Labor Market Power, Tax Progressivity and Inequality

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Questions

Question 1

- How does income tax policy and market power in labor markets interact?

Question 2

- What is the effect of changes in market structure on wage, consumption inequality?

Question 3

- How do shocks to firms pass-through to consumption across the wealth / income distribution?

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Necessary features

- Rich firm heterogeneity, concentrated markets, imperfect competition (BHM, 2022)

∗ Rich household heterogeneity, consumption, savings, labor supply (e.g. HSV, 2020)

Tax progressivity in a simplified BHM economy

- Household

$$\max_{C,\{n_j\}} \quad \log\left(C - \frac{\mathcal{N}^{1+1/\varphi}}{1+1/\varphi}\right) \quad , \quad \mathcal{N} = \left[\int n_j^{\frac{\eta+1}{\eta}}\, dj\right]^{\frac{\eta}{\eta+1}}$$

subject to $$C = \sum_j \left(1-\tau_0\right)\left(w_j n_j\right)^{1-\tau_1} + \Pi$$

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- Firm

$$y_j = Z n_j \quad , \quad n_j = \left(\frac{w_j}{\mathcal{W}}\right)^{\varepsilon}\mathcal{N} \quad , \quad w_j = \frac{\varepsilon}{\varepsilon+1}Z \quad , \quad \varepsilon = \frac{(1-\tau_1)\,\eta}{1+\tau_1\eta}$$

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∗ Additional distortion of progressive taxes

$$\mu = \left(1-\tau_1\right)\frac{\eta}{\eta+1} \quad , \quad Y = \underbrace{\left[\left(1-\tau_1\right)\frac{\eta}{\eta+1}\right]^{\frac{\varphi(1-\tau_1)}{1+\varphi\tau_1}}}_{\text{Monopsony term}} \times \underbrace{\left[\left(1-\tau_0\right)\left(1-\tau_1\right)Z^{\frac{\varphi+1}{\varphi}}\right]^{\frac{\varphi}{1+\varphi\tau_1}}}_{\text{Competitive distortion, } W = Z}$$

This paper

Environment - Study a stationary general equilibrium economy in which ...

- Heterogeneous households consume, save, choose (i) firm to work at, (ii) hours to work
- Heterogeneous firms strategically set wages facing dist. of household labor supply

Tax progressivity

- More progressive taxes make labor supply *more inelastic*
- In imperfectly competitive labor markets, firms internalize these effects

Positive

- Match joint distribution of marginal propensities to *consume* and *earn*, by income

  Golosov, Graber, Mogstad, Novgorodsky (2021) - *How Americans Respond to Idiosyncratic and Exogenous Changes in Household Wealth and Unearned Income*

▸ Literature

Today

1. Theory

- Incomplete markets + Intensive margin supply + Extensive margin supply + Oligopsony
  (Bewley (1977); Macurdy (1981); Card et al (2020); BHM (2022))
- Characterize (i) Supply elasticities, (ii) Sorting, (iii) Pass-through

2. Numerical example

- Simple case - Homogeneous firms, no strategic interaction
- Result - Optimal progressivity increases inequality, but increases output

▸ Literature

Environment

Firms - Labor markets $m \in \{1, \ldots, M\}$. Firm $j \in \{1, \ldots, J_m\}$. Productivity $z_{jm} \sim \Gamma_z(z)$

$$y_{jmt} = z_{jm}\, n_{jmt}^{\alpha}$$

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Households - Continuum of workers $i \in [0, 1]$

