

Interdependent Development: Market Access and Institutions in a Global Economy

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Motivation - Market Access

- The **Debate of Geography vs. Institutions** on Economic Development:
 - Diamond (1997): geographic fundamentals are decisive.
 - Acemoglu and Robinson (2012): institutions are decisive.
- Yet geography can shape institutions themselves.
 - This paper: the role of market access
 - Different from geographical determinism: market access incorporates geography and various man-made factors such as political relations and the endogenous effects of institutions themselves.
- Empirical evidence of the **positive effect of market access and trade on economic development**: Ades and Glaeser (1999); Alcalá and Ciccone (2004); Alesina et al. (2000); Frankel and Romer (1999).
- This paper aims to understand the role of institutions in this relationship.

Motivation - Flying Geese

- Real market access: a country's firms' access to global markets evaluated in real terms.
- Trade barriers include geography, transport infrastructure/technology, and political relations.
- **Historical Anecdotes:**
 - Post-war growth of South Korea and Taiwan attributed to close political and economic ties with the US and Japan.
 - Sequential economic development observed in East Asia, suggesting a "flying geese" pattern. Institutional reforms along the way.
 - Mediterranean trade and medieval Venice (the onset of modern contracting institutions; Puga and Trefler (2014))
 - Atlantic trade (Acemoglu, Johnson, and Robinson 2005) and the flying geese pattern in Europe.

What this paper does

- We propose a theory of interdependent development among countries by explaining:
 - ① how a larger market access may induce institutional reforms and hence further economic development.
 - ② how this process can become a domino effect.
- Using Vietnamese and ICRG data, Jiao and Wei (2022) show that positive foreign demand shocks induce institutional reforms.
- We illustrate how the **mutual reinforcing effects between market access and institutions** works by building a general-equilibrium trade model.
- The flying geese pattern emerges from the mutual reinforcing effect in the global economy.
- Jiao and Wei's (2022) theory explains **the link from trade to institutional quality**; their small-open-economy approach captures only one side of the relationship.

How we do it

- Generalize the incomplete-contract model in Acemoglu et al. (2007) to a general equilibrium trade environment via Krugman (1980).
- National planners optimize their countries' welfare by choosing institutional qualities.
- Analyze competitive equilibrium, Nash equilibrium, and global optimal solution.

Preview of Main Findings

- Institutional quality and real market access are **complementary** in determining a country's real income.

$$\frac{w_i L_i}{P_i} = \left(\frac{M_i}{P_i^\sigma} \frac{D(\mu_i)}{f} \right)^{\frac{1}{\sigma}} L_i$$

- Real market access and real income are the same in the closed economy.
- Microfounds the empirical specification in Alcalá and Ciccone (2004)
- Under three types of solution concepts, we show that **an increase in real market access leads to higher institutional quality**.
- We highlight the role of **cross-country institutional externality through market access** and show that in both **institutional quality and welfare**:

global optimal > Nash E. > Competitive E.

Preview of Main Findings

- **Scale effect of the population** depends on the relative strength of real market access and institutional costs.
- **Trade diversion effect:** trade liberalization within a trade bloc induces worse institutional qualities outside the bloc.
- **Flying geese pattern**

Flying Geese

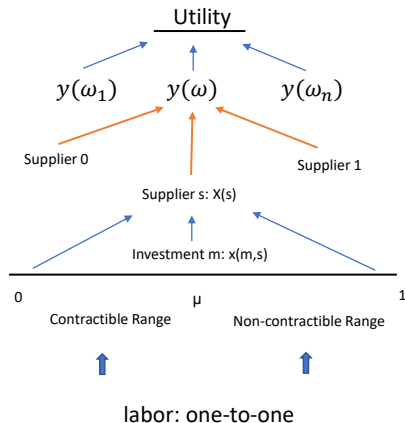
Literature Review

- **Institutions as a cause:** Acemoglu et al. (2007), Levchenko (2007), Chor and Ma (2021), and Beverelli et al. (2018)
- **Institutions as a result:** Acemoglu et al. (2005), Jiao and Wei (2022), Levchenko (2012), Mukoyama and Popov (2015), and Puga and Trefler (2014).
- This paper: **institutions as both a cause and a result $\Rightarrow$ interdependent development.**
- Levchenko (2012): the international competition among countries in the sector subject to the hold-up problem, which reduces the rents available, prompts lobbyists to improve institutions to increase comparative advantage.
- Puga and Trefler (2014): a dynamic theory that explains why the concentration of trade and wealth leads to a retreat in institutional quality.

