Why do Americans Work So Much More than Europeans?

How Plausible is Prescott (2004) Story?

- What does government do with tax revenue?
- How much does labor supply respond to tax changes?

Role of Labor Supply Elasticity

Illustration

- Preferences

$$+\frac{(1-h)^{1-\eta}}{1-\eta}$$

$$\log c - \alpha \frac{h^{1+\gamma}}{1+\gamma}$$

- Technology $c = h$
- Government $T = \tau h$

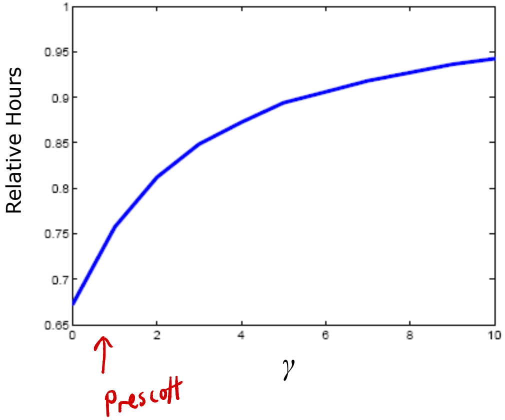
Role of Labor Supply Elasticity

Illustration

- Choose value of γ
- Calibrate to US
  - Set $\tau = 0.3$
  - Given τ and γ, set α so that $h = 1/3$
  - Compute hours for different combinations of γ when $\tau = 0.5$

Role of Labor Supply Elasticity

Illustration



Role of Labor Supply Elasticity

Value of γ

- What is appropriate value of γ?
  - Small γ is large elasticity and vice versa

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- MaCurdy (1981) wrote down life cycle model of labor supply
- Estimated IES

intertemporal elasticity of substitution

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

β^t $\quad \frac{1}{(1+\rho)^t}$ discounting

consumption

leisure $\quad 1-N$

- Decision problem

$$\max \sum_{t=0}^{T} \frac{1}{(1+\rho)^t} U(C_t, L_t)$$

$$\text{s.t. } \underbrace{A_0}_{\text{wealth}} + \underbrace{\sum_{t=0}^{T} \frac{1}{(1+r)^t} N_t W_t}_{\text{labor income}} = \sum_{t=0}^{T} \frac{1}{(1+r)^t} C_t$$

net interest rate

- Consumption-savings
- Intertemporal allocation of time

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

$$\mathcal{L} = \sum_{t=0}^{T} \frac{1}{(1+\rho)^t} U(C_t, L_t) - \lambda_0 \left[\sum_{t=0}^{T} \frac{1}{(1+r)^t} C_t - \sum_{t=0}^{T} \frac{1}{(1+r)^t} \overbrace{N_t}^{1-L_t} W_t - A_0 \right]$$

- First-order conditions

$$C_t: \quad \frac{1}{(1+\rho)^t} \frac{\partial U}{\partial C_t} = \lambda_0 \frac{1}{(1+r)^t} \tag{1}$$

$$L_t: \quad \frac{1}{(1+\rho)^t} \frac{\partial U}{\partial L_t} = \lambda_0 \frac{1}{(1+r)^t} W_t \tag{2}$$

Envelope theorem: $\dfrac{\partial \mathcal{L}}{\partial A_0} = \lambda_0$

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- According to envelope theorem
  - λ_0 = marginal utility of wealth

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

kids, health etc.

- Assume utility function with taste shifters

$$U(C_t, L_t) = \eta_{1t} C_t^{\omega_1} - \eta_{2t} N_t^{\omega_2}$$

  - $N = 1 - L$

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- Rewrite eq. (2) as

$$\frac{1}{(1+\rho)^t}\omega_2\eta_{2t}N_t^{\omega_2-1} = \lambda_0\frac{1}{(1+r)^t}W_t$$

- Take logs

$$\ln N_t = \frac{1}{\omega_2-1}\Big[\ln\lambda_0 - \ln\eta_{2t} - \ln\omega_2 + \ln\left(\frac{1}{(1+r)^t}\right)$$
$$+t\ln(1+\rho) + \ln W_t\Big]$$

first-difference:

$\ln N_{t-1} = \ldots$

$\rightarrow \ln N_t - \ln N_{t-1}$

$$\frac{1}{(1+\rho)^t}\,\omega_2\,\eta_{2t}\,N_t^{\omega_2-1} = \lambda_0\,\frac{1}{(1+r)^t}\,W_t \qquad (2)$$

$$\underbrace{\ln\left(\frac{1}{(1+\rho)^t}\right)}_{\underbrace{\ln(1)}_{=0} - t\ln(1+\rho)} + \ln\omega_2 + \ln\eta_{2t} + (\omega_2-1)\ln N_t = \ln\lambda_0 + \underbrace{\ln\left(\frac{1}{(1+r)^t}\right)} + \ln W_t$$

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

→ only way to hold wealth constant when raise wage in one period is to lower wage in another

- *Intertemporal elasticity of substitution*

$$IES = \frac{\partial \ln N_t}{\partial \ln W_t} = \frac{1}{\omega_2 - 1}$$

good approxim. for small changes

- Holding λ_0 constant → substitution elasticity (no wealth effect)

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- First differencing

$$\Delta \ln N_t = \frac{1}{\omega_2 - 1}\Big[-(\ln \eta_{2t} - \ln \eta_{2,t-1}) + \ln\left(\frac{1}{1+r}\right) + \ln(1+\rho) + \Delta \ln W_t\Big]$$

$\ln N_t - \ln N_{t-1} = \Delta \ln N_t$

For small ρ and r $(\rho - r)$ good proxy for $\ln(1+\rho) - \ln(1+r)$

- Approximating

$$\Delta \ln N_t = \frac{1}{\omega_2 - 1}\left[-(\ln \eta_{2t} - \ln \eta_{2,t-1}) + (\rho - r) + \Delta \ln W_t\right]$$

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- Three reasons why hours could change over life cycle
  - Change in wages
  - $\rho \neq r$
  - Changes in tastes for work

Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

- Estimated on PSID data
  - White, married men
  - Aged 25-55
  - No corner solutions, sample of people who all work
- Elasticity estimates small → Prescott chose too large elasticity?

