Job creators, job creation and the tax code

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MOTIVATION

Lowering marginal tax rates on high income individuals is associated with:

1. Increasing (before-tax) income dispersion (Occupy Wall Street)
2. Job creation (Tea Party)

Objective: To understand when either or both can be true?
Requires:

1. Income dispersion (Lucas [1978] span-of-control)
2. Matching frictions (DMP)

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  - Tax evasion effect
- In favor of a "bargaining effect"
- **Bivens and Mishel [2013]:** High incomes largely come from corporate profits or capital gains

ENVIRONMENT: Time and Demography

- **Time:**
  - Continuous, Infinite horizon
- **Demography:**
  - Mass 1 of individuals indexed by $p \in \left[\underline{p}, \bar{p}\right]$
  - $p \sim H(.)$ is their (ex ante) ability as firm owner
  - The density, $h(.)$, is the population of each type
  - Infinite lives
  - Everyone has the same ability as a worker
  - Individuals decide (at no cost) to be a worker or to set up a firm

ENVIRONMENT: Preferences

- Individuals are risk neutral
- They discount the future at rate r
- Workers experience disutility of work, z

ENVIRONMENT: Production

- Employers establish a firm and can hire any number of workers
- When a worker is hired, capital is acquired from competitive market
- The ith worker hired by a firm type p associated with k_i units of capital produces $pf(k_i)$ units of the consumption good.
- $f(.)$ is increasing, concave, Inada conditions
- Depreciation rate of capital is δ
- Separation occurs at rate λ (irreconcilable tiff)
- Undepreciated capital returned to market

ENVIRONMENT: Matching

- Firms are always in the market
- Workers direct their search based on the ability of the employers
- Employers, firms and markets are indexed by $p \in P_A \subset [\underline{p}, \bar{p}]$
- $\theta(p) = h(p)/u(p)$ is ratio of firms to job seekers in market p

ENVIRONMENT: Matching (cont.)

- Workers meet firms at rate $m(\theta)$
- $m(.)$ is
  - increasing,
  - concave,
  - passes through origin,
  - $m'(0) = \infty$,
  - $\eta(\theta) \equiv \theta m'(\theta)/m(\theta) < 1$
- Firms meet workers at rate $q(\theta) = m(\theta)u/h = m(\theta)/\theta$
  - So $q'(\theta) < 0$

ENVIRONMENT: Bargaining

- Wage formation is by generalized Nash bargaining
- β is the bargaining power of the firm

ENVIRONMENT: Tax code

- Tax code is exogenous for analytical part
- Tax on capital, τ_k
- User cost, ρ, solves $\rho(1-\tau_k) = r + \delta$
- Tax on wages, τ_w
- Tax on profits, τ_f
- Revenues thrown away

ANALYSIS: Firm size

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- Given $\sum_n \gamma_n = 1$ firm's number of workers is distributed Poisson with parameter $q(\theta)/\lambda$.
- The matching rate of the firm, $q(\theta)$, is proportional to its expected size (balanced matching).

ANALYSIS: Worker Value functions

- For the unemployed

$$rV_u = m(\theta)\mathbb{E}_n\left(V_e^n - V_u\right)$$

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- For the employed

$$rV_e^n = w_n(1 - \tau_w) - z + \lambda(V_u - V_e^n).$$

ANALYSIS: Firm Value functions

- With n employees

$$rV_f^n = \sum_{i=1}^{n} y_i + q(\theta)\left(V_f^{n+1} - V_f^n\right) + n\lambda\left(V_f^{n-1} - V_f^n\right) \quad \text{for } n = 0, 1, 2..$$

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- If $\Delta_f^n = V_f^n - V_f^{n-1}$,

$$(r + q(\theta) + n\lambda)\,\Delta_f^n = q(\theta)\Delta_f^{n+1} + (n-1)\lambda\Delta_f^{n-1} + y_n$$

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- **Example:** $y_n = y$ for all n (ruling out non-fundamental paths)

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$$V_f^0 = \frac{q(\theta)y}{r(r+\lambda)}$$

$$V_f^n = \left(\frac{q(\theta) + nr}{r}\right)\left(\frac{y}{r+\lambda}\right).$$

ANALYSIS: Bargaining and Capital stock

- On meeting a worker, a type p employer with $n-1$ workers solves

$$\max_{k_n}(1-\tau_f)[pf(k_n)-w_n-\rho k_n]$$

where: $$w_n = \arg\max_{w} (\Delta_f^n)^{\beta} (V_e - V_u)^{1-\beta}$$

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- $k = k(p)$, which solves $pf'(k) = \rho$, for all n
- $w = w(p, \theta)$, for all n solves

$$\max_{w} \left(\frac{(1-\tau_f)[pf(k) - w - \rho k]}{r+\lambda} \right)^{\beta} \left(\frac{w(1-\tau_w) - z + \lambda V_u}{r+\lambda} - V_u \right)^{1-\beta}$$

