Institutional and Organizational Development

Ping Wang
Department of Economics
Washington University in St. Louis

August 2010

A.   Introduction

It is not until recent that macroeconomists have devoted effort toward understanding the role of institutions and organizations played in the process of economic development. This relatively thin but important literature includes:

- **Institutional development:**
  - classic: North (1990), Rogoff (1990)
  - voting and political equilibrium: Grossman-Helpman (1993), Perotti (1993), Alesina-Spolaore (1997), Bolton-Roland (1997), Saint-Paul (2002), Rotemberg (2003)
  - new wave: Acemoglu-Robinson (2000, 2008), *Acemoglu-Johnson-Robinson (2005)*, Galor-Moav-Vollrath (2009), Palivos-Wang-Yip (2010)

- **Organizational capital:**
  - classic: Lucas (1978), Kilstrom-Tirole (1979), Prescott-Visscher (1980), Jovanovic (1982)
  - new wave:
    - *Atkenson-Kehoe* (*2005*, 2007) – theory and measurement
    - Samaniego (2006) and Burstein & Monge-Naranjo (2009) –

organizational capital and productivity
- Grossman-Helpman (2002, 2004), Grossman & Esteban Rossi-Hansberg (2008), Lai-Riezman-Wang (2009), Lai-Riezman-Wang (2009) – organization of trade
- Ghatak-Morellib-Sjostromc (2007), Newman (2007), Antunes-Cavalcanti-Villamil (2008), Jiang-Wang-Wu (2009) – entrepreneurial capital
- Lu-Peng-Wang (2009) – organization of production and trade

- Integrating institutions and organizations: *Hsieh-Klenow (2009)*, Buera-Shin (2009)

B. The Importance of Institutions and Organizations

- Institutional factors
  - affect laws and regulations under which households and firms function
  - shape the incentives individuals have for various decision-making
- Organizational structures
  - affect the operations of firms and government agencies
 - influence the efficiency of production and the effectiveness of public policy

