Discussion of Liu, Wang, and Xu (2017) "Interest Rate Liberalization and Capital Misallocation"

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Summary: liberalization and misallocation

- Interest wedge prevents efficient allocation of capital
  - standard models: liberalization (wedge $\searrow$) improves efficiency
  - this paper: SOEs receive subsidies $\Longrightarrow$ liberalization could be harmful
  - important insight, nice paper!
- This discussion:
  - graphical representation of the theory
  - some extensions

A simplified model

- Measure one of capital
- Measure one of firms indexed by productivity $z \sim F(z)$

  Credit market: an assignment rule from capital to firm, $k(z)$

$$\text{(Aggregate output)} \qquad Y = \mathbb{E}^f [z \cdot k(z)] = \int z \cdot k(z)\, dF(z)$$

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- Equivalent representation: endogenous productivity distribution $dG(z)$

$$dG(z) \equiv k(z)\, dF(z)$$

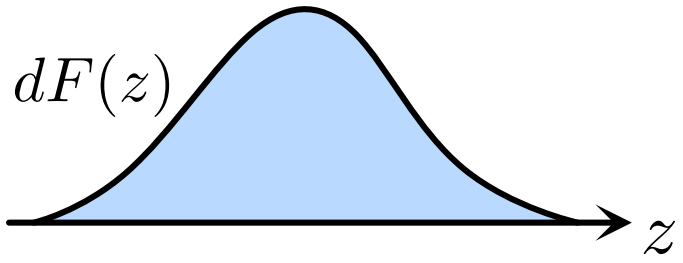
$$Y = \mathbb{E}^g [z] = \int z\, dG(z)$$

Assignment under first-best, autarky, and second-best

- Autarky: one unit of capital per firm

$$k(z) = 1 \quad \text{for all } z$$

$$Y = \int z \, dF(z)$$



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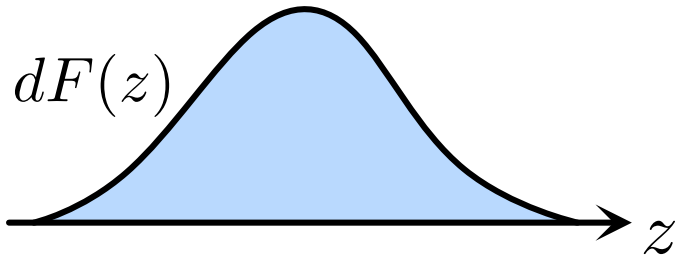

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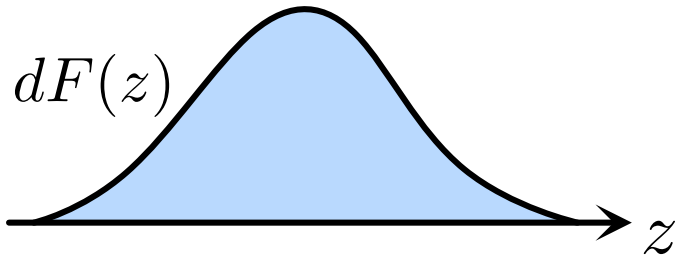

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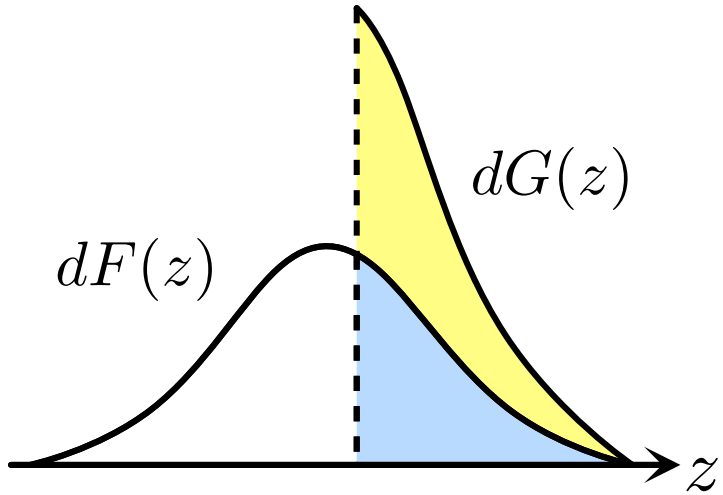
- Model has leverage constraints: restricts $k(z) \in \{0, 1, 1+\lambda\}$
  - second-best allocations:

