Institutional Development

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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:

- **Institutions:**
  - **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, 2001, *2008*), Acemoglu-Johnson-Robinson (2001, 2002, 2005), Galor-Moav-Vollrath (2009), Cheung-Palivos-Wang-Wang-Yip (2017)**

- **The importance of institutions: institutional factors**
  - **affect laws and regulations under which households and firms function**
  - **shape the incentives individuals have for various decision-making**

- **Institutions and growth: *Acemoglu-Naidu-Restrepo-Robinson (2017)*, Acemoglu-Robinson-Verdier (2017), *Wang-Wong-Yip (2017)***

B. Societal Hierarchy and Institutions: Acemoglu and Robinson (2008)

- **While Acemoglu-Johnson-Robinson (2005) provide convincing empirical evidence and informal arguments on the role of institutions played in the development of Western European Atlantic traders, a formal modeling framework has been absent**
- **This paper makes crucial progress toward filling the gap by constructing a model to study how changes in political institutions can lead to subsequent changes in economic institutions**

1. The Model

- **Total population L within which there is a small elite (E) group of size M with the remaining as general citizen (C)**
- **Preference:** $\sum_{j=0}^{\infty}\beta^{j}\left(c_{t+j}^{h,i}+G_{t+j}^{h}\right)$**, linear over private/public goods, h** $\in$ **{E, C}**
- **In each period, only 2 types of public goods are provided:**
  - g_{t+j} **= e (elite type)** => $G^{E}_{t+j} = \gamma^{E} > 0$, $G^{C}_{t+j} = 0$
  - g_{t+j} **= c (citizen type)** => $G^{E}_{t+j} = 0$, $G^{C}_{t+j} = \gamma^{C} > 0$

- **Ricardian technology: each citizen owns one unit of labor (supplied inelastically), capable of producing A units of good**
- **Institutions: $\tau_t \in \{e, c\}$ (pro-elite or pro-citizen)**
  - **$\tau_t = c$ => $w_c = A$, $R_c = 0$**
  - **$\tau_t = e$ => $w_e = \lambda(1-\delta)A$, $R_e = (1-\lambda)(1-\delta)AL/M$**
    where δ = inefficiency loss due to labor repression under e-institution
  - **labor wage and elite rent differentials under the two institutions:**
    - **$\Delta w = w_c - w_e = [1-\lambda(1-\delta)]A > 0$**
    - **$\Delta R = R_e - R_c = (1-\lambda)(1-\delta)AL/M > 0$**
    - **since L/M is very large, $\Delta R >> \Delta w$**
- **Political regimes $s \in \{N, D\}$ (nondemocracy/monarchy or democracy)**
- **De facto political power depends on the investment in power-gaining:**
  - **elite:** $P_t^E(s) = \phi^E(s) \sum_{i \in \mathcal{E}} \theta_t^i(s)$
  - **citizen:** $P_t^C(s) = \phi^C(s) \sum_{i \in \mathcal{C}} \theta_t^i(s) + \omega_t + \eta I(s_t = D)$**, with**
    - **ω iid, drawn from a given distribution F with support ($\underline{\omega}$, ∞), $\underline{\omega} < 0$, and single-peaked density**
    - **η measuring citizens' de jure power in democracy**
  - **indicator of power $\pi \in \{e, c\}$: $\pi = e$ iff $P_t^E(s) \geq P_t^C(s)$, and = c otherwise**

- **Timing of events:**
  - **the group in power at t decides $g_t \in \{e, c\}$**
  - **each elite i ∈ E and each citizen i ∈ C choose their investment in gaining power and P^E_t is determined**
  - **ω is drawn from F and P^C_t is determined**
  - **if π = e, a representative elite chooses current institution and future regime (τ_t, s_{t+1}); otherwise, a representative citizen chooses**
  - **given τ_t, R_t and w_t are determined and consumption takes place**
- **Symmetric Markov perfect equilibrium (MPE):**
  - **equilibrium strategies are mappings from payoff-relevant states s ∈ {N, D}**
  - **all agents in the same group behave symmetrically**
- **Symmetry implies:**
  - $P^E\left(\theta^i, \theta^E(s), \theta^C(s)|s\right) = \phi^E(s)\left((M-1)\theta^E(s) + \theta^i\right)$
  - $P^C\left(\theta^i, \theta^E(s), \theta^C(s)|s\right) = \phi^C(s)L\theta^C(s) + \eta I(s=D) + \omega_t$
  - **pr(e in power) =** $p\left(\theta^i, \theta^E(s), \theta^C(s)|s\right) = F\left[\phi^E(s)\left((M-1)\,\theta^E(s) + \theta^i\right) - \phi^C(s)L\theta^C(s) - \eta I(s=D)\right]$
- **Backward induction within each stage implies the following best responses:**
  - **g(N) = e, g(D) = c**
  - **τ(e) = e, τ(c) = c**
  - **s′(e) = N, s′(c) = D**

- **Values under N (using one-step-ahead deviation principle a la Fudenberg-Tirole 1994):**
  - **elite:** $$V^E(N|\theta^E,\theta^C) = \max_{\theta^i \geq 0} \{-\theta^i + \gamma^E + p(\theta^i,\theta^E(N),\theta^C(N)|N)[R_e + \beta V^E(N|\theta^E,\theta^C)] + [1 - p(\theta^i,\theta^E(N),\theta^C(N)|N)][R_c + \beta V^E(D|\theta^E,\theta^C)]\}$$
  - **citizen:** $$V^C(N|\theta^E,\theta^C) = \max_{\theta^i \geq 0} \{-\theta^i + p_0(\theta^i,\theta^E(N),\theta^C(N)|N)[w_e + \beta V^C(N|\theta^E,\theta^C)] + [1 - p_0(\theta^i,\theta^E(N),\theta^C(N)|N)][w_c + \beta V^C(D|\theta^E,\theta^C)]\}$$

    where $p_0(\theta^i,\theta^E(s),\theta^C(s)|s) = F[\phi^E(s)M\theta^E(s) - \phi^C(s)((L-1)\theta^C(s) + \theta^i) - \eta I(s = D)]$ **is the conditional probability for e in power given all elite members choosing θ^E and all other citizens choosing θ^i**
- **First-order conditions for power-spending θ under N:**
  - **elite:** $\phi^E(N) f[\phi^E(N)((M-1)\theta^E(N) + \theta^i) - \phi^C(N)L\theta^C(N)][\Delta R + \beta\Delta V^E] \leq 1$
  - **citizen:** $\phi^C(N) f[\phi^E(N)M\theta^E(N) - \phi^C(N)((L-1)\theta^C(N) + \theta^i)][\Delta w + \beta\Delta V^C] \leq 1$

    where $\Delta V^E \equiv V^E(N|\theta^E,\theta^C) - V^E(D|\theta^E,\theta^C)$ **and** $\Delta V^C \equiv V^C(D|\theta^E,\theta^C) - V^C(E|\theta^E,\theta^C)$ **measure value differentials between two political regimes**
- **Values under D and the associated first-order conditions:**
  - **elite:** $$V^E(D|\theta^E,\theta^C) = \max_{\theta^i \geq 0} \{-\theta^i + p(\theta^i,\theta^E(D),\theta^C(D)|D)[R_e + \beta V^E(N|\theta^E,\theta^C)] + [1 - p(\theta^i,\theta^E(D),\theta^C(D)|D)][R_c + \beta V^E(D|\theta^E,\theta^C)]\}$$

    (FOC) $\phi^E(D) f[\phi^E(D)((M-1)\theta^E(D) + \theta^i) - \phi^C(D)L\theta^C(D) - \eta][\Delta R + \beta\Delta V^E] \leq 1$

- **citizen:** $V^C(D|\theta^E,\theta^C) = \max_{\theta^i \geq 0} \{-\theta^i + \gamma^C + p_0(\theta^i,\theta^E(D),\theta^C(D)|D)[w_e + \beta V^C(N|\theta^E,\theta^C)] + [1 - p_0(\theta^i,\theta^E(D),\theta^C(D)|D)][w_c + \beta V^C(D|\theta^E,\theta^C)]\},$

  (FOC) $\phi^C(D) f[\phi^E(D) M\theta^E(D) - \phi^C(D)((L-1)\theta^C(D) + \theta^i) - \eta][\Delta w + \beta \Delta V^C] \leq 1$

2. Results

- **Power-gaining investment: Any symmetric MPE involves:**
  - **$\theta^C(N) = \theta^C(D) = 0$: this is because the elite group has much larger gains from power than citizens ($\Delta R >> \Delta w$), implying two of the 4 FOCs hold for inequality**
  - **$\{\theta^E(N), \theta^E(D)\}$ solve the remaining 2 FOCs:**
    - $\phi^E(N) f[\phi^E(N) M\theta^E(N)]\,[\Delta R + \beta \Delta V^E] = 1$
    - $\phi^E(D) f[\phi^E(D) M\theta^E(D) - \eta]\,[\Delta R + \beta \Delta V^E] = 1$
- **Condition R: The additional rent by elite from labor repression is sufficiently large such that** $\min\{\phi^E(N) f[0]\,\Delta R, \phi^E(D) f[-\eta]\Delta R\} > 1$
- **State Dependence: Under Condition R, a symmetric MPE features:**
  - **Markov regime switch with the society fluctuating between {N,e} and {D,c}**
    - **with the regime probabilities p(N) > p(D) if** $\phi^E(N) > \phi^E(D)$
    - **with invariance p(N) = p(D) if** $\phi^E(N) = \phi^E(D) = \phi^E$

- **Condition I:** $\exists\ \bar{\theta}^E(N) > 0$ **s.t.** $\phi^E(N) f\left[\phi^E(N) M \bar{\theta}^E(N)\right]\left(\frac{\Delta R + \beta\gamma^E - \beta\bar{\theta}^E(N)}{1 - \beta F\left[\phi^E(N) M \bar{\theta}^E(N)\right]}\right) = 1$

