Productivity and Credibility in Industry Equilibrium

Michael Powell
Kellogg M&S
CEPR IMO Workshop
September 27th 2013

Organization in Equilibrium

- Organization of firms is affected by competitive environment
- Competitive environment determined by firms
- Equilibrium approach: efficiency of market equilibrium, role of institutions and environment on productivity distribution

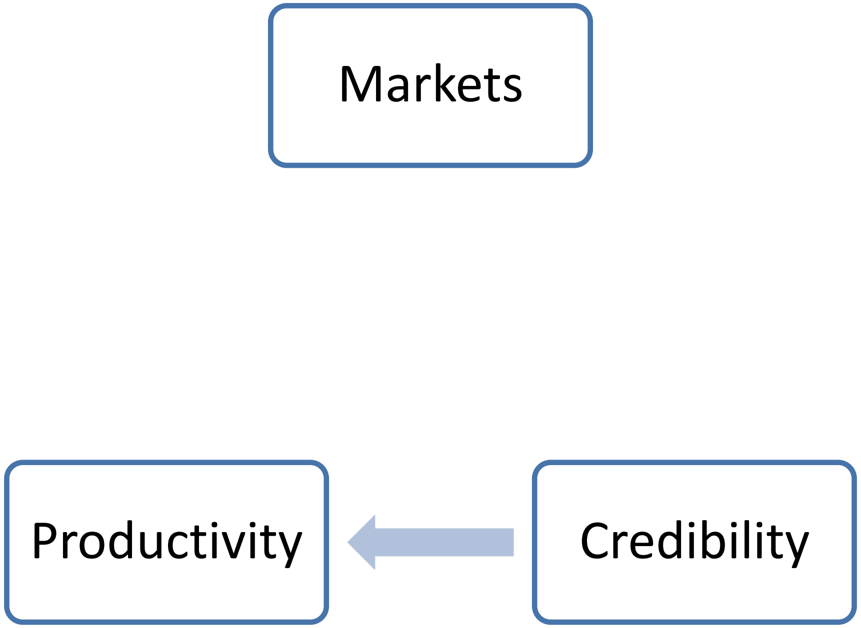
Credibility is Important in Production

- For a large firm to operate efficiently, it must decentralize

Credibility is Important in Production

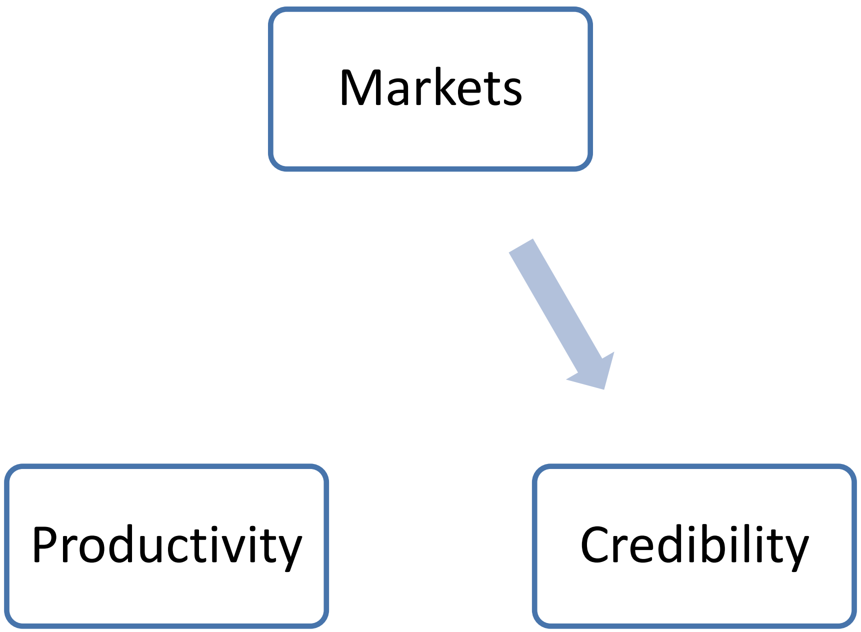
- For a large firm to operate efficiently, it must decentralize
- Decentralization requires trust

Credibility is Important in Production



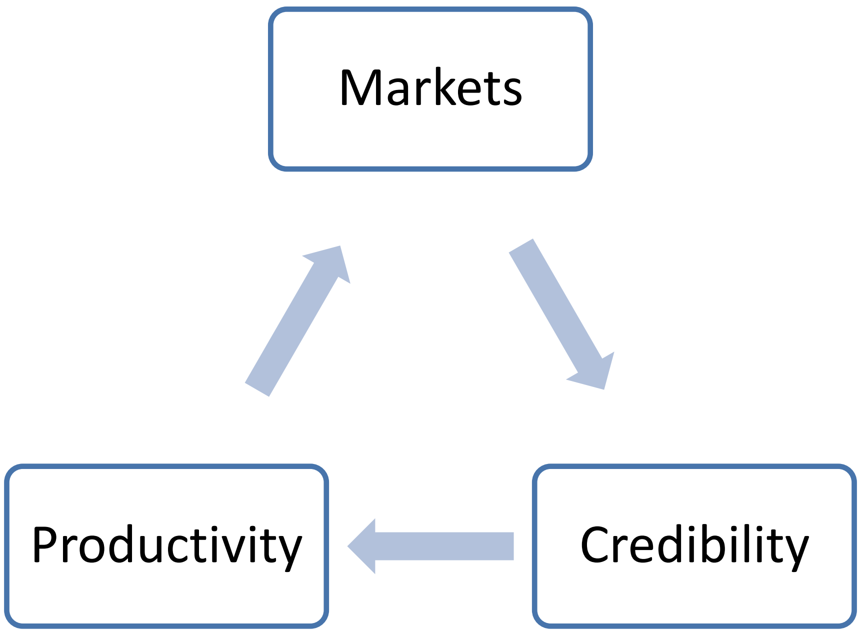
- For a large firm to operate efficiently, it must decentralize
- Decentralization requires trust
- Trust = credibility in a repeated game

