

Chapter 12: Labor Supply

Graduate Macroeconomics Slides

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Why labor supply matters

- Hours worked = key input in aggregate production \Rightarrow driver of output per capita.
- Our goal: understand variation in hours across countries, time, and demographics.
- Three building blocks:
 - ① Incentives.
 - ② Elasticities.
 - ③ Aggregation.



Cross-country differences

- OECD countries differ widely in hours.
- Intensive vs extensive margins.
- US high; Europe low (Rogerson, 2024).

<0.75	(.75,.85)	(.85,.95)	>.95
Italy (0.69)	Finland (0.77)	UK (0.85)	Canada (0.96)
France (0.70)	Austria (0.79)	Sweden (0.90)	Australia (0.98)
Belgium (0.72)	Norway (0.80)	Ireland (0.91)	US (1.00)
Greece (0.73)	Netherlands (0.82)	Japan (0.91)	New Zealand (1.07)
Denmark (0.74)	Portugal (0.85)	Switzerland (0.93)	Korea (1.12)
Germany (0.74)			
Spain (0.75)			

Table 12.1: Hours of work per person aged 15+ relative to the US 2015-2019



Panel A: Extensive Margin: Employment to Population (%)				
<50	(50,55)	(55,60)	(60,65)	>65
Greece (40.9)	Belgium (50.0)	Ireland (57.7)	US (60.1)	Switzerland (65.1)
Italy (44.1)	France (50.5)	Austria (57.9)	UK (60.4)	New Zealand (66.9)
Spain (48.6)	Portugal (52.3)	Denmark (58.3)	Korea (60.7)	Sweden (67.6)
	Finland (54.4)	Germany (58.8)	Australia (61.7)	
		Japan (59.0)	Canada (61.8)	
			Netherlands (62.3)	

Panel B: Intensive Margin: Annual Hours Worked per Employed Person				
<1500	(1500,1650)	(1650,1750)	(1750,1850)	> 1850
Germany (1388)	Austria (1502)	Spain (1693)	New Zealand (1761)	Greece (1941)
Denmark (1395)	France (1516)	Japan (1693)	US (1825)	Korea (2026)
Norway (1423)	UK (1535)	Canada (1699)		
Netherlands (1435)	Finland (1549)	Italy (1718)		
Sweden (1466)	Switzerland (1563)	Ireland (1720)		
	Belgium (1577)	Portugal (1736)		
		Australia (1737)		

Table 12.2: Labor supply along the intensive and extensive margin 2015-2019



Secular decline in hours

- G7: hours/person fell 30–40% since 1950; exception = US (flat).
- Decline stronger in intensive margin than extensive.

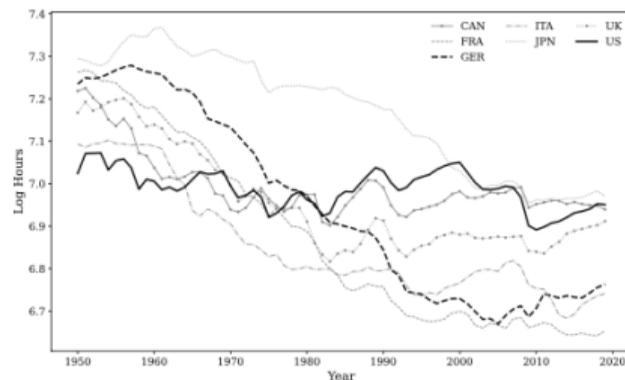


Figure 12.1: Log average annual hours worked per person for the G7 countries from 1950-2019



