Market Size, Trade, and Institution*

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Abstract

This paper proposes a theory of market size and institution by incorporating the incomplete-contract model in Acemoglu et al. (2007) in a general-equilibrium, open-economy environment and in a Nash-equilibrium setting in which national planners optimize their countries' welfare over institutional qualities. Our theory predicts that a larger effective market size leads to a higher institutional quality, that a status-quo country may reduce its institutional quality when other countries trade-liberalize among themselves, and a flying geese pattern of institution. Empirically, we find that a larger effective market size does lead to improvement in contracting institution, but it affects little of other dimensions of institution. Quantitatively, we find that institutional improvement induced by trade liberalization from autarky to current trade costs accounts for a sizeable portion of a country's total welfare gains from trade.

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1 Introduction

Institution is arguably one of the most important determinants of economic development (North and Thomas, 1973). An also important determinant that is often emphasized is the role of geography (Acemoglu, 2008; Diamond, 1997). The two determinants are, however, unlikely to be orthogonal. In particular, institution gradually changes over time and can be shaped by various geographic factors and spatial distributions such as market size and international trade; see Acemoglu et al. (2005), Levchenko (2012) and Puga and Trefler (2014), among others.

This paper focuses on the effect of geographic factors on a specific and yet important dimension of institution: contracting institution, which can be broadly interpreted as including any factors affecting contractual environment and contract enforcement that is vital to the functioning of the economy. More specifically, we develop a theory that explains the effect of effective market size on contracting institution by incorporating Acemoglue et al.'s (2007) model of contractual environment and technology adoption in an international trade environment *á la* Krugman (1980). We empirically test the model prediction that a larger effective market size leads to better contracting institution. We also conduct a quantitative analysis on welfare gains from trade to gauge how much the incorporation of endogenous formation of contracting institution may reshape gains from trade.

The key building block of the theory is that a better contractual environment improves production efficiency when firms are inter-linked and trade among each other. Following Acemoglu et al. (2007), the production process is modeled as two layers of production, the first being differentiated-product firms and the second being the input suppliers to these firms. The inputs for each differentiated product are specialized, and thus there is a relationship specificity between each firm and each supplier. If various contingencies are not well specified in the contract between a firm and its suppliers and if the contracting institutional quality is inadequate, then hold-up problem arises (Williamson, 1985; Grossman and Hart, 1986). The hold-up problem make suppliers under-invest in their own activities and tend to depress their supply to the firms. Firms, who demand inputs from its suppliers, thus cannot operate at full efficiency due to distorted input supply.

In an open-economy environment, a larger effective market size (which may arise from locational advantages or trade liberalization or an increase in home or nearby countries' population, etc.) makes the pie of a better production process larger, and hence governments may have in-

centives to improve contracting institution, as long as the the cost of institution building and maintenance is not prohibitive. For simplicity, we assume national governments are benevolent, and an equilibrium of endogenous institutional qualities is determined by a Nash equilibrium in which each national government maximizes its country's welfare by choosing an optimal institutional quality given other national planners' choices. The main model prediction is that a larger effective market size measured by the real market access (to be defined shortly) leads to higher institutional quality.

Moreover, we find an interesting strategic interactions in the event of trade liberalization among a subset of countries. The effective market sizes for the subset of countries that experience trade liberalization increase, leading to higher institutional quality, but the countries outside this subset may actually reduce their institutional qualities. The intuition is related to the logic of trade diversion by which the effective market sizes for the non-trade-liberalized countries actually shrink. Although we do not intend to confront this theoretical prediction in the current paper, we consider this theoretical prediction complementing the arguments for "why nations fail" in Acemoglu and Robinson (2012) in explaining why there has been difficulties for certain developing countries to improve their institutional qualities. In other words, while some countries become ever more engaged in the world trade system in the course of time, some other countries may actually find that the pie or stake of improving institution has shrunk over time.

For another interesting application of our theory, notice that in the course of history, population increases and transport technology improves, both of which enlarge effective market size. Consider the institutional reforms that occurred in Western Europe between 1500 and 1850 (Acemoglu et al., 2005) and the ensuing similar reforms around the globe.[1] With the navigation technology developed in Western Europe in that era, Western Europe may be considered as a "world center". Based on the uneven geography due to differences in relative locations, our model predicts that the decreases in trade costs alone generates a flying geese pattern of institutional reforms, starting from the world center.[2]

We empirically test the main model prediction that a larger effective market size facing firms in a country leads to a higher institutional quality. Following literature, the effective market size

[1] Although one may find institutional reforms hard to come by and even when it occurs, later setbacks are observed. However, a flying geese pattern of institutional reforms is evident from a longer historical perspective.

[2] For a "flying geese pattern of development", see Akamatsu (1962) who coined and popularized this term. Note, however, that the theoretical underpinnings of Akamatsu (1962) is more similar to the product-cycle theory *á la* Antràs (2005), rather than the theory proposed here.

is measured by *market access*, a weighted sum of nominal expenditures in different countries discounted by trade costs and "supply indices", which are inversely related to the price indices in respective countries.[3] Using data from International Country Risk Guide (henceforth ICRG), we use the *Law and Order* measure as the proxy for the quality of contracting institution (Howell, 2011). Apparently, there may be reverse causality as institutional quality may enhance market access, our identification strategy relies on using geographic centrality of a country as an instrument, following Redding and Venables (2004) and Mayer (2008). Geographic centrality is the sum of the inverse of the country's distances to all countries (including itself).

We find a significant and positive effect of *Real Market Access* on the *Law and Order*, and this finding is robust to various specifications and an alternative measure of contracting institution. There are 11 other dimensions of institution in the ICRG data, and we also examine whether *Real Market Access* affects these dimensions. We find little effects of *Real Market Access* on most of these 11 dimensions, except for investment profile and religious tensions. Interestingly, investment profile captures some features of a contracting institution that might not be reflected by the *Law and Order*. These findings corroborate our focus on contracting institution in our theoretical formulation.

To explore the welfare impacts of our proposed mechanism of institutional change, we place the evaluation in the context of well-developed literature on gains from trade. For this purpose, the model is calibrated to a world where countries are aggregated into seven trade blocs, following Ossa (2011). We conduct a quantitative analysis of welfare gains from trade by comparing the welfare under the calibrated model and that under the case when each country is shut down to autarky. We decompose the gains into two components: a component that is directly affected by the change in trade costs holding institutional qualities fixed and a component that reflects the welfare changes due to the changes in institutional qualities induced by the reduction of trade costs. We find that the component due to institutional changes contribute a sizeable portion of the overall gains from trade, ranging from 18.6% to 35.5% across the seven trade blocs. The contribution is particularly large for developing countries such as China and India, as this reflects the particularly large changes in institutional quality for these countries, which in turn are mainly attributed to the much larger increases in real market access from autarky to actual

[3] This measure was first proposed by Harris (1954). Recent studies that explore the effects of market access include Redding and Venables (2004), Head and Mayer (2004, 2006), Redding and Sturm (2008), Hering and Poncet (2010), among others. This measure is sometimes called market potential.

trade costs. Also note that our model, by adopting Krugman (1980) for the trade framework, falls in the ACR framework (Arkolakis et al., 2012) if institutional qualities are taken as given. Our gains from trade figures are generally larger than what would be predicted by the ACR formula partly due to the institutional improvement in response to trade liberalization.

The literature on the relations between institution and economic development is extensive. Whereas a substantial portion of the literature focuses on the effect of institution on economic development, e.g., Acemoglu et al. (2007), Levchenko (2007), Dutt and Traca (2010), and Beverelli et al. (2018), several studies have also examined the reverse relationship, such as Acemoglu et al. (2005), Jiao and Wei (2017), Levchenko (2012), Mukoyama and Popov (2015), and Puga and Trefler (2014), among others. Our work joins the second line of research, and the most closely related studies are by Acemoglu et al. (2005), Jiao and Wei (2017) and Levchenko (2012).

Acemoglu et al. (2005) empirically investigate how the rise of Atlantic trade promotes the institutions that protect property rights. Our work differs as we focus on contracting institution rather than the institutions on property right protection. Jiao and Wei (2017) study the interactions between trade and institutions in a setting in which trade costs are functions of institution and international trade is more sensitive to institutions than domestic trade. Empirically, they show that intrinsic openness (such as population size, geography, or exogenous trade opportunities) promotes investments in institutional building. Our mechanism differs as it focuses on how institution improves production efficiency rather than affects trade costs. Our empirical finding is also unique in showing that market access promotes contracting institution, but not much on other dimensions of institutions. Levchenko (2012) presents a theory in which trade promotes institutional quality, and his mechanism relies on the competition among countries in the sector subject to the hold-up problem, which reduces the rents available. Thus, interest groups have incentives to lobby the government to improve institution to enhance their comparative advantages in this particular sector. Our study is different because our mechanism focuses on market size and increasing returns rather than on comparative advantages.