$$k(z) = \begin{cases} 1+\lambda & \text{for } z \geq \bar{z} \\ 0 & \text{otherwise} \end{cases}$$

$$Y = \mathbb{E}^G[z]$$

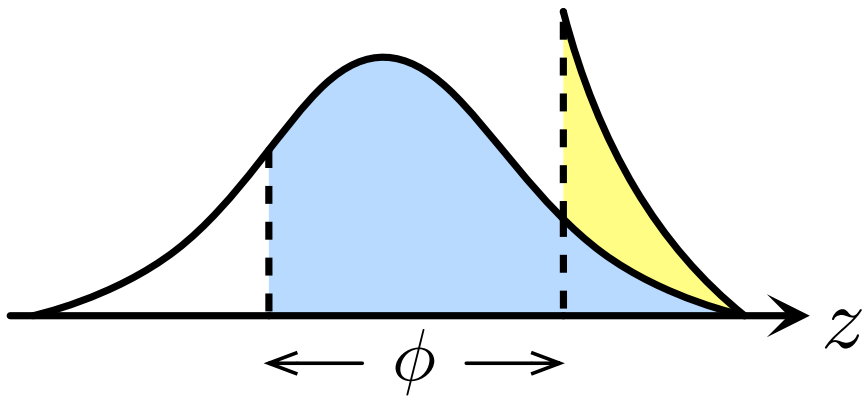


- Now: add other market imperfections, study $G(z)$

Additional Friction #1: interest wedge

- Interest wedge ϕ: lending rate $<$ borrowing rate ($r < r + \phi$)
- Capital assignment follows cut-off rule

$$k(z) = \begin{cases} 0 & \text{if } z \leq r, \\ 1 & \text{if } r < z \leq r + \phi, \\ 1 + \lambda & \text{if } r + \phi < z. \end{cases}$$



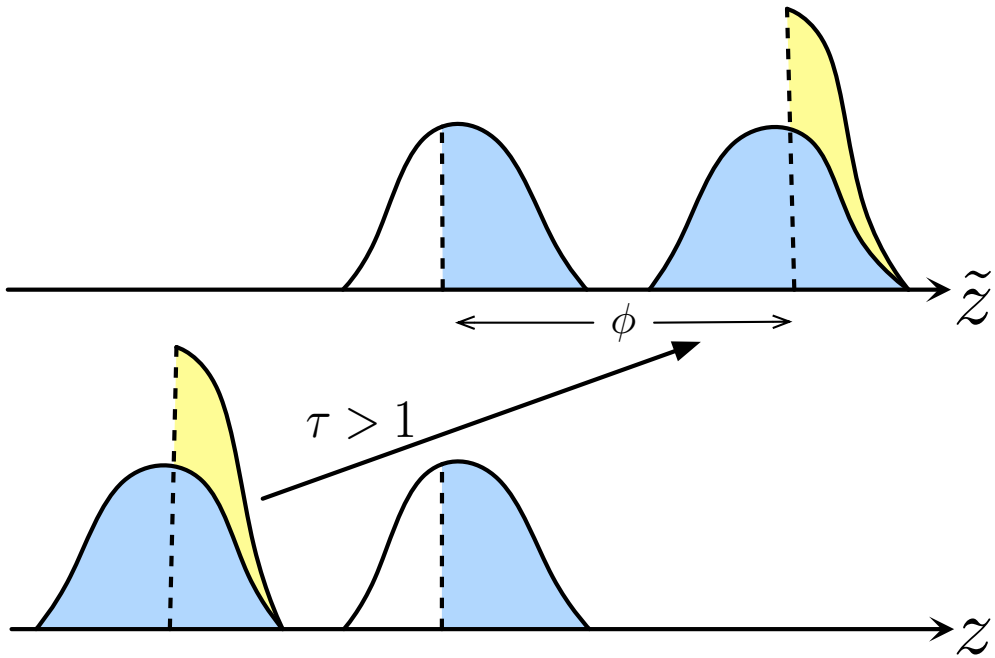
- $dG(z)$: upper-envelope of colored regions
- Credit market reallocates capital from white to yellow
- Reduction in ϕ: better assignment, output increases