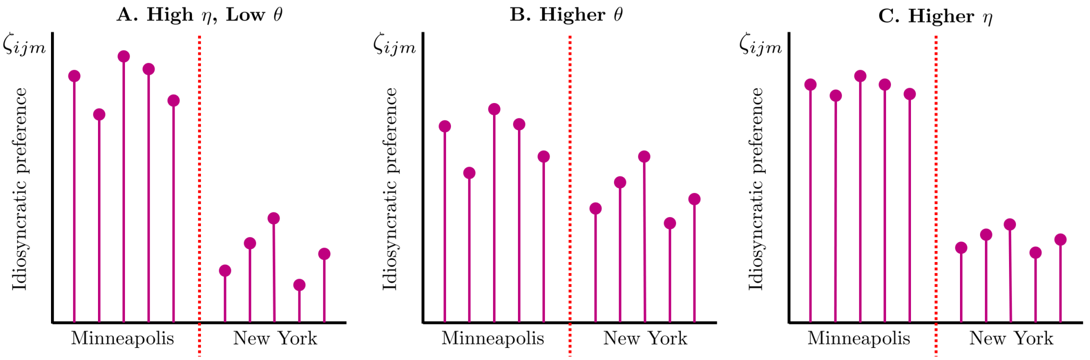
- Stochastic productivity e_i: $e_{it+1} \sim \Gamma_e(e|e_{it})$
- Each period decide market and firm to work at

$$\mathbb{E}_0\left[\sum_{t=0}^{\infty} \beta^t u_{ijmt}\right] \quad , \quad u_{ijmt} = \underbrace{\frac{c_{ijmt}^{1-\sigma}}{1-\sigma}}_{\text{Consumption}} - \underbrace{\frac{1}{\overline{\varphi}^{1/\varphi}} \frac{h_{ijmt}^{1+1/\varphi}}{1+1/\varphi} + \zeta_{ijmt}}_{\text{Labor supply}} \quad , \quad \underbrace{\zeta_{ijmt} \sim \Gamma_\zeta(\zeta)}_{\text{iid each period}}$$

- Save in government debt, interest rate r, borrowing constraint $a_{it+1} \geq \underline{a}$.

Environment - Preferences - Nested Gumbel

$$\Gamma_\zeta(\boldsymbol{\zeta}) = \prod_{m \in \mathcal{M}} \exp\left\{ - \left(\sum_{j \in m} e^{-\eta \zeta_{jm}} \right)^{\theta/\eta} \right\} \qquad \underbrace{\Gamma_\zeta(\boldsymbol{\zeta}) = \prod_{m \in \mathcal{M}} \prod_{j \in m} \exp\left\{ - e^{-\eta \zeta_{jm}} \right\}}_{\text{if } \theta = \eta}$$



Household problem

1. Choice over employers j and markets m, given wages w_{jm}

$$\widetilde{V}\left(a, e\right) := \mathbb{E}_{\zeta}\left[\max_{j,m}\left\{V\left(a, e, w_{jm}\right) + \zeta_{jm}\right\}\right]$$

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2. Consumption, savings, hours decision, given, w, r, Π

$$\begin{aligned} V\left(a,e,w\right) &= \max_{a',c,h} u\left(c,h\right)+\beta\int \widetilde{V}\left(a',e'\right)d\Gamma_e\left(e'|e\right) \\ c+a' &= \left(1-\tau_0\right)\left(whe\right)^{1-\tau_1}+\left(1+r\right)a+\Pi \\ a' &\geq \underline{a} \end{aligned}$$

▸ Monotonicity, Discounting

Household problem

1. Choice over employers j and markets m, given wages w_{jm}

$$\widetilde{V}\left(a, e\right) = \frac{1}{\theta} \log \left[\sum_m e^{\theta \overline{V}(a,e,\mathbf{w}_m)}\right]$$

$$\overline{V}\left(a, e, \mathbf{w}_m\right) = \frac{1}{\eta} \log \left[\sum_{j \in m} e^{\eta V\left(a,e,w_{jm}\right)}\right]$$

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▸ Monotonicity, Discounting

Firm problem

Problem - Takes as given $\mathbf{w}_{-jm}$ and *aggregates* and chooses wage w_{jm} to maximize profits

$$w_{jm}^* = \arg\max_{w_{jm}} \; z_j n\Big(w_{jm}, \mathbf{w}_{-jm}\Big)^{\alpha} - w_j n\Big(w_j, \mathbf{w}_{-jm}\Big)$$