C. Institutions and the Rise of Europe: Acemoglu, Johnson and Robinson (2005)

- **The rise of Europe after 1500 is believed due largely to strong growth in countries involving cross-Atlantic trade with the "New World," particularly over the period of 1500-1850**
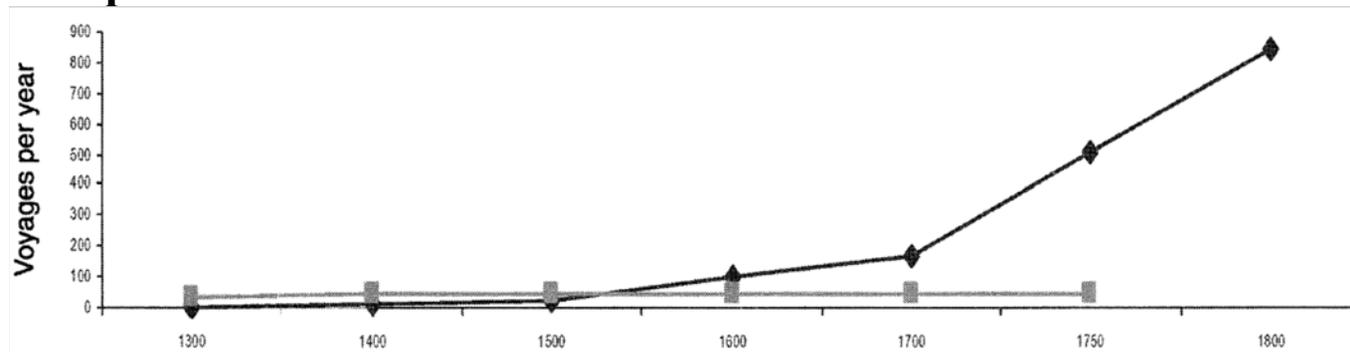
- **Such substantial trade and associated colonialism changed institutions (in England and the Duchy of Burgundy), strengthening merchant groups by constraining the power of the monarchy and by protecting property rights**
- **Improved institutions led to faster and more sustained economic growth**
- **A notable phenomenon accompanying such development is rapid urbanization: Atlantic traders (UK, Netherlands, Portugal, Spain) were not as urbanized as non-Atlantic traders in Western Europe during 1300-1700, but become urbanized rapidly afterwards**
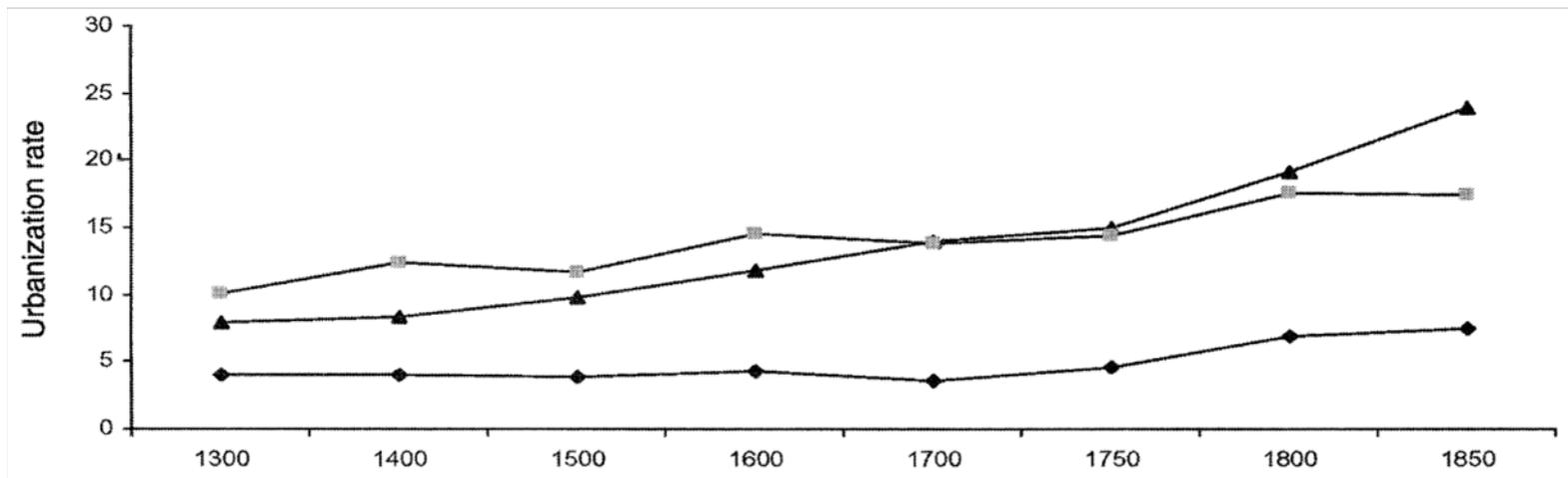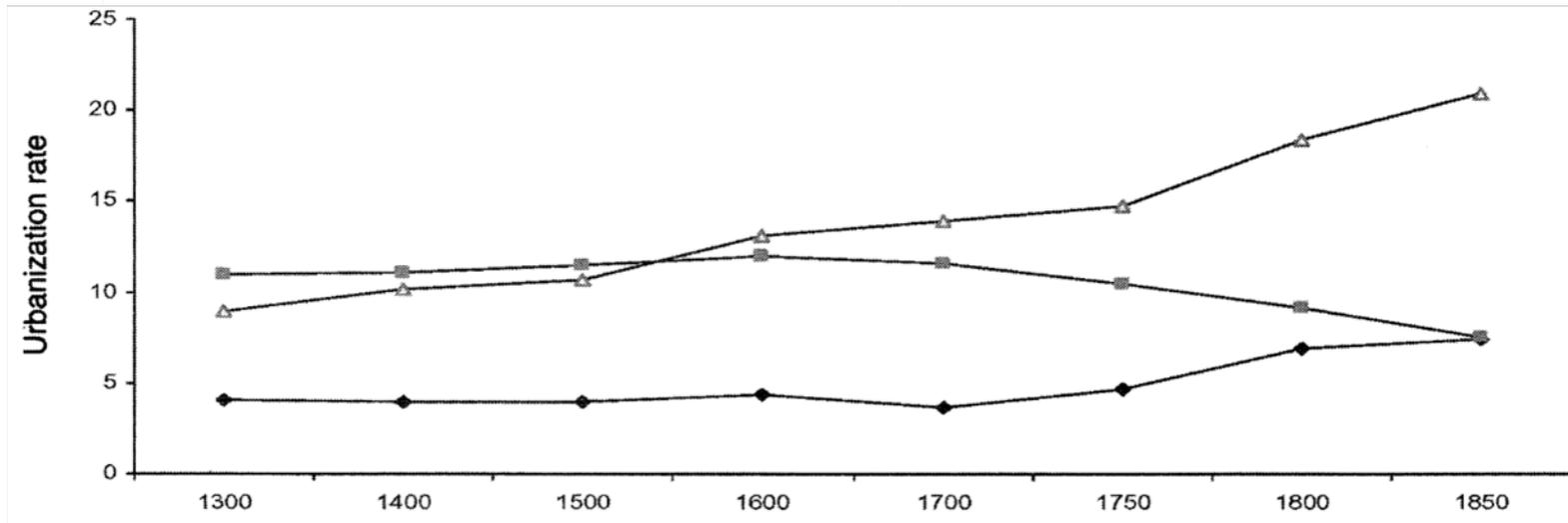
1. **The Hypothesis**