Future Profits as Collateral



- Failure to uphold promises may jeopardize firm’s labor-market reputation
- Future of the firm is at stake in its promises
- Future profits serve as collateral

Industry Equilibrium

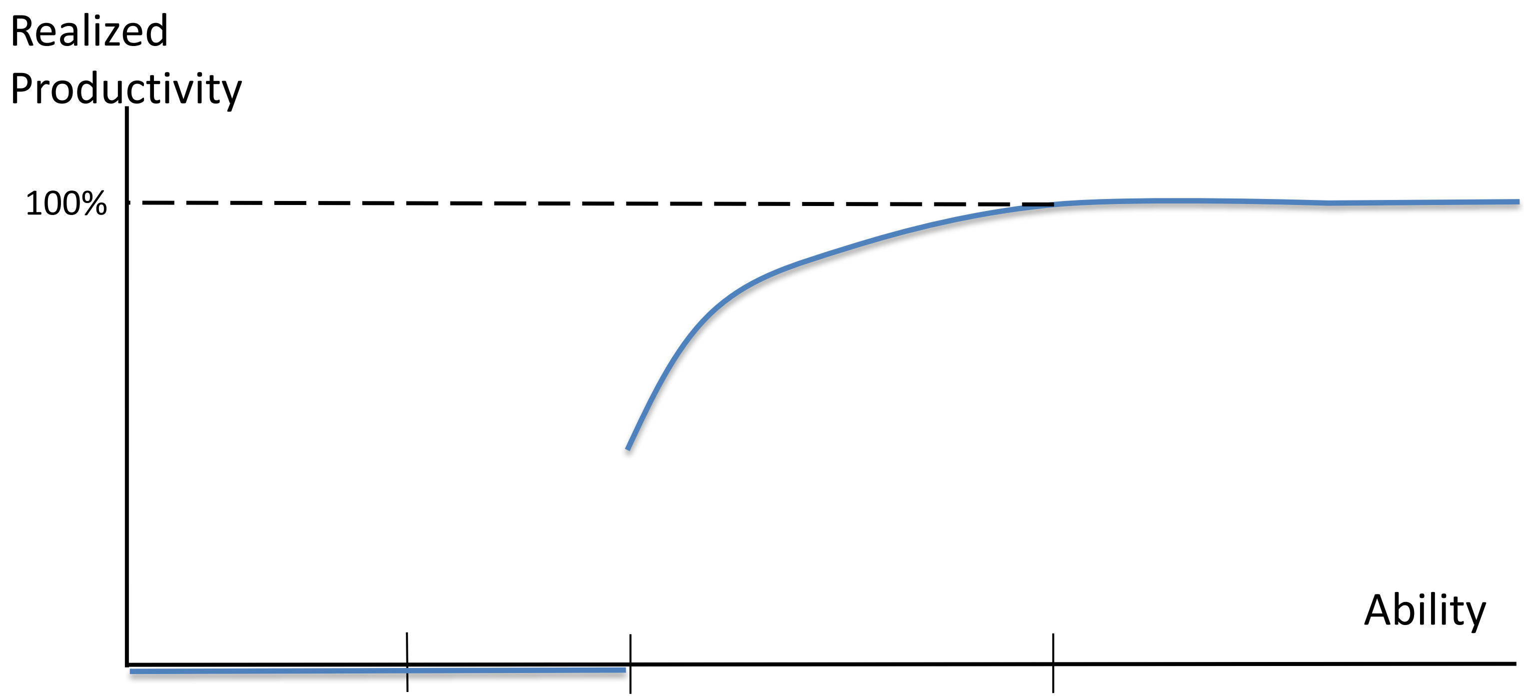


- Future profits are endogenous
- Profits, credibility, decentralization, and hence productivity jointly determined in equilibrium

Firm-level Heterogeneity

- "… virtually without exception, enormous and persistent measured productivity differences across producers, even within narrowly defined industries." (Syverson `11)
- Firm fixed effect: scarce, inalienable resource
  - Owner's ability, quality of founding idea, position

Stronger Firms Realize their Potential



THE MORNING STAR COMPANY
MANAGEMENT INNOVATOR OF THE YEAR

LINCOLN ELECTRIC
THE WELDING EXPERTS®

Future Profits are Today's Inputs

1. **Normative**: are profits allocated efficiently?
   - Profit are inefficiently concentrated at the top: pecuniary externality that is not internalized
   - Declining firm-level wealth effects with efficiency consequences

Productivity is Endogenous

2. **Positive**: how do firms of different profitability respond to environment?
   A. Changes in aggregate demand?
   – Lower-ability firms' productivities are more sensitive to demand-driven business cycles
   B. Differences in institutional environments?
   – Improved formal contracts reduce importance of credibility, primarily benefiting low-ability firms

Roadmap

- Model setup
  - Individual firm’s problem
  - Industry equilibrium
- “Policies”
  - Explore efficiency of industry equilibrium
- Empirical Implications
  - Within-firm responses to aggregate fluctuations
  - Cross-country differences in prod. distributions

THE MODEL

The Model

- Continuum of firms of mass 1, indexed by $i \epsilon [0,1]$, each consisting of risk-neutral owner
  - Heterogeneous ability φ ~ Φ (φ)
  - Common discount factor $\frac{1}{1+r}$
- Large mass of risk-neutral managers with outside opportunity W > 0
  - Competition among managers ensures they receive W
  - Common discount factor $\frac{1}{1+r}$
- Owner-manager problem produces homogeneous output that is sold into perfectly competitive market at price p_t
- Stationary quasilinear preferences. Demand $D_t(\cdot) = D(\cdot)$