Also closely related is the work by Mukoyama and Popov (2015) who study how inadequate contracting institution may adversely affect capital accumulation in a dynamic setting and how a benevolent government who maximizes social welfare may want to improve contracting institution. Our study differs from Mukoyama and Popov (2015) as we focus on how effective market size and trade affects contracting institution.

The rest of the paper is organized as follows. Section 2 presents a theory of market size,

trade, and contracting institution. Section 3 tests the main theoretical prediction and presents the results. Section 4 quantitatively investigates the role of institution on welfare gains from trade. Section 5 concludes.

2 A Theory of Market Size and Contracting Institution

We propose a theory of market access and contracting institution by embedding Acemoglu et al. (2007) in an international trade model *à la* Krugman (1980).

2.1 Model Setup

2.1.1 Consumption

There are N countries with each having population L_j, where $j \in \{1, 2, ..., N\}$. Each individual is endowed with unit labor, which is inelastically supplied. Each individual obtains wage w_j, and pays a lump-sum tax t_j to the government. Consumers have an identical preference, which is represented by the CES preference

$$U_j = \left(\int_\omega y_j^\beta (\omega) \, d\omega \right)^{\frac{1}{\beta}},$$

where $\beta \in (0, 1)$, ω indexes a good in a continuum, and $y_j(\omega)$ is the quantity purchased and consumed. The elasticity of substitution is given by $\sigma \equiv \frac{1}{1-\beta} > 1$. Subject to the budget constraint $\int_\omega y_j (\omega) \, p_j (\omega) \, d\omega \leqslant w_j - t_j$, each consumer chooses the optimal consumption bundle to maximize her utility. Country j's price index is derived in a standard way as $P_j = \left(\int_\omega p_j^{1-\sigma} (\omega) \, d\omega \right)^{\frac{1}{1-\sigma}}$.

2.1.2 Production

Labor is the only fundamental input of this economy. There are two layers of production: differentiated goods and specialized inputs. The market for the differentiated goods is monopolistically competitive. Each firm that produces a distinct differentiated good uses specialized inputs procured from various suppliers. As will be described shortly, contract incompleteness (i.e., inverse of institutional quality) between a firm and its suppliers results in a hold-up problem and causes under-investment and inefficiency.

Each differentiated-good firm ω demands specialized inputs $X_i (s)$ from domestic suppliers $s \in [0, 1]$, but it can sell goods abroad. For tractability, firm heterogeneity is abstracted away

from the model, and for notational convenience the use of a specialized input is simply denoted as $X_i(s)$ even though each specialized input is specific to each ω. Selling abroad from country i to country j incurs an iceberg trade cost so that for one unit of a good to arrive at country j, $\tau_{ij} > 1$ units need to be shipped from country i. The production function for every firm ω is given by

$$y_i(\omega) = \left(\int_0^1 X_i(s)^\alpha \, ds \right)^{\frac{1}{\alpha}}, \tag{1}$$

where $\alpha \in (0,1)$. To produce specialized input $X_i(s)$, a continuum of specific investments $x_i(m,s)$, where $m \in [0,1]$, by supplier s are required; the production function of the specialized input is given by a Cobb-Douglas form:

$$X_i(s) = \exp\left[\int_0^1 \ln x_i(m,s) \, dm \right]. \tag{2}$$

Any specific investment $x_i(m,s)$ is made of labor using a one-to-one mapping: $x = l$ with labor l. The price of investment x in country i is thus the wage w_i.

Assume that the offer from the monopolist firm to any supplier is take-it-or-leave-it. As the input $X_i(s)$ is specialized, we further assume its outside option is 0. The firm needs to sign a contract with each of her suppliers s designating the investment level $x_i(m,s)$ for each $m \in [0,1]$. If the contract is complete and specifies fully the terms and conditions about the amounts of the investment $x_i(m,s)$ that supplier s should make for each m, then supplier s will abide by the contract and make corresponding investments. Otherwise, if part of the investments is not contractible (i.e., cannot be covered by the contract), then the supplier will only follow the contract to make the designated investments for the contractible part and determine the remaining investments at their discretion. Let $\mu_i \in [0,1]$ reflects the degree of the contracting institution in country i such that μ_i fraction of the types of investment is contractible, whereas the remaining $1 - \mu_i$ fraction is not. Without loss of generality, we can denote that $m \in [0, \mu_i]$ is contractible and $[\mu_i, 1]$ is not.

The timeline of the model is that each country's government chooses its contracting institutional quality in an environment that will be detailed in Section 2.3. There is a large pool of potential entrants in each country, and given institutional qualities $\{\mu_i\}_{i=1}^N$, the potential entrants decide whether or not to enter, and if yes, an entry cost f must be paid. Upon entry, each entrant obtains a distinct product and becomes a monopolist for it. The timeline of the game between each firm and its suppliers is given as follows:

1. The firm ω in country i offers a contract $\left[\{x_{i,c}(m,s)\}_{m=0}^{\mu_i}, \kappa_s\right]$ to every supplier s. Here

$x_{i,c}(m,s)$ is the contractible investment level and κ_s is an upfront payment to supplier s, which could be either positive or negative;

2. Each potential supplier decides whether to apply for the contracts, after observing μ_i;

3. For m in $[0,\mu_i]$, the suppliers invest $x_i(m,s) = x_{i,c}(m,s)$ as specified in the contract. For m in $(\mu_i, 1]$, the investment is determined by the suppliers in anticipation of the ex post distribution of the total revenue. Suppliers hire workers to make investments;

4. The firm and suppliers bargain over the division of the revenue, and suppliers could withhold their specific investments in non-contractible activities;

5. Output is produced and sold, and the revenue is distributed according to the bargaining agreement.

2.2 Equilibrium given Institutional Quality

This subsection derives the equilibrium given institutional quality $\{\mu_i\}_{i=1}^N$, and we will show how the institutional qualities are endogenized in the next subsection. For the above-described game between a firm and its potential suppliers, we focus on the symmetric sub-game perfect equilibrium (SSPE), following Acemoglu et al. (2007). We start with the simpler case of complete contract ($\mu_i = 1$) and then proceed to study the case of incomplete contract ($\mu_i < 1$). Since the outside value of any specialized input is 0, the firm could hold up any of its suppliers and the latter tend to under-produce these specialized inputs. When the contracting environment is better, the hold-up problem is ameliorated. Firms' profits can be shown to increase in institutional quality, *ceteris paribus*.

2.2.1 Complete Contracts

Let the factory-gate price be denoted by p_i (for cleaner exposition, index ω is suppressed). In this model with monopolistic competition and the CES preference, the price facing consumers at country j for a good originated from country i is $p_{ij} = p_i\tau_{ij}$. The revenue for any firm in i is $r_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma} E_j$, where P_j and E_j are the price index and the expenditure in country j, respectively. Let the number of firms in country i be denoted by n_i. As all firms sell to all countries, the trade flow $R_{ij} = n_{ij}r_{ij}$ between exporting country i and importing country j is

$$R_{ij} = s_i\tau_{ij}^{1-\sigma}m_j, \tag{3}$$

where $s_i = n_i p_i^{1-\sigma}$ refers to the supply capacity of country i , and $m_j = E_j P_j^{\sigma-1}$ refers to the demand capacity of country j (Redding and Venables, 2004). In other words, trade flows between two countries depend on three factors: the supply capacity that measures the competitiveness of exporters to all destinations, the demand capacity that reflects the purchasing power of importers from all sources,[4] and the trade cost indicating the bilateral accessibility.

Total revenue of a firm in country i is $r_i \equiv \sum_{j=1}^{N} r_{ij} = p_i^{1-\sigma} M_i$, where the market access M_i for firms in country i is

$$M_i \equiv \sum_j \tau_{ij}^{1-\sigma} m_j = \sum_j \tau_{ij}^{1-\sigma} E_j P_j^{\sigma-1}. \tag{4}$$

The larger the market access M_i, the more revenue for firms in country i, as it is a sum of demand capacity m_j across countries, discounted by the trade costs linking each market j with country i.

Combining the fact that revenue $r_i \equiv p_i y_i$ with $r_i = p_i^{1-\sigma} M_i$ entails

$$r_i = y_i^{\beta} M_i^{1-\beta}. \tag{5}$$

With complete contract, the symmetry across all s in (1) and that across all m in (2) imply that $x_i(m, s) = y_i$ for any m and s. The cost function to produce y_i units of goods is therefore $C(y_i) = w_i y_i$. Note here that by construction, productivity and unit labor requirement are both normalized to 1 under complete contract. The profit maximization problem for the firm is

$$\begin{aligned} \pi_i^* &= \max_{y_i} r_i - C(y_i) \\ &= \max_{y_i} y_i^{\beta} M_i^{1-\beta} - w_i y_i \end{aligned}$$

Standard solution yields optimal price, output, and profit:

$$\begin{aligned} p_i^* &= \frac{\sigma}{\sigma - 1} w_i \\ y_i^* &= \beta^{\frac{1}{1-\beta}} w_i^{-\frac{1}{1-\beta}} M_i \\ \pi_i^* &= (1-\beta)\, \beta^{\frac{\beta}{1-\beta}} w_i^{-\frac{\beta}{1-\beta}} M_i. \end{aligned}$$

Free entry implies that $\pi_i^* = w_i f$. The total revenue in country i is $R_i = \sum_j R_{ij} = n_i p_i^{1-\sigma} M_i$. Assume that trade is balanced, and thus the total expenditure equals the total revenue, i.e., $E_i = R_i$. The price index P_j satisfies

$$P_j^{1-\sigma} = \sum_i n_i p_{ij}^{1-\sigma} = \sum_i \frac{R_i}{M_i} \tau_{ij}^{1-\sigma}; \tag{6}$$

[4]Note a larger price index P_j implies greater potential for foreign firms selling to market j via substitution effect.