Model Overview

- Take the incomplete-contract model of Acemoglu et al. (2007) and shut down technology adoption.
- Embed this into a general equilibrium trade model *à la* Krugman (1980).
- National planner's problems: Competitive E. and Nash E.
- Global planner's problem

Production and Consumption



$$U = (\int y(\omega)^\beta d\omega)^{1/\beta}; \quad P = (\int p(\omega)^{1-\sigma} d\omega)^{1/1-\sigma}$$

$$y(\omega) = \left(\int_0^1 X(s)^\alpha ds \right)^{1/\alpha}$$

$$X(s) = \exp \left(\int_0^1 \ln x(m,s) dm \right)$$

Timeline of the Model

- ① Each country's government chooses its contracting institutional quality μ_i .
- ② There is a large pool of potential entrants, and given institutional qualities $\{\mu_i\}_{i=1}^J$, the potential entrants decide whether or not to enter, and if yes, pay an entry cost f in units of labor.
- ③ Each entrant obtains a distinct product and becomes a monopolist for it. To produce, each monopolist firm produces using inputs procured from a unit continuum of input suppliers.

The Game Between a Firm and its Suppliers

- ① The firm ω offers a contract $[\{x_{i,c}(m, s)\}_{m=0}^{\mu_i}, \kappa_s]$ to every supplier s . Here $x_{i,c}(m, s)$ is the contractible investment level and κ_s is an upfront payment to each supplier s ;
- ② For $m \in [0, \mu_i]$, the suppliers invest $x_i(m, s) = x_{i,c}(m, s)$. For $m \in (\mu_i, 1]$, the suppliers determine investments $x_{i,n}(m, s)$ in anticipation of the ex-post distribution of the total revenue between the firm and the suppliers;
- ③ The firm and suppliers bargain over the division of the revenue, and at this stage, suppliers could withhold their specific services in non-contractible activities;
- ④ Output is produced and sold, and the revenue is distributed according to the bargaining agreement.

SSPE of the Game

- For the symmetric subgame perfect equilibrium (SSPE), first consider the bargaining stage.
- As in Hart and Moore (1990), the Shapley value is used as the bargaining solution.
- Symmetry: $x_c(m, s) = x_c(m, -s) = x_c$, $x_n(m, s) = x_n(s)$, and $x_n(m, -s) = x_n(-s)$. For the non-contractible portion, suppliers can “potentially” act differently.
- The Shapley value of supplier s is given by

$$SV_s = (1 - \gamma) [x_c^{\mu_i} x_n(-s)^{1-\mu_i}]^\beta M_i^{1-\beta} \left(\frac{x_n(s)}{x_n(-s)} \right)^{(1-\mu_i)\alpha}$$

where $\gamma \equiv \frac{\alpha}{\alpha+\beta}$.

- In equilibrium, $x_n(s) = x_n(-s) = x_n$, and

$$SV_s = (1 - \gamma) (x_c^{\mu_i} x_n^{1-\mu_i})^\beta M_i^{1-\beta} = (1 - \gamma) r_i.$$

SSPE of the Game

- Taking the upfront payment κ_s , the contractible investment x_c , and others' non-contractible investments $x_n(-s)$ as given, each supplier s solves

$$x_n = \arg \max_{x_n(s)} (1 - \gamma) [x_c^{\mu_i} x_n(-s)^{1-\mu_i}]^\beta M_i^{1-\beta} \left(\frac{x_n(s)}{x_n(-s)} \right)^{(1-\mu_i)\alpha} + \kappa_s \\ - \mu_i x_c w_i - (1 - \mu_i) x_n(s) w_i.$$