Additional friction #2: output subsidies

- Firms participate in credit market with "incorrectly perceived" productivity

$$\tilde{z} \equiv \begin{cases} \tau z & \text{if SOE} \\ z & \text{if POE} \end{cases}$$

  - $\tilde{z} \sim \tilde{F}$: "**credit productivity**"



- Punchline: reduction in ϕ could lead to lower output
- A possibility result: generically ambiguous

Extension under log-normal

- A generalization: all firms get random subsidy τ

- Suppose (z, τ) are jointly distributed as log-normal (so is $\tilde{z} \equiv \tau z$):

$$\begin{bmatrix} z \\ \tau \end{bmatrix} \sim \log N \left(\begin{bmatrix} \mu \\ 0 \end{bmatrix}, \begin{bmatrix} \sigma_z^2 & \sigma_{\tau z} \\ \sigma_{\tau z} & \sigma_\tau^2 \end{bmatrix} \right)$$

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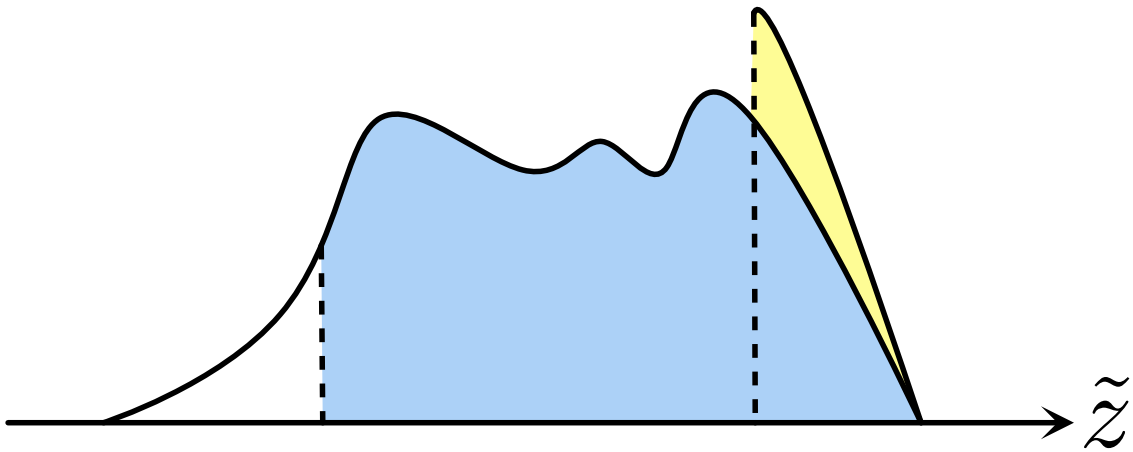
Proposition. Reduction in interest wedge lowers welfare ($\frac{dY}{d\phi} > 0$) if and only if

$$Cov(z, \tilde{z}) < 0 \qquad \text{(i.e. } \sigma_{\tau z} < -\sigma_z^2\text{)}.$$