  (interior power-gaining investment)
- **Condition D: Democracy creates a substantial advantage in favor of citizens s.t. $\eta > -\underline{\omega}$**
- **Nondemocracy as Absorbing State: Under Conditions I and P, there exists a symmetric MPE in which p(N) ∈ (0, 1) and p(D) = 0**
- **Comparative Statics: Under Condition R with $\phi^E(N) = \phi^E(D) = \phi^E$, a symmetric MPE features:**
  - **equilibrium power-gaining investments $\{\theta^E(N), \theta^E(D)\}$ are increasing in ΔR, β and η, and decreasing in M**
  - **the equilibrium probability for the elite to be in power is increasing in ΔR, β, η, and ϕ^E**
  - **more patient (β) or greater de jure power advantage for citizens (η) causes the elite to have greater incentive to invest in power-gaining and raises the likelihood of labor repression institution**
- **Meeting the facts: M was sufficiently large while η was sufficiently low in UK and the Netherlands, thereby *destroying the elite incentive to invest in its de facto power* and leading to the eventual establishment of the democracy regime**

C. Human Capital Institutions, Land Inequality and the Emergence of the Great Divergence: Galor-Moav-Vollrath (2009)

- **The Great Divergence: the ratio of per capita real GDP between the richest and poorest regions increased from 3 in 1820 to 18 in 2001 (Maddison 2001)**
- **Main idea: link human capital promoting institutions (public schooling/child labor regulations) to the emergence of the Great Divergence**

1. The Model

- **Agriculture production (CRS in workers and land):** $y_t^A = F(X_t, L_t)$
  - **(raw) labor demand:** $w_t^A = F_L(X_t, L_t)$
  - **land demand:** $\rho_t = F_X(X_t, L_t)$
- **Manufacturing production (CRS in physical/human capital):** $y_t^M = K_t^\alpha H_t^{1-\alpha} = H_t k_t^\alpha$
  - **(effective) labor demand:** $w_t^M = (1-\alpha)k_t^\alpha \equiv w^M(k_t)$
  - **capital demand:** $R_t = \alpha k_t^{\alpha-1} \equiv R(k_t)$
- **Two-period lived OG with pop(generation) = 1 and household preference:** $u_t^i = (1-\beta)\log c_{t+1}^i + \beta \log b_{t+1}^i$ **(i.e., an individual household values only 2nd-period consumption and bequest to descendant)**

- **Bequest tax: at rate τ_t, to finance public education e_t**
- **Intergenerational human capital transmission: $h_{t+1} = h(e_t)$, strictly increasing and strictly concave in e, satisfying h(0) = 1 and Inada conditions**
- **Household budget constraint: $c^i_{t+1} + b^i_{t+1} \leq I^i_{t+1}$, where $I^i_{t+1} = w_{t+1} + b^i_t(1-\tau_t)R_{t+1} + x^i\rho_{t+1}$**
- **Household optimization:**
  - **consumption-bequest allocation: $b^i_{t+1} = \beta I^i_{t+1}$**
  - **indirect utility: $v^i_t = \log I^i_{t+1} + \xi \equiv v(I^i_{t+1})$, where $\xi \equiv (1-\beta)\log(1-\beta) + \beta\log\beta$**

2. Equilibrium

- **Aggregate output:** $y_t = y^A_t + y^M_t$
- **Aggregate bequest:** $B_t = \beta y_t$
- **Public education:** $e_t = \tau_t \beta y_t$
- **Equilibrium capital evolution:**
  - **physical capital:** $K_{t+1} = (1-\tau_t)\beta y_t$
  - **human capital:** $H_{t+1} = \theta_{t+1} h(\tau_t \beta y_t)$, **where θ = manufacturing labor**
- **Equilibrium sectoral outputs:**
  - **agricultural sector:** $y^A_{t+1} = F(X, 1-\theta_{t+1}) \equiv y^A(\theta_{t+1}; X)$
  - **manufacturing sector:** $y^M_{t+1} = [(1-\tau_t)\beta y_t]^\alpha [\theta_{t+1} h(\tau_t \beta y_t)]^{1-\alpha} \equiv y^M(y_t, \tau_t, \theta_{t+1})$

- **Equilibrium capital-effective labor ratio:** $k_{t+1} = \frac{(1-\tau_t)\beta y_t}{\theta_{t+1} h(\tau_t \beta y_t)} \equiv k(y_t, \tau_t, \theta_{t+1})$**, which is strictly increasing in y and strictly decreasing in (θ, τ)**
- **Equilibrium labor allocation:**
  - **factor price equalization:** $w^A_{t+1} = h_{t+1} w^M_{t+1} \equiv w_{t+1}$
  - **MPL equalization:** $F_L(X, 1-\theta_{t+1}) = h(\tau_t \beta y_t)(1-\alpha)\left(\frac{(1-\tau_t)\beta y_t}{\theta_{t+1} h(\tau_t \beta y_t)}\right)^{\alpha}$**, implying:**
    - **the RHS is:**
      - **strictly increasing/concave in y and strictly decreasing in θ**
      - **strictly increasing/concave in τ if α < 1/2**
    - **the solution** $1-L_{t+1} = \theta_{t+1} = \theta(y_t, \tau_t; X)$ **is:**
      - **strictly increasing in y**
      - **strictly decreasing in (X, τ)**
- **Aggregate output-maximizing tax rate** τ_t^***:**
  - **(FOC):** $\theta_{t+1} w^M(k_{t+1}) h'(\tau_t^* \beta y_t) = R(k_{t+1})$**, implying:**
    - $\tau_t^* = \tau^*(y_t)$
    - $\tau^*(y_t) y_t$ **is strictly increasing in y**
  - **w (ρ) is strictly increasing (decreasing) in τ for** $\tau \in (0, \tau_t^*)$
  - **θ,** y^M **and (1-τ)R are all strictly increasing in τ for** $\tau \in (0, \tau_t^*)$
  - τ_t^* **is optimal to individuals with low landownership** x^i

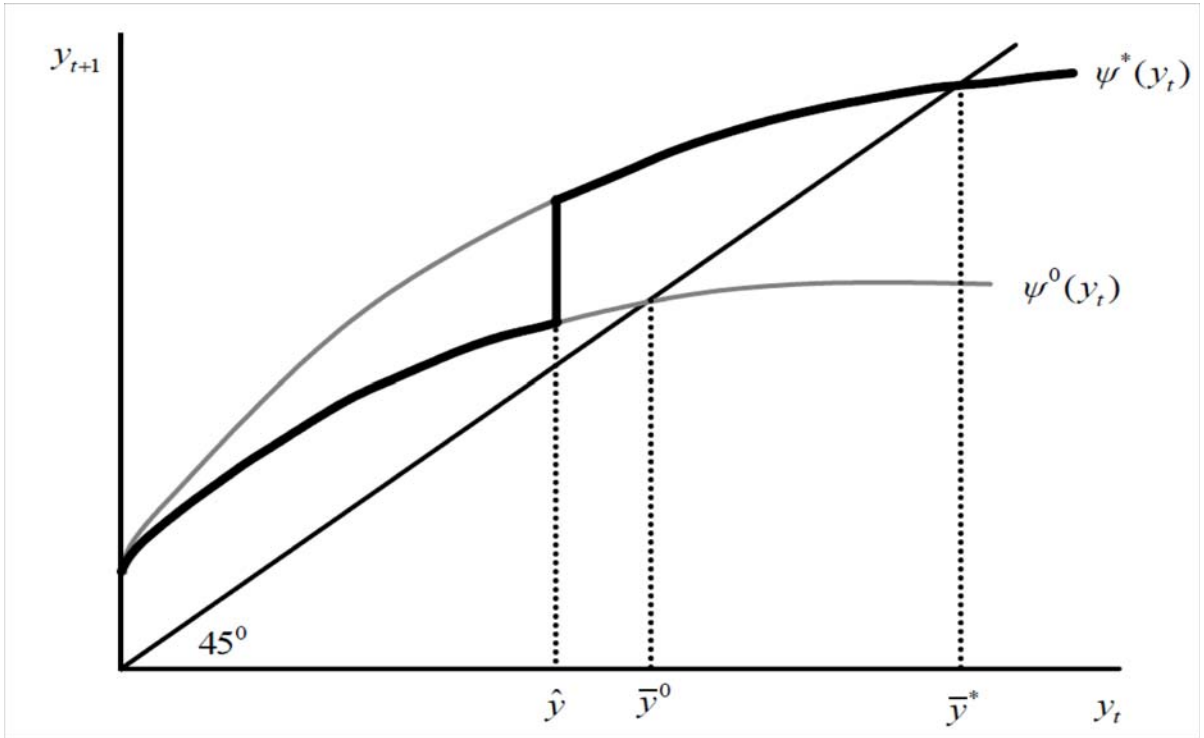
3. Political Equilibrium

- **Political mechanism: changes in the existing educational policy require the consent of all groups**
- **Landownership: suppose that a fraction λ of young individuals in period 0 are landlords, each owning an equal fraction 1/λ of the aggregate stock land X (i.e., per landlord land holding is X/λ) and being endowed with b_0^L units of output**
- **Key result: ∃ a critical income $\widehat{y}_t = \widehat{y}(b_t^L, \lambda; X)$ s.t. ∀ $y_t > \widehat{y}_t$, $\tau_t^L = \tau_t^*$, with $\widehat{y}$ increasing in X and decreasing in λ, satisfying:**
  - $\widehat{y}(b_t^L, 1; X) = 0$ **=> with no land inequality, human capital promoting institutions, $\tau_t^L = \tau_t^*$, emerges at date 0**
  - $\lim_{\lambda \to 0} \widehat{y}(b_t^L, \lambda; X) = \infty$ **(extremely high land inequality results in $\tau_t^L = 0$)**
- **Process of development: a nation's output per capita evolves according to:**

$$y_{t+1} = \begin{cases} \psi^0(y_t) \equiv (\beta y_t)^\alpha \theta_{t+1}{}^{1-\alpha} + F(X, 1-\theta_{t+1}) & for \quad \tau = 0; \\ \\ \psi^*(y_t) \equiv [(1-\tau_t^*)\beta y_t]^\alpha [\theta_{t+1} h(\tau_t^* \beta y_t)]^{1-\alpha} + F(X, 1-\theta_{t+1}) & for \quad \tau = \tau^* \end{cases}$$