Moreover, total revenue R_i equals to workers' total income:

$$E_i = R_i = w_i L_i. \tag{7}$$

The equilibrium under the case of complete contracts can be easily solved, and as it is a special case of incomplete contracts, the equilibrium description is postponed to Section 2.2.2.

Note that the above-defined market access is a nominal variable. To properly obtain market access in real terms from the viewpoint of the firms in country i, (4) informs that the *real market access* should be obtained by deflating M_i by P_i^{σ}.

2.2.2 Incomplete Contracts

Our modeling of the incomplete-contract case is mostly similar to Acemoglu et al. (2007), but the number of suppliers for each firm is normalized to unity to abstract away technology adoption, which is not our focus. As in Acemoglu et al. (2007), we focus on the symmetric subgame perfect equilibrium (SSPE) of the game between a firm and its suppliers. The equilibrium is solved by backward induction. To start off, the Shapley value is used as the bargaining solution for the firm and its various suppliers. For any supplier s, she follows the contract and make investment level $x_c(m, s)$ for contractible $m \in [0, \mu_i]$, and determines at her discretion the non-contractible investment level $x_n(m, s)$ for $m \in (\mu_i, 1]$. (For convenience, the country subscript i is dropped in these investment notations.) Meanwhile, the firm's other suppliers make investment level $x_c(m, -s)$ for $m \in [0, \mu_i]$ and the non-contractible investment level $x_n(m, -s)$ for $m \in (\mu_i, 1]$. In the setting of symmetric equilibrium, let $x_c(m, s) = x_c(m, -s) = x_c$, $x_n(m, s) = x_n(s)$, $x_n(m, -s) = x_n(-s)$. The Shapley value of supplier s is given by

$$SV_s = (1-\gamma)\left[x_c^{\mu_i} x_n(-s)^{1-\mu_i}\right]^{\beta} M_i^{1-\beta}\left(\frac{x_n(s)}{x_n(-s)}\right)^{(1-\mu_i)\alpha}, \tag{8}$$

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

In equilibrium, $x_n(s) = x_n(-s) = x_n$, and $SV_s = (1-\gamma)\left(x_c^{\mu_i} x_n^{1-\mu_i}\right)^{\beta} M_i^{1-\beta}$. By (1), (2) and (5), $SV_s = (1-\gamma) r_i$; that is, suppliers share $1-\gamma$ fraction of the firm's revenue. Thus, γr_i is the Shapley value of the firm, and it increases in α but decreases in β. This is intuitive since larger α implies greater elasticity of substitution among specialized inputs from suppliers and more bargaining power for the firm. Higher β corresponds to larger elasticity of substitution among differentiated goods which reduces the firm' marginal contribution to the production relationship and thus lowers the bargaining power of the firm.

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

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

Therefore, this incentive compatibility constraint together with the symmetry requirement entails

$$x_n = \left[\frac{\alpha(1-\gamma)\, x_c^{\mu_i \beta} M_i^{1-\beta}}{w_i}\right]^{\frac{1}{1-\beta(1-\mu_i)}}. \tag{9}$$

The firm solves the following problem:

$$\pi = \max_{x_c} \gamma\left[x_c^{\mu_i} {x_n}^{1-\mu_i}\right]^{\beta} M_i^{1-\beta} - \kappa_s,$$

subject to the participation constraint of suppliers:

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

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

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

and the solution is

$$x_c = [\alpha(1-\gamma)]^{\frac{\beta(1-\mu_i)}{1-\beta}} B(\mu_i)^{1-\beta(1-\mu_i)}\, w_i^{-\frac{1}{1-\beta}} M_i, \tag{10}$$

where $B(\mu_i) = \left[\left(\frac{1-\gamma}{1-\beta(1-\mu_i)} + \gamma\right)\beta\right]^{\frac{1}{1-\beta}}$ is a decreasing function in μ_i. Plugging (10) into (9) entails

$$x_n = [\alpha(1-\gamma)]^{\frac{1-\beta\mu_i}{1-\beta}} B(\mu_i)^{\beta\mu_i}\, w_i^{-\frac{1}{1-\beta}} M_i. \tag{11}$$

When $\mu_i < 1$, it can be readily shown that $x_n < x_c$, i.e., the suppliers under-invest for the non-contractible portion. The output for supplier is

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

where $I(\mu_i) = [\alpha(1-\gamma)]^{\frac{1-\mu_i}{1-\beta}} B(\mu_i)^{\mu_i}$ is increasing in μ_i as shown in Appendix A. The $I(\mu_i)$ term captures the institutional impact on the production of specialized inputs.

For any firm in country i, the price charged for a differentiated good, the revenue, and the profit are

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

where

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

which is increasing in μ_i, as shown in Appendix B. The $K(\mu_i)$ term therefore captures the institutional impact on firm profit. Note that the better the institution, the lower the price as production efficiency increases. In the case where $\mu_i = 1$, the markup reverts to the familiar constant markup at $\sigma/(\sigma-1)$. Interestingly, other things being equal, firms in countries with higher institutional qualities charge lower mark-ups and yet gain more profits.

Free entry condition, $\pi = w_i f$, implies that

$$M_i = \frac{w_i^{\sigma} f}{K\left(\mu_i\right)}. \tag{12}$$

Therefore, the real market access is $\frac{M_i}{P_i^{\sigma}} = \left(\frac{w_i}{P_i}\right)^{\sigma} \frac{f}{K(\mu_i)}$, and the real GDP in country i is $\frac{w_i L_i}{P_i} = \left(\frac{M_i}{P_i^{\sigma}} \frac{K(\mu_i)}{f}\right)^{\frac{1}{\sigma}} L_i$, which increases in institutional quality μ_i and the real market access. The number of firms in country i is

$$n_i = \frac{L_i}{f + \mu x_c + (1-\mu) x_n} \tag{13}$$
$$= \frac{L_i}{f}\left[1 - \beta\left(\frac{(1-\gamma)\mu_i}{1-\beta+\beta\mu_i} + \gamma\right)\right], \tag{14}$$

The denominator in (13) is the total labor hired by each firm, comprising of the entry cost f in terms of labor units, the employment $\mu_i x_c$ for contractible investments and the employment $(1-\mu_i)x_n$ for non-contractible investments. Equation (14) is then derived by invoking the expression of x_c and x_n from (10-11), together with the free entry condition (12). Intuitively, the number of firms is proportional to the population size. Moreover, it decreases in institutional quality μ_i. This is because worse institutional quality results in more severe hold-up problems and firm size tends to be smaller; given the fixed population size, there must be more firms. This relationship resonates with the findings by Hsieh and Olken (2014) that developing countries like Indonesia

and India may have relatively more small firms compared with the US and this model serves as a micro-foundation for explaining this phenomenon by the distortions arising from contract incompleteness.

We are now ready to define an *exogenous-institution* equilibrium, that is, an equilibrium given institutional qualities $\{\mu_i\}$.

Definition 1. *Given population $\{L_i\}_{i=1}^N$ and trade costs $\{\tau_{ij}\}_{i,j=1}^N$, an equilibrium under a vector of exogenous institutional quality $\{\mu_i\}_{i=1}^N$ is a wage vector $\{w_i\}_{i=1}^N$, price indexes $\{P_i\}_{i=1}^N$, market access $\{M_i\}_{i=1}^N$ and expenditures $\{E_i\}_{i=1}^N$ that satisfy equilibrium conditions (4), (6), (7) and (12) for each country i.*

2.3 National Planners and Institutional Qualities

We now consider how institutional qualities may be endogenously determined. For this purpose, we consider benevolent governments who choose institutional qualities subject to certain costs of building/maintaining the institutions. For tractability, assume that these costs are raised by levying lump-sum taxes t_i from each individual, and the government runs a balanced budget. The model consists of two stages. The first stage is when each government chooses its institutional quality given other governments' choices. The second stage is the stage of production and consumption given institutional qualities as detailed by the previous subsection.

