Labor Market Power, Tax Progressivity and Inequality

David Berger
Duke University, NBER

Kyle Herkenhoff
University of Minnesota, NBER

Simon Mongey
University of Chicago, Federal Reserve Bank of Minneapolis, NBER

Adam Oppenheimer
University of Minnesota

Minneapolis Fed - 2023

The views expressed herein are those of the authors and not those of the Federal Reserve System.

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?

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?

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

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

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

- Firm

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

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

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

- Firm

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

* Additional distortion of progressive taxes

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

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

- Firm

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

∗ Additional distortion of progressive taxes

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

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 (Bewley (1977)) + Intensive margin supply (Macurdy (1981)) + Extensive margin supply (Card et al (2020)) + Oligopsony (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 $z_{jm} \sim \Gamma_z(z)$

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

Environment

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

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

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

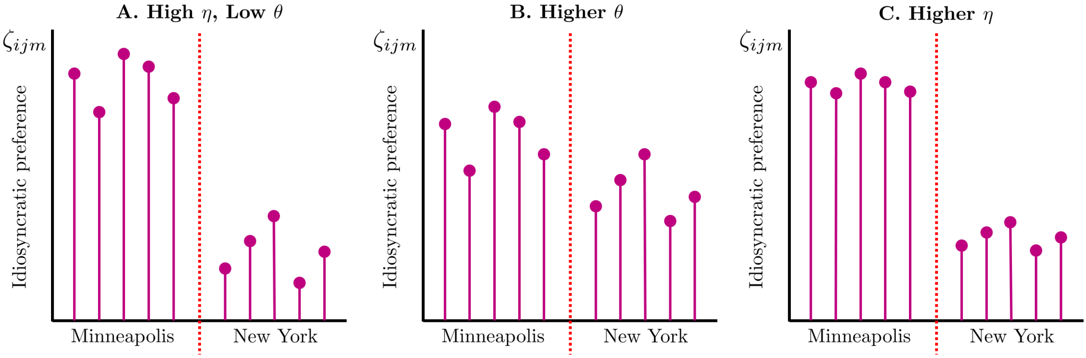
- Stochastic productivity e_i: $\quad e_{it+1} \sim \Gamma_e(e|e_{it})$
- Each period decide market and firm to work at

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

- 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}

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

Household problem

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

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

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

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

▸ Monotonicity, Discounting

Household problem

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

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

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

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

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

▸ Monotonicity, Discounting

Household problem

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

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

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

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

$$\begin{aligned} V\left(a, e, w\right) &= \max_{a',c,h} u(c, h) + \beta \int \widetilde{V}\left(a', e'\right) d\Gamma_e(e'|e) \\ c + a' &= \left(1 - \tau_0\right)\left(whe\right)^{1-\tau_1} + (1 + r)a + \Pi \quad , \quad \frac{\partial V_{ijm}}{\partial \log w_{jm}} = \Lambda_{ijm}\widetilde{y}_{ijm}\left(1 - \tau_1\right) \\ a' &\geq \underline{a} \end{aligned}$$

▸ Monotonicity, Discounting

Firm problem

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

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

Firm problem

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

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

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

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

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

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

Firm problem

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

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

Optimality / Nash - Standard markdown condition

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

▸ 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:

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

1. Sorting

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

2. Across-firm elasticity

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

3. Pass-through

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

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

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

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

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

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

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

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

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

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

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

1. Preferences less dispersed $\uparrow \eta$, $\uparrow \theta$, More elastic
2. Larger firm in the market $\uparrow \rho_{ij|m}$, Less elastic (BHM, 2022)

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

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

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

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

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

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

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

1. Preferences less dispersed $\uparrow \eta$, $\uparrow \theta$, More elastic
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
4. Higher earning $\uparrow \widetilde{y}_{ij}$, More at stake, More elastic