- **Four subhypotheses:**
  - ○ **political institutions constraining state power are essential for the merchant's incentives to undertake investment**
  - ○ **such institutions were not welcome by the monarchy earlier in Europe**
  - ○ **institutions favored by economically and politically powerful groups are more likely to prevail**
  - ○ **in countries with nonabsolutist initial political institutions, Atlantic trade and colonization strengthened commerce, including new groups without ties to the monarchy**
- **These subhypotheses imply that, in countries with easy access to the New World via Atlantic and without an absolutist monarchy,**
  - ○ **Atlantic trade provided substantial profits and hence political power for commerce outside the monarchy circle**
  - ○ **the rise of this merchant group demanded and obtained favorable political institutions protecting their property rights**
  - ○ **with such newly gain power and favorable institutions, these Atlantic trading merchants had higher incentives to invest and continued growing, fueling the first *Great Divergence* of cross-country per capital real income**

- **The difference in success between UK/Netherlands and Portugal/Spain: the former countries had political institutions placing sufficient checks on the monarchy**
  - **UK's key institutional development:**
    - **the Civil War of 1642-1649 with Parliamentarian forces defeating Charles I**
    - **the Glorious Revolution of 1688-1680 with James II deposed by Parliament since then a parliamentary regime was formed**
  - **The Netherlands' key institutional development:**
    - **the establishment of the independent Dutch Republic replacing the Habsburg monarchy, starting 1570 and ending 1648**
- **Significance of Atlantic trade in the UK and the Netherlands:**
  - **UK: mostly known the East India Company founded in 1600, since then Atlantic trade created large profits, about:**
    - **£0.2m per year, 1601-1650**
    - **£0.5m per year, 1651-1675**
    - **£0.9m per year, 1676-1700**
    - **£1.7m per year, 1701-1750, growing to about £5.0m per year by 1800**
  - **Netherlands: mostly known the Dutch West India Company created by Philip III in 1609**

D. Organizational Capital – Theory and Measurement: Atkeson and Kehoe (2005)

- Organizational capital is an important part of intangible capital
- Organizational capital can be tied to the life cycle of a plant:
  - variable profit of a plant of age s: $d_s = \max_l f_s(l) - wl$

  - cost of the fixed factor: w_m
  - organization rent: $d_s - w_m$

  - free entry condition: $\sum_{s=0}^{N} \left(\frac{1}{1+i}\right)^s (d_s - w_m) = 0$

  - cross-section aggregate organization rent: $\pi = \sum_{s=0}^{N} (d_s - w_m)$

  - if MPL rises with plant age (learning by doing), then older plants will be larger and hire more labor than younger ones
  - thus, organizational capital is summarized by the plant-specific productivity (f_s') as well as the age of the plant (s)
  - letting variable profit to grow at a constant rate $\gamma > 1$ (i.e., $d_s = \gamma^s d_0$), we can then use free entry condition to obtain: $w_m = d_0 \dfrac{\sum_{s=0}^{N} [\gamma/(1+i)]^s}{\sum_{s=0}^{N} [1/(1+i)]^s}$

  - thus, $\pi = d_0(N+1) \sum_{s=0}^{N} \gamma^s \omega_s$, where $\omega_s = \dfrac{1}{N+1} - \dfrac{[1/(1+i)]^s}{\sum_{s=0}^{N} [1/(1+i)]^s}$

1. The Basic Model

- **Preference:** $U = \sum_{t=0}^{\infty} \beta^t \log(c_t)$

- **Budget constraint:** $\sum_{t=0}^{\infty} p_t c_t \leq \sum_{t=0}^{\infty} p_t(w_t + w_{mt}) + k_0 + a_0$

- **Production:** $y = zA^{1-v}F(k, l)^v$
  - **F is CRTS**
  - **z = aggregate technology**
  - **v = span of control parameter determining the return to scale (Lucas 1978)**
- **Organization capital (A, s): a plant with organization capital (A, s) at t has stochastic organization capital (Aε, s+1) at t+1**
- **Time-to-build: a plant built in t-1 can start operating in t**
- **Frontier knowledge: productivity τ_t, adopted by all new plants, implying a new plant built in t-1 will have organization capital (τ_t, 0) at t**
- **Plant optimization:** $\max_{k,l} z_t A^{1-v} F(k, l)^v - r_t k - w_t l - w_{mt}$

  - **variable profit:** $d_t(A) = z_t A^{1-v} F(k_t(A), l_t(A))^v - r_t k_t(A) - w_t l_t(A)$
  - **fixed cost of hiring a manager (one per plant, fixed supply): w_m**

  - **Bellman:** $V_t(A, s) = \max\left[0, d_t(A) - w_{mt} + \frac{p_{t+1}}{p_t} \int_\epsilon V_{t+1}(A\epsilon, s+1) \pi_{s+1}(d\epsilon)\right]$

- **Plant operating decision $x_t(A, s)$ (=1 if operating, =0 otherwise)**
- **Plant establishment decision, determined by the value of a new plan:**

$$V_t^o = -w_{mt} + \frac{p_{t+1}}{p_t} V_{t+1}(\tau_{t+1}, 0) \geq 0, \text{ which pins down the measure of managers } \phi_t$$

- **Measure of operating plants:** $\lambda_t(A, s) = \int_0^A x_t(a, s)\mu_t(da, s)$, **with the distribution**

  evolving as: $\mu_{t+1}(A', s + 1) = \int_A \pi_{s+1}\left(\frac{A'}{A}\right)\lambda_t(dA, s)$