  - $\psi^*(y_t) > \psi^0(y_t) \quad for\ y_t > 0$ **and both ψ^0 and ψ^j are:**
    - **strictly increasing and strictly concave in y with** $lim_{y_t \to \infty} d\psi^j(y_t)/dy_t = 0$
    - **strictly increasing in X**
  - **economic growth is higher under human capital promoting institution**

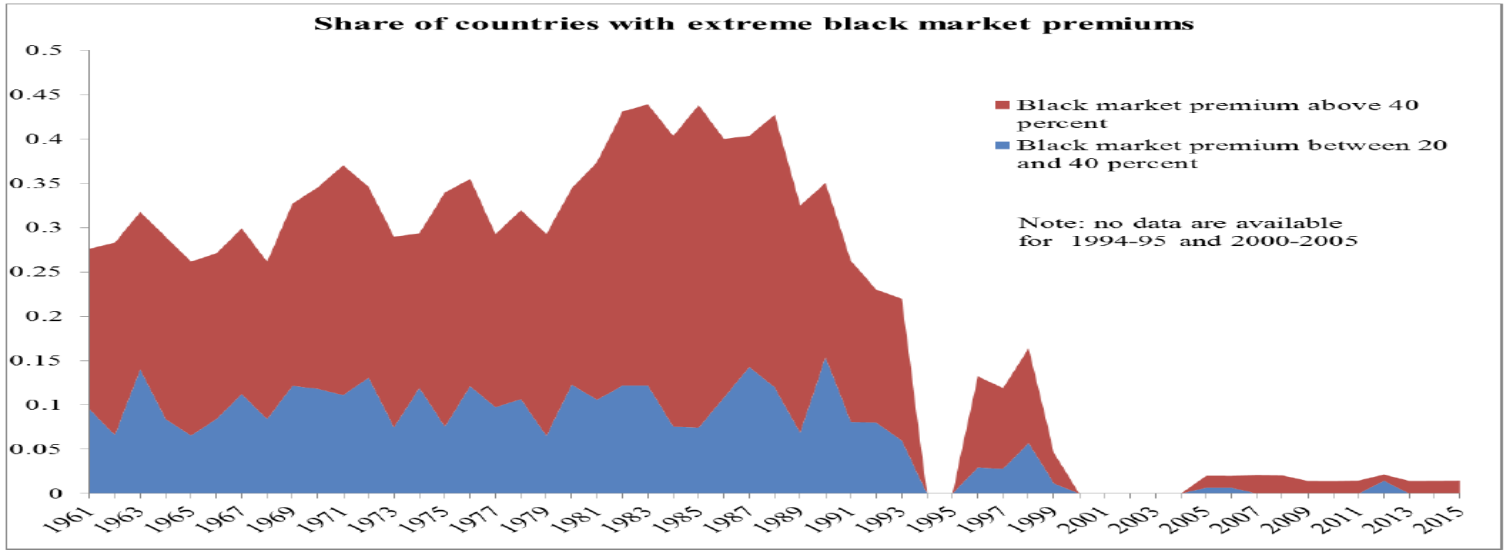
- **Switch to the human capital promotion regime:**

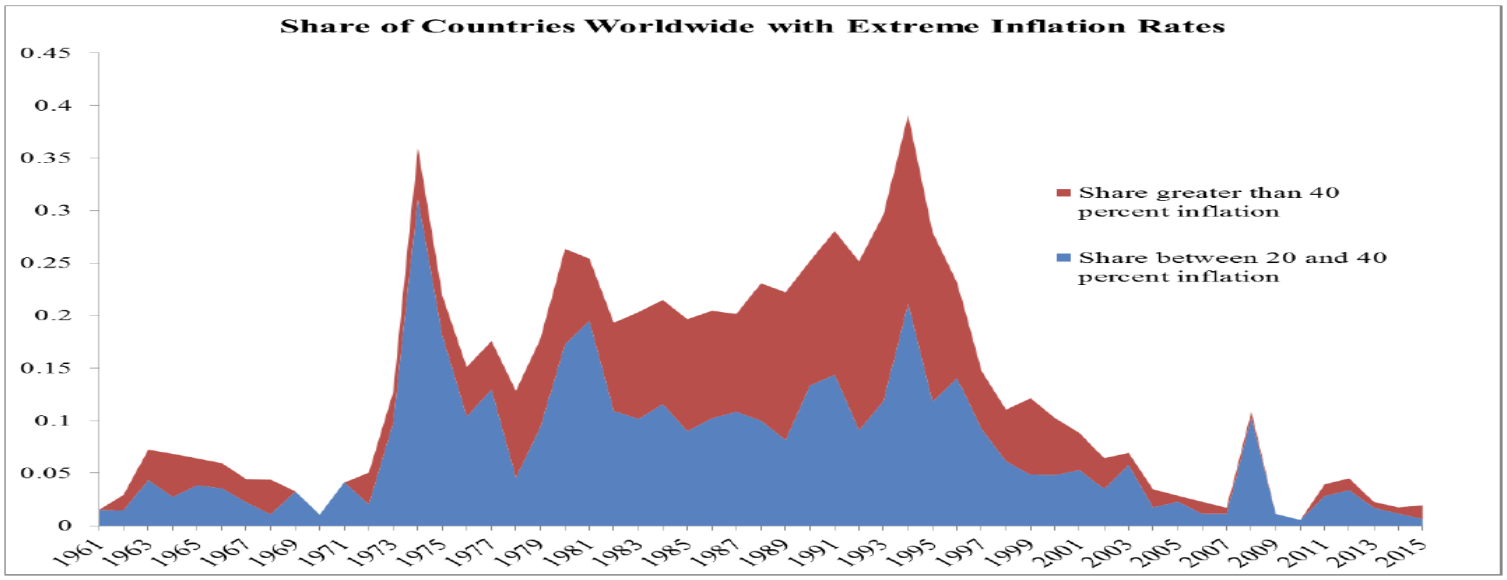


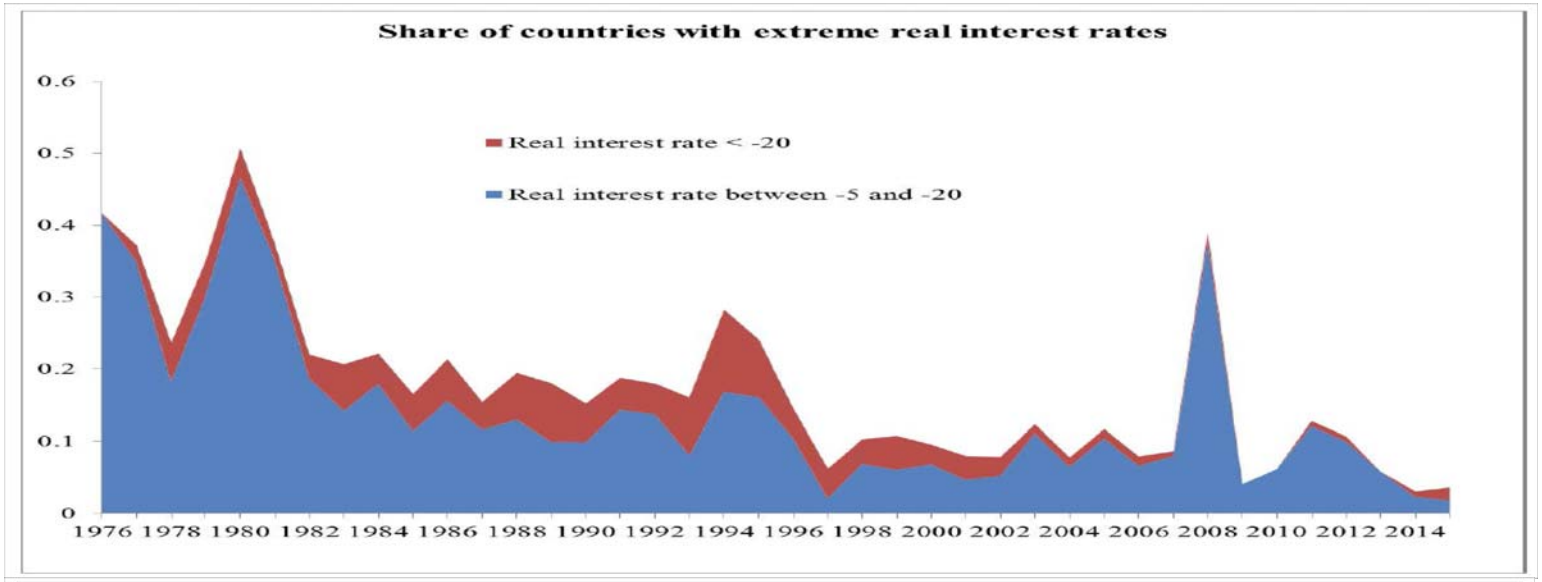
- **Main Finding: countries with *higher land inequality* will implement *sooner human capital promoting institutions* and experience *higher economic growth***
- **Empirical test: historical evidence in the U.S. during the high school movement over 1880-1920 suggests that the Northeast and the Pacific regions had lower land inequality and higher high school graduation rates than the South region**

