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Motivation

- Micro estimates of labor supply elasticities (i.e. $\epsilon = \frac{\Delta l}{\Delta w} \frac{w}{l}$) are much lower than macro ones;

- Possible estimation strategy: use changes in tax systems as quasi-experiments;

- The literature assumes that workers can freely choose jobs and hours of work...

- ...but frictions and adjustment costs may attenuate estimates of the elasticity!
Economic Mechanism

- Workers have to pay search costs to find their preferred job;

- Effects of taxes on labor supply are shaped by
  1. *Adjustment costs*: is it *worth it* to search?
  2. *Hours constraints*: will you be able to *find* your preferred job?

- Firms face technological constraints: they *commit* ex-ante to a level of work hours;
  - → they target the most common preferences on hours;
  - → many individuals do not work their optimum... and have little advantage to change!
Results

- True $\epsilon = \textbf{macro } \epsilon$!
- Micro $\hat{\epsilon} < \text{true } \epsilon$; frictions attenuate the estimates;
- Predictions:
  1. ↑ size of tax change $\Rightarrow$ ↑ micro $\hat{\epsilon}$;
  2. ↑ # of people affected by tax change $\Rightarrow$ ↑ micro $\hat{\epsilon}$;
  3. More workers bunch at a kink $\Rightarrow$ more workers, searching different jobs, will bunch there.
- Predictions are tested on Denmark tax records and hold for wage earners;
- Predictions do not hold for self employed: they are able to adjust hours more easily.
- Results suggest that $\epsilon \simeq 10 \hat{\epsilon}$... but do not justify very large elasticities (i.e. $> 1$).
Related Literature


- Non-Linear budget sets: Hausman 1981; Moffitt 1990; MaCurdy, Green and Paarsch 1990;

- Taxable income as a measure of labor supply: Feldstein 1999; Slemrod and Yitzhaki 2002; Chetty 2009.
To fix ideas: the model

- Static model;
- Firm $j$ posts a job requiring $h_j$ hours at wage rate $w(h_j)$.
- Firms cannot change hours after matching with a worker because of technological constraints.
- So they aim to maximize profits

$$\pi_j = ph_j - w(h_j)h_j$$

- $G(h)$ (hours offered) is determined in equilibrium.
To fix ideas: the model

- Workers (index $i$) have quasi-linear utility

$$u_i(c, h) = c - \alpha_i^{-1/\epsilon} \frac{h^{1+1/\epsilon}}{1 + 1/\epsilon}$$

where $\alpha_i \sim F(\alpha_i)$.

- Frisch elasticity of labor supply $= \epsilon$, absent frictions.

- Assume there are two types of tax systems, $s \in \{NL, L\}$. A fraction $0 < \zeta < 1$ faces $NL$.

- Individuals who face $NL$ have two brackets, $\tau_2 > \tau_1$, separated by threshold $K$.

- Individuals who face $L$ always pay $\tau$. Then

$$c_i(h_i) = \begin{cases} (1 - \tau_1) \min(w_i h_i, K) + (1 - \tau_2) \max(w_i h_i - K, 0) & \text{if } s_i = NL \\ (1 - \tau) w_i h_i & \text{if } s_i = L \end{cases}$$
Timing and Equilibrium

- Workers begin their search by drawing an initial offer $h_i^0$ from $G(h)$.
- They can accept the offer or turn it down and search for another job, paying a utility cost $\phi_i$.
- The search process maps $G(h)$ and the wage schedule $w(h)$ into $F(G^*(h), p)$.

Under two different equilibrium concepts (collective bargaining and competitive equilibrium):

1. $w = p$;
2. $G^*(h) = F(G^*(h), p)$ (fixed point)

hence $G^*(h)$ reflects $F(\alpha)$ of workers, ensuring full employment.
Key Predictions

“By the end of November, some of my colleagues stop working. It does not pay anymore, because they have reached the high tax bracket.”

Danish construction worker

- In a frictionless model ($\phi_i = 0$):

$$h_i^* = \begin{cases} 
\alpha_i((1 - \tau_1)w)^\epsilon & \text{if } \alpha_i < \alpha \\
K \quad & \text{if } \alpha_i \in [\alpha, \overline{\alpha}] \\
\alpha_i((1 - \tau_2)w)^\epsilon & \text{if } \alpha_i > \alpha 
\end{cases}$$

- Workers with moderate disutilities **bunch at the kink** because the net-of-tax wage falls at $h_K$.

- If workers face a linear tax system:

$$d \log h = \epsilon \cdot d \log(1 - \tau)$$
Key Predictions

- Bunching can be used to identify $\epsilon$;
- Definitions:
  - $B_{NL}(\tau_j, \tau_{j+1})$: fraction of individuals who choose $h_i = h_K$;
  - $\tilde{g}_{NL}$: counterfactual density in absence of tax kink;
- Saez (2010) shows that
  \[ \epsilon \approx \frac{B_{NL}(\tau_1, \tau_2)/\tilde{g}_{NL}(h_K)}{K \log\left(\frac{1-\tau_1}{1-\tau_2}\right)} \]
- Intuition: the fraction of individuals who stop working at $h_K$ hours is
  - proportional to $\epsilon$;
  - independent of $\zeta$.
- Result underlies micro logic of using changes in taxes to identify $\epsilon$...
- ...but is invalid if there are search costs and hour constraints!
Prediction 1: Bunching and Costs

\[ \frac{\partial \hat{\epsilon}}{\partial \tau_2} > 0, \quad \frac{\partial \hat{\epsilon}}{\partial \tau_1} < 0, \quad \lim_{(\tau_2 - \tau_1) \to \infty} \hat{\epsilon} = \epsilon. \]
Micro vs. Macro