- **Factor market clearing:**
  - **capital:** $\sum_s \int_A k_t(A)\lambda_t(dA, s) = k_t$
  - **labor:** $\sum_s \int_A l_t(A)\lambda_t(dA, s) = 1$
  - **manager:** $\phi_t + \sum_s \int_A \lambda_t(dA, s) = 1$
- **Goods market clearing:** $c_t + k_{t+1} = y_t + (1 - \delta)k_t$, **where aggregate output is**

  given by $y_t = z_t \sum_s \int_A A^{1-\nu} F(k_t(A), l_t(A))^\nu \lambda_t(dA, s)$

- **Plant size:** $n_t(A) = \left(\frac{A}{\bar{A}_t}\right)$, $\bar{A}_t = \sum_s \int_A A\lambda_t(dA, s) =$ **aggregate specific productivity**

- **Equilibrium allocation:** $k_t(A) = n_t(A)k_t$ **and** $l_t(A) = n_t(A)l_t$
- **Equilibrium output:** $y_t(A) = n_t(A)y_t = n_t(A) z_t \bar{A}_t^{1-\nu} F(k_t, l_t)^\nu$
- **Equilibrium variable profit:** $d_t(A) = (1 - \nu)y_t(A) = (1 - \nu)n_t(A)y_t$

2. Generalization: Monopolistic Competition

- The competitive final good output: $y_t = \left[\sum_s \int_A y_t(A)^\theta \lambda_t(dA, s) \right]^{1/\theta}$, implying the demand schedule for intermediate goods: $y_t(A) = p_t(A)^{-1/(1-\theta)} y_t$
- Supply of intermediate goods: $y_t(A) = z_t^{1/\theta} A_t^{(1-\gamma\theta)/\theta} F(k_t(A), l_t(A))^\gamma$, with the powers adjusted to include the markup accrued from local monopoly power
- All other setups remain the same

3. Calibration Analysis

- Use standard macroeconomics and firm-distribution parameters and set the markup parameter to $\theta = 0.9$ and the span of control parameter to $\gamma = 0.95$
- The rates of job turnovers can then be computed (based on the definition by Davis-Haltiwanger-Schuh 1996):

	Data	Model
Overall job creation rate	8.3	10.2
Overall job destruction rate	8.4	10.2

● **Mean and standard deviation of shocks to ln(n):**
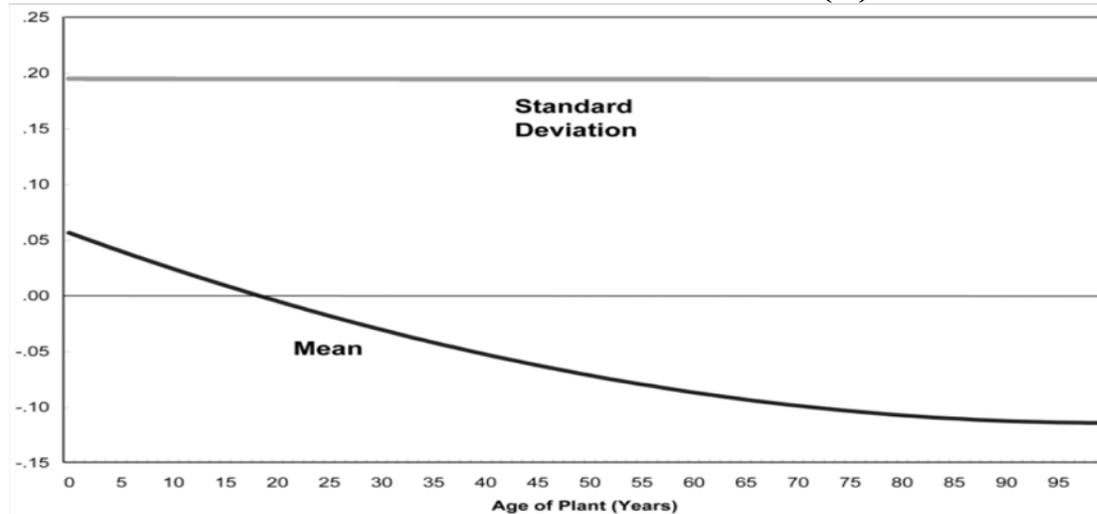
● **Firm age and average productivity**
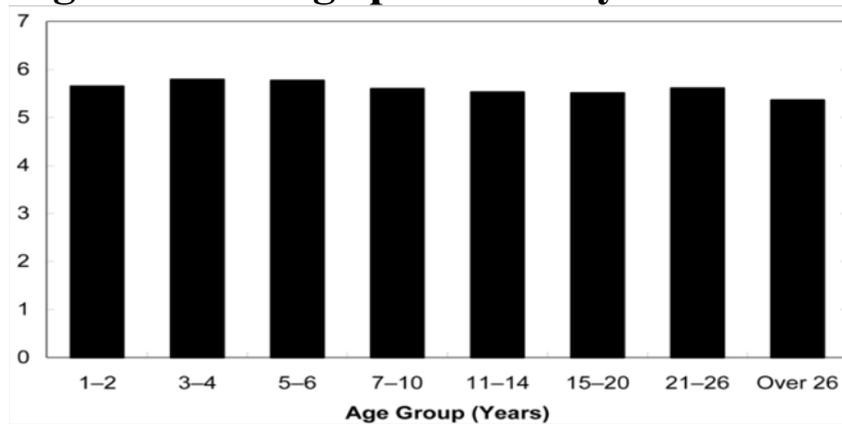
- **Measurement of organizational capital and growth accounting**
  - **physical capital income share: $\theta\gamma\alpha = 19.9\%$**
  - **labor income share: $\theta\gamma(1-\alpha) = 65.1\%$**
  - **managerial and organization rent share: $1-\theta\gamma = 15\%$**
    - **by using the expression for w_m, managerial rent share is: 11.7%**
    - **organization rent share is: 3.3%**
  - **Varying $v = \theta\gamma$ by 5 percentage points, we obtain:**