Timing

- Each periods t = 1,2,3,… has several stages

1. Owner *i* has can pay fixed cost F or exit
2. Owner *i* rents capital K_{it} (at rental rate R) and hires mass of managers M_{it}
3. Owner *i* offers each manager *m* a triple $(s_{itm}, b_{itm}, \delta_{itm})$
   - s_{itm} - contractible (non-contingent) payment
   - δ_{itm} - resources allocated to manager
   - b_{itm} - promised bonus iff manager *m* utilizes δ_{itm}

Timing

4. Manager *m* accepts/rejects in favor of *W*
5. If manager *m* accepted, he chooses resources $\hat{\delta}_{itm} \leq \delta_{itm}$ to utilize and keeps remainder
6. Owner *i* observes $\hat{\delta}_{itm}$ and decides whether or not to pay *m* a bonus of b_{itm}
7. Output for firm *i* is realized and sold for p_t

Production

- Production function for firm *i*:

$$y_i\left(\hat{\delta}_{it}, K_{it}, M_{it}\right) = \varphi_i K_{it}^{\alpha} \left(\int_0^{M_{it}} \left(\hat{\delta}_{itm}\right)^{\frac{\theta}{1-\alpha-\theta}} dm \right)^{1-\alpha-\theta}$$

with $\theta < 1 - \alpha - \theta$

- Profit if pay all bonuses

$$\pi_{it} = p_t y_i\left(\hat{\delta}_{it}, K_{it}, M_{it}\right) - RK_{it} - \int_0^{M_{it}} \delta_{itm} dm - \int_0^{M_{it}} (s_{itm} + b_{itm}) dm - F$$

Perfect Public Monitoring

- **Assumption 1:** Future potential managers commonly observes allocated resources, utilization choices, and bonus payments
  - Future competitive rents can be used as collateral
- **Assumption 2:** Managers outside options independent of employment history; capital is not firm-specific
  - No quasi-rents from market frictions

Dynamic Enforcement

- When can firm ensure that $\{\delta_{itm}\}$ will be utilized in equilibrium?
  - Dynamic Enforcement (DE) constraint
- Trigger strategy equilibrium:
  - “Cooperate”: δ_{itm} resources transferred, full utilization, promised bonus paid
  - “Punish”: owner doesn’t pay F, all managers choose $\hat{\delta}_{itm} = 0$, bonuses never paid

Dynamic Enforcement

- If manager m believes owner will pay b_{itm} if $\hat{\delta}_{itm} = \delta_{itm}$, then m will choose δ_{itm} iff

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq \delta_{itm}$$

  - $U_{i,t+1,m}$ = *m*'s continuation value if not renege
  - $\widetilde{U}_{i,t+1,m}$ = *m*'s continuation value if renege

Dynamic Enforcement

- Manager m's constraint:

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq \delta_{itm}$$

Dynamic Enforcement

- Manager m's constraint:

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq \delta_{itm}$$

- After δ_{itm} has been chosen, *i* pays b_{itm} iff

$$\frac{1}{1+r}\left(\Pi_{i,t+1,m} - \tilde{\Pi}_{i,t+1,m}\right) \geq b_{itm}$$

  – $\Pi_{i,t+1,m}$= *i*'s cont. value if not renege on *m*

  – $\tilde{\Pi}_{i,t+1,m}$= *i*'s cont. value if renege on *m*

Dynamic Enforcement

- Manager m's constraint:

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq \delta_{itm}$$

- Owner's constraint:

$$\frac{1}{1+r}\left(\Pi_{i,t+1,m} - \tilde{\Pi}_{i,t+1,m}\right) \geq b_{itm}$$

Can Pool within Dyad

- Manager m's constraint:

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq \delta_{itm}$$

- Owner's constraint:

$$\frac{1}{1+r}\left(\Pi_{i,t+1,m} - \tilde{\Pi}_{i,t+1,m}\right) \geq b_{itm}$$

- Pool (DE) across *m* and *i* ($S = U + \Pi$)

$$\frac{1}{1+r}\left(S_{i,t+1,m} - \tilde{S}_{i,t+1,m}\right) \geq \delta_{itm}$$

Can Pool Across Dyads

$$\frac{1}{1+r}\left(S_{i,t+1}-\tilde{S}_{i,t+1}\right) \geq \int_0^{M_{it}} \delta_{itm}\, dm$$

Future Surplus Depends on Future Prices

$$\sum_{\tau=t+1}^{\infty}\left(\frac{1}{1+r}\right)^{\tau-t-1}\left[\begin{array}{c} p_\tau \varphi_i K_{i\tau}\left(\int_0^{M_{i\tau}}(\delta_{i\tau m})^{\frac{\theta}{1-\alpha-\theta}}dm\right)^{1-\alpha-\theta} \\ -RK_{i\tau}-WM_{i\tau}-\int_0^{M_{i\tau}}\delta_{i\tau m}dm-F \end{array}\right]$$

Rational Expectations Equilibrium

Definition: An **REE** is a sequence of prices $\{p_t\}_t$, capital and management $\{K_{it}, M_{it}\}_{it}$, offers $\{s_{itm}, b_{itm}, \delta_{itm}\}_{itm}$, and utilization choices $\left\{\hat{\delta}_{itm}\right\}_{itm}$ such that at each time *t*