Margins over time

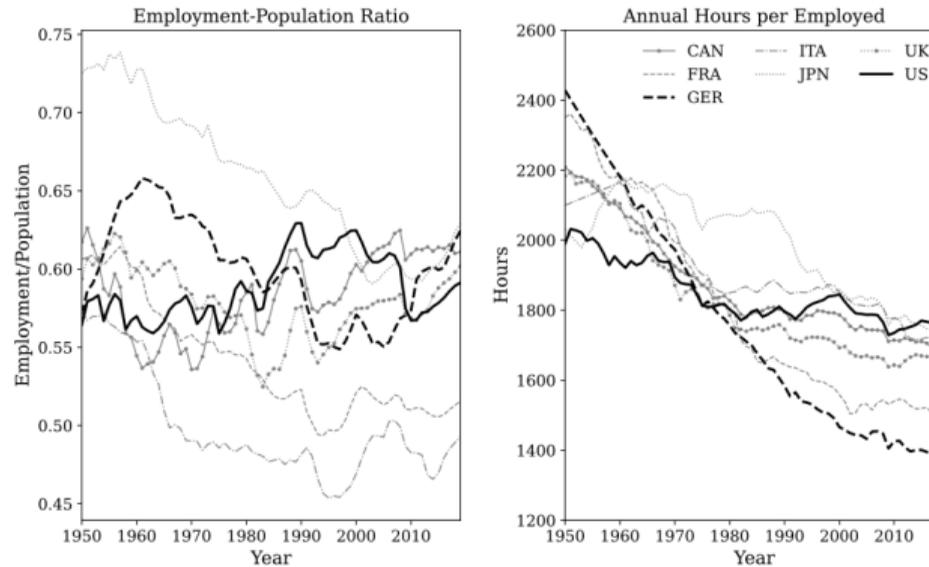


Figure 12.2: Intensive and extensive margins of labor supply for G7 countries from 1950 to 2019. Left panel: employment to population ratio. Right panel: annual hours per employed person

Business cycle fluctuations

- Hours fluctuate strongly; peak-to-trough ≥ 10 p.p. in US.
- Both margins cyclical; extensive somewhat larger.

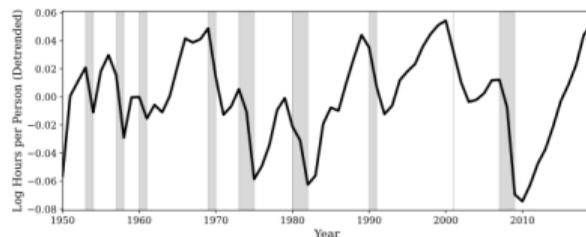


Figure 12.3: Business cycle fluctuations worked per person for the US from 1950-2019, calculated as the residual of a regression of log average annual hours worked per person on a quartic polynomial in time.

Margins in cycles

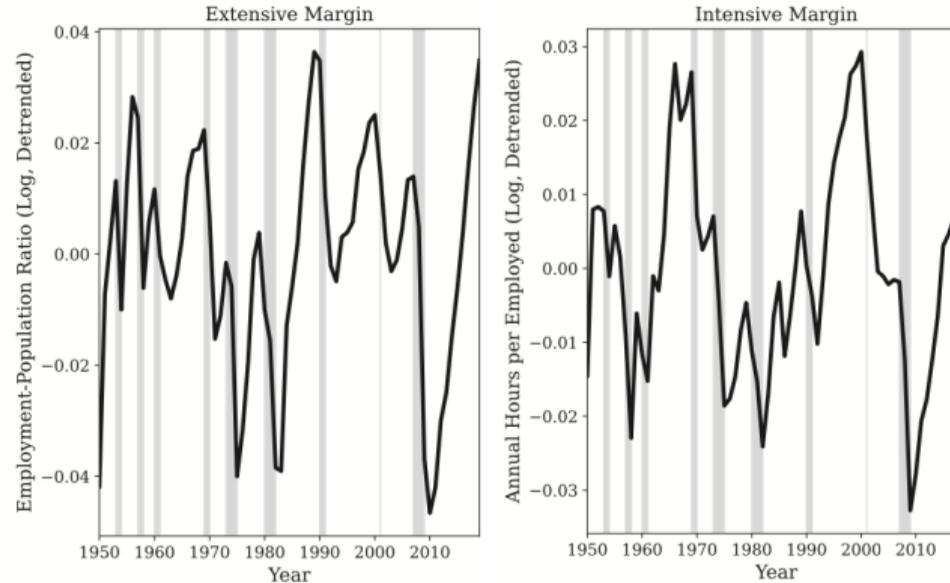


Figure 12.4: Business cycle fluctuations in labor supply on the intensive (left panel) and extensive (right panel) margins for the US. from 1950-2019. The business cycle variation in the intensive margin of labor supply is calculated as the residual of a regression of log annual hours worked per employed on a quartic polynomial in time. The business cycle variation in the extensive margin of labor supply is calculated as the residual of a regression of log employment to population ratio on a quartic polynomial in time.

Life-cycle and gender patterns

- Hump-shaped hours: peak 25–54, decline after 55.
- Male profile above female, except teens.
- Female employment rose sharply post-1950.