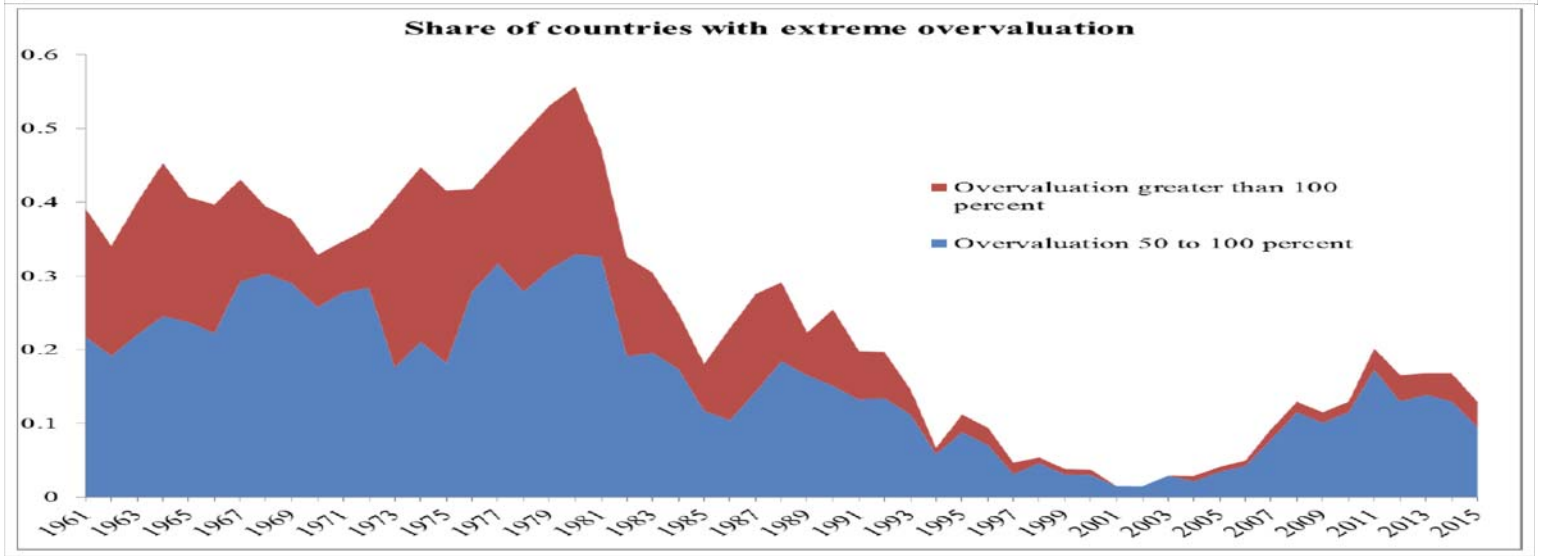
D. Can Policy Reforms Promote Growth: Easterly (2019)

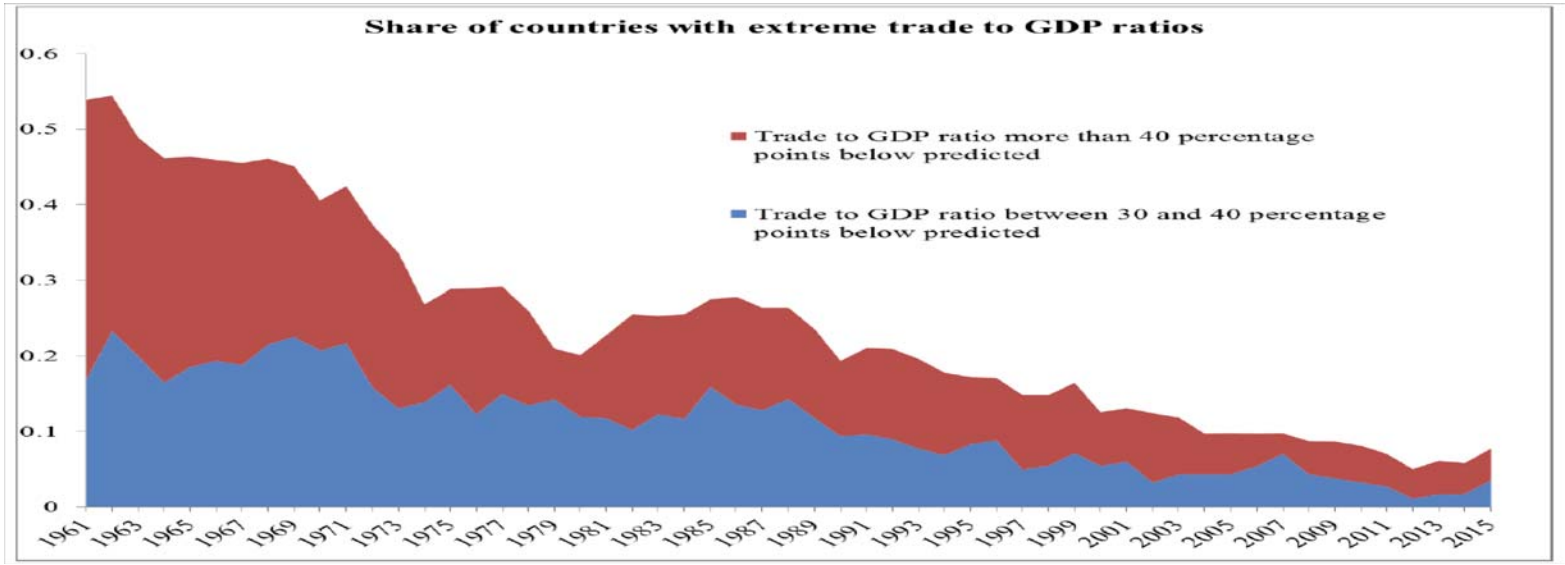
- Three new styplized facts:
  - policy outcomes worldwide have improved a lot since the 1990s,
  - improvements in policy outcomes and improvements in growth across countries are correlated with each other
  - growth has been good after reform in Africa and Latin America, in contrast to the "lost decades" of the 80s and 90s
- Stylize Fact 1: based on bad (blue) and extremely bad (red) policy indicators
  - black market preimum (bad: 20-40%, extreme: > 40%)
  - inflation (bad: 20-40%, extreme: > 40%)
  - real interest rate (bad: -20 to -5%, extreme: < -20%)
  - exchange rate overvaluation (bad: 50-100%, extreme: > 100%)
  - residual trade share (bad: -30 to -40% below predicted, extreme: -40% below predicted)
  - large improvements from 1980-1998 to 1999-2015


Share of countries with extreme black market premiums
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Black market premium above 40 percent
Black market premium between 20 and 40 percent
Note: no data are available for 1994-95 and 2000-2005


Share of Countries Worldwide with Extreme Inflation Rates
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015
Share greater than 40 percent inflation
Share between 20 and 40 percent inflation


Share of countries with extreme real interest rates
0.6
0.5
0.4
0.3
0.2
0.1
0
Real interest rate < -20
Real interest rate between -5 and -20
1976 1978 1980 1982 1984 1986 1988 1990 1992 1994 1996 1998 2000 2002 2004 2006 2008 2010 2012 2014

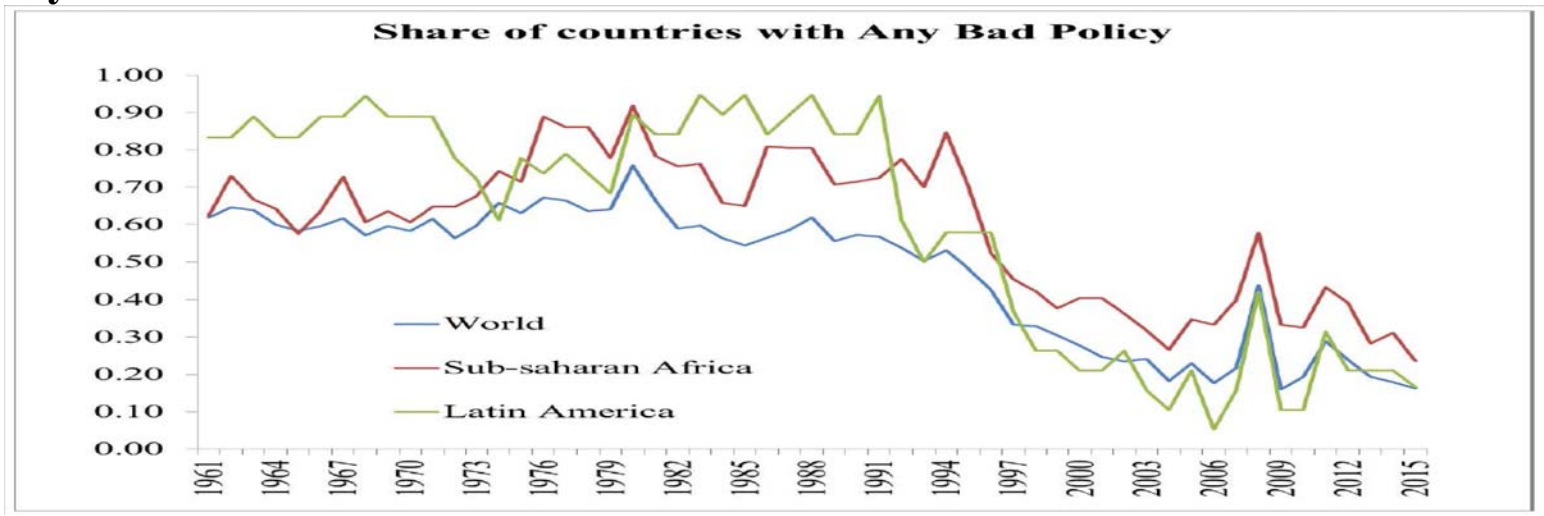

Share of countries with extreme overvaluation
0.6
0.5
0.4
0.3
0.2
0.1
0
Overvaluation greater than 100 percent
Overvaluation 50 to 100 percent
1961 1963 1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015

