Redistribution with Performance Pay

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Positive & normative study of taxation with performance-based earnings

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- High fraction ($\approx 50\%$) of jobs in the US feature pay-for-performance
  - piece rates, commissions, bonuses, stock options Lemieux MacLeod Parent '09
  - bankers, CEOs, but also real estate brokers, sales workers, fruit harvesters
  - **question 1:** how do taxes affect performance sensitivity of wages?

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  - **question 1:** how do taxes affect performance sensitivity of wages?
- Standard (Mirrlees) models of taxation assume exogenous wage rates
  - concern: overestimate the benefits of raising tax progressivity
  - why? crowd-out of private insurance via higher performance sensitivity
  - **question 2:** how is optimal policy altered w/ performance-pay contracts?

MAIN FINDINGS

1. Tax progressivity hardly affects sensitivity of pay to performance
   - crowd-out of within-firm insurance is present...
   - ...but almost fully offset by a new crowd-in effect due to effort change
   - consistent with empirical evidence: Rose Wolfram '02, Frydman Molloy '11

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3. Quantitative: crowd-in offsets 92% of crowd-out
   - 0.3% welfare loss from igoring welfare effect of crowd-out
   - welfare loss $> 4\times$ as high if all jobs had performance-pay

RELATED LITERATURE

- Income tax in labor markets with agency frictions

  Golosov Tsyvinski '07, Scheuer '13, Stantcheva '14, Kaplow '91, Chetty Saez '10, Ferey Haufler Perroni '22

- Taxation and regulation of bonuses

  Besley Ghatak '13, Thanassoulis '12, Benabou Tirole '16, Gietl Haufler '18, Haufler Nishimura '22

- Income tax with endogenous consumption insurance

  Cremer and Pestieau '96, Netzer Scheuer '07, Abraham Koehne Pavoni '16, Park '14, Chang Park 2017, Attanasio Rios-Rull '00, Heathcote Storesletten Violante '17, Krueger Perri '11, Raj '19

- Income tax with (endo or exo) earnings risk

  Varian '80, Eaton Rosen '80, Shourideh '14, Boadway Sato '15, Findeisen Sachs '16, Stantcheva '17, Craig '19, Kapicka Neira '19, Makris Pavan '21, Sleet Yazici '17, Doligalski '19

WORKER – FIRM RELATIONSHIP

- Agents indexed by exogenous innate ability $\theta \in \Theta \subset \mathbb{R}_+$
  - preferences $\log(c) - h(\ell)$ in cons. c, labor effort $\ell \in [0,1]$, h str. convex
  - (pre-tax) earnings z, consumption $c = R(z)$: where $R(z) = \frac{1-\tau}{1-p} z^{1-p}$
  - p is the rate of progressivity Feldstein '69, Benabou '00

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  - p is the rate of progressivity Feldstein '69, Benabou '00
- Worker who provides effort ℓ produces $\begin{cases} \theta & \text{with prob. } \ell \\ 0 & \text{with prob. } 1-\ell \end{cases}$
  - moral hazard: firm observes worker's ability and output, but not effort
  - contract: effort $\ell(\theta)$, base pay $\underline{z}(\theta)$, bonus pay $e^{\beta(\theta)} \cdot \underline{z}(\theta)$

    $\hookrightarrow$ $\beta(\theta)$ is a "bonus rate"

    $\hookrightarrow$ $\beta(\theta) > 0$: incomplete insurance against performance shocks

- Firm maximizes expected profit taking taxes & reservation value as given

$$\Pi(\theta) \quad = \quad \max_{\{\ell,\underline{z},\beta\}} \theta \cdot \ell - \left[(1-\ell)\cdot \underline{z} + \ell \cdot e^{\beta}\underline{z}\right]$$

  - incentive constraint: contract must induce the worker to provide effort ℓ

$$\ell \quad \in \quad \arg\max_{l} \quad (1-l)\,\log\left(R\left(\underline{z}\right)\right) \;+\; l\,\log\left(R\left(e^{\beta}\underline{z}\right)\right) \;-\; h\left(l\right)$$