Firm problem

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Supply - For a wage w_{jm}, equilibrium quantity of labor a firm receives is given by

$$n\Big(w_{jm}, \mathbf{w}_{-jm}\Big) = \int \rho\Big(a, e, w_{jm}, \mathbf{w}_{-jm}\Big) h\Big(a, e, w_{jm}\Big) e \lambda(a, e) \, d(a, e)$$

$$\rho\Big(a, e, w_{jm}, \mathbf{w}_{-jm}\Big) = \frac{e^{\eta V(a,e,w_{jm})}}{e^{\eta \overline{V}(a,e,\mathbf{w}_m)}} \times \frac{e^{\theta \overline{V}(a,e,\mathbf{w}_m)}}{e^{\theta \widetilde{V}(a,e)}}$$

$$\overline{V}\Big(a, e, \mathbf{w}_m\Big) = \frac{1}{\eta} \log\left[e^{\eta V(a,e,w_{jm})} + \sum_{k \neq j} e^{\eta V(a,e,w_{km})}\right]$$

Firm problem

Problem - Takes as given $\mathbf{w}_{-jm}$ and *aggregates* and chooses wage w_{jm} to maximize profits

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Optimality / Nash - Standard markdown condition

$$w_{jm}^* = \underbrace{\frac{\varepsilon\big(w_{jm}, \mathbf{w}^*_{-jm}\big)}{\varepsilon\big(w_{jm}, \mathbf{w}^*_{-jm}\big)+1}}_{\text{Markdown}} \underbrace{\alpha z_j n\big(w_{jm}, \mathbf{w}^*_{-jm}\big)^{\alpha-1}}_{\text{Marginal product}} \quad , \quad \varepsilon_{jm} := \left.\frac{\partial \log n\big(w_{jm}, \mathbf{w}_{-jm}\big)}{\partial \log w_{jm}}\right|_{\mathbf{w}^*_{-jm}}$$

▸ Details - Second order conditions

Key objects for Question 3 - *Welfare effects of shocks*

Holding competitor's wages fixed, the effect of a productivity shock to z_{jm} on ex-ante utility is:

$$d\widetilde{V}(a,e) = \rho\Big(a,e,w_{jm}\Big)\varepsilon_{\rho}\Big(a,e,w_{jm}\Big)\varphi\Big(w_j\Big)\, d\log z_{jm}$$

1. Sorting

$$\rho\Big(a,e,w_{jm}\Big)$$

2. Across-firm elasticity

$$\varepsilon_{\rho}\Big(a,e,w_{jm}\Big) = \frac{\partial \log \rho(a,e,w_{jm})}{\partial \log w_{jm}}$$

3. Pass-through

$$\varphi\Big(w_j\Big) = \frac{\partial \log w_{jm}}{\partial \log z_{jm}}$$

1. Elasticity of labor supply - $\varepsilon(w_j)$

Firm labor supply elasticity

$$n\left(w_j\right) = \int \rho_i(w_j)h_i(w_j)e_i\, di$$

$$\varepsilon\left(w_j\right) = \int \underbrace{\frac{\rho_i(w_j)h_i(w_j)e_i\, di}{\int \rho_k(w_j)h_k(w_j)e_k\, dk}}_{\text{Share of labor of type } (a_i,\, e_i)} \times \left[\varepsilon_i^{\rho}\left(w_j\right) + \varepsilon_i^{h}\left(w_j\right)\right] di$$

Extensive margin elasticity

$$\varepsilon_i^{\rho}\left(w_j\right) = \frac{\partial \log \rho_i(w_j)}{\partial \log w_j}$$

Intensive margin elasticity

$$\varepsilon_i^{h}\left(w_j\right) = \frac{\partial \log h_i(w_j)}{\partial \log w_j}$$