2.3.1 National Planner's Problem

For each country i, the cost of building and maintaining the contracting institutional quality μ_i is in terms of the final goods and takes the form $D_i^G = A_i\mu_i L_i$. The institution cost is therefore $C(\mu_i) = P_i D_i^G = P_i A_i \mu_i L_i$. Given institutional quality μ_i, the institution cost increases in population L_i which reflects the fact that various institution-related costs such as education effort (including public and compulsory education), law enforcement, legal system, etc., increase in the population size.[5] The parameter A_i inversely reflects the efficiency of institution building/-maintenance and captures any country-specific factors that are not captured by model such as a

[5]We choose to model the costs to be proportional to population size for simplicity. On the one hand, there may be convex costs of institutional building due to the likelihood to have a larger heterogeneity when the population is larger (Alesina and Spolaore, 1997). On the other hand, there are various scale economies in institution building as many components in the education and legal systems are public goods or fixed costs. The linear form is a simple and reasonable compromise.

country's particular geography and history.

The total government revenue is given by $T_i = t_i L_i$, and balanced budget implies that $T_i = C(\mu_i)$. That is, the lump-sum tax that each individual needs to pay is $t_i = C(\mu_i)/L_i = P_i A_i \mu_i$. The welfare of a country is the real income net of the taxes. Given other countries' choices of institutional qualities, each national planner solves the following problem

$$\max_{\mu_i} W_i \equiv \frac{w_i L_i - T_i}{P_i},$$
$$s.t. \quad T_i = P_i A_i \mu_i L_i,$$

which is equivalent to

$$\max_{\mu_i} W_i = \frac{w_i L_i}{P_i} - A_i \mu_i L_i. \tag{15}$$

An *endogenous-institution equilibrium* is defined as follows.

Definition 2. *Given institutional qualities $\{\mu_i\}$, an equilibrium is given by Definition 1. An endogenous-institution equilibrium is a Nash equilibrium of institutional qualities $\{\mu_i\}$ such that each national planner's optimal choice of institutional quality μ_i is the best response to other national planners' optimal choices $\{\mu_j\}_{j \neq i}$. That is, each equilibrium μ_i is the solution to* (15) *given equilibrium $\{\mu_j\}_{j \neq i}$.*

2.3.2 Real Market Access and Institutional Quality

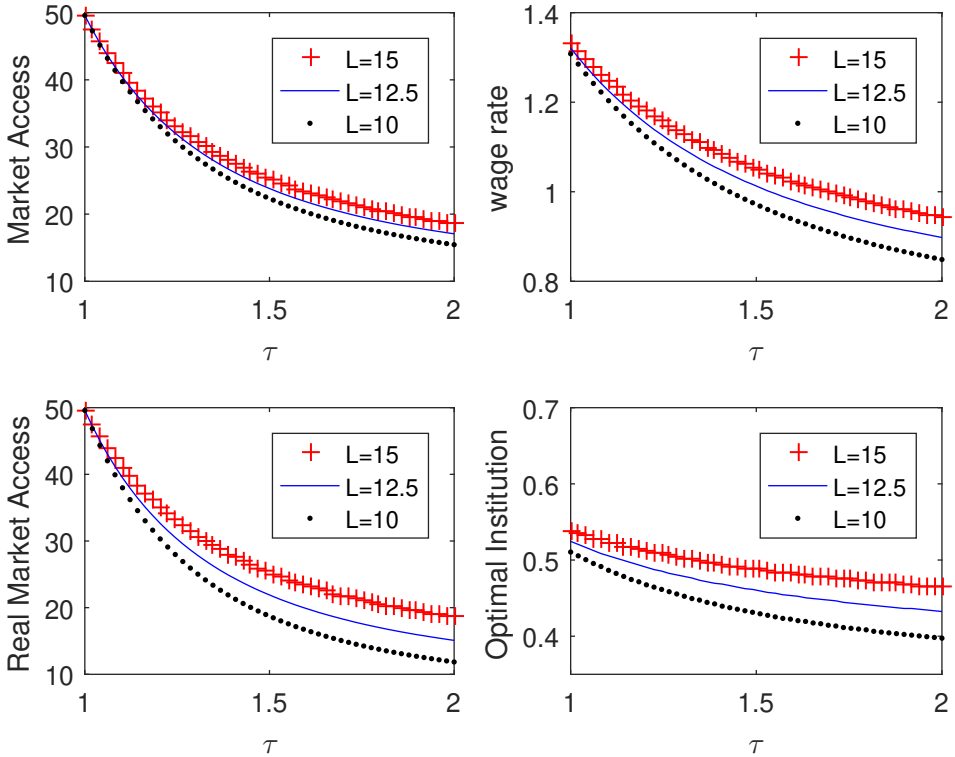
It is impossible to get an analytical solution for the exogenous-institution equilibrium under the related system of equations, let alone the endogenous-institution one. However, more analytical clarity can be obtained in the symmetric-country case, and we have the following proposition. The proof is relegated to Appendix A.

Proposition 1. *Under symmetry and regular conditions where the objective function has interior solution, a country will experience better institutional quality if its real market access is larger, i.e., the number of trading partners n or effective population size L increases or trade cost τ decreases.*

When the countries are not symmetric, we resort to numerical simulations to investigate the effects of real market access on the institutional quality. We separate the effects of population size and trade cost, respectively. To this end, we consider two scenarios in a three-country setting: countries of different population size but with symmetric trade costs, and countries of same population size but with asymmetric trade costs.

Figure 1 plots the case where the three countries differ in population size, other things being equal. Country 1, 2, and 3 have $L = 15, 12.5$ and 10, respectively. Trade costs between any pair of

Figure 1: Effects of Population Size on Institutional Quality



Notes: Three countries differ in their effective population size. Price index in country 1 is normalized to be 1.

countries are symmetric and take on value τ ranging from 1 to 2. It is no surprise that country 1 has the largest real market access and thus the best institutional quality among the three nations, whereas country 3 experiences the worst institutional quality since it has the smallest population. This result is robust to various values of L_i and wider range of trade costs. Note that the gap between institutional qualities widened when τ increases. This is because when there are larger trade barriers, each country's own population carries a larger weight in the real market access and population heterogeneity plays a larger role in explaining institution quality.

Figure 2 shows the case where three countries have an equal population size but asymmetric trade costs. Suppose that the trade cost between Countries 2 and each of the other two countries is given by $\tau_{21} = \tau_{12} = \tau_{23} = \tau_{32} = 2$, whereas Countries 1 and 3 reduce their bilateral trade costs $\tau_{13} = \tau_{31} = \tau$ from 2 to 1. From Figure 2, all of the countries experience increases in the market access, driving up wage rate; these effects are larger for Countries 1 and 3 than that for Country

2. Given institutional qualities, the price indices in Countries 1 and 3 decrease, and thus their real market access, M_i/P_i^σ, increases. This induces an increase in institutional qualities in these two countries, which further reduces their price indices due to improved production efficiency.

In contrast, Country 2's real market access decreases, reflecting the fact that its price index must have increased faster than its (nominal) market access. It is readily verified that when institutional qualities are fixed, Country 2's price index must increase because of increasing wages of the foreign countries and the fact that its trade costs with its trade partners have not changed. When institutional qualities are endogenous, increased real market access for Countries 1 and 3 induces the increases in their institutional qualities, which further reduce the price indices of Countries 1 and 3, which in turn reduce the magnitude of increase in Country 2's market access due to fiercer competition. In other words, the market access M_2 rises much slower when institutions are endogenous; as the price index P_2 has risen, this results in a lower real market access for Country 2 and hence lower institutional quality.

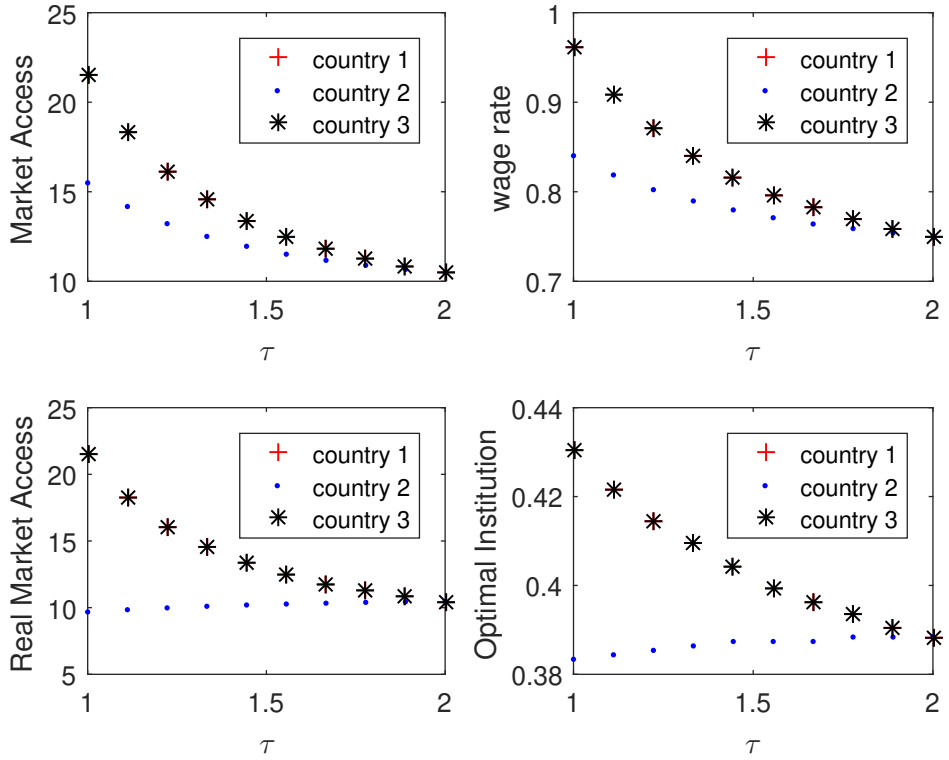
2.4 Flying Geese Paradigm of Institutions