- This incentive compatibility constraint entails

$$x_n = \left[\frac{\alpha(1 - \gamma) x_c^{\mu_i \beta} M_i^{1-\beta}}{w_i} \right]^{\frac{1}{1-\beta(1-\mu_i)}}$$

- The firm solves

$$\pi = \max_{x_c} \gamma (x_c^{\mu_i} x_n^{1-\mu_i})^\beta M_i^{1-\beta} - \kappa_s$$

subject to the participation constraint of suppliers:

$$(1 - \gamma) [x_c^{\mu_i} x_n^{1-\mu_i}]^\beta M_i^{1-\beta} + \kappa_s \geq (\mu_i x_c + (1 - \mu_i) x_n) w_i.$$

SSPE of the Game

- The firm can extract all the surplus from its suppliers so that the participation constraint holds in equality.
- The firm's problem can be written as

$$\pi = \max_{x_c} (x_c^{\mu_i} x_n^{1-\mu_i})^\beta M_i^{1-\beta} - [\mu_i x_c + (1 - \mu_i) x_n] w_i,$$

and the solution is

$$x_c = [\alpha(1 - \gamma)]^{\frac{\beta(1-\mu_i)}{1-\beta}} B(\mu_i)^{1-\beta(1-\mu_i)} w_i^{-\frac{1}{1-\beta}} M_i,$$

where $B(\mu_i) \equiv \left[\left(\frac{1-\gamma}{1-\beta(1-\mu_i)} + \gamma \right) \beta \right]^{\frac{1}{1-\beta}}$ is a decreasing function in μ_i .

- Consequently,

$$x_n = [\alpha(1 - \gamma)]^{\frac{1-\beta\mu_i}{1-\beta}} B(\mu_i)^{\beta\mu_i} w_i^{-\frac{1}{1-\beta}} M_i$$

General Equilibrium given $\{\mu_i\}$

- The output for each differentiated good $y(\omega)$ is given by

$$y_i = X_i = x_{c,i}^{\mu_i} x_{n,i}^{1-\mu_i} = I(\mu_i) w_i^{-\frac{1}{1-\beta}} M_i$$

where $I(\mu) = [\alpha(1 - \gamma)]^{\frac{1-\mu}{1-\beta}} B(\mu)^\mu$.

- For any firm in country i , the price revenue, and profit are

$$p_i = y_i^{-\frac{1}{\sigma}} M_i^{\frac{1}{\sigma}} = I(\mu_i)^{\beta-1} w_i,$$

$$r_i = I(\mu_i)^\beta w_i^{-\frac{\beta}{1-\beta}} M_i,$$

$$\pi_i = D(\mu_i) w_i^{-\frac{\beta}{1-\beta}} M_i,$$

where

$$D(\mu) = \left[1 - (1 - \gamma) \left(\frac{\beta\mu}{1 - \beta + \beta\mu} + \alpha \right) \right] I(\mu)^\beta$$

- Conditional on wages and market access, overall production efficiency and firm profits increase in institutional quality.

General Equilibrium given $\{\mu_i\}$

- **Lemma 1.** $I(\mu)$ and $D(\mu)$ are both strictly increasing in μ .
- Conditioned on wages w_i and market access M_i , the higher the μ_i , the higher the
 - overall production efficiency (y_i)
 - firm profits (π_i) ... so the markups depends on μ_i .
- Free entry condition implies

$$M_i = \frac{w_i^\sigma f}{D(\mu_i)},$$

which implies that

$$\frac{w_i L_i}{P_i} = \left(\frac{M_i}{P_i^\sigma} \frac{D(\mu_i)}{f} \right)^{\frac{1}{\sigma}} L_i$$

Complementary between institutional quality and real market access in determining real income.

General Equilibrium given $\{\mu_i\}$

$$\frac{w_i L_i}{P_i} = \left(\frac{M_i}{P_i^\sigma} \frac{D(\mu_i)}{f} \right)^{\frac{1}{\sigma}} L_i$$

- As in Acemoglu et al. (2007), the term $D(\mu_i)^{1/\sigma}$ can be called the derived efficiency.
- In a **closed economy**, RMA = real income, and thus, real income is solely determined by the derived efficiency, and **RMA does not play a separate role**.
- In an open economy, RMA $\neq$ real income.