Age	All	Male	Female
15 – 19	1.27	1.24	1.29
20 – 24	3.67	3.81	3.52
25 – 34	5.02	5.90	4.13
35 – 44	5.04	5.79	4.29
45 – 54	4.79	5.45	4.15
55 – 64	4.02	4.73	3.35
65 – 74	1.42	1.88	1.02
75+	0.37	0.55	0.23
<i>Total</i>	3.56	4.17	2.98

Table 12.3: Hours of work per day



Gender employment rates

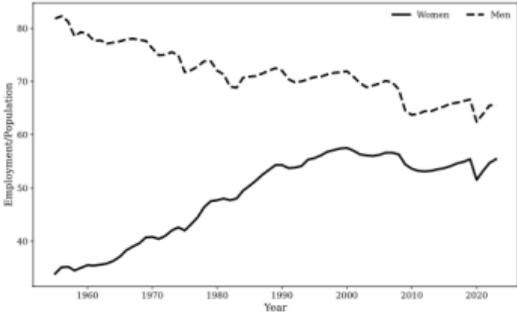


Figure 12.5: Employment to population by gender for the US by gender from 1950-2019



Education differences

- Higher education \Rightarrow more hours worked.

<HS	HS	SC	C	>C
2.89	3.39	3.90	4.08	4.17

Table 12.4: Hours of work per day by education



Benchmark static model

Preferences:

$$U(c, h) = u(c) - v(h), \quad u(c) = \frac{c^{1-\sigma}}{1-\sigma}, \quad v(h) = \frac{\psi}{1 + \frac{1}{\gamma}} h^{1 + \frac{1}{\gamma}}.$$

Budget: $c = wh + I$. FOC:

$$\frac{\psi h^{1/\gamma}}{(wh + I)^\sigma} = w.$$

Interpretation: work until MRS between leisure and consumption = real wage.



Elasticities

Define $s_l = l/(wh + l)$. Then:

$$\varepsilon_{h,l} = -\frac{\sigma}{\frac{1}{\gamma} + \sigma(1 - s_l)} \frac{1 - s_l}{s_l} < 0,$$

$$\varepsilon_{h,w}^M = \frac{1 - \sigma(1 - s_l)}{\frac{1}{\gamma} + \sigma(1 - s_l)}.$$

- Income effect: always < 0 .
- Marshallian wage elasticity: ambiguous (substitution vs income).



Hicksian elasticity

$$\varepsilon_{h,w}^H = \frac{1}{\frac{1}{\gamma} + \sigma(1 - s_l)} > 0.$$

Policy mapping:

- Proportional tax τ : acts like lower $w \Rightarrow$ Marshallian.
- Lump-sum transfer T : acts like $I \Rightarrow$ income elasticity.
- Balanced tax-transfer (rebate): \Rightarrow Hicksian (Prescott, 2004).



Home production

Time split: h_m (market), h_h (home). Home production: $y_h = A_h h_h$. Consumption aggregator:

$$c = [\theta c_m^\eta + (1 - \theta)c_h^\eta]^{1/\eta}, \quad 0 < \eta < 1.$$

Implication:

$$\frac{h_h}{h_m} = \left(\frac{1 - \theta}{\theta}\right)^{1/(\eta-1)} \left(\frac{w}{A_h}\right)^{\eta/(\eta-1)}.$$

Tech progress in home (higher A_h) \Rightarrow more market work ([Greenwood et al., 2005](#)).



Household labor supply

Two-member household (unitary):

$$U(c, h_f, h_m) = u(c) - v(h_f) - v(h_m), \quad c = w_f h_f + w_m h_m + I.$$

FOCs \Rightarrow

$$\frac{h_f}{h_m} = \left(\frac{w_f}{w_m} \right)^\gamma.$$

Implications:

- Specialization by relative wages.
- Added-worker effect if partner loses job (Bourguignon and Chiappori, 1992; Attanasio, 1999).



Leisure technologies

Leisure bundle $\{l_j\}$ with productivity A_j :

$$v(\ell) = \frac{1}{1-\delta} \left(\sum_j (A_j l_j)^{1-\delta} \right).$$

Higher A_j (e.g., video games) \Rightarrow higher leisure value \Rightarrow lower hours. Helps explain declining work among young men ([Aguiar et al., 2021](#)).



Two-stage budgeting

Preferences:

$$\mathbb{E}_0 \sum_{t=0}^T \beta^t \left(\frac{c_t^{1-\sigma}}{1-\sigma} - \frac{\psi}{1+1/\gamma} h_t^{1+1/\gamma} \right).$$

Budget:

$$c_t + a_{t+1} = Ra_t + (1 - \tau)w_t h_t + T.$$

Step 1: choose $\{a_{t+1}\}$ across time (Euler). Step 2: given l_t , choose h_t intratemporally (Blundell and MaCurdy, 1999; Keane, 2011).