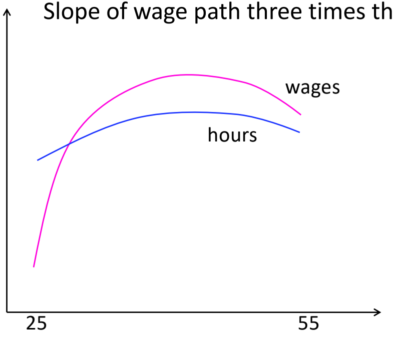
Estimating Labor Supply Elasticity

Classic estimates: MaCurdy (1981)

wages measured with error
→ IV
age, age², educ ...

- Why is elasticity estimate small?

Slope of wage path three times that of hours



Critiques:
- borrowing constraints
- human capital accumulation
- extensive margin of labor supply

Estimating Labor Supply Elasticity

Borrowing Constraints: Domeij and Floden (2006)

- Omitting borrowing constraints biases elasticity estimates downward
- Include borrowing constraint in simple 2-period model

$$\begin{gathered}\max\ u(c_1) - v(h_1) + u(c_2) - v(h_2)\\ \text{s.t. } c_1 + b = w_1 h_1\\ c_2 = w_2 h_2 + b\\ b \geq \underline{\mathrm{b}}\end{gathered}$$

Baseline 2-period model

$$\mathcal{L} = u(c_1) - v(h_1) + u(c_2) - v(h_2) - \lambda_1 [c_1 + b - w_1 h_1] - \lambda_2 [c_2 - w_2 h_2 - b]$$
$$- \lambda_3 [b - \underline{b}]$$

c_1: $u'(c_1) = \lambda_1$

c_2: $u'(c_2) = \lambda_2$

h_1: $v'(h_1) = \lambda_1 w_1$

h_2: $v'(h_2) = \lambda_2 w_2$

$$\frac{v'(h_1)}{v'(h_2)} = \frac{\lambda_1}{\lambda_2} \frac{w_1}{w_2} \rightarrow \frac{v'(h_1)}{v'(h_2)} = \frac{w_1}{w_2}$$

$\rightarrow$ b: $\lambda_1 = \lambda_2$

$-\lambda_1 + \lambda_2 - \lambda_3 = 0 \rightarrow \lambda_1 = \lambda_2 - \lambda_3$

$$\rightarrow \frac{v'(h_1)}{v'(h_2)} = \underbrace{\frac{\lambda_2 - \lambda_3}{\lambda_2}}_{\text{Domeij and Floden (2006)}} \frac{w_1}{w_2}$$

Estimating Labor Supply Elasticity

Human Capital: Imai and Keane (2004), Wallenius (2011)

- Omitting human capital accumulation biases elasticity estimates downward
- Include learning by doing in simple 2-period model

$$\max \ u(c_1) - v(h_1) + u(c_2) - v(h_2)$$
$$\text{s.t. } c_1 + c_2 = w_1 h_1 + w_2(h_1) h_2$$

$$\mathcal{L} = u(c_1) - v(h_1) + u(c_2) - v(h_2) - \lambda\left[c_1 + c_2 - w_1 h_1 - w_2(h_1) h_2\right]$$

c_1 : $u'(c_1) = \lambda$

c_2 : $u'(c_2) = \lambda$

$$\begin{cases} h_1 : & -v'(h_1) + \lambda w_1 + \lambda w_2'(h_1) h_2 = 0 \rightarrow v'(h_1) = \lambda(w_1 + w_2'(h_1) h_2) \\ h_2 : & v'(h_2) = \lambda w_2(h_1) \end{cases}$$

$$\rightarrow \frac{v'(h_1)}{v'(h_2)} = \frac{w_1 + w_2'(h_1) h_2}{w_2(h_1)}$$

Estimating Labor Supply Elasticity

Human Capital: Wallenius (2011)

- Omitting human capital accumulation biases elasticity estimates downward
- Include Ben Porath on-the-job training in simple 2-period model

$$\max \; u(c_1) - v(h_1 + T) + u(c_2) - v(h_2)$$
$$\text{s.t. } c_1 + c_2 = w_1 h_1 + w_2(T) h_2$$

$$\mathcal{L} = u(c_1) - v(h_1 + T) + u(c_2) - v(h_2) - \lambda\left[c_1 + c_2 - w_1 h_1 - w_2(T) h_2\right]$$

$$c_1: \quad u'(c_1) = \lambda$$

$$c_2: \quad u'(c_2) = \lambda$$

$$\left.\begin{aligned} h_1&: \quad v'(h_1 + T) = \lambda w_1 \\ h_2&: \quad v'(h_2) = \lambda w_2(T) \end{aligned}\right\} \quad \frac{v'(h_1+T)}{v'(h_2)} = \frac{w_1}{w_2(T)}$$

$$T: \quad v'(h_1 + T) = \lambda w_2'(T) h_2$$

important to take a stand on how variables map to data

Estimating Labor Supply Elasticity

Extensive Margin: Rogerson and Wallenius (2009)

- Two labor supply margins: extensive (fraction of life worked) and intensive (hours worked when working)
- Ignoring extensive margin biases elasticity estimates downward