ANALYSIS: Directed search

- For each $p \in P_A \subseteq [\underline{p}, \bar{p}]$, tightness, $\theta(p)$, solves

$$V_u(p,\theta) \equiv \frac{m(\theta)\left[(1-\tau_w)w(p,\theta)-z\right]}{r\left(r+\lambda+m(\theta)\right)} = \bar{V}_u.$$

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- The value to establishing a type p firm is

$$V_f^0(p) \equiv \frac{q(\theta(p))(1-\tau_f)[pf(k(p))-w(p,\theta(p))-\rho k(p)]}{r\left(r+\lambda\right)}$$

ANALYSIS: Threshold value of ability

Lemma

For any given value of $\bar{V}_u$ such that

$$(1-\tau_w)\left(\bar{p}f(\bar{k})-\rho\bar{k}\right) > z + r\bar{V}_u,$$

where $\bar{k} = k(\bar{p})$, $\theta(p)$ is unique and V_f^0 is strictly increasing in p.

So,

1. $\theta(p)$ is a well defined decreasing function of p.
2. $w(p, \theta(p))$ is a well defined increasing function of p.
3. For any given value of $\bar{V}_u$, $P_A = [\tilde{p}, \bar{p}]$.

ANALYSIS: Steady State

$e(p)$ is the population of workers employed at type p firms
$u(p)$ is the population of workers looking for employment at type p firms
$j(p) = e(p) + u(p)$ is the total population of workers associated with market p

- The total workforce is given by

$$J(\tilde{p}) = \int_{\tilde{p}}^{\bar{p}} j(p)dp.$$

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- As $\theta(p) = h(p)/u(p)$

$$j(p) = \frac{[\lambda + m(\theta(p))]\, h(p)}{\lambda\theta(p)}.$$

EQUILIBRIUM: Definition

Definition

A steady state directed search equilibrium is a threshold value of entrepreneurial ability, $\tilde{p}$, and a market tightness function $\tilde{\theta}(p)$ such that:

1. All individuals with $p < \tilde{p}$ are workers while those with $p \geq \tilde{p}$ are employers
2. Type $\tilde{p}$ individuals are indifferent between being a worker and starting a firm, $V_f^0(\tilde{p}) = \bar{V}_u$.
3. $\bar{V}_u = V_u(p, \tilde{\theta}(p))$ for all $p \geq \tilde{p}$
4. The population of workers equals the labor force: $H(\tilde{p}) = J(\tilde{p})$

EQUILIBRIUM: Characterization

- **Result 1:**

$$H(\tilde{p}) = \int_{\tilde{p}}^{\bar{p}} \left(\frac{\lambda + m(\tilde{\theta}(p))}{\lambda \tilde{\theta}(p)} \right) dH(p).$$

$\tilde{p}$ is unique.

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- **Result 3:** For any $p, p' \in [\tilde{p}, \bar{p}]$,

$$\frac{V_f^0(p')}{V_f^0(p)} = \frac{\tilde{\theta}(p)}{\tilde{\theta}(p')}$$

EFFICIENCY

- Focus on steady states and constant government spending without discounting

$$\max_{k(p),\theta(p),\tilde{p}} \int_{\tilde{p}}^{\bar{p}} (pf(p) - \delta k(p) - z) \frac{m(\theta(p))}{\lambda\theta(p)} dH(p) - G$$

$$\text{subject to } H(\tilde{p}) = \int_{\tilde{p}}^{\bar{p}} \left(\frac{\lambda + m(\tilde{\theta}(p))}{\lambda\tilde{\theta}(p)} \right) dH(p).$$

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- **Results:**

$$\tilde{\theta}_p = \frac{\eta(\tilde{\theta}_p)}{1 - \eta(\tilde{\theta}_p)}$$

If $\eta(\tilde{\theta}_p) = \beta$ and $\tau_w = \tau_f$, the market economy will choose $\tilde{\theta}$ optimally.

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  If $\eta(\tilde{\theta}_p) = \beta$ and $\tau_w = \tau_f$, the market economy will choose $\tilde{\theta}$ optimally.

- If $m(.)$ isoeslastic with $\eta = \beta$ and $G = 0$ (no taxes) market economy coincides with constrained efficient allocation

SIMULATIONS: Government Budget Constraint

$$G = \int_{\tilde{p}}^{\bar{p}} \{ [pf(k(p)) - w(p, \theta(p)) - \rho k(p)] \tau_f + \rho k(p) \tau_k + w(p, \theta(p)) \tau_w \} e(p) dp$$

SIMULATIONS: Functional Forms

- Production: $f(k) = k^{\phi}$
- Matching: $m(\theta) = \bar{m}\theta^{\eta}$
- Distribution of p is Pareto:

$$H(p) = 1 - \left(\frac{\underline{p}}{p}\right)^{\sigma}$$

So

$$\tilde{H}(p) = \frac{H(p) - H(\tilde{p})}{1 - H(\tilde{p})} = 1 - \left(\frac{\tilde{p}}{p}\right)^{\sigma}$$

