated Regression Coefficients

Debt Scaled by Lagged Wage

Estimated Regression Coefficients

Debt Scaled by Current Wage

Estimated Regression Coefficients – Fixed Effects
1969–1997
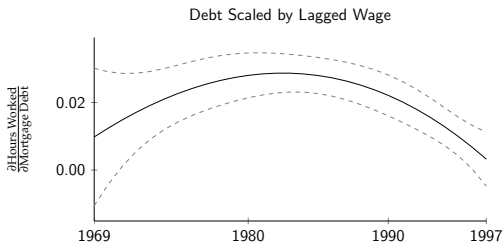
Debt Scaled by Lagged Wage

Estimated Regression Coefficients – Fixed Effects
1968–2005
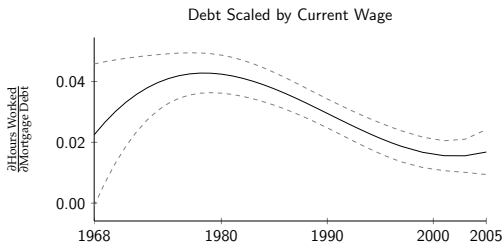
Debt Scaled by Current Wage

| | 1969–1997 | | 1968–2005 | |
	F-Statistic	*p*-value	*F*-statistic	*p*-value
1983	1.41	0.24	21.26	0.00
1984	1.83	0.18	22.54	0.00
1985	2.35	0.13	23.54	0.00
1986	2.99	0.08	24.35	0.00
1987	3.80	0.05	25.03	0.00
1988	4.84	0.03	25.64	0.00
1989	6.21	0.01	26.24	0.00
1990	7.99	0.00	26.87	0.00
1991	10.29	0.00	27.57	0.00
1992	13.04	0.00	28.38	0.00
1993	15.83	0.00	29.31	0.00
1994	17.74	0.00	30.43	0.00
1995	17.77	0.00	31.75	0.00
1996	15.87	0.00	33.33	0.00
1997	13.02	0.00	35.23	0.00
1999			40.09	0.00
2001			46.21	0.00
2003			50.58	0.00
2005			43.88	0.00

| | 1969–1997 | | 1968–2005 | |
	F-Statistic	*p*-value	*F*-statistic	*p*-value
1968			0.28	0.59
1969	1.54	0.21	0.10	0.75
1970	1.47	0.23	0.00	0.94
1971	1.30	0.25	0.05	0.83
1972	1.04	0.31	0.29	0.59
1973	0.70	0.40	0.81	0.37
1974	0.37	0.54	1.71	0.19
1975	0.13	0.72	3.05	0.08
1976	0.01	0.91	4.89	0.03
1977	0.02	0.90	7.19	0.01
1978	0.11	0.74	9.81	0.00
1979	0.28	0.60	12.57	0.00
1980	0.49	0.48	15.23	0.00
1981	0.75	0.39	17.62	0.00

Concluding Remarks: Macroeconomic Implications

- Households: A persistent wage increase generates a liquidity shortage: "financial labor supply accelerator."
- Firms: The usual financial accelerators is triggered by an *increase* in the availability of funds.
- Difference: allocation of time
- Productivity shocks: likely to trigger both mechanisms simultaneously
- Main macroeconomic implication: Possible link with the "great moderation" early 1980s – 2007