  - participation constraint: contract must provide the reservation value

$$(1-\ell)\,\log\left(R\left(\underline{z}\right)\right) \;+\; \ell\,\log\left(R\left(e^{\beta}\underline{z}\right)\right) \;-\; h\left(\ell\right) \quad \geq \quad U\left(\theta\right)$$

- Free-entry (zero profits) on labor market θ pins down equilibrium $U(\theta)$

- **Key:** incentive constraint pins down the optimal amount of risk (bonus) to which the firm exposes the worker in order to elicit an effort level ℓ

$$\boxed{\beta(\theta) \quad = \quad \frac{h'(\ell(\theta))}{1-p}}$$

- Moral hazard intuition: higher effort requires a higher bonus

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- Compare this model of endogenous wage setting to standard Mirrlees

  - Mirrlees: effort ℓ leads to a single earnings level (full insurance) $\theta\ell$

  - in our model, average earnings $(1-\ell)\,\underline{z} + \ell\, e^{\beta}\underline{z}$ are exactly the same, $\theta\ell$

  - but the dispersion of earnings around the mean is endogenous to taxes: β

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    - higher tax progressivity reduces consumption risk, hence effort incentives
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2. indirect crowd-in via product of elasticities $\varepsilon_{\beta,\ell} \cdot \varepsilon_{\ell,1-p}$
   - higher progressivity reduces labor effort: $\varepsilon_{\ell,1-p} = \frac{d \log(\ell)}{d \log(1-p)} > 0$
   - ... but eliciting lower effort requires weaker incentives $\varepsilon_{\beta,\ell} = \frac{\partial \log(\beta)}{\partial \log(\ell)} > 0$

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  - key insight: $\varepsilon_{\beta,\ell} = \frac{\ell h''(\ell)}{h'(\ell)} = \frac{1}{e_F}$, where e_F is Frisch elasticity of effort
  - Intuition: If effort elasticity $\approx$ Frisch elasticity, then $\varepsilon_{\beta,\ell} \cdot \varepsilon_{\ell,1-p} \approx 1$
  - then crowd-in offsets the entire crowd-out:

$$\frac{d\log(\beta)}{d\log(1-p)} = \underbrace{\varepsilon_{\beta,1-p}}_{\text{crowd-out}} + \underbrace{\varepsilon_{\beta,\ell} \cdot \varepsilon_{\ell,1-p}}_{\text{crowd-in}} \approx -1 + 1 = 0$$

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  - More rigorously: we show that $\varepsilon_{\ell,1-p} > \frac{e_F}{1+e_F}$ when e_F is constant
  - thus, $\varepsilon_{\beta,\ell} \cdot \varepsilon_{\ell,1-p}$ is bounded from below by $\frac{1}{e_F} \cdot \frac{e_F}{1+e_F} = \frac{1}{1+e_F}$

$\rightarrow$ at least 67% offset when $e_F = 0.5$ (Chetty et al. 2011, Keane 2011)

$\rightarrow$ as $e_F \rightarrow 0$, at least 100% offset: crowd-in powerful even when labor effort very insensitive!

- **Conclusion:** the (pre-tax) bonus rate is insensitive to tax policy
  - consistent w/ empirical findings: Rose Wolfram '02, Frydman Molloy '11

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- Is our analysis robust to alterative forms of performance pay? Yes!
  - Piece rates, commisions
    - Holmström Milgrom 1987 w/ linear taxes, slope of contract is also $\frac{h'(\ell)}{1-\tau}$
  - Stock options, non-linear commisions
    - Edmans Gabaix 2011, continuous output shocks, CRP taxes: $\frac{h'(\ell)}{1-p}$
  - Dynamic incentives
    - Edmans Gabaix Sadzik Sannikov 2012, dynamic model, CRP: $\propto \frac{h'(\ell_t)}{1-p}$