1. Elasticity of labor supply - $\varepsilon(w_j)$ - Extensive margin

$$\rho_i(w_j) = \frac{e^{\eta V_i(w_j)}}{e^{\eta \widetilde{V}_i(\mathbf{w}_m)}} \frac{e^{\theta \widetilde{V}_i(\mathbf{w}_m)}}{\sum_m e^{\theta \widetilde{V}_i(\mathbf{w}_m)}} \quad , \quad \widetilde{V}_i(\mathbf{w}_m) = \frac{1}{\eta} \log \left[\sum_{j \in m} e^{\eta V_i(w_j)} \right]$$

$$\varepsilon_i^{\rho}(w_j) = \frac{\partial \log \rho_i(w_j)}{\partial \log V_i(w_j)} \frac{\partial \log V_i(w_j)}{\partial \log w_j}$$

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$$\varepsilon_i^{\rho}(w_j) = \underbrace{\left(\eta \left(1 - \rho_{ij|m}\right) + \theta \rho_{ij|m}\right)}_{\text{Oligopsony}} \underbrace{V_{a,i}\left(w_j\right) \widetilde{y}_{ij}}_{\text{Wealth}} \underbrace{\left(1 - \tau_1\right)}_{\text{Progressive tax}}$$

1. Preferences less dispersed $\uparrow \eta$, $\uparrow \theta$, More elastic

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2. Larger firm in the market $\uparrow \rho_{ij|m}$, Less elastic (BHM, 2022)

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2. Larger firm in the market $\uparrow \rho_{ij|m}$, Less elastic (BHM, 2022)
3. Poorer households $\uparrow V_a$, Higher marginal value of a dollar, More elastic

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2. Larger firm in the market $\uparrow \rho_{ij|m}$, Less elastic (BHM, 2022)
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4. Higher earning $\uparrow \widetilde{y}_{ij}$, More at stake, More elastic

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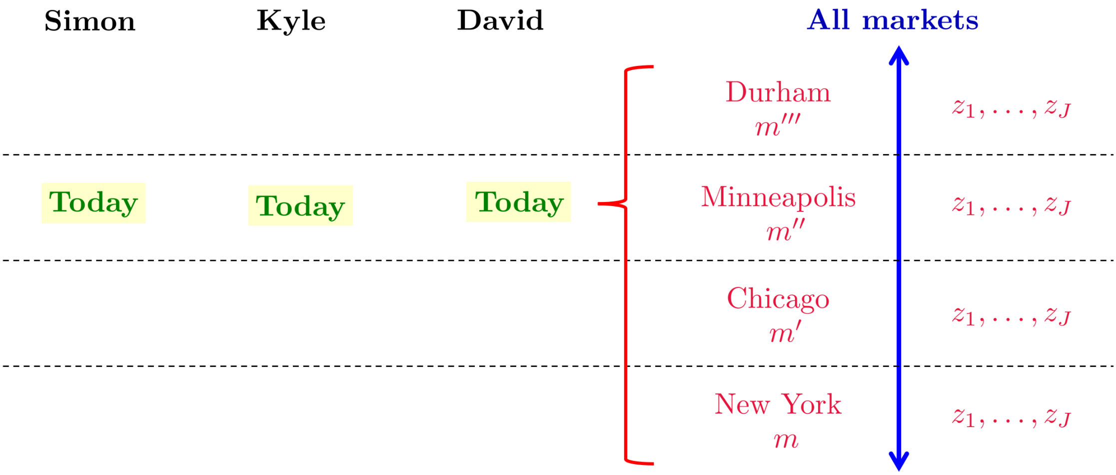
5. Higher progressivity $\uparrow \tau_1$, Competitor's higher offer is taxed away, Less elastic

1. Elasticity of labor supply - $\varepsilon(w_j)$ - Extensive margin

Simon	Kyle	David	Labor markets	
		Today	Durham m'''	$z_1, \ldots, z_J$
	Today		Minneapolis m''	$z_1, \ldots, z_J$
Today			Chicago m'	$z_1, \ldots, z_J$
			New York m	$z_1, \ldots, z_J$