| | DATA ON U.S. MANUFACTURING* | MODEL | | |
		$v = .80$	$v = .85$	$v = .90$
		Shares of Output (%)		
Labor	72.2	75.7	76.8	77.9
Workers	. . .	60.1	65.1	70.1
Managers	. . .	15.6	11.7	7.8
Physical capital	19.9	19.9	19.9	19.9
Intangible capital	8.0	. . .	. . .	. . .
Organization capital	. . .	4.4	3.3	2.2

E. Institutional and Organizational Barriers to Productivity Growth: Hsieh and Klenow (2009)

- Cross-country differences in income and TFP are large and widened (see a nice survey in the North-Holland Handbook of Economic Growth by Caselli 2005
- Restuccia-Rogerson (2008) argue tht misallocation of resources across firms can have large effects on aggregate TFP
- Lewis (2004, McKinsey Global Institute) argues that many institutions and policies can result in resource misallocation
- This paper ties all such bolts and nuts together

1. The Basic Model: Monopolistic Competition

- In addition to production efficiency differences as in Melitz (2003), firms also face different output and capital distortions
- A single final good is produced with a basket of industry goods, taking a Cobb-Douglas form: $Y = \prod_{s=1}^{S} Y_s^{\theta_s}$, with $\sum_{s=1}^{S} \theta_s = 1$, where industry s's output is a CES aggregate of M_s differentiated products: $Y_s = \left(\sum_{i=1}^{M_s} Y_{si}^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$, with $Y_{si} = A_{si} K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}$

- **Profit of firm i in industry s yields:** $\pi_{si} = (1-\tau_{Ysi})P_{si}Y_{si} - wL_{si} - (1+\tau_{Ksi})RK_{si}$
  - τ_{Ysi} and τ_{Ksi} measure output and capital distortions tied to economic institutions and policies
    - τ_{Ysi} captures entry barriers, good market imperfections, income taxes, and/or transport costs
    - τ_{Ksi} capture capital barriers, credit market imperfections, capital taxes and/or intermediation costs
  - **profit maximization implies:**
    - **MRTS = relative cost:** $\dfrac{K_{si}}{L_{si}} = \dfrac{\alpha_s}{1-\alpha_s} \cdot \dfrac{w}{R} \cdot \dfrac{1}{(1+\tau_{Ksi})}$
    - **competitive profit:** $P_{si} = \dfrac{\sigma}{\sigma-1}\left(\dfrac{R}{\alpha_s}\right)^{\alpha_s}\left(\dfrac{w}{1-\alpha_s}\right)^{1-\alpha_s}\dfrac{(1+\tau_{Ksi})^{\alpha_s}}{A_{si}(1-\tau_{Ysi})}$
  - **induced demand for labor:** $L_{si} \propto \dfrac{A_{si}^{\sigma-1}(1-\tau_{Ysi})^{\sigma}}{(1+\tau_{Ksi})^{\alpha_s(\sigma-1)}}$
  - **firm output:** $Y_{si} \propto \dfrac{A_{si}^{\sigma}(1-\tau_{Ysi})^{\sigma}}{(1+\tau_{Ksi})^{\alpha_s\sigma}}$
  - **marginal revenue product of labor:** $MRPL_{si} \triangleq (1-\alpha_S)\dfrac{\sigma-1}{\sigma}\dfrac{P_{si}Y_{si}}{L_{si}} = w\dfrac{1}{1-\tau_{Ysi}}$
  - **marginal revenue product of capital:** $MRPK_{si} \triangleq \alpha_S\dfrac{\sigma-1}{\sigma}\dfrac{P_{si}Y_{si}}{K_{si}} = R\dfrac{1+\tau_{Ksi}}{1-\tau_{Ysi}}$