General Equilibrium given $\{\mu_i\}$

- The number of firms in country i is

$$n_i = \frac{L_i}{f + \mu_i x_c + (1 - \mu_i) x_n} \quad (21)$$

$$= \frac{L_i}{f} \left[1 - \beta \left(\frac{(1 - \gamma)\mu_i}{1 - \beta + \beta\mu_i} + \gamma \right) \right] \quad (22)$$

- The number of firms decreases (and hence the firm size increases) in institutional quality.
- More severe hold-up problems lead to smaller firm size.
- Hsieh and Olken (2014): developing countries like Indonesia and India have relatively more small firms compared with the US.

Determining Institutional Qualities

- For tractability, we focus on benevolent governments.
- The cost of building and maintaining the contracting institutional quality μ_i is final goods:

$$C_i(\mu_i, L_i) = A_i \mu_i^\rho L_i^\eta.$$

Examples:

- communication costs and investments in the legislative procedure
- public and compulsory education, law enforcement
- building the legal system
- attrition due to political economy
- A larger population $\Rightarrow$ a more heterogeneous or geographically dispersed population $\Rightarrow$ more difficulty
- A_i : country-specific factors in these costs, such as the country's geography, demography, and history.

Determining Institutional Qualities

- Lump-sum taxes t_i from each individual and balanced budget:

$$P_i C_i(\mu_i, L_i) = T_i = t_i L_i$$

- The benevolent government solves

$$\max_{\mu_i} W_i \equiv \frac{w_i L_i - T_i}{P_i}$$

which is equivalent to

$$\max_{\mu_i} W_i = \frac{w_i L_i}{P_i} - C_i(\mu_i, L_i),$$

which is equivalent to

$$\mu_i^* = \arg \max_{\mu_i} W_i = \left(\frac{M_i}{P_i^\sigma} \frac{D(\mu_i)}{f} \right)^{\frac{1}{\sigma}} L_i - A_i \mu_i^\rho L_i^\eta$$

Determining Institutional Qualities

Consider three solution concepts:

- **Competitive equilibrium** (numerous small countries) in which national planners take $\{P_i, M_i\}$ as given.
- **Nash equilibrium** (a few large countries) in which national planners do not take $\{P_i, M_i\}$ as given.
- **Global planner's solution**

Determining Institutional Qualities

- Lemma 2.** Given any $\beta \in (0, 1)$, for any x such that $x \in \left[\beta, \frac{\beta}{1-\beta}\right]$, let $\alpha_0(x)$ denote the unique solution to $(\sqrt{x} + 1) \frac{x}{\alpha_0 + x} - \ln \left(1 + \frac{x}{\alpha_0}\right) = 0$ with the constraint that $0 \leq \alpha_0 \leq 1$. Define

$$\bar{\alpha}_0(\beta) \equiv \max_{x \in \left[\beta, \frac{\beta}{1-\beta}\right]} \alpha_0(x)$$

If $\alpha > \bar{\alpha}_0(\beta)$, then $D(\mu)^{\frac{1}{\sigma-1}}$ is strictly concave, which, in turn, implies that the derived efficiency $D(\mu)^{\frac{1}{\sigma}}$ is also strictly concave.

- This lemma ensures that the marginal benefit in institutional quality is strictly decreasing.

Competitive Equilibrium

Proposition 2. Suppose that the regularity condition in Lemma 2 holds. There exists a unique competitive equilibrium in which $\{\mu_i = \mu_i^c\}_{i=1}^J$ satisfies

$$\frac{1}{\sigma} \left(\frac{\text{RMA}_i}{f} \right)^{\frac{1}{\sigma}} D(\mu_i)^{\frac{1-\sigma}{\sigma}} D'(\mu_i) L_i = \rho A_i \mu_i^{\rho-1} L_i^{\eta}. \quad (1)$$

Moreover, a country's institutional quality increases when its real market access increases with its population size held fixed.