1. Given promised bonus b_{itm}, manager *m* for firm *i* optimally chooses utilization level $\hat{\delta}_{itm} = \delta_{itm}$
2. Given price sequence $\{p_t\}_t$, owner *i* optimally makes offers $\{s_{itm}, b_{itm}, \delta_{itm}\}_{tm}$ and chooses capital and management levels $\{K_{it}, M_{it}\}_t$
3. Output, capital, and labor markets for all *t*

Stationary REE; Existence and Uniqueness

Definition: A **stationary REE** is a REE with constant prices, stationary relational contracts, and constant capital, labor, and utilization

Theorem: Suppose D is smooth, decreasing, and satisfies $\lim_{p \to 0} D(p) = \infty$ and $\lim_{p \to \infty} D(p) = 0$, and suppose Φ is absolutely continuous. There exists a unique stationary REE

Existence and Uniqueness

Sketch of Proof:

- Spse within each firm, there is a common conjecture $p_t = p$ for all t
- Fix an owner *i* and assume all other use a stationary relational contract $\left(s_{jtm}, b_{jtm}, \delta_{jtm}\right) = \left(s_{jm}, b_{jm}, \delta_{jm}\right)$ and choose constant capital and management levels $\left(K_{jt}, M_{jt}\right) = \left(K_j, M_j\right)$
- Suppose *i* chooses $(K_{it}, M_{it}) = (K_i, M_i)$ for all t
- Stationary environment ⇒ *i* can replicate any optimal relational contract with a stationary relational contract
- For all *i* $(s_{itm}, b_{itm}, \delta_{itm}) = (s_{im}, b_{im}, \delta_{im})and(K_{it}, M_{it}) = (K_i, M_i)$
- Hence constant aggregate supply $S(p)$
- $S(p)$ is increasing in p and smooth, since Φ is absolutely continuous
- Since aggregate demand has infinite choke price, is decreasing and smooth, there exists a unique price p

Non-Stationary Equilibria?

- Multiplicity? (i.e., is this unique stationary REE the unique REE?)
  - Within firms, could potentially have suboptimal relational contracts (folk theorem)
  - Even conditional on optimal relational contracts, could have non-stationary REE
- Alternating two-price equilibrium

Optimal Relational Contracts

- Suppose constant prices p
- Manager symmetry and diminishing returns implies $\delta_{im} = \delta_i$ for all m
- At steady state, per-period profits are
$$\pi_i = p\varphi_i\delta_i^{\theta}K_i^{\alpha}M_i^{1-\alpha-\theta} - RK_i - (W + \delta_i)M_i - F$$
- Optimal relational contract chooses δ_i, K_i, and M_i to maximize π_i subject to (DE) constraint
$$\frac{\pi_i}{r} \geq M_i\delta_i$$

Unconstrained Problem

$$\max_{\delta_i, M_i, K_i} p\varphi_i \delta_i^{\theta} K_i^{\alpha} M_i^{1-\alpha-\theta} - RK_i - (W + \delta_i)M_i - F$$

Unconstrained Solution

Proposition: If $\varphi > \varphi_S$, optimal solution satisfies

$$\delta^{FB} = \frac{W}{1 - \alpha - 2\theta}\theta$$

$$M^{FB}(\varphi_i, p),\, K^{FB}(\varphi_i, p) \propto H(\varphi_i, p)$$

TFP is $A_i^{FB}(\varphi_i, p) = \frac{y}{K^{\alpha} M^{1-\alpha-\theta}} = \varphi_i (\delta^{FB})^{\theta}$

Constrained Problem

$$\max_{\delta_i, M_i, K_i} p\varphi_i \delta_i^{\theta} K_i^{\alpha} M_i^{1-\alpha-\theta} - RK_i - (W + \delta_i)M_i - F$$

subject to

$$p\varphi_i \delta_i^{\theta} K_i^{\alpha} M_i^{1-\alpha-\theta} - RK_i - (W + \delta_i)M_i - F \geq rM_i\delta_i$$

Solution is Proportional to Unconstrained

Proposition: The optimal solution satisfies

$$\frac{\delta^*(\varphi_i, p)}{\delta^{FB}} = \frac{K^*(\varphi_i, p)}{K^{FB}(\varphi_i, p)} = \frac{M^*(\varphi_i, p)}{M^{FB}(\varphi_i, p)} = \mu^*(\varphi_i, p)$$