1. Elasticity of labor supply - $\varepsilon(w_j)$ - Extensive margin



E.g. Berger, Herkenhoff, Mongey (2022)

1. Elasticity of labor supply - $\varepsilon(w_j)$ - Intensive margin

$$\varepsilon_i^h(w_j) = \frac{\partial \log h_i(w_j)}{\partial \log w_j}$$

$$\varepsilon_i^h(w_j) = \frac{\left(1 - \sigma \frac{\partial \log c_i}{\partial \log \widetilde{y}_i}\right)\left(1 - \tau_1\right)}{\left(1 + 1/\varphi\right) - \left(1 - \sigma \frac{\partial \log c_i}{\partial \log \widetilde{y}_i}\right)\left(1 - \tau_1\right)} \quad , \quad \frac{\partial \log c_i}{\partial \log \widetilde{y}_i} = \frac{\{dc_i / db_i\}}{\{c_i / \widetilde{y}_i\}} = \frac{mpc_i}{apc_i}$$

- Special case - Static $(mpc_i = apc_i)$, Constant tax $(\tau_1 = 0)$ $\Rightarrow$ $\varepsilon_h = \frac{1-\sigma}{1/\varphi+\sigma}$
- Progressivity - More progressivity $\uparrow \tau_1$, Additional hour taxed more, Less elastic $\downarrow \varepsilon_h$
- MPC - Get \$1, spend it, negative wealth effect. Higher if spend more. Less elastic $\downarrow \varepsilon_h$

Proposition 1 - *On both the extensive, and intensive margins, the partial equilibrium effect of higher tax progressivity is a lower labor supply elasticity*

2. Sorting - $\rho(a, e, w_j)$

Proposition 2 - *Higher productivity workers sort into higher wage firms*

- Cross-elasticity of choice probability with respect to w_j and e_i, with $\tau_1 = 0$, and $J \to \infty$

$$\frac{\partial^2 \log \rho_{ij}}{\partial \log e_i \partial \log w_j} = \varepsilon^{\rho}_{ij}\left(1+\varphi\right)\left(1 - \sigma \frac{\partial \log c_{ij}}{\partial \log e_{ij}}\right) > 0$$

- Inherits the sign of the cross-partial derivative of $V(a_i, e_i, w_j)$

$$\frac{\partial V_{ij}}{\partial \log w_j} = u'\left(c_{ij}\right) w_j e_i h_{ij}$$

- Since earnings are $\widetilde{y}_{ij} = w_j e_i h_{ij}$, then w_j and w_i are complements

3. Pass-through - $\varphi(w_j)$

Rich literature understanding *pass-through* of productivity to wages

- Why? In competitive markets, then 1:1
- Simplified: (i) No intensive margin labor supply $h_{ij} = \overline{h}$, (ii) Constant tax $(\tau_1 = 0)$

Pass-through and *Super-elasticity* of labor supply to the firm

- We would measure change in wage relative to output-per-worker E.g. KPWZ (QJE, 2018)

$$w_j = \alpha\, \mu_j\, (y_j / n_j)$$

$$\frac{\partial \log w_j}{\partial \log(y_j / n_j)} = \frac{[\varepsilon_j + 1]}{[\varepsilon_j + 1] - \mathcal{E}_j}$$

$$\mathcal{E}_j = \frac{\partial \log \varepsilon_j}{\partial \log w_j}$$

- BHM (2022) - Higher wage, Higher market share, Less elastic: $\mathcal{E}_j < 0$, $\varphi_j < 1$

3. Pass-through - $\varphi(w_j)$

Elasticity

$$\varepsilon_j = \int s_{ij}\varepsilon^{\rho}_{ij} di \quad , \quad s_{ij} = \frac{\rho_{ij} e_i}{n_j} \quad , \quad \varepsilon^{\rho}_{ij} = \Big(\rho_{ij}\theta + (1-\rho_{ij})\eta\Big) u'(c_{ij}) e_i w_j$$