OPTIMAL POLICY

- Taxes hardly affect earnings risk $\rightarrow$ set taxes as in the standard model?
  - Not exactly: **endogeneity of earnings risk matters for welfare**
  - Exp. utility: $U(\theta) = \ell \log(R(e^{\beta}\underline{z}(\theta))) + (1-\ell)\log(R(\underline{z}(\theta))) - h(\ell)$
  - 1st order impact of progressivity change on expected utility:

$$\frac{dU(\theta)}{dp} = \overbrace{\frac{\partial U(\theta)}{\partial p}\,|_{\beta,\ell}}^{\text{standard}} + \overbrace{\left(\frac{\partial \beta}{\partial p} \times \frac{\partial U(\theta)}{\partial \beta}\right)|_{\ell}}^{\text{crowd-out}} + \overbrace{\frac{\partial \ell}{\partial p} \times \underbrace{\frac{\partial U(\theta)}{\partial \ell}}_{=0 \text{ by envelope}}}^{\text{effort adjustment incl. crowd-in}}$$

  - Crowd-out has 1st order impact on welfare, crowd-in does not
  - Welfare affected *as if* the crowd-out was not offset by crowd-in

Optimal rate of tax progressivity (for Utilitarian planner)

$$\frac{p^*}{(1-p^*)^2} = \frac{Var(\log\theta) + \kappa_1\left(1+\varepsilon_{\beta,1-p}\right)Var\left(\log z \mid \theta\right)}{\kappa_2 \cdot \varepsilon_{\ell,1-p} + \kappa_3(1-p^*)\varepsilon_{\beta,\ell} \cdot \varepsilon_{\ell,1-p} Var\left(\log z \mid \theta\right)}$$

- Exogenous-risk model (β exog., $\varepsilon_{\beta,1-p} = \varepsilon_{\beta,\ell} = 0$):
  - numerator simplifies to $Var(\log\theta) + \kappa_1 Var\left(\log z \mid \theta\right)$
  - p^* increases in ex-ante inequality and ex-post risk
  - p^* decreases in the labor effort elasticity $\varepsilon_{\ell,1-p}$
- Performance-pay model ($\beta = \frac{h'(\ell)}{1-p}$):
  - $\varepsilon_{\beta,1-p} = -1 \Rightarrow$ crowding-out offsets gains of insuring ex-post risk
  - $\varepsilon_{\beta,\ell} > 0 \Rightarrow$ negative fiscal externality from crowding-in
  - more fiscal and welfare effects of crowd-out, but they cancel out
- Consequence: strictly lower optimum progressivity than w/ exog. risk

CALIBRATION

- Facts about performance-pay jobs (Lemieux et al. 2009, PSID)
  - 45% of private sector jobs have performance pay
  - mean earnings 58% higher than in jobs w/o perf-pay
  - variance of log earnings 42% higher than in jobs w/o perf-pay

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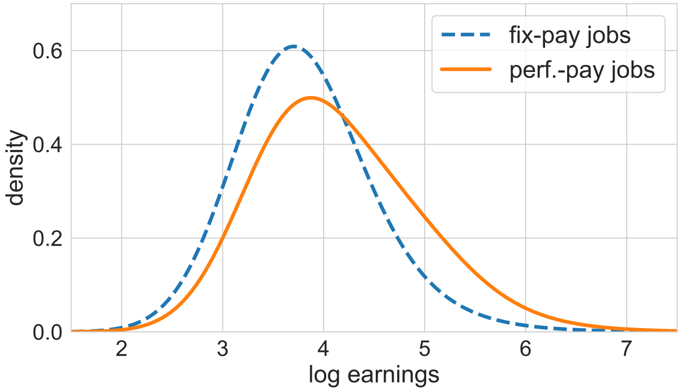
- Quantitative model
  - Workers draw ability θ and a job type (perf-pay or fix-pay)
  - Conditional on a job type, ability θ is Pareto-lognormal
    - Perf-pay jobs have higher average $\theta \rightarrow$ higher mean earnings
    - Risky bonus $\rightarrow$ higher variance of log earnings
  - Frisch elasticity $\varepsilon = 0.5$ (Keane 2011, Chetty et al. 2011)
  - Initial rate of progressivity $p = 0.181$ (Heathcote et al 2017)