In this subsection, we take advantage of our model to demonstrate a flying geese pattern of institutions driven by improving transport technology and effective market sizes. We assume that there exists a world center among the N countries on a line segment. [6]. For example, one may take Western Europe during 1500-1850 as the world center with the navigation technology developed there. To further associate this idea with the model, we label the countries from 1 to N. Starting from some point in time t = 0, we let the trade cost between country i and country j at year t take the form $\tau_{ijt} = 1 + \exp(-\eta t)(\tau_0^{|i-j|} - 1)$, where η is the tuning parameter governing the extent to which trade costs decline over time due to development and advancement of transportation-wise technology, and τ_0 is a parameter related to trade costs at $t = 0$. The world center is $\frac{N+1}{2}$ if N is odd, and $\frac{N}{2}$ and $\frac{N}{2} + 1$ if N is even.

To highlight the core idea and simplify the simulation, we assume there are 6 countries in the world. Each country can choose either a good or bad institution by taking others' institutions into account— a Nash equilibrium. We further assume the institution building/maintenance cost is proportional to the institution; the higher the institutional quality, the larger the cost. Every country is symmetric except for its geographical centrality. Table 1 shows how institutions

[6]These countries can also scatter in a circle or the globe, as long as the trade costs structure between countries is the same as in a line to generate a world center

Figure 2: Trade Liberalization between Country 1 and Country 3



Notes: Three countries have equal effective population size; Country 1 and country 3 are liberalizing trade bilaterally from trade costs $\tau = 2$ to $\tau = 1$, whereas country 2 has trade costs $\tau = 2$ unchanged with its two trading partners country 1 and country 3. Price index in country 1 is normalized to be 1.

have evolved over time. Initially, before period 5, despite the fact that market access increases because of the decline in trade costs, and institution is complementary to market access, the marginal benefit of switching from bad to good institutions doesn't compensate the marginal cost incurred. As a result, all institutions remain bad. As the global trade liberalization process continues , the most central countries 3 and 4 take the initiative to reform and switch to the good institutions, followed by country 2 and 5 at period 8, and finally country 1 and 6 at an even later period. The reforms, therefore, display a flying-geese pattern.

3 Empirical Test of the Main Model Prediction

This section empirically tests the main model prediction, i.e., a larger market access leads to a better quality of contracting institution, *ceteris paribus*. To do this, we first estimate a gravity

Table 1: Flying Geese Pattern of World Institutions Over Time

	Time														
Country	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1										X	X	X	X	X	X
2								X	X	X	X	X	X	X	X
3						X	X	X	X	X	X	X	X	X	X
4						X	X	X	X	X	X	X	X	X	X
5								X	X	X	X	X	X	X	X
6										X	X	X	X	X	X

Note: There are 6 countries in the world, each of which can either choose good or bad institution, given others' choices. The trade cost between country i and country j at year t take the form $\tau_{ijt} = 1 + \exp(-\eta t)(\tau_0^{|i-j|} - 1)$, where η is the tuning parameter governing the extent to which trade costs decline over time, and τ_0 is a parameter related to trade costs at $t = 0$. Entries with blank and X refer to bad and good institutions, respectively.

equation to construct country-specific market access following Redding and Venables (2004) We also examine how market access may affect different other dimensions of institution.

3.1 Data

To proxy for the contracting institutional quality, we mainly use the *Law and Order* index from the International Country Risk Guide (ICRG) (Howell, 2011). Such an index are comparable over time and across countries. ICRG comprises 22 variables in three different categories of risk: political, financial, and economic. We focus on the most relevant measure *Law and Order* index under the political risk category[7]. Taken directly from the documentation of ICRG, the two elements of "Law and Order" are assessed separately, with each element being scored from zero to three points. The element of "Law" refers to the strength and impartiality of the legal system, while the "Order" element is an assessment of popular observance of the law. Alternatively, for robustness check, we use the *Rule of Law* index from the Worldwide Governance Indicators

[7]This category consists of 12 dimensions assigned with a range of points: (A) Government Stability, 12 points; (B) Socio-economic Conditions, 12 points; (C) Investment Profile, 12 points; (D) Internal Conflict, 12 points; (E) External Conflict, 12 points; (F) Corruption, 6 points; (G) Military in Politics, 6 points; (H) Religious Tensions, 6 points; (I) Law and Order, 6 points; (J) Ethnic Tensions, 6 points; (K) Democratic Accountability, 6 points; (L) Bureaucracy Quality, 4 points

(WGI) (Kaufmann et al., 2011).[8] The *Rule of Law* index captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. We linearly transform both indexes so that they range from 0 to 1[9]. We prefer ICRG because its over-time comparability is better as WGI's underlying sources of data may vary over time.

For trade flows and gravity variables including physical distance, border, common language, colonial links, GATT/WTO and RTA status between trading partners, we take from CEPII the "TRADEHIST" dataset constructed by Fouquin et al. (2016).

3.2 Estimation of Gravity Equation

Head and Mayer (2014) have surveyed various forms of gravity equations to model trade flows between two countries. We adopt the general gravity form as in (3) for estimation purpose. Directly taking logs of trade flows in equation (3) would drop zero trade and generate selection bias. One remedy is to add one to each trade flow and then take logs on both sides (Redding and Venables, 2004; Head and Mayer, 2010). However, as suggested by Head and Mayer (2014), the coefficients on the gravity variables are quite sensitive to the number added. Therefore, we resort to the Pseudo Poison Maximum Likelihood (PPML) (Santos Silva and Tenreyro, 2006) as our baseline estimation of the gravity equation (3). Specifically, the regression equation is specified as follows:

$$R_{ijt} = \exp(\ln s_{it} + \ln m_{jt} + \ln \tau_{ijt}^{1-\sigma}) + \epsilon_{ijt}, \tag{16}$$

where $\ln \tau_{ijt}^{1-\sigma} = \delta_1 ldist_{ij} + \delta_2 border_{ij} + \delta_3 com\_lang_{ij} + \delta_4 colony_{ij} + \delta_5 WTO\_both_{ijt} + \delta_6 RTA_{ijt}$, and $ldist_{ij}$ refers to the log of great-circle distance between capital cities in country i and j, $border_{ij}$ takes 1 when the two countries share the same border and 0 otherwise, com_lang_{ij} takes 1 when at least one language is spoken by more than 9% of the population in both countries

[8]WGI reports on six broad dimensions of governance for over 200 countries and territories over the period 1996-2016: Voice and Accountability, Political Stability and Absence of Violence, Government Effectiveness, Regulatory Quality, Rule of Law, and Control of Corruption. Each of six aggregate WGI measures are constructed by averaging together data from the underlying sources that correspond to the concept of governance being measured. The composite measures of governance generated by the aggregate methodology are in units of a standard normal distribution, running from approximately -2.5 to 2.5, with higher values corresponding to better governance.

[9]Specifically, for the *Law and Order* index from ICRG we divide each value by 6. For the *Rule of Law* index from WGI, we subtract the minimum -2.5 from each value and then divide them by 5.

and 0 otherwise, $colony_{ij}$ takes 1 if they were ever in a colonial relationship and 0 otherwise, WTO_both_{ijt} takes 1 when both belong to GATT/WTO and 0 otherwise, and RTA_{ijt} takes 1 when the two countries are in a regional trade agreement.

We estimate equation (16) in the panel setting from 1984 to 2010, the time periods when ICRG is available, and treat $\ln s_{it}$ and $\ln m_{jt}$ as time-varying fixed effects.[10] The estimates of coefficients of gravity variables are shown in Table D1 and their magnitudes and signs are consistent with the literature.

3.3 Construction of the Real Market Access

To construct the *Real Market Access* $RMA_j = \frac{M_j}{P_j^\sigma}$, we need to estimate both the nominal market access M_j and price index P_j. Based on the estimation results of the gravity equation, the nominal market access can be constructed as $\hat{M}_i = \sum_j \hat{\tau}_{ij}^{1-\sigma} \exp(\hat{\text{FE}}_j)$, where we replace demand capacity m_j and trade cost τ_{ij} by the estimated fixed effects $\hat{\text{FE}}_i$ and trade costs $\hat{\tau}_{ij}^{1-\sigma}$. As there is lack of domestic trade data, the domestic trade cost can not be estimated directly.[11] Following Redding and Venables (2004), we approximate $\hat{\tau}_{ii}^{1-\sigma} = dist_{ii}^{\frac{\hat{\delta}_1}{2}}$, where $d_{ii} = 0.66\sqrt{\text{area}_i/\pi}$ and area_i is country i's area. Note that the trade elasticity of internal distance $\frac{\hat{\delta}_1}{2}$ reflects the border effect that internal trade costs are lower than international.