- In other words, perverse effect only if high $\tilde{z}$ signals for low z

Non-parametric generalization: two sufficient statistics

- Under arbitrary joint distribution over z, τ, and leverage constraints



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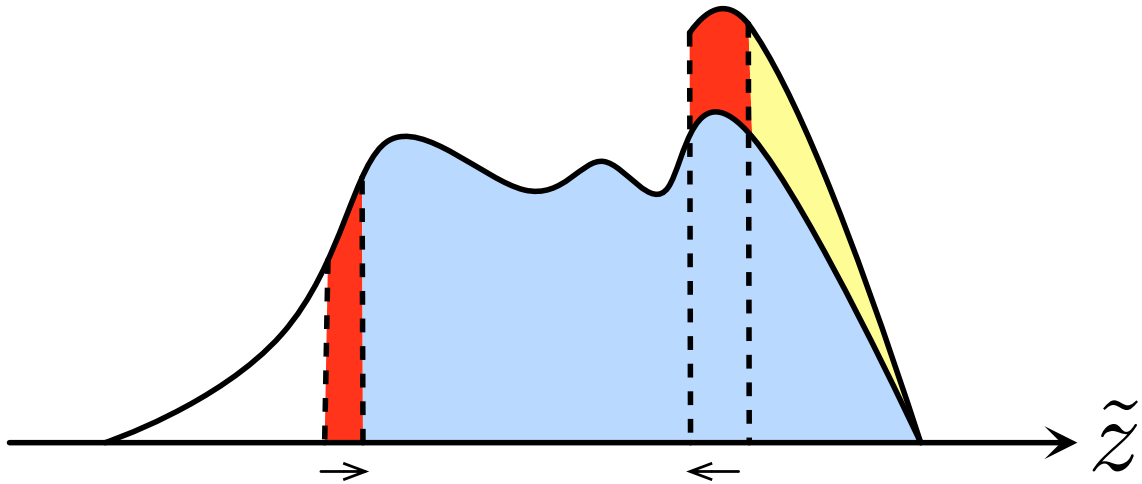

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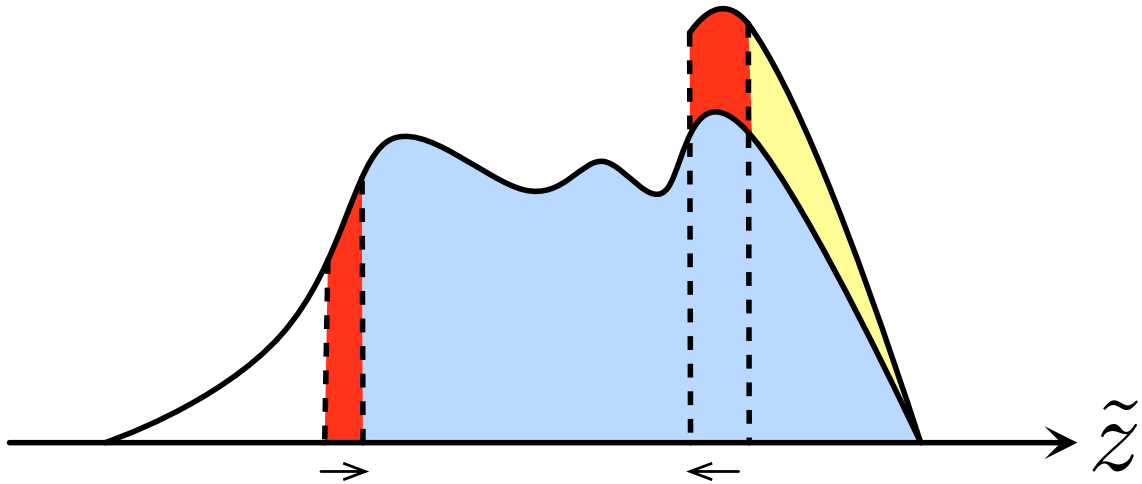

Theorem. Reduction in interest wedge lowers welfare ($\frac{dY}{d\phi} \geq 0$) if and only if

$$\underbrace{\mathbb{E}^{F|\tilde{F}}\left[z|\tilde{z}=r\right]}_{\text{average productivity of marginal lenders}} \geq \underbrace{\mathbb{E}^{F|\tilde{F}}\left[z|\tilde{z}=r+\phi\right]}_{\text{average productivity of marginal borrowers}}$$

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- Over-time variation in ϕ and diff-in-diff:

$$D_{it} \equiv \mathbf{1}\left(z_{it}^{Autarky,1\%} \geq z_{it}^{Borrower,1\%}\right)$$

$$\Delta Y_{it} = \beta_1 D_{it} + \beta_2 \cdot \Delta\phi_{it} + \beta_3 \cdot D_{it} \cdot \Delta\phi_{it} + \alpha_t + \delta_i + \epsilon_{it}$$

model predicts $\beta_2 < 0$ (standard channel), $\beta_2 + \beta_3 > 0$ (perverse effect)