- Consider two economies with tax rates $\tau \neq \tau'$;

  $$\hat{\epsilon}_{MAC} = \frac{\mathbb{E} \log h_i(\tau') - \mathbb{E} \log h_i(\tau)}{\log(1 - \tau') - \log(1 - \tau)}$$

- For workers choosing optimal hours:

  $$\log h_i^*(\tau') - \log h_i^*(\tau) = \epsilon \left[ \log(1 - \tau') - \log(1 - \tau) \right]$$

- For workers who retain the initial draw $h_i^0$, movement in the inaction region is also given by $\epsilon$;

- Under the approximation that $G(h)$ is uniform in the inaction region:

  $$\mathbb{E} \log h_i(\tau') - \mathbb{E} \log h_i(\tau) \simeq \epsilon \left[ \log(1 - \tau') - \log(1 - \tau) \right]$$

$$\Rightarrow \hat{\epsilon}_{MAC} \simeq \epsilon$$ regardless of $\phi$ [intuition: ex-ante vs. ex-post search].
Hours Constraints and Firm Responses

- Special case: for a fraction $\delta$ of workers, $\phi_i = 0$, for the rest $\phi_i = \infty$.

- The search process maps choices into $F(G) = \delta G^* + (1 - \delta)G$; $G^*$ is the only fixed point.

- Firms target the preferences of the fraction $\delta$.

- Then the bunching takes form

$$B_{NL} = \delta B_{NL}^* + (1 - \delta)\zeta B_{NL}^*$$

  - Individual bunching: workers who optimally choose the kink.
  - Aggregate bunching: workers who “find” the kink (of mass $\zeta$) generated by unions or firms, but cannot search anymore.

$$\hat{\epsilon} = \delta \epsilon + (1 - \delta)\zeta \epsilon < \epsilon$$
Predictions 2 and 3

- **Prediction 2**: Search costs and hours constraints interact, generating aggregate bunching $B^A_{NL}$. Moreover

\[
\frac{\partial B^A_{NL}}{\partial \zeta} > 0, \quad \frac{\partial \hat{\epsilon}}{\partial \zeta} > 0
\]

- **Prediction 3**: Aggregate bunching at the kink and Individual bunching are positively correlated across occupations $q$:

\[
\text{cov} \left( B^I_{NL,q}, B^A_{NL,q} \right) > 0
\]

Intuition: in occupations where workers are more tax-elastic, there should be both higher $B^I_{NL,q}$ and $B^A_{NL,q}$, because more workers will relocate at the kink.
Institutional Background

- Danish labor market, 1994-2001: “flexicurity” + collective bargaining;
- Wages are negotiated at occupation level by unions and employer associations;
- Performance is similar to US (job turnover, job creation, job destruction, unemployment rate);
The Data

- Primary dataset: tax register, 1994-2001;
- Panel Data on wage earnings, self-employment income, pensions, capital income, deductions;
- Records include more than 99.9% of individuals between ages 15-70;
- The data is merged with the Danish Integrated Database for Labor Market Research, including education, firm ID, occupation etc.
- Sample of wage earners (17.9 million observations);
- Most wage earners have small net deductions (60% < 7500 DKr)
Bunching at Top Kink

**Introduction**

**Model**

**Empirical Results**

**Conclusions**
Prediction 1: Size of tax change

- Several tax reforms between 1994 and 2001: \[ \Delta w(1 - \tau) \simeq \pm 10\% \]
- Difference-in-difference design:

\[
\Delta \log y_{i,t} = \alpha + \beta \Delta \log (1 - MTR_{i,t}) + \left\{ (y_{i,t-2}) \right\} + \gamma X_{i,t-2} + \epsilon_{i,t}
\]

- Estimated elasticities are very close to 0. Upper bound = 0.004.
- Bunching implies \( \hat{\epsilon} \simeq 0.01 \).
Prediction 2: Aggregate Bunching

We should observe

1. Significant aggregate bunching at the statutory top tax kink (60% of workers have small deductions)
2. Little aggregate bunching at the pension kink (applies only to 2.7% of workers)
3. More bunching for individuals with small deductions: they have more common tax preferences.
Prediction 2: Aggregate Bunching

**Wage Earnings Around Pension Kink: Deductions > 20,000**

- Excess mass ($\delta$) = 0.70
- Standard error = 0.20

**Wage Earnings Around Pension Kink: Deductions Between 7,500 and 25,000**

- Excess mass ($\delta$) = -0.01
- Standard error = 0.15

**Wage Earnings Around Statutory Kink: Deductions Between 7,500 and 25,000**

- Excess mass ($\delta$) = 0.56
- Standard error = 0.10
Prediction 3: Correlation in Bunching

- The prediction is that \( \text{cov}(b_A^q, b_I^q) > 0; \)
- \( b_A^q = \) excess mass at the **statutory** kink for workers with more than DKr 20,000 in deductions;
- \( b_I^q = \) excess mass at the **pension kink** for same group of workers;
- \( \rho(b_A^q, b_I^q) = 0.65 \) and \( \neq 0 \) at significance 0.001.
Conclusions

- Effects of tax policies on labor supply are shaped by adjustment costs and hours constraints;

- These factors **considerably attenuate** microeconometrics estimates of the elasticity of labor supply;

- The structural elasticity that matches the evidence is an order of magnitude larger than the observed elasticity at the top kink;

- Results caution in using quasi-experiments that apply to small subgroups to understand the effects of economic policies on behavior.