Super-elasticity

$$\frac{\partial \log \varepsilon_j}{\partial \log w_j} = \underbrace{-\Big(\eta - \theta\Big) w_j \mathbb{E}_{s\varepsilon}\Big[\rho_{ij} u'\left(c_{ij}\right) e_i\Big]}_{\text{1. Market power}} \underbrace{+1 - \sigma \mathbb{E}_{s\varepsilon}\left[mpc_{ij} \times \left(\frac{w_j e_i}{c_{ij}}\right)\right]}_{\text{2. Individual elasticity}} \underbrace{+ \frac{\mathbb{V}_s[\varepsilon_{ij}]}{\mathbb{E}_s[\varepsilon_{ij}]}}_{\text{3. Composition}}$$

Proposition 3 - *Pass-through is ambiguous*

(-) Raise wage, Raise market share, Lowers elasticity

(-) Raise wage, Raise consumption, Lowers elasticity

(+) Raise wage, Workers you hire on the margin are more elastic, Raises elasticity

Consistent with recent empirical evidence on MPE's and MPC's

Golosov et al (2021) - *Americans' Response to Idiosyncratic Changes in Unearned Income*

- In the model, the *marginal propensity to earn* is $dy_i \,/\, db_i$

$$MPE_i = -\frac{\varphi\sigma}{1+\varphi\tau_1} \times \frac{MPC_i}{APC_i}$$

	All	**Income group**		
GGMN		Q1	Q2-Q3	Q4
MPE	-0.52	-0.31	-0.55	-0.67
MPC	0.58	0.73	0.54	0.50

- Given $\sigma = 1.50$ and $\tau_1 = 0.186$ (HVS, 2020), average estimates imply $\varphi = 0.45$
- Fix $r = 0.02$ and calibrate β to match estimates of MPC_i
- Declining APC_i with income, delivers higher MPE_i with income

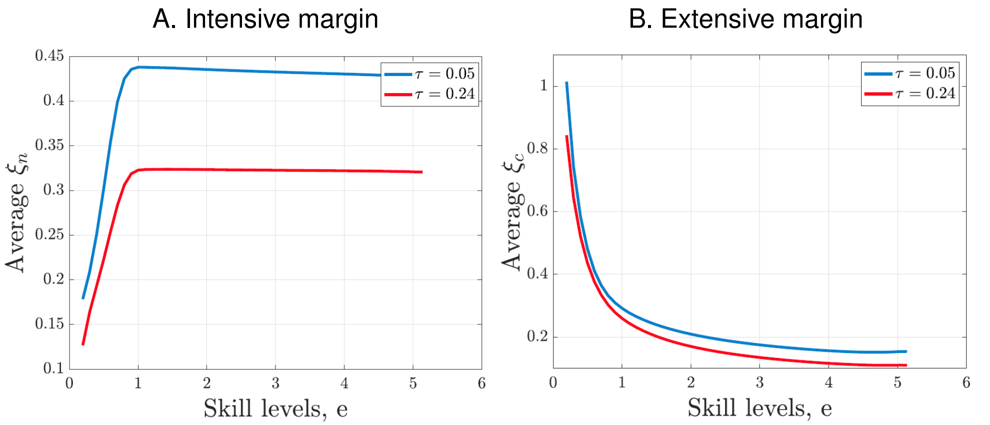
NUMERICAL EXAMPLE

Parameters

Special case - No firm heterogeneity

Parameter		Value	Source
Discount factor	β	0.96	Risk free rate 4 percent
Risk aversion	σ	2	
Frisch elasticity	φ	0.50	Chetty et al (2011)
Prod. persistence	ρ_e	0.98	Boar Midrigan (2021)
Prod. shock size	σ_e	0.20	Boar Midrigan (2021)
Borrowing limit	$\underline{a}$	0	
Tax progressivity	τ_1	0.18	Heathcote et al (2017)
Government spending to GDP	g	0.10	Boerma Karabarbounis (2021)
Preference dispersion	η	8.64	Markdown of 0.74 (BHM, 2022)
Tax level	τ_0	0.32	Delivers g