Densities of log earnings



Share of performance-pay jobs by earnings (non-targeted)

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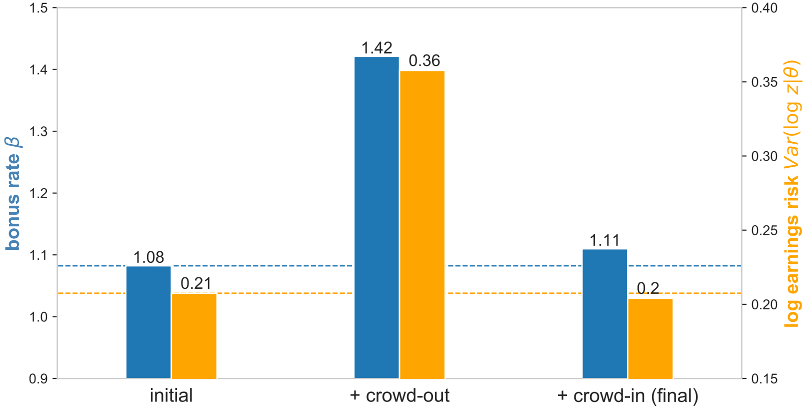
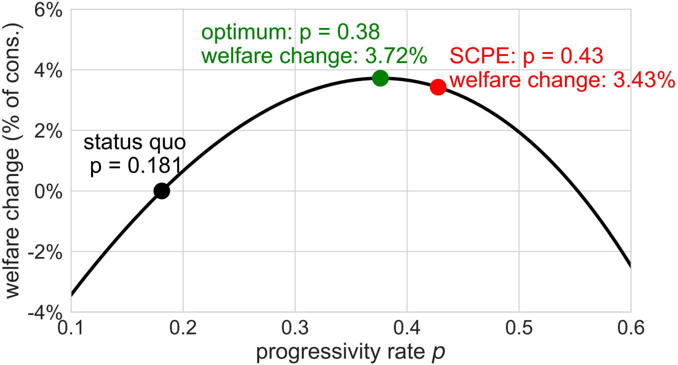
TAX INCIDENCE

- Consider a large reform: let's double the level of progressivity p



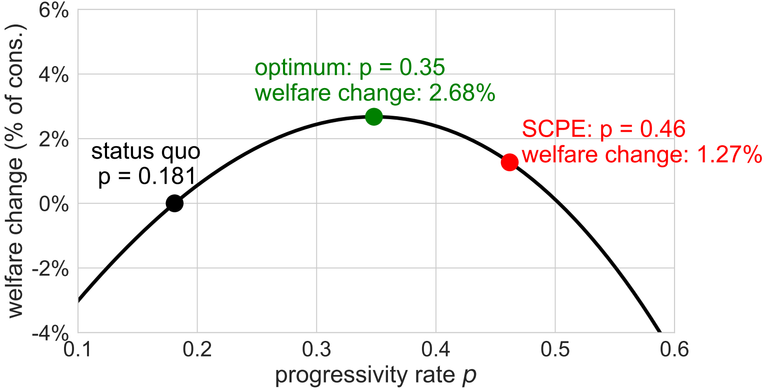
- Crowd-out increases strongly both β and $Var(\log z \mid \theta)$
- ... but is almost exactly offset by the crowd-in effect (92% for β)

OPTIMAL POLICY



- SCPE: progressivity chosen when endogenous earnings risk is ignored
- Quantitatively: 0.3% welfare loss from ignoring endogenous earnings risk when choosing progressivity