TFP is $A_i^*(\varphi_i, p) = \mu^*(\varphi_i, p)^\theta A_i^{FB}(\varphi_i, p)$

Solution is Proportional to Unconstrained

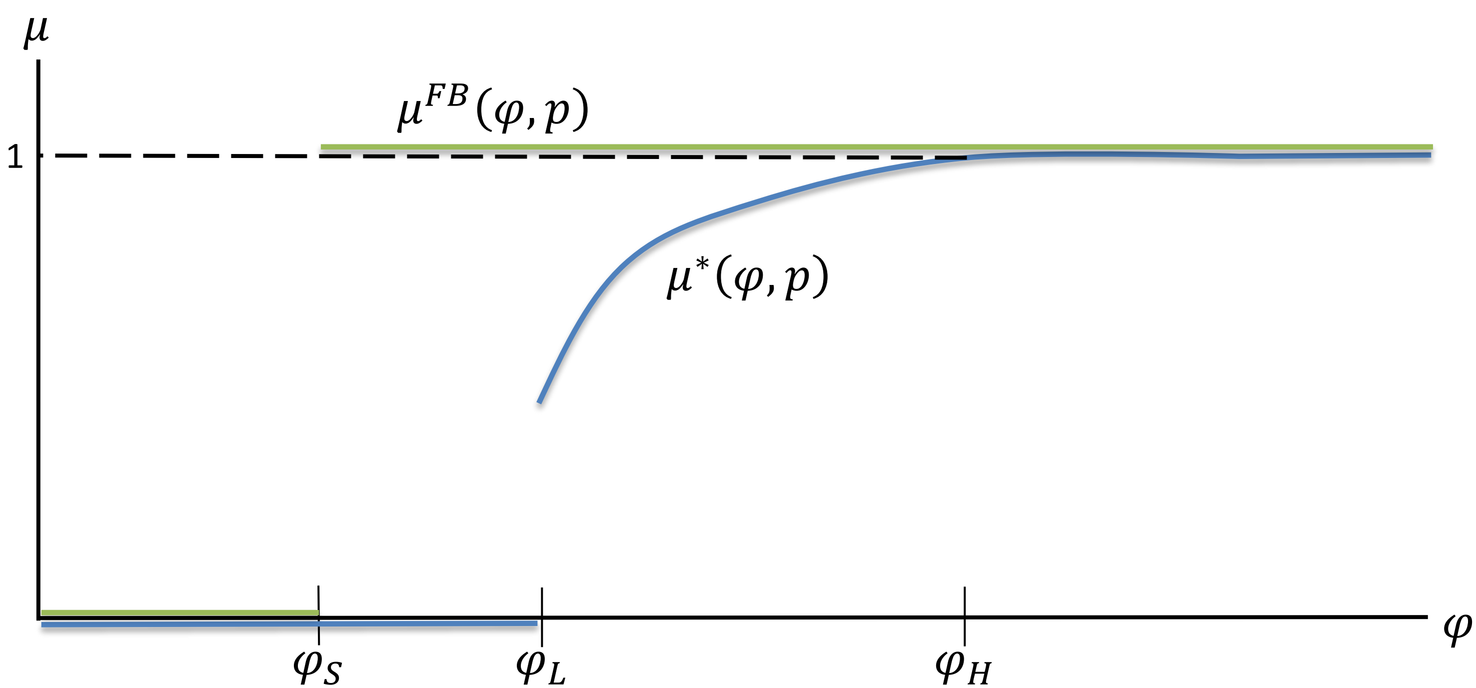
Proposition: The optimal solution satisfies

$$\frac{\delta^*(\varphi_i, p)}{\delta^{FB}} = \frac{K^*(\varphi_i, p)}{K^{FB}(\varphi_i, p)} = \frac{M^*(\varphi_i, p)}{M^{FB}(\varphi_i, p)} = \mu^*(\varphi_i, p)$$

TFP is $A_i^*(\varphi_i, p) = \mu^*(\varphi_i, p)^\theta A_i^{FB}(\varphi_i, p)$

Management as technology

Higher Ability -> Less Constrained



Prices Clear Output Markets

- For given p, firm of ability φ produces $y^*(\varphi, p)$
- Aggregate supply at price p

$$S(p) = \int_{\varphi_L(p)}^{\infty} y^*(\varphi, p) d\Phi(\varphi)$$

- $y^*(\varphi, p)$ is increasing and $\varphi_L(p)$ (the cutoff level) is decreasing, so $S(p)$ is increasing
- Equilibrium prices p^* solve

$$D(p^*) = S(p^*)$$

NORMATIVE IMPLICATIONS

Profits Inefficiently Concentrated at Top

$$L = \pi(\varphi) + \lambda(\varphi)(\pi(\varphi) - rM\delta)$$

- Are competitive rents allocated efficiently? Competitive rents serve two roles:

$$\frac{d\pi^*(\varphi)}{d(-F)} = \underbrace{1}_{Consumption} + \underbrace{\lambda(\varphi)}_{Collateral}$$

  - Goal of production – reallocation is a transfer
  - Collateral for promises – reallocation could improve firms' productivity
- Shadow cost of (DE) constraint is decreasing in φ $\Rightarrow$ profits are inefficiently concentrated at the top

Welfare-Improving Tax Scheme

- Suppose Φ is unbounded from above
- Impose a proportional output tax τ on $\varphi_i \geq \varphi_H(p) + \zeta$ firms, $\zeta > 0$
- Total welfare:

$$W(\tau) = CS + PS(Untaxed)$$
$$+PS(Taxed) + Taxes$$

Theorem: W'(0) > 0

Proof: Step 1 – Price effect

- At $\tau = 0$ and p^0, $\tau \uparrow$ implies $S \downarrow$, so prices must increase
- Therefore

$$\frac{dp^\tau}{d\tau}|_{\tau=0} > 0$$

Theorem: W'(0) > 0

Proof: Step 2 – Simplify

$$W(\tau) = CS + PS(Untaxed)$$
$$+PS(Taxed) + Taxes$$

Theorem: W'(0) > 0

Proof: Step 2 – Simplify

$$W(\tau) = \int_{p^\tau}^{\infty} D(p)dp + \int_{\varphi_L(p^\tau)}^{\varphi_H(p^\tau)+\zeta} \pi^*(p^\tau, \varphi; 0) d\Phi(\varphi)$$

$$+ \int_{\varphi_H(p^\tau)+\zeta}^{\infty} \pi^*(p^\tau, \varphi; \tau)\, d\Phi(\varphi) + T(\tau)$$

Theorem: W'(0) > 0

Proof: Step 2 – Simplify

$$W(\tau) = \int_{p^\tau}^{\infty} D(p)dp + \int_{\varphi_L(p^\tau)}^{\varphi_H(p^\tau)+\zeta} \pi^*(p^\tau, \varphi; 0)d\Phi(\varphi)$$

$$+ \int_{\varphi_H(p^\tau)+\zeta}^{\infty} \pi^*(p^\tau, \varphi; \tau)\, d\Phi(\varphi) + T(\tau)$$