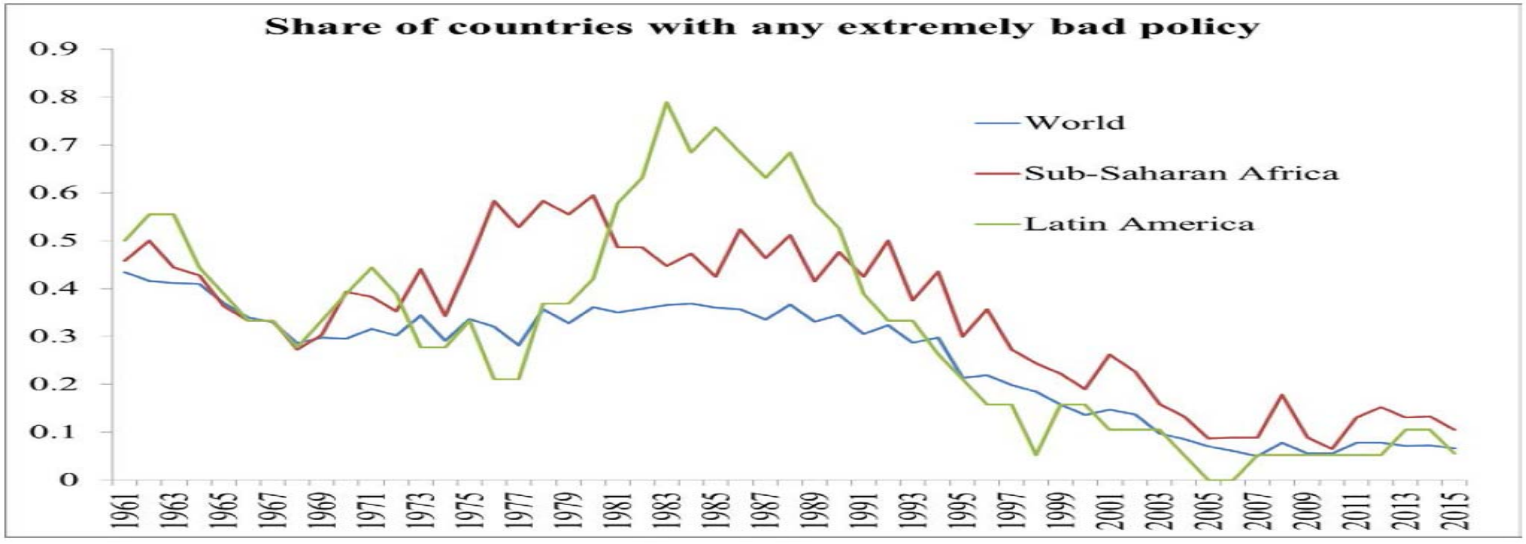


- **Stylize Fact 2: policy improvements correlated with growth enhancement**

	Countries that had any extreme policy 1980-1998			*Countries with no extreme policies 1980-1998*	
	1980-1998	1999-2015		1980-1998	1999-2015
Per Capita Growth	**0.7%**	**2.1%**		**2.3%**	**1.7%**
Frequency of Policy Outcomes:					
Black Market Premium Over 40	33.3%	6.0%		0.0%	0.0%
Inflation Over 40	16.7%	2.0%		0.0%	0.0%
Real Interest Rate Below -20	8.0%	1.5%		0.0%	0.2%
Overvaluation Over 100 Percent	10.9%	1.7%		0.0%	0.0%
Residual Trade Share -40 Below Predicted	19.0%	7.4%		0.0%	3.9%
Number of observations on per capita growth	1603	1541		928	878
Number of countries	92	92		52	52

- **Stylized Fact 3: reversal of lost decades in Africa and Latin America**





	Africa 1980-98	Africa 1999-2015	Actual Africa growth change	Predicted Africa growth change
Per Capita Growth	0.1%	1.8%	1.76%	1.27%
Frequency of Policy Outcomes:				
Black Market Premium Over 40	27.5%	3.7%		0.22%
Black Market Premium 20 to 40	10.8%	0.7%		0.04%
Inflation Over 40	14.6%	3.0%		0.31%
Inflation 20 to 40	15.3%	4.9%		0.13%
Real Interest Rate Below -20	9.2%	2.2%		0.05%
Real Interest Rate -20 to -5	20.1%	8.9%		-0.02%
Overvaluation Over 100 percent	15.0%	4.1%		0.17%
Overvaluation 50 to 100 percent	20.2%	10.1%		0.03%
Residual Trade Share -40 Below Predicted	19.0%	8.1%		0.25%
Residual Trade Share -40 to -30 Below Predicted	15.0%	6.5%		0.10%

	Latin America 1980-98	Latin America 1999-2015	Actual Latin America growth change	Predicted Latin America growth change
Per Capita Growth	0.4%	2.1%	1.67%	1.74%
Frequency of Policy Outcomes:				
Black Market Premium Over 40	24.9%	7.4%		0.16%
Black Market Premium 20 to 40	15.9%	1.6%		0.06%
Inflation Over 40	27.5%	2.2%		0.67%
Inflation 20 to 40	24.9%	4.1%		0.25%
Real Interest Rate Below -20	10.9%	2.3%		0.06%
Real Interest Rate -20 to -5	13.5%	9.6%		-0.01%
Overvaluation Over 100 percent	4.8%	0.7%		0.06%
Overvaluation 50 to 100 percent	8.3%	4.1%		0.01%
Residual Trade Share -40 Below Predicted	17.7%	2.5%		0.34%
Residual Trade Share -40 to -30 Below Predicted	14.9%	3.8%		0.13%

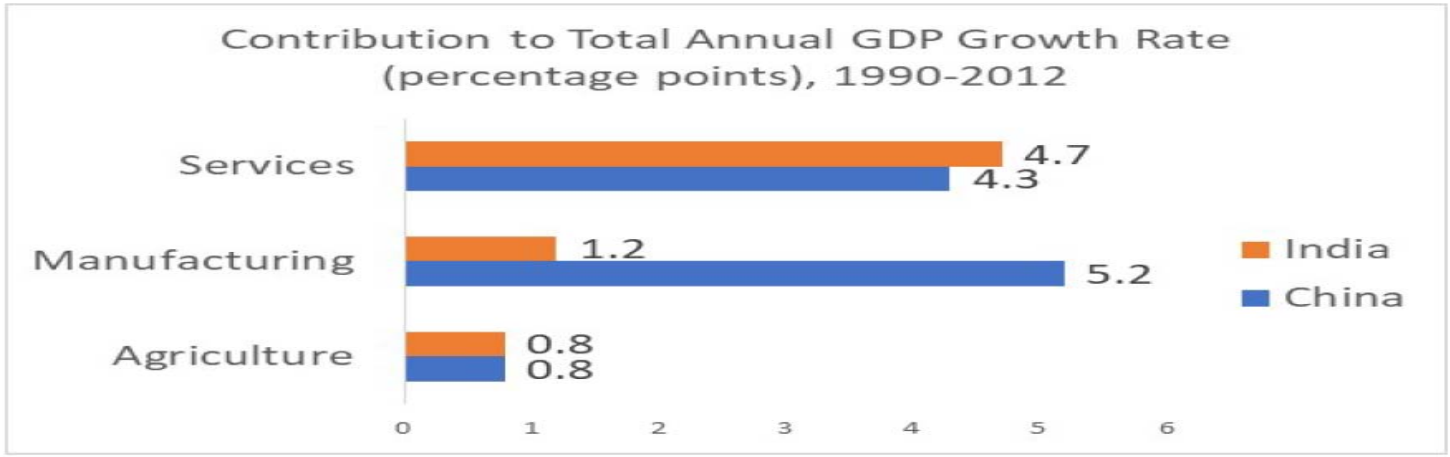
E. Failure of Hyperglobalization: Rodrik (forthcoming)

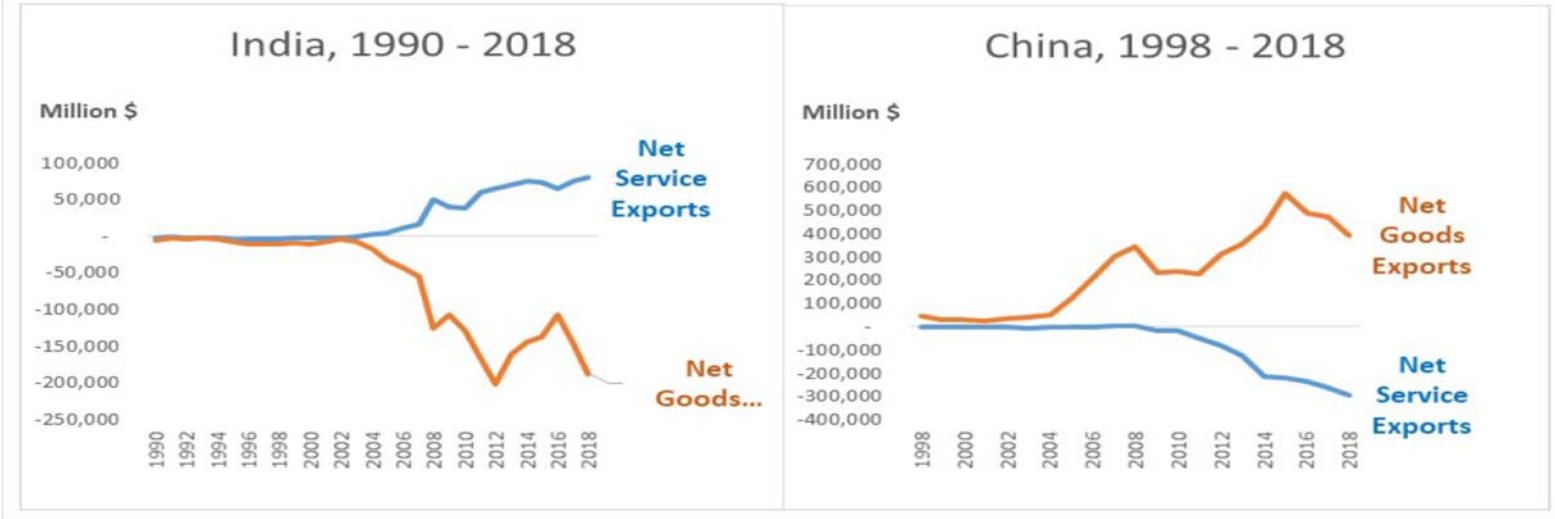
- **The recent rise of populism, long dragging pandemic that caused broken global supply chain and tensions of trade & chip wars have all led to deglobalization**
- **Rodrik (forthcoming) argues that this is foreseeable long before the recent development because an international order lacks a global enforcer where "global institutions are, by their nature, weak, and have no enforcement power"**
- **The past trend of globalization:**
  - **the first era of globalization in the modern period: Gold Standard**
  - **the second major global economic order: Bretton Woods regime where the state played a key role in macro-prudent policy as well as in the creation of social insurance and a welfare state and in restructuring the economy, which, in the field of international relations (IR), is referred to as an era of embedded liberalism**
  - **the third era after the 1990s: hyper-globalization era where the global economic system entailed deeper integration in goods/service trade and in financial markets and where, as a by-product, democracy was strengthened globally that also ensured lessen conflict, which in IR is referred to as *liberal internationalism***