By utilizing the expression of the price index that $P_j^{1-\sigma} = \sum_j s_i \tau_{ij}^{1-\sigma}$, we have $\hat{P}_j^{1-\sigma} = \sum_i \exp(\hat{\text{FE}}_i)\hat{\tau}_{ij}^{1-\sigma}$. Therefore, $\ln \hat{\text{RMA}}_j = \ln \hat{M}_j + \frac{\sigma}{\sigma-1} \ln \hat{P}_j^{1-\sigma}$.[12] Figure 3 shows the scatter plot of *Law and Order* from ICRG versus *Real Market Access* (log) in 2005, indicating a positive relationship.

[10] We use commands taken from Larch et al. (2017) for fast estimation. Country pair dummies are excluded as they will absorb the gravity variables that are not time varying.

[11] Alternatively, we may use the value added share of gross output taken from Caliendo and Parro (2015) and the GDP data to back out the gross output. Then the internal trade can be approximated as the difference between gross output and international trade. We then follow Head and Mayer (2004) to estimate the market access by introducing a border effect. The results are similar.

[12] Since $\ln \hat{M}_i$ and $\ln \hat{P}_j^{1-\sigma}$ are highly correlated with other (up to 0.6 in 2005), the size of σ will only affect the absolute value of the *Real Market Access* proportionally when we study its relationship with the institutional quality. We take $\sigma = 5.12$ as the baseline estimate from the literature (Head and Mayer, 2014). All the results are robust to other values of σ

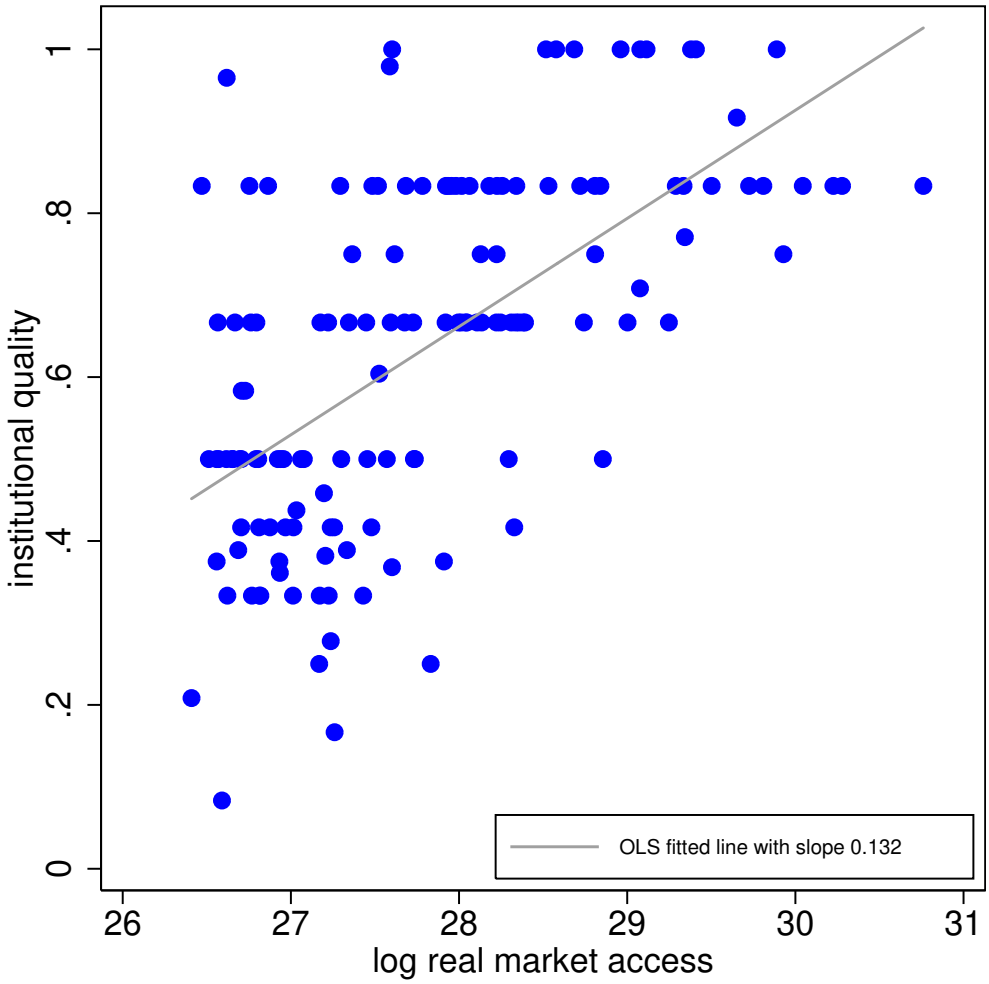


Figure 3: Scatter plot of institutional quality versus Real Market Access (log) in 2005. Institutional quality refers to Law and Order taken from ICRG.

3.4 Main Results

There are several other potential determinants of institutions besides market access. La Porta et al. (2008) show that legal origins—broadly interpreted as highly persistent systems of social control of economic life——can account for cross-country differences of rule of law and regulations and economic outcomes. Acemoglu et al. (2001) study the effect of mortality rates faced by European settlers on institutions. Auer (2013) further extends the definition of the settler mortality rate (Acemoglu et al., 2001) to a measure of "Early Disease Environment"—hypothetical mortality rate predicted by some geographical characteristics—so that the number of countries in the sample increases from around 70 to more than 150. We therefore focus on the measure of "Early Disease Environment" in this paper. In addition, human capital can play a role in facilitating the building of institution; and larger population may also potentially cost the government more to maintain institution. We will control for these determinants in our empirical specifications.

Table 2 presents the baseline regression results of the effect of *Real Market Access* on institutional quality proxied by *Law and Order* from ICRG. We focus on cross-country data in year 2005 as institution evolves slowly[13] and does not exhibit much variation over time (Levchenko, 2012). As the *Real Market Access* is a constructed variable, the usual standard errors are invalid (Pagan, 1984); thus, we resort to bootstrap techniques following Redding and Venables (2004). The first three columns shows the results under OLS estimation. Column 1 shows the simple OLS regression of *Law and Order* on the *Real Market Access*; there is a positive and significant correlation, and 38% of the variation in *Law and Order* can be explained by the *Real Market Access*. In Column 2, we control for legal origins and population; we further control for early disease environment and human capital in Column 3.[14] The coefficients on the market access remain positive and significant. Note that this may not be a causal relationship as there may be concerns of reverse causality, among other potential endogeneity issues. Contractual environment may affect a country's market access via general equilibrium effects because it may affect firms' incentives for investment, hence affecting aggregate productivity and the income level of the country.

To examine a potential causal relationship, we use the exogenous variation of the market access that stems from geographic centrality, measured as the sum of inverse distance to each

[13]Similar results with other years are available upon request.

[14]Note that there is a drop in sample size from Column 2 to Column 3 as early disease environment or human capital is not available for one-fifth of the countries in the ICRG sample.

Table 2: Effects of Real Market Access on Institutional Quality

	Dependant variable: ICRG Law and Order					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			IV		
ln(RMA)	0.132***	0.144***	0.115***	0.112***	0.093*	
	(0.014)	(0.017)	(0.025)	(0.040)	(0.049)	
ln(RMA) – lagged 5 years						0.100*
						(0.058)
French legal origin		-0.043	-0.076**	-0.043	-0.077**	-0.075**
		(0.036)	(0.033)	(0.037)	(0.034)	(0.036)
German legal origin		-0.050	-0.073*	-0.004	-0.059	-0.048
		(0.040)	(0.043)	(0.054)	(0.043)	(0.049)
Scandinavian legal origin		0.196***	0.167***	0.233***	0.177***	0.180***
		(0.041)	(0.043)	(0.047)	(0.046)	(0.048)
ln(population)		-0.036***	-0.025**	-0.031***	-0.021	-0.021
		(0.008)	(0.011)	(0.010)	(0.015)	(0.017)
Early disease environment			-0.017		-0.023	-0.021
			(0.022)		(0.027)	(0.031)
Human capital			0.006		0.009	0.007
			(0.007)		(0.009)	(0.010)
First stage F				43.63	56.37	31.68
Observations	138	138	113	138	113	113
R-squared	0.376	0.511	0.529	0.495	0.525	0.495

Note: Bootstrapped standard errors in parentheses (200 replications). The omitted category of legal origin is English legal origin. The data are taken from year 2005. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

country in the world (including itself), i.e. $\sum_{j=1}^{N} 1/\text{dist}_{ij}$. Columns 4–6 show the IV estimation results. Columns 4 and 5 have the same specification as Columns 2 and 3, respectively, except for the instrument. There is a slight decrease in the coefficient of interest – which typically arises when there is reversal causality – but remains positive and significant. To further alleviate endogeneity concerns, we lag each country's market access by 5 years, and the result remains robust.