- **Industry factor demand:**
  - **labor:** $L_s \equiv \sum_{i=1}^{M_s} L_{si} = L \dfrac{(1-\alpha_s)\theta_s/\overline{MRPL}_s}{\sum_{s'=1}^{S}(1-\alpha_{s'})\theta_{s'}/\overline{MRPL}_{s'}}$, **with** $\overline{MRPL}_s \propto \left(\sum_{s=1}^{M_s} \dfrac{1}{1-\tau_{Ysi}} \dfrac{P_{si}Y_{si}}{P_sY_s} \right)$
  - **capital:** $K_s \equiv \sum_{i=1}^{S} K_{si} = K \dfrac{\alpha_s\theta_s/\overline{MRPK}_s}{\sum_{s'=1}^{S}\alpha_{s'}\theta_{s'}/\overline{MRPK}_{s'}}$, **with** $\overline{MRPK}_s \propto \left(\sum_{s=1}^{M_s} \dfrac{1+\tau_{Ksi}}{1-\tau_{Ysi}} \dfrac{P_{si}Y_{si}}{P_sY_s} \right)$
  - **aggregate factor demand:** $L \equiv \sum_{s=1}^{S} L_s$ **and** $K \equiv \sum_{s=1}^{S} K_s$
- **Final sector:**
  - **aggregate output:** $Y = \prod_{s=1}^{S}\left(TFP_s \cdot K_s^{\alpha_s} \cdot L_s^{1-\alpha_s}\right)^{\theta_s}$
  - **cost minimization implies:** $P_sY_s = \theta_s PY$, **where** $P \equiv \prod_{s=1}^{S}\left(\dfrac{P_s}{\theta_s}\right)^{\theta_s}$
- **Measurement of TFP:**
  - **physical productivity of firm i in industry s:** $TFPQ_{si} \triangleq A_{si} = \dfrac{Y_{si}}{K_{si}^{\alpha_s}(wL_{si})^{1-\alpha_s}}$
  - **revenue productivity of firm i in industry s:** $TFPR_{si} \triangleq P_{si}A_{si} = \dfrac{P_{si}Y_{si}}{K_{si}^{\alpha_s}(wL_{si})^{1-\alpha_s}}$, **or,**

    $TFPR_{si} \propto \left(MRPK_{si}\right)^{\alpha_s}\left(MRPL_{si}\right)^{1-\alpha_s} \propto \dfrac{(1+\tau_{Ksi})^{\alpha_s}}{1-\tau_{Ysi}}$, **which *increases in both distortions*,**

    implying that those facing larger barriers are smaller than the optimal size and hence have higher marginal products (under diminishing returns)

- ○ **industry TFP:** $TFP_s = \left[\sum_{i=1}^{M_s} \left\{ A_{si} \cdot \frac{\overline{TFPR_s}}{TFPR_{si}} \right\}^{\sigma-1} \right]^{\frac{1}{\sigma-1}}$, **with** $\overline{TFPR_s} \propto \left(\overline{MRPK_s} \right)^{\alpha_s} \left(\overline{MRPL_s} \right)^{1-\alpha_s}$

- ○ **if TFPQ (A) and TFPR are jointly log-normally distributed, then:**

  $\log TFP_s = \frac{1}{\sigma-1} \log \left(\sum_{i=1}^{M_s} A_{si}^{\sigma-1} \right) - \frac{\sigma}{2} \mathrm{var} \left(\log TFPR_{si} \right)$, **that is, greater dispersion of marginal products worsens the extent of misallocation, thus lowering industry TFP**

2. **Applications: China/India versus U.S.**

- ● **Calibration: based on the theory developed above, we can back out the two distortion measures as well as firm-level productivity:**

  - ○ **capital distortion:** $1 + \tau_{Ksi} = \frac{\alpha_s}{1-\alpha_s} \frac{wL_{si}}{RK_{si}}$

  - ○ **output distortion:** $1 - \tau_{Ysi} = \frac{\sigma}{\sigma-1} \frac{wL_{si}}{(1-\alpha_s) P_{si} Y_{si}}$

  - ○ **firm productivity:** $A_{si} = \kappa_s \frac{(P_{si} Y_{si})^{\frac{\sigma}{\sigma-1}}}{K_{si}^{\alpha_s} L_{si}^{1-\alpha_s}}$, **with** $\kappa_s = w^{1-\alpha_s} \left(P_s Y_s \right)^{-\frac{1}{\sigma-1}} / P_s$ **set as one to infer** P_s **from observed value** $P_s Y_s$

- **Sources of TFPR variation within industries**

	Ownership	Age	Size	Region
India	0.58	1.33	3.85	4.71
China	5.25	6.23	8.44	10.01

- **TFP gains from equalizing TFPR within industries**
  - China: 115.1% in 1998   86.8% in 2005
  - India: 100.4% in 1987   127.5% in 1994
 - U.S.:   36.1% in 1977   42.9% in 1997

- **TFP gains from equalizing TFPR relative to 1997 U.S. gains**
  - China: 50.5% in 1998   30.5% in 2005
  - India: 40.2% in 1987   59.2% in 1994