Nash Equilibrium

Proposition 3. Suppose that the regularity condition in Lemma 2 holds. Also, suppose that there are J symmetric countries; i.e., $L_j = L$ and $A_j = A$ for all j , and that the trade costs for any pair of countries is $\tau \geq 1$. Then, there exists a unique symmetric Nash equilibrium in which $\{\mu_i = \mu^n\}_{i=1}^J$ satisfies

$$\varsigma(\phi, J) D(\mu_i)^{\frac{2-\sigma}{\sigma-1}} D'(\mu_i) L^{\frac{\sigma}{\sigma-1}} = \rho A \mu_i^{\rho-1} L^\eta, \quad (2)$$

where $\varsigma(\phi, J)$ increases in $\phi \equiv \tau^{1-\sigma}$ and J . Moreover, larger real market access, either induced by a decrease in trade cost τ or an increase in the number of trading partners $J - 1$, leads to a higher institutional quality.

Effects of Population Size

Proposition 4. Suppose that the regularity condition in Lemma 2 holds. Under the Nash equilibrium in the symmetric world,

- the equilibrium μ_i increases in L_i if $\eta < \frac{\sigma}{\sigma-1}$.
- the equilibrium μ_i decreases in L_i if $\eta > \frac{\sigma}{\sigma-1}$.

Institutional Externality

$$M_i \equiv \sum_j \tau_{ij}^{1-\sigma} d_j = \tau_{ii}^{1-\sigma} \frac{E_i}{P_i^{1-\sigma}} + \sum_{j \neq i} \tau_{ij}^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}} \quad (3)$$

- When a country improves its institutional quality, it increases its own real income and hence its (real) home market access
- A country's home market access is other countries' foreign market access.
- Both competitive and Nash equilibria are not optimal because they do not account for institutional externality effects.

Comparison of Three Solutions

The global planner's problem:

$$\max_{\{\mu_i\}} \sum_i W_i$$

Proposition 5. Suppose Lemma 2 holds. Suppose that there are J symmetric countries. Then, there exists a unique global planner's solution that satisfies

$$\frac{1}{\sigma-1} \left(\frac{1+(J-1)\phi}{f} \right)^{\frac{1}{\sigma-1}} D(\mu_i)^{\frac{2-\sigma}{\sigma-1}} D'(\mu_i) L^{\frac{\sigma}{\sigma-1}} = \rho A \mu_i^{\rho-1} L^\eta. \quad (4)$$

Moreover,

- ① $\mu^g > \mu^n > \mu^c$, and $W^g > W^n > W^c$.
- ② $\mu^n \rightarrow \mu^c$ and $W^n \rightarrow W^c$ as $J \rightarrow \infty$, whereas the gap between μ^g and μ^n and hence that between W^g and W^n remain.

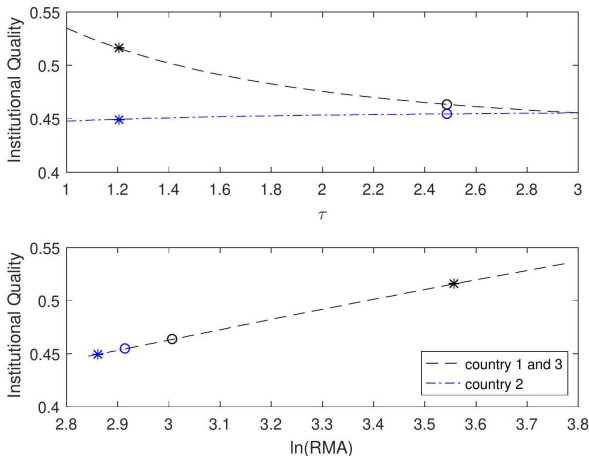
Nash E: An increase in μ_i increases the country's own real market access, and thus there is an amplifying effect that is absent in the CE case.

Nash Equilibrium with Asymmetric Countries

- A series of numerical simulations that verify the results (Propositions 2-4) under asymmetric countries.
- Robust across a wide range of parameters

Trade Diversion Effect

- Three countries with the same population size.
- Countries 1 and 3 reduce their bilateral trade costs from $\tau = 3$, whereas country 2's trade cost with the other two countries remains at $\tau = 3$.