Elasticities of supply - Individuals



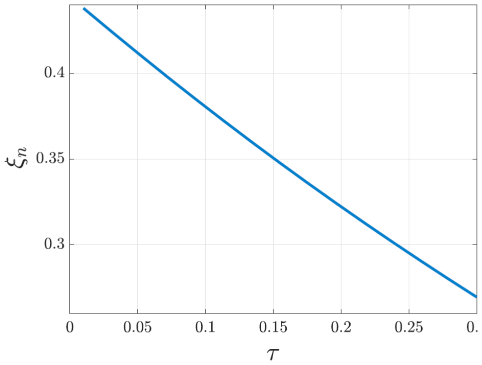
A. Poorer households, higher MPC's, less elastic on intensive margin

B. Poorer households, higher marginal value of wealth, more elastic on extensive margin

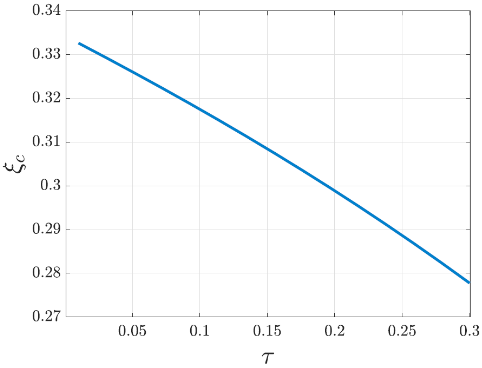
∗ *Higher progressivity lowers elasticities*

Elasticities of supply - Firm

A. Intensive margin



B. Extensive margin



∗ *Higher progressivity lowers elasticities*

Optimal progressivity

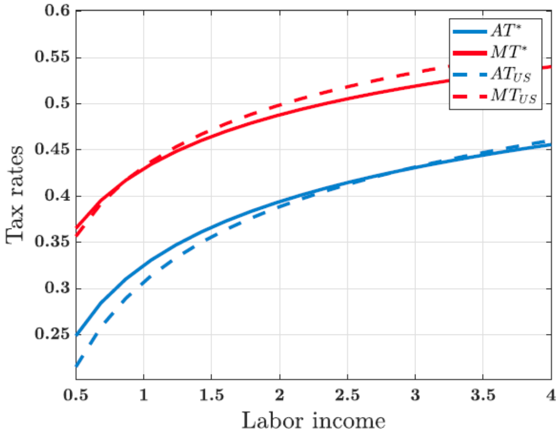
Similar exercise to Karabarbounis Boerma (2021)

- Baseline - Fix $\tau_1 = 0.18$ and $g = G/Y$ to 0.10, then determine $\tau_0 = 0.32$ and implied $\overline{G}$
- Counterfactual - For a τ_1' determine τ_0' to maintain $\overline{G}$

Parameter		**Current**	**Optimal**
Progressivity	τ_1	0.18	0.15
Level	τ_0	0.32	0.34
Markdown	μ	0.74	0.76
Output	Y	1	1.02

- Optimal progressivity is slightly lower, which narrows markdowns

Optimal progressivity - Average and marginal taxes



- Optimal taxes increase average taxes and reduce progressivity

Conclusion

- Unified theory of consumption, savings, labor supply, labor market power
- Foregrounds interaction between wealth and labor supply elasticities
- Going forward
  - Calibration to heterogeneous markets
  - Compare implications for MPE's and MPC's to recent estimates
  - Additional counterfactuals - E.g. mergers, minimum wages
- Plug - *Pricing Inequality* - with Mike Waugh

APPENDIX SLIDES