Dynamic elasticities

FOC: $c_t^{-\sigma}(1 - \tau)w_t = \psi h_t^{1/\gamma}$. Marshallian and Hicksian elasticities mirror static case. Frisch elasticity:

$$\varepsilon_{h,w}^F = \gamma.$$

Interpretation: intertemporal substitution. Hours shift to periods of high wages if credit markets work (MaCurdy, 1981).



Balanced growth restrictions

Labor-augmenting growth requires preferences consistent with constant hours:

$$U(C, 1 - H) = \begin{cases} \frac{C^{1-\sigma} - 1}{1 - \sigma} + v(1 - H), & \sigma \neq 1, \\ \log C + v(1 - H), & \sigma = 1. \end{cases}$$

⇒ offsetting income & substitution effects (King et al., 1988).



Taxes and hours

Representative household with $\log C - \psi H^{1+1/\gamma}/(1 + 1/\gamma)$. Tax wedge $\tau = \frac{\tau_h + \tau_c}{1 + \tau_c}$. Steady-state hours:

$$H^* = \left(\frac{(1 - \tau)(1 - \alpha)}{\chi\psi} \right)^{\gamma/(1+\gamma)}.$$

Cross-country tax differences explain US–Europe hours gap (Prescott, 2004).



Business cycles

Frisch elasticity determines cyclical response of hours. Higher $\gamma \Rightarrow$ stronger adjustment to shocks. But representative-agent model cannot explain all cyclical variation.



Dynamic returns

If hours today raise future wages: return = w_t + human-capital gain. γ = elasticity to total return.
Measured Frisch \rightarrow biased downward for young workers (Imai and Keane, 2004; Keane and Rogerson, 2015).



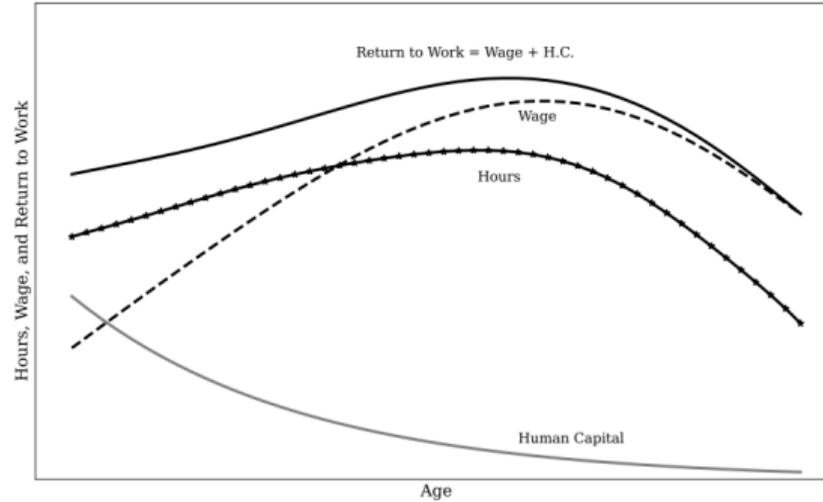


Figure 12.6: Life cycle profile of hours, wages, the human capital term, and the return to work in the Imai-Keane model

Policy with human capital

Permanent tax cuts reduce both current and future returns \Rightarrow stronger substitution effect. Ranking of elasticities may flip: Frisch $<$ Hicksian $<$ Marshallian (Keane and Rogerson, 2015).



Indivisible labor

Fixed costs and nonconvexities \Rightarrow indivisible labor. Implication: extensive margin dominates aggregate response even if individual intensive elasticity is modest (Chang and Kim, 2006; Rogerson and Wallenius, 2009).



Aggregate vs micro elasticities

Micro estimates may understate aggregate responsiveness. With extensive adjustments, aggregate elasticity $\approx 1.5-2$ (Erosa et al., 2016).



Key takeaways

- Static model: clear Marshallian/Hicksian formulas.
- Dynamic: Frisch elasticity captures intertemporal substitution.
- Balanced growth constrains preferences.
- RA models explain cross-country/tax effects but miss heterogeneity.
- Human capital and extensive margin amplify responses.



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Thank you!

Questions or comments?

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