Trade Diversion Effect

Country 2's institutional quality deteriorates because

- Trade diversion: Trade costs fall $\Rightarrow$ Price indices in Countries 1 and 3 fall $\Rightarrow$ fiercer competition for Country 2's firms in the other two countries' markets $\Rightarrow$ lower RMA_2
- Countries 1 and 3's improved institutional quality further reduces the price indices there and strengthens the trade diversion effect.
- Institutional externality effect: Country 2 strategically free rides on increased institutional qualities of the other two countries.

Flying Geese Pattern

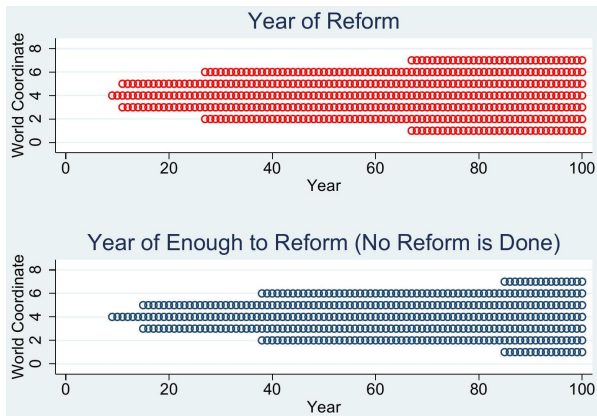
- J same-sized countries
- Geography
 - a line segment with the countries being spaced evenly
 - the one(s) in the middle enjoy the largest real market access – referred to as the "world center"
- Starting from $t = 0$, the trade costs are given by

$$\tau_{ijt} = 1 + \exp(-vt) \left(\tau_0^{|i-j|} - 1 \right),$$

where v is the tuning parameter governing the extent to which trade costs decline over time.

- Every country starts with μ_L , and to obtain and maintain μ_H , a fixed improving cost F is required for every period that this country wants the institutional quality μ_H .
- Nash equilibrium

Flying Geese Pattern



- The lower panel shows that even if institutional qualities are all fixed, countries have incentives to reform.
- The difference between the upper and lower panels: one country's institutional reform speeds up other countries' reforms.

Conclusion

Summary:

- The complementarity between real market access and institutional quality.
- Explain how institutional externality emerges through market access
- The complementarity + the institutional externality
⇒ real market access and institutional quality are mutually reinforcing.
- In both institutional quality and welfare,

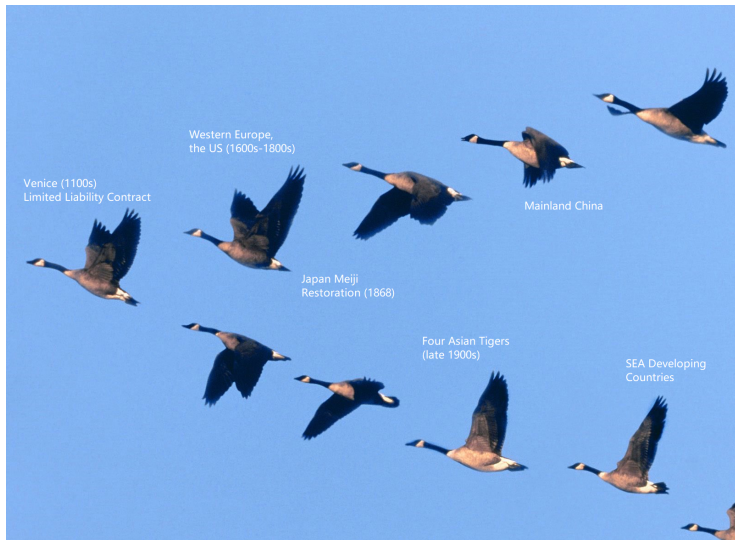
global optimal > Nash E. > Competitive E.

- Trade diversion effect.
- Flying geese pattern.

Policy Implications:

- The predicament in Africa? Trade diversion effect?
- Trade opportunity might be more important than macro or micro subsidies to induce institutional reforms.

Flying Geese Pattern of Institutions in the World

[Return](#)

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