- Let $T(\varphi;\tau) = \pi^*(p^\tau, \varphi; 0) - \pi^*(p^\tau, \varphi; \tau) - O(\tau^2)$
- Then, $T(\tau) = \int_{\varphi_H(p^\tau)+\zeta}^{\infty} T(\varphi;\tau)d\Phi(\tau)$

Theorem: W'(0) > 0

Proof: Step 2 – Simplify

$$W(\tau) = \int_{p^{\tau}}^{\infty} D(p)dp + \int_{\varphi_L(p^{\tau})}^{\varphi_H(p^{\tau})+\zeta} \pi^*(p^{\tau}, \varphi; 0) d\Phi(\varphi)$$
$$+ \int_{\varphi_H(p^{\tau})+\zeta}^{\infty} \pi^*(p^{\tau}, \varphi; 0)\, d\Phi(\varphi) - O\left(\tau^2\right)$$

- Marginal tax + lump-sum subsidy makes unconstrained firms as well off to first-order

Theorem: W'(0) > 0

Proof: Step 2 – Simplify

$$W(\tau) = \int_{p^\tau}^{\infty} D(p)dp + \int_{\varphi_L(p^\tau)}^{\infty} \pi^*(p^\tau, \varphi; 0)d\Phi(\varphi) - O(\tau^2)$$

Theorem: W'(0) > 0

Proof: Step 3 – Differentiate

$$W'(0) = \frac{d}{d\tau}\int_{p^\tau}^{\infty} D(p)dp \,|_{\tau=0} + \frac{d}{d\tau}\int_{\varphi_L(p^\tau)}^{\infty} \pi^*(p^\tau, \varphi; 0)d\Phi(\varphi) \,|_{\tau=0}$$

Theorem: W’(0) > 0

Proof: Step 3 – Consumers

$$W'(0) = \frac{d}{d\tau}\int_{p^\tau}^{\infty} D(p)dp\,|_{\tau=0} + \frac{d}{d\tau}\int_{\varphi_L(p^\tau)}^{\infty} \pi^*(p^\tau,\varphi;0)d\Phi(\varphi)\,|_{\tau=0}$$

- Quasi-linear preferences:

$$\frac{d}{d\tau}\int_{p^\tau}^{\infty} D(p)dp\,|_{\tau=0} = -D(p^0)\frac{dp^\tau}{d\tau}\,|_{\tau=0}$$

Theorem: W'(0) > 0

Proof: Step 4 – Producers

$$W'(0) = -D(p^0)\frac{dp^\tau}{d\tau}|_{\tau=0} + \frac{d}{d\tau}\int_{\varphi_L(p^\tau)}^{\infty} \pi^*(p^\tau, \varphi; 0)\, d\Phi(\varphi)\, |_{\tau=0}$$

- Only a price effect:

$$\frac{d}{d\tau}\int_{\varphi_L(p^\tau)}^{\infty} \pi^*(p^\tau, \varphi; 0)\, |_{\tau=0} = (S(p^0) + \Delta + E[\chi|\varphi \geq \varphi_L])\frac{dp^\tau}{d\tau}|_{\tau=0}$$

- Δ **–** extensive-margin improvement
- $E[\chi|\varphi \geq \varphi_L]$ - intensive-margin improvement

Theorem: W'(0) > 0

Proof: Step 5 – Result

$$W'(0) = -D(p^0)\frac{dp^\tau}{d\tau}|_{\tau=0} + (S(p^0) + \Delta + E[\chi|\varphi \geq \varphi_L])\frac{dp^\tau}{d\tau}|_{\tau=0}$$

- Equilibrium: $D(p^0) = S(p^0)$. Therefore

$$W'(0) = (\Delta + E[\chi|\varphi \geq \varphi_L])\frac{dp^\tau}{d\tau}|_{\tau=0} > 0$$

Summary of Proof

- Small marginal tax on high-ability firms, returned lump-sum $\Rightarrow$ these firms indifferent
- Reduced production, so increase in prices
  - Transfer from consumers to constrained producers
  - Improves efficiency of constrained producers
- Increase in total welfare

What About Subsidizing Small Firms?

- Taxing big firms ≠ subsidizing small firms
- Subsidizing small firms (via tax credit funded by nondistortionary head tax) improves their profits by more than cost of tax
- Such firms expand, driving down prices, reducing profits of all other firms, some of which are constrained

EMPIRICAL IMPLICATIONS

Productivity is Endogenous

- **Key:** low-ability firms' TFP more sensitive

- **Two applications:**
  A. Across countries: institutional environment
  B. Within-country, over time: agg demand shifts

ACROSS COUNTRIES

Why Cross-Country Differences?

- "… huge variation among countries in the speed and quality of courts." (Djankov, et. al. `03)
- "… entrepreneurs who say the courts are effective have measurably more trust in their trading partners…" (Johnson, et. al. `02)
- With stronger formal contracting institutions, credibility becomes relatively less important
  - Decentralizing decision making in firms is positively correlated with "rule of law" (Bloom, Sadun, and Van Reenen `12)
- Firms with lower competitive rents disproportionately benefit from formal contracting institutions

Partial Formal Contracting

- Third-party enforcer observes δ_{itm} and $\hat{\delta}_{itm}$
- Will only enforce deviations that are at least $(1-\omega)$-egregious
  - Can effectively write a contract on whether or not $\hat{\delta} \leq \omega\delta_{itm}$
  - Enforcement is otherwise costless
  - Focus on full-utilization relational contracts
- Effectively ensures that $\omega\delta_{itm}$ is contractible, so s_{itm} can be conditioned on it