- **TFP by ownership in China and India**

TFP by ownership

China

	TFPR	TFPQ
State	-0.415 (0.023)	-0.144 (0.090)
Collective	0.114 (0.010)	0.047 (0.013)
Foreign	-0.129 (0.024)	0.228 (0.040)

India

	TFPR	TFPQ
State (Central)	-0.285 (0.082)	0.717 (0.295)
State (Local)	-0.081 (0.063)	0.425 (0.103)
Joint Public/Private	-0.162 (0.037)	0.671 (0.085)

- **China and India have lower TFPQ and higher TFPR than the U.S.:**
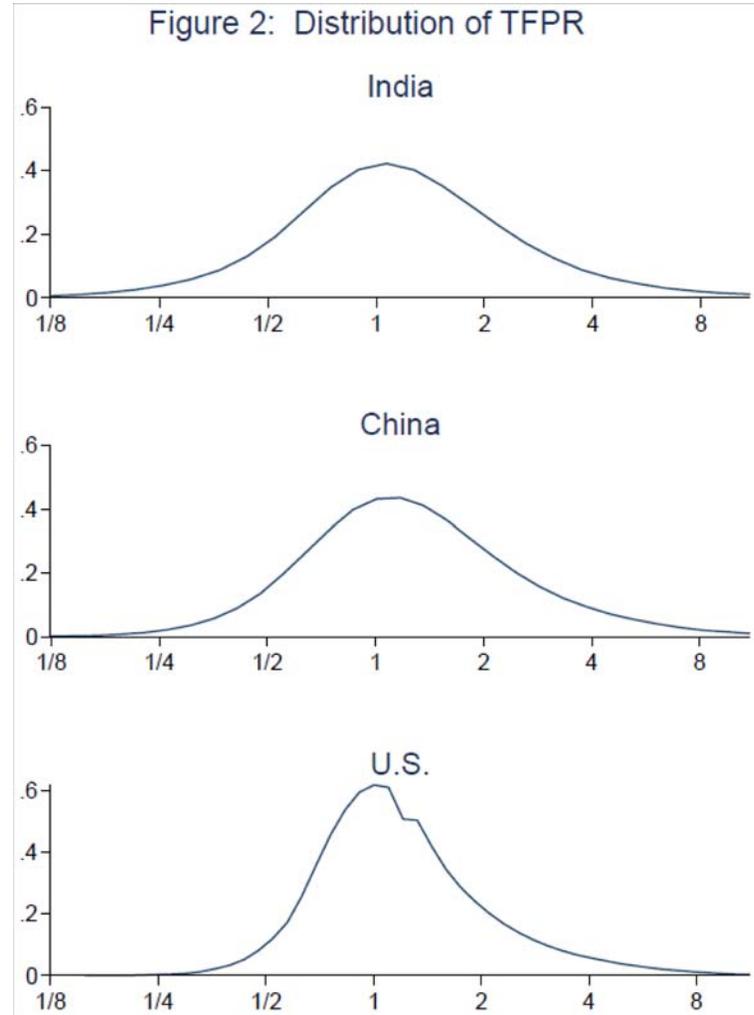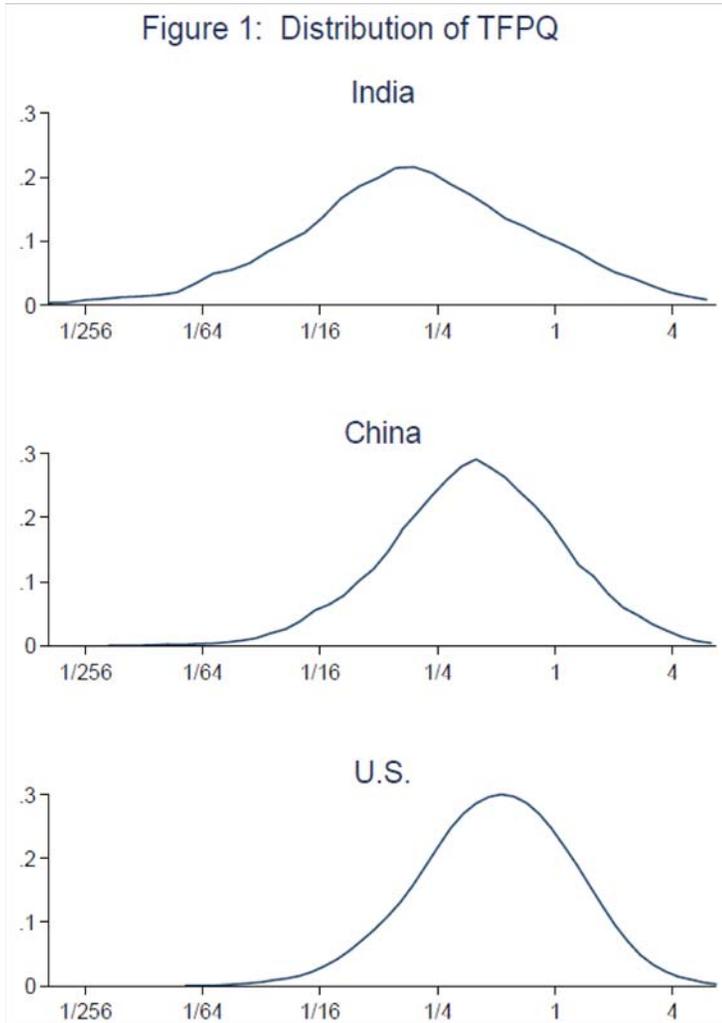
● **China and India have overly concentrated plan size distribution than the efficient one**