3.5 Other Dimensions of Institution

As mentioned in the introduction, we are also interested in examining the potential effects of market access on other dimensions of institution. Table 3 reports the results for the remaining 11 dimensions of institution from the ICRG data; the specification is the same as Column (5) of

Table 2, using geographic centrality as instrument.

The effects of market access on these 11 dimensions are insignificant except for investment profile and religious tensions. Investment profile refers to an assessment of factors affecting the risk to investment that are not covered by other political, economic and financial risk components. It includes three sub-components: contract viability/expropriation, profits repatriation, and payment delays; these are indeed important factors of a contractual environment that would be conducive for business besides *Law and Order*. Namely, the results on investment profile actually complement our previous results on *Law and Order* in confirming the effect of market access on contracting institution.

3.6 Robustness Checks

We conduct robustness checks using an alternative measure for contracting institution, the rule-of-law measure from the WGI data. All of the details are relegated to Appendix B.1.

Our analysis above focuses on cross-sectional data in 2005 and is robust to using different years; we find a causal relationship between market access and contracting institution, instrumenting using geographic centrality. Exploiting the fact that the ICRG data is comparable over time and countries, we run a panel regression as a robustness check. However, geographic centrality can no longer be used as an instrument here. Also, as Head and Mayer (2014) point out the lack of a convincing time-varying instrument for market access in the literature, the results here only serve to examine correlation (or the lack of) after controlling for time-invariant factors and suitable covariates. Using the ICRG data from 1984 to 2010, the panel regression results are shown in Table 4. The pooled regression result is shown in Column (1) and indicates a positive correlation between market access and institutional quality. We control for year fixed effects and country ones in the the other columns and add time varying variables one by one. As the data on human capital are available every five years, there is a sharp reduction of observations from Column (3) to Column (4). Nevertheless, a positive and significant correlation prevails.

4 A Quantitative Analysis on the Role of Institution on the Gains from Trade

Our empirical evidence lends support to the mechanism of larger market access leading to a better contracting institution. This section investigates the quantitative importance of such a

Table 3: Effects of Real Market Access on Other Dimensions of Institutional Quality

VARIABLES	(1) government Stability	(2) socioeconomic conditions	(3) investment profile	(4) internal conflict	(5) external conflict	(6) corruption control	(7) military in politics	(8) religious tensions	(9) ethnic tensions	(10) democratic accountability	(11) bureaucracy quality
ln(RMA)	0.101	0.129*	0.162***	0.006	-0.050	0.018	0.025	-0.132***	-0.006	-0.051	0.012
	(0.065)	(0.070)	(0.062)	(0.049)	(0.042)	(0.048)	(0.044)	(0.047)	(0.054)	(0.061)	(0.029)
French legal origin	-0.097*	-0.085	-0.098	0.029	0.049	-0.062*	-0.054	0.032	0.080*	0.022	-0.117***
	(0.056)	(0.066)	(0.061)	(0.043)	(0.041)	(0.035)	(0.047)	(0.047)	(0.046)	(0.059)	(0.030)
German legal origin	-0.189**	-0.251***	-0.118*	0.156***	0.119*	-0.102**	-0.014	0.116	0.054	0.073	-0.078**
	(0.081)	(0.094)	(0.064)	(0.054)	(0.067)	(0.049)	(0.064)	(0.078)	(0.081)	(0.086)	(0.038)
Scandinavian legal origin	-0.135	0.214**	0.037	0.109	0.173*	0.301***	0.066	0.174**	0.123	0.204***	0.088*
	(0.103)	(0.101)	(0.076)	(0.094)	(0.097)	(0.083)	(0.062)	(0.089)	(0.104)	(0.079)	(0.048)
ln(population)	-0.036	-0.025	-0.068***	-0.058***	-0.022	-0.011	-0.022	-0.011	-0.026	0.017	0.005
	(0.022)	(0.026)	(0.020)	(0.018)	(0.016)	(0.014)	(0.014)	(0.020)	(0.020)	(0.024)	(0.011)
Early disease environment	-0.008	-0.094**	-0.027	-0.049	0.023	-0.061**	-0.035	-0.113***	-0.044	-0.041	-0.047**
	(0.042)	(0.043)	(0.042)	(0.036)	(0.028)	(0.028)	(0.036)	(0.032)	(0.033)	(0.042)	(0.019)
Human capital	-0.035**	0.046***	0.029*	0.015	0.018*	0.018*	0.041***	0.025*	0.005	0.039**	0.027***
	(0.016)	(0.015)	(0.015)	(0.013)	(0.010)	(0.009)	(0.014)	(0.014)	(0.012)	(0.017)	(0.007)
Observations	113	113	113	113	113	113	113	113	113	113	113
R-squared	0.136	0.617	0.526	0.351	0.093	0.523	0.449	0.225	0.133	0.231	0.634

Note: Bootstrapped standard errors in parentheses (200 replications). The omitted category of legal origin is English legal origin. The data are taken from year 2005. We instrument the *Real Market Access* with countries' geographic centrality. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

Table 4: Effects of Real Market Access on Institutional Quality: Panel Data

	Dependant variable: ICRG Law and Order			
VARIABLES	(1)	(2)	(3)	(4)
ln(RMA)	0.122***	0.045***	0.068***	0.053**
	(0.003)	(0.012)	(0.011)	(0.025)
ln(population)			0.194***	0.184***
			(0.023)	(0.052)
Human capital				-0.001
				(0.012)
Year FE	No	Yes	Yes	Yes
Country FE	No	Yes	Yes	Yes
Observations	3,505	3,505	3,500	693
R-squared	0.326	0.791	0.796	0.805

Note: Bootstrapped standard errors in parentheses (200 replications). The data cover years from 1984 to 2010. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

mechanism in the lens of the gains from trade literature. In particular, the gains from trade in our model given institutional quality actually follows the ACR formula, as our trade framework is essentially a Krugman (1980) model, which is within the ACR framework. As trade liberalization generally enlarges market access and hence higher institutional qualities, we are interested in knowing how this mechanism reshape the gains from trade.

4.1 Calibration

To solve a Nash equilibrium with about 200 countries is computationally cumbersome and adds little insight into the strategic interaction between countries. We therefore follow Ossa (2011) to focus on the main players in the world trade: Brazil, China, the European Union[15], India, Japan, the United States and the rest of the world (ROW). For the aggregated regions (the EU and ROW) in these seven trade blocs, the institutional quality is proxied by the GDP-weighted average of the institutional qualities of member countries.

The elasticity of substitution in consumers' preference σ is set to 5.12 so that the trade elastic-

[15]We use EU-15, i.e., Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, and the United Kingdom, since these were the member states prior to the accession of ten candidate countries in May 2004 and they share similar institutional quality levels.

ity ($\sigma - 1$) matches the mean value estimated in structural gravity models surveyed by Head and Mayer (2014). The parameter α that determines the elasticity of substitution between specialized inputs is set to 0.27 so that our model's firm markup matches the median markup, 1.3, in the US as reported by Feenstra and Weinstein (2017). Following Di Giovanni and Levchenko (2012), the entry cost f is assumed to be homogeneous for all countries since it indicates the ability to become an entrepreneur and is not expected to vary across countries. We modify the approach of Di Giovanni and Levchenko (2012) to calibrate f by taking into account the impact of institutional quality on the number of firms, as reflected in (14). Specifically, using data on population size and institutional quality and (14), f is set 8.46 such that the number of firms in the US is equal to 7 millions according to the 2002 US Economic Census.

To obtain trade costs τ_{ij}, we first use the estimates in the gravity equation (16) to calculate $\tau_{ij}^{1-\sigma}$ up to a multiplicative constant for the entire sample of countries. To map to our aggregation of seven trade blocs, the value of $\tau_{ij}^{1-\sigma}$ between a pair of trade blocs is proxied by the market-access-weighted average of the value of $\tau_{ij}^{1-\sigma}$ between each pair of countries in different blocs. The above-mentioned multiplicative constant is further pinned by matching the median of openness (the ratio of the sum of imports and exports to GDP) among the seven trade blocs. For a given value of σ, the trade costs τ_{ij} are backed out accordingly. From now on, we refer to each trade bloc as a country.

As countries differ in human capital, we augment the model with a country-specific parameter H_i, which reflects the efficiency units per unit labor. Thus, $H_i L_i$ is the effective labor force. With the institutional qualities given by the data values (ICRG *Law and Order*), H_i is calculated so that each country's GDP generated by the model match the data value. Finally, the country-specific institutional-cost parameter A_i is set to the value such that the solution to government i's problem matches the observed μ_i, given other countries' institutional quality.