Counterfactual: all workers have performance pay



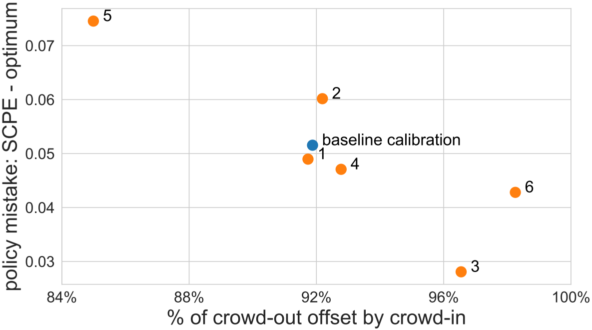
- If all workers had performance pay, welfare loss from ignoring endog. earnings risk would increase to 1.4%

CONCLUSIONS

- Labor income taxation with performance pay
  - endogenous private insurance constrained by moral hazard frictions
  - analysis of tax incidence and optimal taxation in this environment
- Main findings:
  - pay-performance sensitivity is invariant to tax progressivity
  - optimal progressivity is lower than with exogenous risk
- Several extensions left for future research
  - taxes may affect extensive margin of performance-pay job creation
  - departures from constrained efficiency and perfect competition

Additional results

ROBUSTNESS



Alternative calibrations considered: (1) higher Frisch elasticity: $\varepsilon_\ell^F = 1$, (2) lower Frisch elasticity: $\varepsilon_\ell^F = 0.1$, (3) stochastic bonuses explain 50% rather than 100% of excess variance at perf.-pay jobs, (4) ratio of mean earnings at perf.-pay and fixed-pay jobs 25% higher than in baseline, (5) ratio of variances of log-earnings at perf.-pay and fixed-pay 25% higher than in baseline, (6) probability of receiving performance pay, conditional on having a perf.-pay job, at the upper bound from Lemieux et al. (2009).

TOP TAX RATE

- The optimal top tax rate with performance pay τ^* satisfies

$$\frac{\tau^*}{1-\tau^*} = \frac{1-\delta_g \cdot g^*}{\delta_\rho \cdot \rho^* \cdot e^*}$$

  - g is the marginal social welfare weight at earnings z^*
  - ρ is the Pareto coefficient of earnings at z^*
  - e is the average elasticity of expected earnings of agents who receive pay above z^* with a positive probability
  - and * indicates a limit as $z^* \to \infty$.

- New: upward adjustments of welfare weights and Pareto coefficient
  - $\delta_g > 1$: negative welfare effect of crowd-out on top earners
  - $\delta_\rho > 1$: earnings respond also below z^*

- Optimal top tax rate is lower than in benchmark models
  - Exogenous-risk model: $\delta_g = 1, \delta_\rho > 1$
  - Full-insurance (standard Mirrlees) model: $\delta_g = 1, \delta_\rho = 1$

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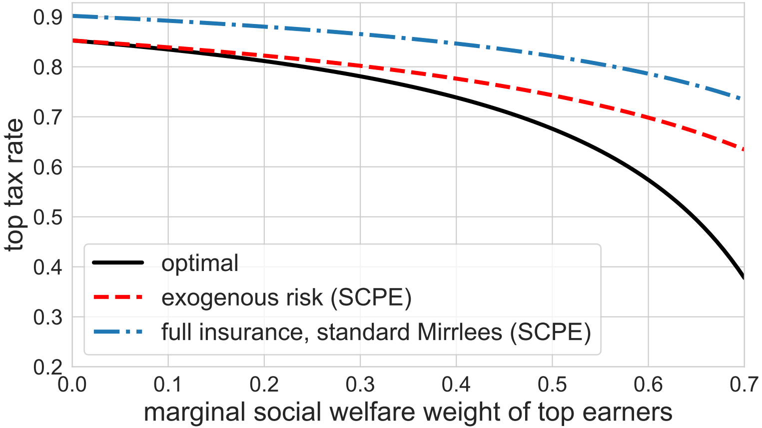

- Optimal top rates much lower than under exogeneous risk only when welfare weight at the top relatively large