SIMULATIONS: Parameters for leading example

- **Time unit:** 1 Year
- **Normalization:** $\underline{p} = 1$
- **External:** $r = 0.04$, $\lambda = 0.2$, $\eta = 0.5$, $\phi = 0.33$, $\beta = 0.96$, $\delta = 0.1$, $\tau_f = 0.15$, $(\tau_k = 0)$
- **Quantitative Targets:**
  - unemployment rate, 6%
  - share of employers in the economy at 5%
  - government spending 18.6% of GDP
  - A share of before-tax income going to top 1% of earners at 20%
- **Internal parameters:** $\bar{m} = 4.52$, $z = 0.748$, $\sigma = 7.65$, $\tau_w = 35.5\%$
- **Implied value of** $G = 0.6954$.

RESULTS: Leading example

Equal: $\tau_w = \tau_f = 28.2\%$ $(\tau_k = 0)$; Unequal: $\tau_w = 35.5\%$, $\tau_f = 15\%$

Metric	Equal tax	Lower τ_f	Unequal tax
Unemployment (%)	5.38	5.32	6.00
GDP	3.660	3.649	3.731
Welfare	1.090	(1.209)	1.140
% Employers	5.29	5.45	5.00
Before-tax income shares:			
All Employers	25.67	25.54	25.27
Top 1% of population	19.49	19.40	20.00
Top 0.1% of population	8.01	7.96	8.45
Top 0.01% of population	2.17	2.14	2.38
Before-tax incomes:			
Top 0.002% of population	1,684	1,653	1,895
Average worker wage	1.693	1.696	1.749

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Metric	Equal tax	Lower τ_f	Unequal tax	Efficient outcome
Unemployment (%)	5.38	5.32	6.00	27.57
GDP	3.660	3.649	3.731	4.404
Welfare	1.090	(1.209)	1.140	2.414
% Employers	5.29	5.45	5.00	0.71
Before-tax income shares:				
All Employers	25.67	25.54	25.27	-
Top 1% of population	19.49	19.40	20.00	-
Top 0.1% of population	8.01	7.96	8.45	-
Top 0.01% of population	2.17	2.14	2.38	-
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SIMULATIONS: Alternative (Hosios) Parameters

- **External:** $r = 0.04$, $\lambda = 0.2$, $\eta = 0.5$, $\phi = 0.33$, $\beta = 0.5$, $\delta = 0.1$, $\tau_f = 0.15$, $\tau_k = 0$
- **Quantitative Targets:**
  - unemployment rate, 6%
  - share of employers in the economy at 5%
  - government spending 18.6% of GDP
- 20% of income going to top 1% of earners now not achievable
- **Internal parameters:** $\bar{m} = 3.3$, $z = 0$, $\sigma = 69.4$, $\tau_w = 28.70\%$
- **Implied value of** $G = 0.2763$.

RESULTS: Alternative (Hosios) Parameters

Unequal: $\tau_w = 28.7\%$, $\tau_f = 15\%$, $(\tau_k = 0)$; Equal $\tau_w = \tau_f = 27.8\%$

Metric	Equal tax	Lower τ_f	Unequal tax
Unemployment (%)	6.46	6.05	6.01
GDP	1.486	1.486	1.486
Welfare	0.720	(0.728)	0.719
% Employers	4.60	4.94	4.97
Before-tax income shares:			
Employers	4.97	4.69	4.67
1% share	1.621	1.482	1.472
0.1% share	0.267	0.248	0.248
0.01% share	0.040	0.036	0.036
Before-tax incomes:			
0.002% income	7.634	7.149	7.112
Average worker wage	1.037	1.040	1.040

RESULTS: Leading example, tax on capital

Unequal: $\tau_k = 15\%$, $\tau_w = 35.39\%$, $(\tau_f = 0)$; Equal: $\tau_k = \tau_w = 28.89\%$

Metric	Equal tax	Unequal tax
Unemployment (%)	6.60	6.65
GDP	3.208	3.506
Welfare	0.791	0.992
% Entrepreneurs	4.65	4.66
Before-tax income shares:		
Entrepreneurs' share (%)	25.12	25.06
1% share (%)	20.46	20.49
0.1% share (%)	8.80	8.85
0.01% share (%)	2.27	2.28
Before-tax incomes:		
0.002% income	1,787	1,963
Average worker wage	1.514	1.658

CONCLUSIONS

In a span-of-control model with labor market frictions:

- Lowering taxes on profits decreases unemployment and decreases inequality
- Effects of budget-balancing increases in the wage tax depend on firm bargaining power:
  - With high power, tax is borne by the firms with a disproportionate effect on small ones
  - With low power, more is borne by workers incentivizing entrepreneurship
- Taxes on capital off-set distributional effects of wage taxes but have a strong impact on investment and output
- **Issue:** how to distinguish between payments to capital and excess profits.