Figure 3: Distribution of Plant Size
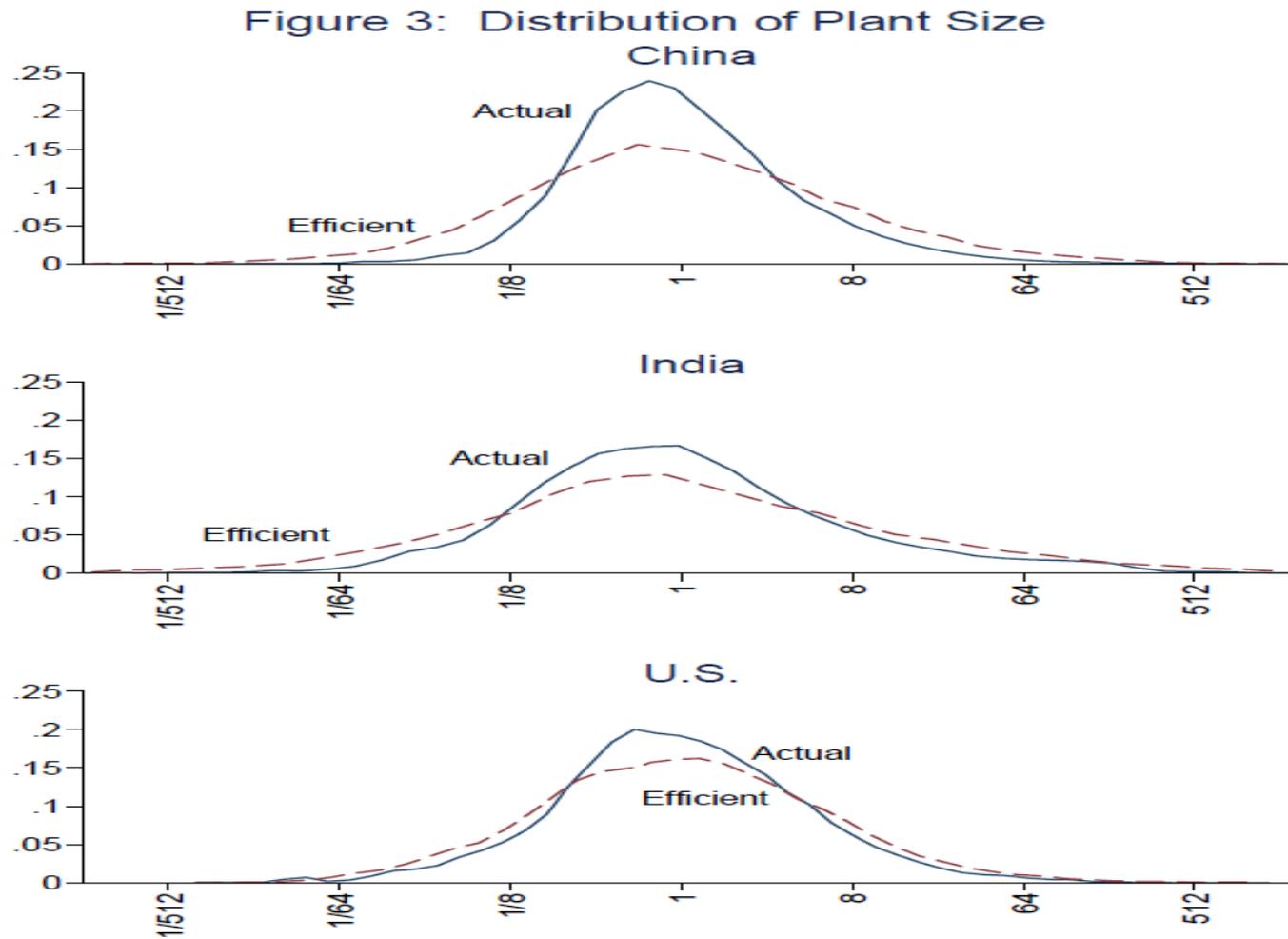
- **Experienced and larger firms in the U.S. have lower TFPR (less barriers)**
    - **in India, the results are *opposite* (need theory to explain)**
    - **in China, experienced and *small* firms have lower TFPR (need theory)**

Figure 7: TFPR and Age

Figure 6: TFPR and Size