- **Problems underlying such development:**
  - **Developing countries such as China rose quickly, threatening the leaders**
  - **When the fast comers turn out to be non-democratic, there would be national security concerns as well**
  - **Major powers in turn became obsessed with geopolitical competition, best illustrated by the US-China case, leading to zero-sum geopolitical games**
- **These problems worsened with populism. pandemic isolation and broken global supply chain, thereby causing decoupling and deglobaling with trade and chip wars that further damaging the global supply chain**
- **A million dollar question: Does hyper-globalization come to an end?**

F. The Role of Service Trade in Global Development Baldwin (forthcoming)

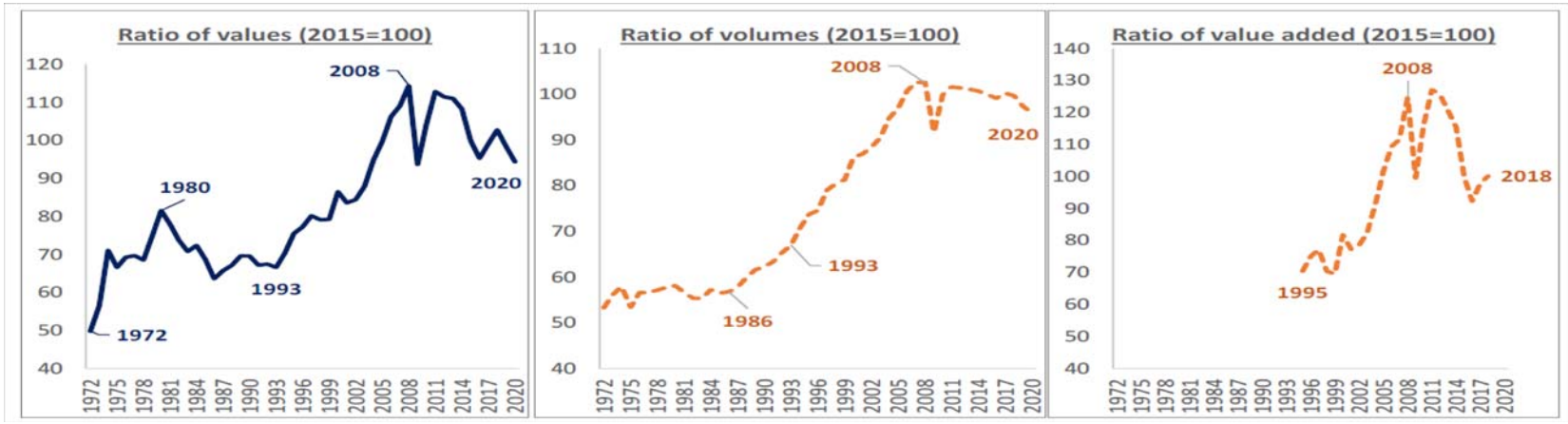
- **A bright angle to deglobalization is an stylized fact suggesting that services, rather than goods, may have played more important roles in development of some major economies, as stressed by Baldwin (forthcoming)**
- **For example, in contrast with China where most trade were in manufactured goods, India's export boom came from the service sector**



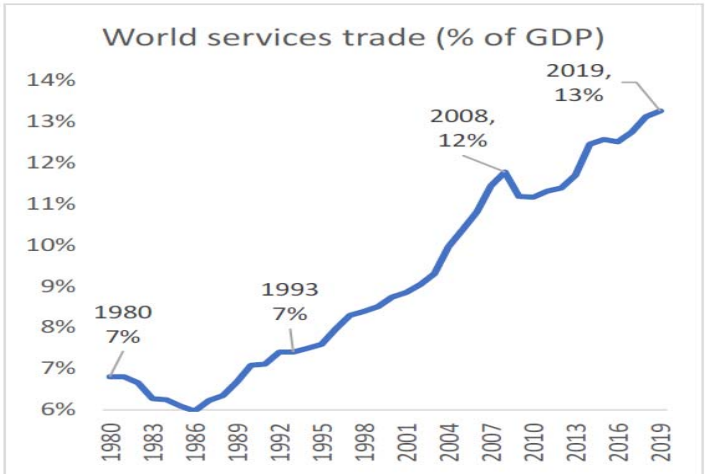


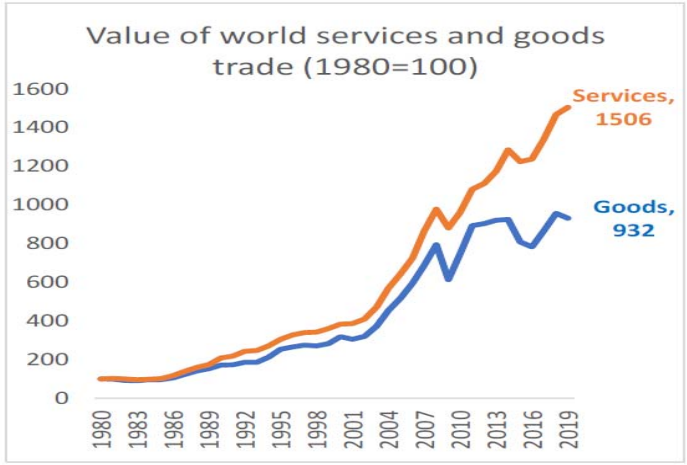
- **More importantly, in the world, goods trade intensity has peaked, but services trade intensity has not**

- **world goods exports to GDP ratios:**



- **world services exports to GDP ratios**





- **While the global trend is obvious, the China path seems to be non-viable**
- **Could the non-viable path be responsible for inducing the conflict and tension as seen?**
- **If so, deglobalization and disturbance to global order may be limited to a smaller group of countries, rather than the entire world economy,**
- **This is particularly relevant because services trade is less vulnerable to global supply chain issues and less subject to tariff or export controls**

G. Global Supply Chain Uncertainty and Geopolitics – Glopalorization of the Semiconductor Industry: Lee-Wang-Wang (Stimson Center 2023)

- **Rise of the Semiconductor Industry**
  - **Rapid industrialization and digitalization => strong demand for chips**
  - **Continual technical progress, expansion of scales economics, modularization (component sourcing without upfront payment of fixed costs) and improvements in organization capital => continual reduction in unit cost of chips making**
  - **Cost reduction further induces more demands => vicious cycle**

- Trend reversal since trade wars, the pandemic and the rapid rise of China
  - In the name of national security
  - Glopolarization with intertwined global power configurations beyond multi-polarization (with separated powers)
  - Systematic economic tradeoff not yet carefully computed (counterfactual exercises)

- **Global supply chain development**
  - Modern supply chains are intricate and global, fueled by tech, communication, and transport progress
  - Firms procure globally for lower costs
    - yielding savings and market access
    - yet intensifying exposure to risks like disruptions, trade tensions, and regulations
  - In the semiconductor industry, better lithography equipment by ASML

    => TSMC can make smaller and more powerful chips

    => more profitable for NVIDIA and AMD to design even better chips

- **Human capital, human capital, human capital**
  - **Within high-tech skilled labor, one must have**
    - **Firm-specific skills**
    - **Fit with firm-specific organization capital & culture**
    - **Loyalty to maintain business secrets**
  - **This makes labor associated with high adjustment costs, much higher than capital that is known to be more flexible nowadays in the IT industry**
  - **New plants in a location with stronger union and less government incentive provision (public infrastructure, utility, among others) will lead to**
    - **Reconfiguration**
    - **Overinvestment in capital to compensate misfit in human capital/business culture**
    - **Lower productivity, especially measured by the average product of capital (labor productivity would be biased due to overinvestment in capital)**