Dynamic Enforcement with Partial Formal Contracts

- Manager's dynamic enforcement:

$$b_{itm} + \frac{1}{1+r}\left(U_{i,t+1,m} - \widetilde{U}_{i,t+1,m}\right) \geq (1-\omega)\delta_{itm}$$

- Owner's dynamic enforcement:

$$\frac{1}{1+r}\left(\Pi_{i,t+1,m} - \widetilde{\Pi}_{i,t+1,m}\right) \geq b_{itm}$$

- Joint dynamic enforcement:

$$\frac{1}{1+r}\left(S_{i,t+1} - S_{i,t+1}(\omega)\right) \geq M_{it}(1-\omega)\delta_{it}$$

Aggregate Dynamic Enforcement

- Stationarity and symmetry imply

$$\Pi_{it+1} = \frac{1+r}{r}\pi_i \quad and$$

$$\tilde{\Pi}_{it+1}(\omega) = \frac{1+r}{r}\max\{\tilde{\pi}_i(\omega), 0\} = 0$$

- Dynamic enforcement:

$$\pi_i \geq (1-\omega) r M_i \delta_i = \tilde{r} M_i \delta_i$$

- Better institutions → lower effective r

Implications of Better Contracts

- Better formal contracts reduce importance of credibility, especially benefiting low-ability firms
- For fixed p, all firms weakly expand output → prices fall → high-ability firms reduce output

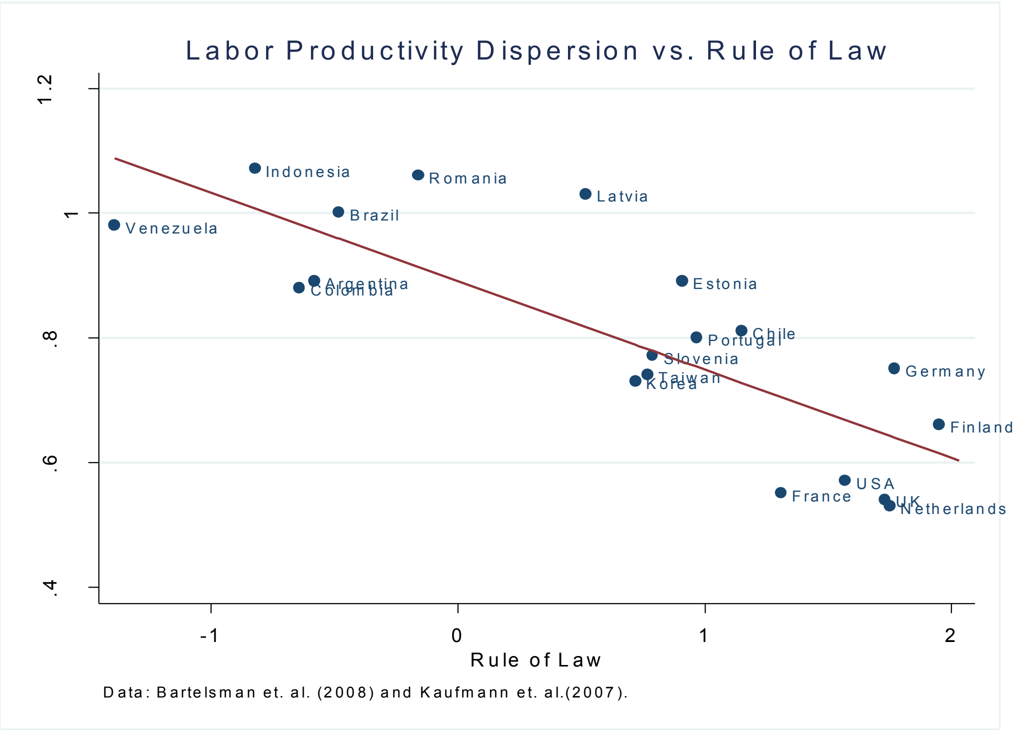
When Formal Contracts are Stronger:

1. Less productivity dispersion
2. Thinner left tail of badly managed, unproductive firms
3. Less output dispersion

- To look at 1., gathered country-level data on productivity dispersion from Bartelsman, Haltiwanger, and Scarpetta `12
- 2005 Rule of Law measure from Kaufmann, Kraay, and Mastruzzi `07

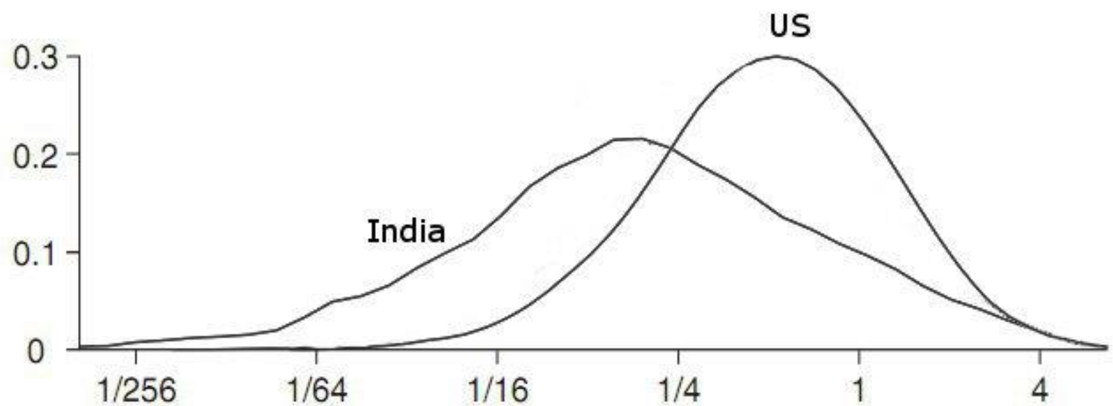
High Rule of Law, Low Prod Dispersion

- **Prediction 1**: Less productivity dispersion in countries with high Rule of Law