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

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

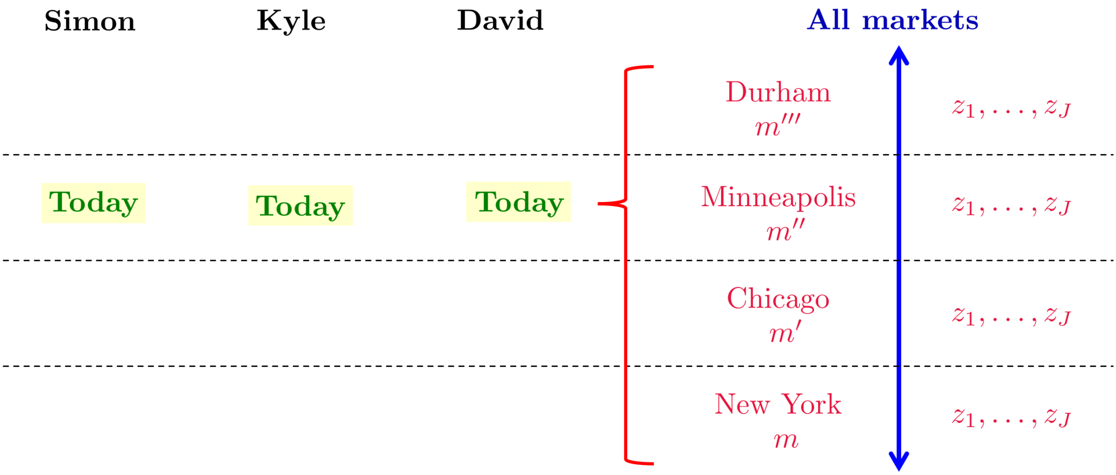
$$\varepsilon_i^{\rho}(w_j) = \underbrace{\left(\eta\left(1-\rho_{ij|m}\right)+\theta\rho_{ij|m}\right)}_{\text{Oligopsony}} \underbrace{V_{a,i}\left(w_j\right)\widetilde{y}_{ij}}_{\text{Wealth}} \underbrace{\left(1-\tau_1\right)}_{\text{Progressive tax}}$$

1. Preferences less dispersed $\uparrow \eta$, $\uparrow \theta$, More elastic
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
4. Higher earning $\uparrow \widetilde{y}_{ij}$, More at stake, More elastic
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 e_i are complements
- Can do a quantitative version of Scheuer Werning (QJE, 2018)

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

Aside - Let's go back to the BHM economy, and add DRS $y_j = z_j n_j^{\alpha}$ and z_j heterog.

- Taxes

$$C = \sum_j \left(\lambda w_j^{1-\tau}\right) n_j + \Pi$$

- Aggregation - Suppose that firms behave competitively, so $w_j = mpl_j = \alpha z_j n_j^{\alpha-1}$:

$$N = \left(\lambda \widetilde{W}^{1-\tau}\right)^{\varphi} C^{-\varphi\sigma} \quad , \quad N = \left[\sum_j n_j^{\frac{\eta+1}{\eta}}\right]^{\frac{\eta}{\eta+1}}$$

$$\widetilde{W} = \alpha Z N^{\alpha-1} \quad , \quad \widetilde{W} = \left[\sum_j \widetilde{w}_j^{(\eta+1)(1-\tau)}\right]^{\frac{1}{(\eta+1)(1-\tau)}}$$

$$Y = Z N^{\alpha}$$

$$Z = \left[\sum_j \widetilde{z}_j^{\frac{(1+\eta)(1-\tau)}{1+\eta(1-\tau)(1-\alpha)}}\right]^{\frac{1+\eta(1-\tau)(1-\alpha)}{(1+\eta)(1-\tau)}}$$

$$G = \sum_j w_j n_j - \lambda \widetilde{W}^{1-\tau} N \quad , \quad n_j = \left(\frac{w_j}{\widetilde{W}}\right)^{\eta(1-\tau)} N$$

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

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

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

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