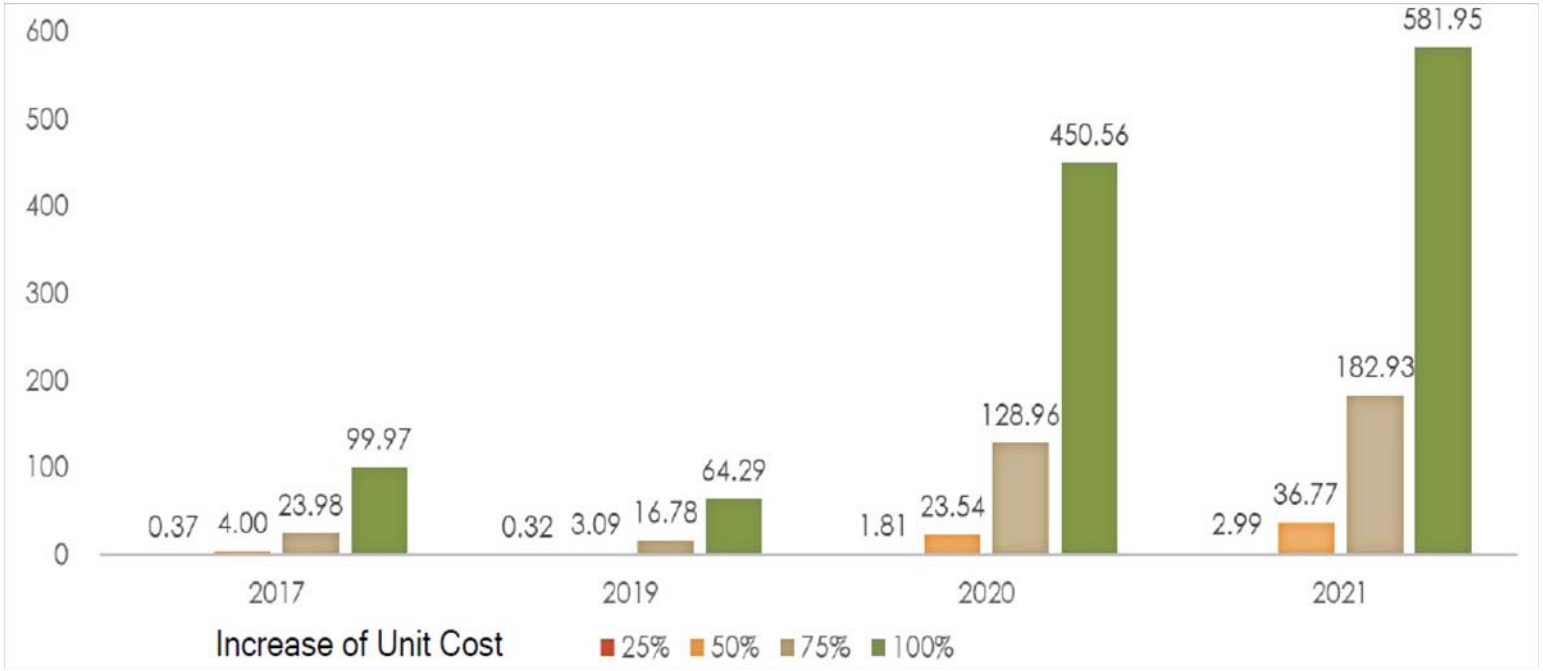
- **ICT giants compared: Taiwan vs. S. Korea (γ = Lucas span of control)**

Production Efficiency in Korea and Taiwan

$\gamma = 0.6$					
Korea	**2004**	**2005**	**2006**	**2007**	**2008**
DRAM	0.9686	0.9679	0.9576	0.9537	0.9667
Foundry					
LCD	0.9365	0.9216	0.9138	0.8897	0.9111
Korea Total	0.9524	0.9445	0.9354	0.9212	0.9385
Taiwan	**2004**	**2005**	**2006**	**2007**	**2008**
DRAM	0.5873	0.6120	0.8434	0.9433	0.9407
Foundry	0.9772	0.9616	0.9578	0.9583	0.9846
LCD	0.9455	0.9727	0.9121	0.9286	0.9324
Taiwan total	0.9019	0.9140	0.9200	0.9415	0.9527
$\gamma = 0.8/\gamma = 0.9$					
Korea	**2004**	**2005**	**2006**	**2007**	**2008**
DRAM	0.9493/0.9135	0.9529/0.9330	0.9225/0.8523	0.9233/0.8688	0.9558/0.9502
Foundry					
LCD	0.8910/0.8121	0.8537/0.7486	0.8161/0.6847	0.7315/0.5885	0.7922/0.6573
Korea Total	0.9197/0.8613	0.9019/0.8357	0.8677/0.7639	0.8218/0.7151	0.8701/0.7903
Taiwan	**2004**	**2005**	**2006**	**2007**	**2008**
DRAM	0.2884/0.1909	0.3112/0.2057	0.6715/0.5500	0.8771/0.7268	0.8590/0.6820
Foundry	0.9477/0.9147	0.9201/0.8835	0.9140/0.8774	0.9158/0.8798	0.9661/0.9455
LCD	0.9049/0.8704	0.9388/0.9006	0.7523/0.6047	0.8028/0.6636	0.8179/0.6906
Taiwan total	0.7981/0.7335	0.8116/0.7434	0.7979/0.6871	0.8528/0.7461	0.8760/0.7757

- **Counterfactual – Labor/Capital Reconfiguration & Changes in Unit Costs: 25%-100% rise in unit cost due to increase in labor adjument cost scalar γ_L or/and capital adjument cost scalar γ_K**
  - **Case 1: Increase in γ_L with γ_K fixed**

- **Case 2: Increase in γ_K with γ_L fixed**



- **Case 3: Increase in both γ_L and γ_K proportionally**

- **Geopolitics and economic/national security**
  - **Economic security**
    - **Main semiconductor players have been pure-play foundry fab**
    - **Compared with other integrated device manufacturers (IDMs), foundry makers have advantages on order acceptance, less trade secret theft**
    - **Yet, due to its centrality, the threat to supply chain causes concerns about economic security**
    - **But no immediate threat to national security because military/public uses of chips are legacy (mature) rather than advanced (cutting-edge) chips (≤14nm, led by TSMC's 1.5/2/3nm – ICT sustainability)**
  - **Global slowdown is expected when reverting the trend of modularization**
    - **The US's 1930 Smoot-Hawley tariff is believed to induce tariff wars and defensive trade blocs and later political and military alliance, eventually as a trigger of WWII (Kindleberger 1989)**
    - **Boulevard of Broken Dreams (Lerner 2012): VC subsidy after the Great Recession failed**
    - **After 25 years of operation, TSMC-Camas still incurred 50% higher cost in its production of legacy chips (Morris Chang)**

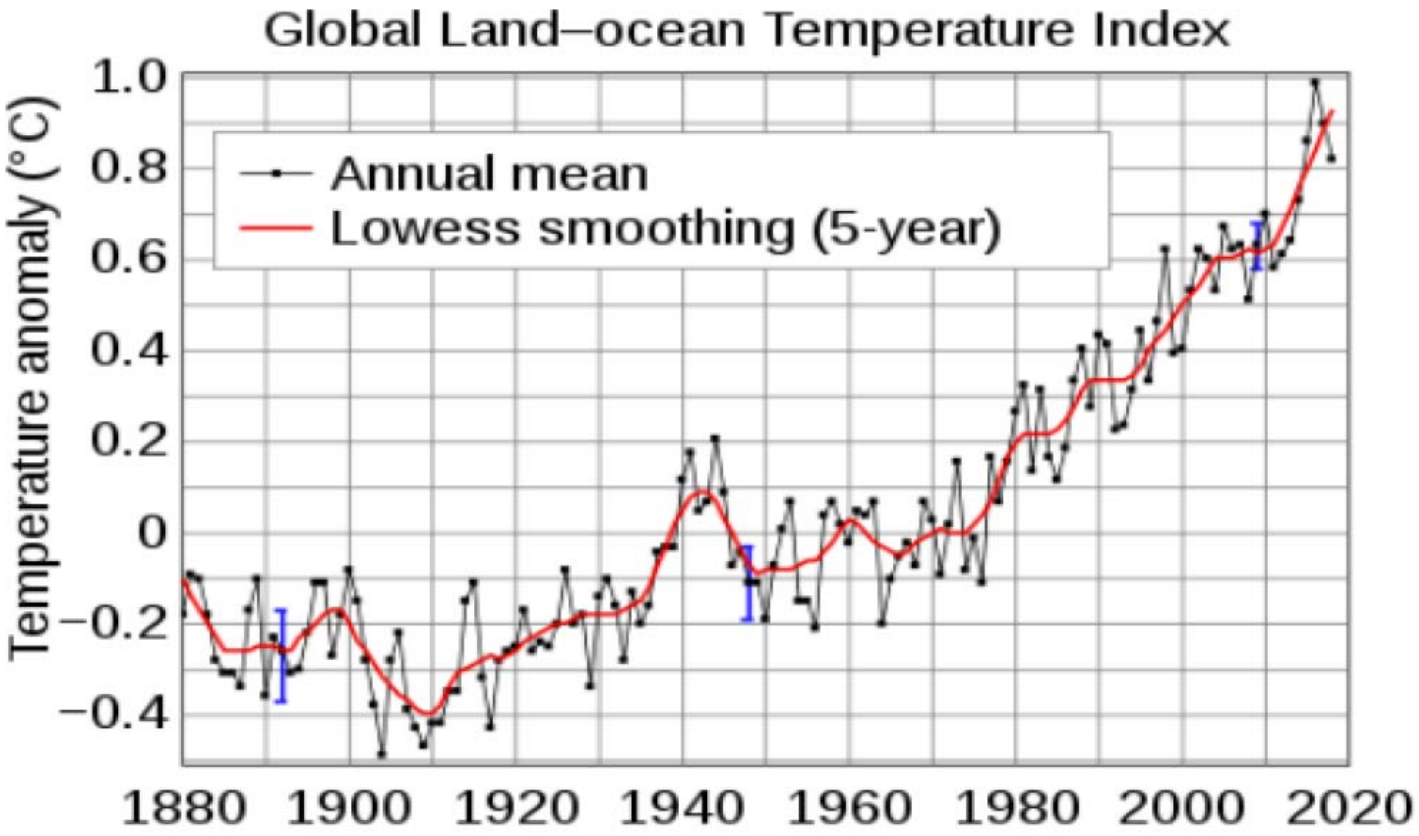
- **Protection and misaligned subsidy policy such as Export Control and Chips Act (ex: the US $52 billion subsidy) may not ensure national security while leading to misallocation and harming economic security**
- **TSMC will faces major adjustments in response to Chip War with large reconfiguration cost, particularly huge labor adjustment costs and relatively moderate capital adjustment costs**
  - **Large manpower gaps in the U.S. as well as other international fabs is the chief concern**
  - **Increasingly sophisticated semiconductor manufacturing harder to re-establish in economies with deindustrialization**
  - **Shortage of high skilled semiconductor labor as most international universities have not offer comprehensive courses**
  - **Shortage of peripheral manpower (construction/operational jobs)**
  - **Possible shortage and misalignment in government incentive and infrastructure provision**
  - **Possible “downgrade” from skill intensity to capital intensity**