Left Tail of TFP is thicker in India than in the US

- **Prediction 2**: Thinner left tail of badly managed, unproductive firms



Hsieh and Klenow (2009)

Size Dispersion and Rule of Law

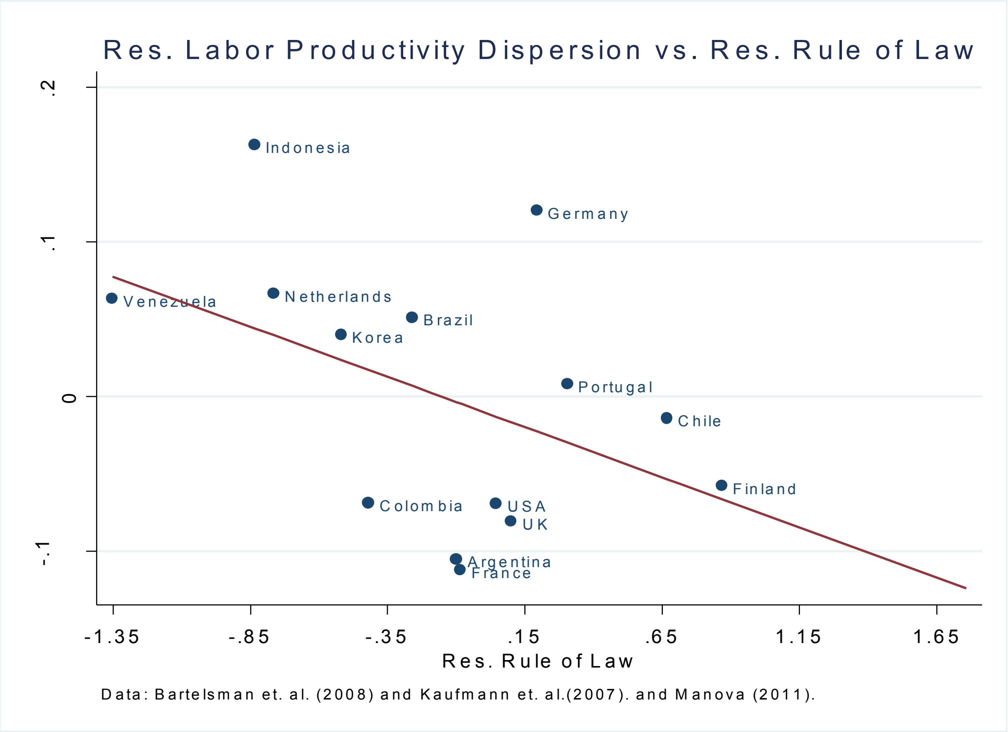
- **Prediction 3**: Less output (size) dispersion in countries with high Rule of Law
- Evidence is more limited
  - Alfaro, Charlton, Kanczuk `08: *establishment* size is more variable in countries with low GDP/capita
  - "The Missing Middle" (Tybout `00, Ayyagari, et. al. `03): medium-sized firms are less prevalent in developing countries than in OECD countries

Credit Rationing?

- Entrepreneurs endowed with (idea,capital)
  - SR misallocation: mismatch b/t capital and good ideas
- But, good ideas should be self-financed
  - No LR misallocation (Banerjee, Moll `10) unless world is sufficiently volatile (Moll `11)
  - Should expect to see small entrepreneurs saving and growing quickly in developing countries, but Hsieh, Klenow `11 show little growth
- Should see too many high-MP firms – improvements should lead to convergence from the right
- Obviously important, complementary view

High Rule of Law, Low Prod Dispersion

- Controlling for Manova (2011) “private credit”



What Else Could Firms Do?

- Overinvest in specific capital
- Leverage profits from other business lines (conglomerates)
- Family-managed firms
- (Over)invest in improving capabilities
- But, these just shift the inefficiencies

WITHIN-COUNTRY OVER TIME

Productivity Dynamics Facts

1. Pro-cyclical aggregate productivity
   - Hultgren (1960)
2. Pro-cyclical within-firm productivity
   - Bartelsman-Doms (2000)
3. Counter-cyclical dispersion
   - Baily, Bartelsman, Haltiwanger (2001), Kehrig (2011)

- Many stories for [1] and [2] but [3] is puzzling
- All three are consistent with “credibility”

Conclusion

- Developed a model of optimal relational contracts in a competitive environment
  - Unique stationary rational-expectations equilibrium
- Inefficient competitive equilibrium
  - Profits are inefficiently concentrated at the top
  - Distortionary tax induces transfers from consumers to low-φ firms, improving welfare
- Low-φ firms more constrained and thus sensitive to changes in rents
  - Two applications: productivity over the business cycle and misallocation

Conclusion

- Productivity dynamics over the business cycle
  - Pro-cyclical within-firm productivity
  - Low-ability firms more sensitive to cycles than high-potential firms
  - Consistent with micro evidence from Baily, et. al. `01 and Kehrig `11
- Misallocation
  - Improved formal contracts disproportionately improve low-ability firms, reducing productivity dispersion
  - Improved formal contracts also reduce size dispersion

Future of this Approach

- Industry Dynamics
  - Currently productive firms overproduce, making small entrants relatively less profitable (in the short-run) and thus harder to get off the ground
  - Improved formal contracts can lead to more firm mobility, preventing industry stagnation
- Trade Liberalization
  - Trade liberalization concentrates profits with already-successful firms (Melitz), which in turn can harm smaller competitors
  - Trade can harm countries with poor formal contracts but is good for countries with stronger institutions
- Antitrust
  - Competition erodes profits, reducing industry productivity
  - Competition law and formal institutions are complementary