- **Experts views:**
  - **Mark Liu (TSMC CEO, stepped down December 2023) and Matt Pottinger (former top Asia official on National Security Council) both dismissed the idea that Taiwan's Silicon Shield would deter China**
  - **Stimson Centre study of Taiwan's Silicon Shield (2022) suggested that the U.S. could lift some sanctions and export bans against China in return for a commitment from Beijing to adopt a less threatening posture.**
- **Summing up, the current semiconductor policy is likely a lose-lose strategy**

H. Climate Changes and Global Development: Rossi-Hansberg (forthcoming)

- **Beyond conventional macroeconomic considerations, severe climate changes have led to deep concern about the earth and the act of Net-Zero Emissions by 2050 and its enforcement using tax policies have been foreseen to yield significant macroeconomic implications (e.g., EU)**
- **Scientists have long realized the damage of human activities on the earth, inclusive drastic climate changes such as global warming**
- **The Intergovernmental Panel on Climate Change (IPCC) report released in October 2018 indicated that carbon dioxide were over 400 parts per million (ppm), causing global warming of 3°C above the late 19th century benchmark**
- **To hold it below 2°C needs to cut emissions by around 40% absolutely in the next two decades, with much bigger cuts required for 1.5°C.**

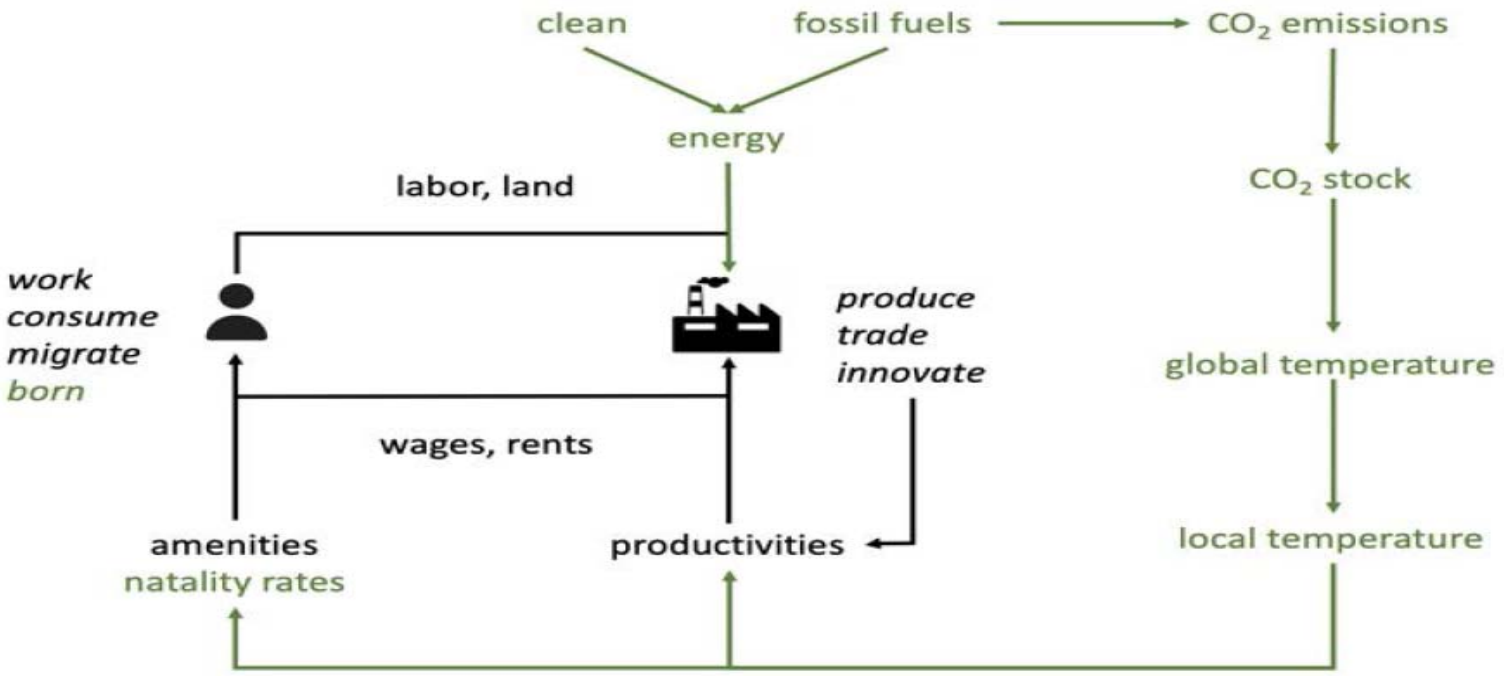
- **Global land-ocean temperature index from late 19 century to 2020:**



  - **one can see a much steeper trend during the post-WWII period, especially since 1975**

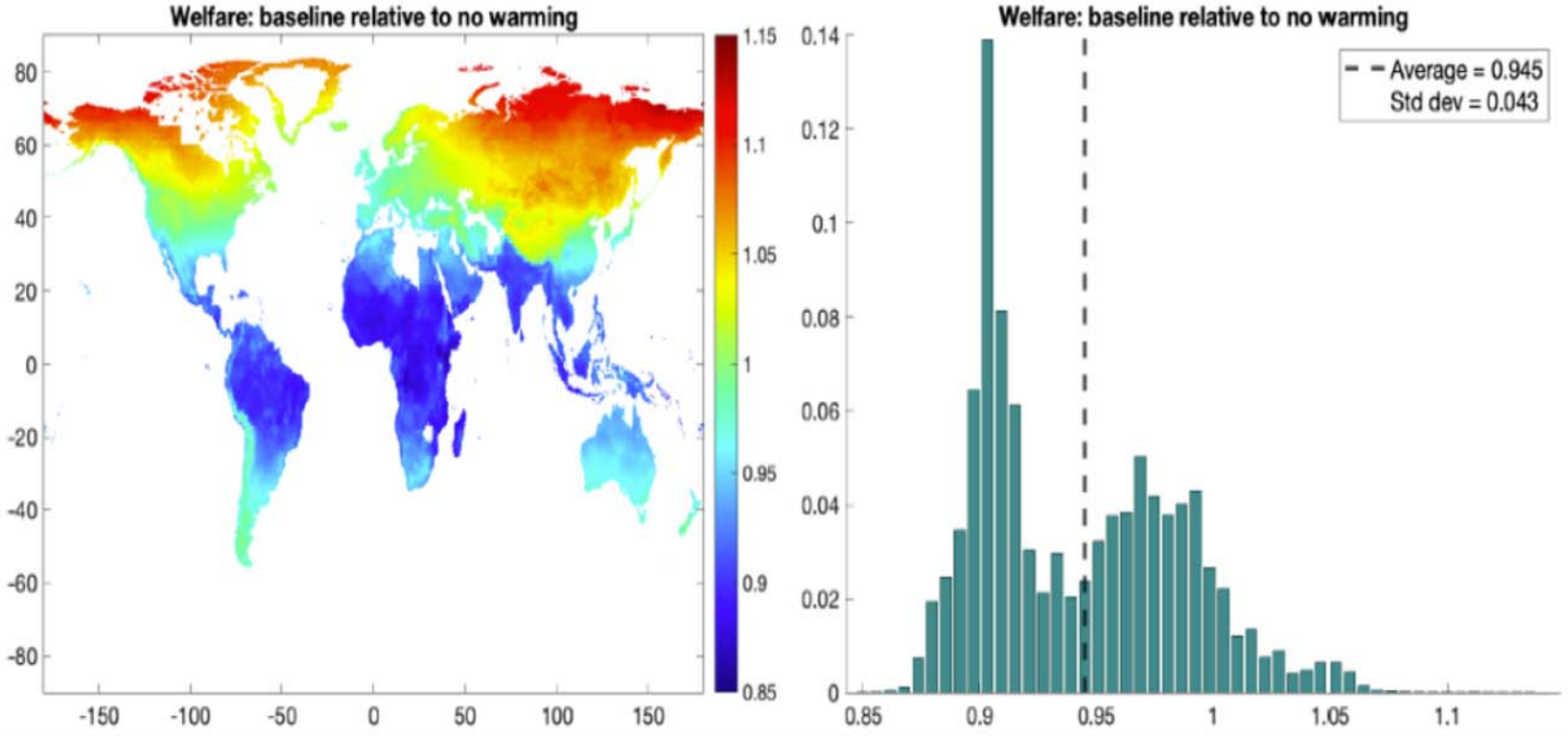
- **Rossi-Hansberg (forthcoming) and his coauthored work Rossi-Hansberg and Cruz (2021, 2022) provide thorough model-based quantitative analysis.**
  - **Based on a spatial integrated assessment models, one may analyze the local social cost of carbon at a detailed spatial resolution**
  - **Because of significant heterogeneity of gains/losses from climate change across countries/locations, some places experience negative local social costs of carbon, while others with positive costs**
  - **This leads to the conflicts inherent in responding to climate change**

- **The structure of the model with a rich array of heterogeneities across workers, producers (firms), and locations/countries:**



- **Climate change thus leads to heterogeneous impact on welfare across countries/locations**

FIGURE 1 SPATIAL IMPACT ON WELFARE OF CLIMATE CHANGE



- **The big policy question: Is the single global agreement – the Paris Agreement – adequate for addressing the environmental issues?**
  - **The answer is, unfortunately and not surprisingly, no**
  - **The agreement's stated goal is to limit temperature increases to 1.5°C by 2100.**
  - **The average global carbon tax recommended by the Paris Agreement is at $12 per ton of CO2**
  - **This falls way short of achieving the goal: The necessary global carbon tax turns out to be unfeasibly large – at $500 per ton of CO2**
  - **This suggests a strong desire for alternative policies that remain unexplored.**