4.2 The Role of Institution on the Gains from Trade

We use the calibrated model to explore the role of institution in welfare gains from trade. Let the overall welfare of a country given by (15) be denoted as $W_i(\tau, \mu)$ under trade cost τ and institutional quality μ. The welfare gains from trade from autarky to the actual trade cost structure can thus be written as $[W_i(\tau^o, \mu^o) - W_i(\infty, \mu^a)] / W_i(\infty, \mu^a)$, where τ^o and μ^o are observed trade cost matrix and institutional quality in the data, and μ^a is the institutional quality under autarky calculated from the calibrated model. The gains from trade can be decomposed into a

Table 5: Welfare Gains from Trade and the Decomposition

	Institution		Welfare			Gains From Trade	Contribution of Institutional Change
	μ^o	μ^a	$W_i(\tau^o, \mu^o)$	$W_i(\tau^o, \mu^a)$	$W_i(\infty, \mu^a)$	$\frac{W_i(\tau^o,\mu^o)-W_i(\infty,\mu^a)}{W_i(\infty,\mu^a)}$	$\frac{W_i(\tau^o,\mu^o)-W_i(\tau^o,\mu^a)}{W_i(\tau^o,\mu^o)-W_i(\infty,\mu^a)}$
Brazil	0.358	0.000	15.9	15.6	14.4	10.1%	18.6%
China	0.779	0.000	36.2	34.7	32.0	13.0%	35.5%
EU	0.912	0.764	274.4	271.7	261.8	4.8%	21.8%
India	0.667	0.000	13.6	13.0	11.5	18.5%	29.5%
Japan	0.901	0.633	85.5	84.0	79.4	7.7%	24.4%
USA	0.943	0.819	247.8	245.7	237.3	4.4%	20.0%
ROW	0.620	0.020	259.3	255.7	246.9	5.1%	29.4%

direct channel and an indirect channel as follows:

$$\frac{W_i(\tau^o, \mu^o) - W_i(\infty, \mu^a)}{W_i(\infty, \mu^a)} = \underbrace{\frac{W_i(\tau^o, \mu^a) - W_i(\infty, \mu^a)}{W_i(\infty, \mu^a)}}_{\text{Direct Channel}} + \underbrace{\frac{W_i(\tau^o, \mu^o) - W_i(\tau^o, \mu^a)}{W_i(\infty, \mu^a)}}_{\text{Indirect Channel}}.$$

The direct channel refers to the welfare gains when trade costs are changed from autarky to τ^o, holding fixed the institutional quality under autarky, μ^a. Meanwhile, institutional qualities change in response to changes in trade costs, and thus the indirect channel refers to the welfare gains from trade when institutional qualities change from μ^a under autarky to μ^o as observed in the data, with trade costs held constant as τ^o. We are interested in evaluating the relative importance of the indirect channel.

Table 5 shows the welfare gains from trade and the decomposition. The first observation is that when the world is reverted to autarky, institutional qualities of all countries worsen, and for developing countries such as Brazil, China, and India, institutional qualities drop drastically to zero, and the rest of the world also drops to a minuscule magnitude. Although this result is rather stark, notice that this is in response to drastic changes in trade costs. Second, the gains from trade range from 4.8% to 18.5%, and the indirect channel accounts for a sizeable portion, which ranges from 18.6% to 35.5% of the total gains. The contribution of the institutional change to the welfare gains from trade is particularly large for China, India, and the rest of the world, and this is consistent with the large changes from μ^a to μ^o for these countries. As most countries in the rest of the world are developing, our result suggests that institutional changes induced by trade is particularly important for the developing world. This is because the percentage increases in real market access from autarky to the actual values for these developing countries are much larger than those for the other countries.

Table 6: Welfare Gains from Trade and the Decomposition: Robustness Check

	Institution		Welfare			Gains From Trade	Contribution of Institutional Change
	μ^o	μ^a	$W_i(\tau^o, \mu^o)$	$W_i(\tau^o, \mu^a)$	$W_i(\infty, \mu^a)$	$\frac{W_i(\tau^o,\mu^o)-W_i(\infty,\mu^a)}{W_i(\infty,\mu^a)}$	$\frac{W_i(\tau^o,\mu^o)-W_i(\tau^o,\mu^a)}{W_i(\tau^o,\mu^o)-W_i(\infty,\mu^a)}$
				$\sigma = 3$			
Brazil	0.358	0.000	21.1	20.6	17.6	19.8%	15.2%
China	0.779	0.000	58.2	55.2	47.5	22.5%	28.0%
EU	0.912	0.658	568.1	559.9	526.4	7.9%	19.7%
India	0.667	0.000	19.7	18.5	14.6	34.5%	23.1%
Japan	0.901	0.432	153.4	149.2	136.2	12.6%	24.3%
USA	0.943	0.724	500.9	494.7	467.1	7.2%	18.2%
ROW	0.620	0.000	511.8	501.0	470.0	8.9%	25.7%
				$\sigma = 10$			
Brazil	0.358	0.081	13.2	13.1	12.5	5.5%	18.4%
China	0.779	0.162	26.8	26.2	24.9	7.5%	31.8%
EU	0.912	0.823	179.2	178.4	174.6	2.7%	17.2%
India	0.667	0.071	10.6	10.3	9.6	10.2%	29.1%
Japan	0.901	0.768	59.9	59.5	57.5	4.3%	19.1%
USA	0.943	0.868	163.6	163.0	159.7	2.4%	15.6%
ROW	0.620	0.202	174.8	173.7	170.0	2.8%	21.9%

Also note that our gains from trade figures are generally larger than what would be predicted by the renowned ACR formula (Arkolakis et al., 2012), and the two main reasons are as follows. First, even though our trade framework follows that of Krugman (1980) and falls in the ACR framework when institutional qualities are exogenous, but the facts that institutional qualities are endogenous in our model and that they contribute a sizeable portion of total gains make the welfare gains larger than what would be predicted by the ACR formula. Second, the welfare measure in (15) is inclusive of the cost of institutional building and maintenance. Although this cost term is differenced out in the numerator of total gains from trade, but the denominator is smaller due to this cost term.

As is well-known, welfare gains from trade are highly sensitive to values of trade elasticity, which is equal to $\sigma - 1$ in our context. We thus explore the robustness of our results using alternative values of $sigma$ at 3 and 10, and the results are reported in Table 6. As expected, the total gains from trade are much larger in the case of $\sigma = 3$ and much smaller in the case of $\sigma = 10$. Nevertheless, the quantitative magnitude of the relative importance of institutional change remains robust, as it changes from 15.2% to 31.8%.

5 Conclusion

Geography and institution are both important in explaining economic development, and this paper explores an particular and yet important aspect of the interactions between the two. Our theory focuses on contracting institution and shows that a larger real market access leads to a higher institutional quality. It also suggests a flying-geese pattern of institution that starts with an exogenously given first institutional reform at a "world center" and emerges with continuously declining trade costs. Related to a trade diversion force, our theory also suggests that a non-trade-liberalized country may be hurt by other countries' mutual trade liberalization not only through trade diversion but also via a worsened incentive to build institution. In short, our theory shows various aspects of how trade and geography may shape institution.

Our empirical evidence supports the main model prediction, and our quantitative analysis shows that trade-induced institutional improvement may account for a sizeable portion of total welfare gains from trade. Globalization comes with various benefits and costs, and at this era when there are signs of reversal to a protectionism-oriented world, our study serves to caution that the potential losses of such reversal can be more devastating than one would usually imagine.

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Appendix

A Theoretical Appendix

A.1 Properties of Function $I(\mu)$

We show that $I(\mu)$ is increasing in μ, and $\ln I(\mu)$ is concave in μ.
Recall $I(\mu) = [\alpha(1-\gamma)]^{\frac{1-\mu}{1-\beta}} \left[\left(\frac{1-\gamma}{1-\beta(1-\mu)} + \gamma\right)\beta\right]^{\frac{\mu}{1-\beta}}$;
Define $\bar{I}(\mu) \equiv (1-\beta)\ln I(\mu)$, and then we have

$$\frac{d\bar{I}}{d\mu} = -\ln\left(\frac{\alpha\beta}{\alpha+\beta}\right) - \frac{\beta^2\mu}{[\beta(\mu-1)+1](-\alpha\beta+\alpha+\beta+\alpha\beta\mu)} + \ln\frac{\beta(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)}{(\alpha+\beta)[\beta(\mu-1)+1]}.$$

It suffices to show that $\frac{d\bar{I}}{d\mu} > 0$.

Note that

$$\begin{aligned}
\frac{d}{\mu}\left(\frac{d\bar{I}}{d\mu}\right) &= \beta^2\frac{2\alpha(\beta-1)[\beta(\mu-1)+1]-\beta[\beta(\mu-2)+2]}{[\beta(\mu-1)+1]^2\{\beta+\alpha[\beta(\mu-1)+1]\}^2} \\
&= \beta^2\frac{\left[2\alpha(\beta-1)\beta-\beta^2\right]\mu-2\left[\alpha(1-\beta)^2+\beta(1-\beta)\right]}{(\beta(\mu-1)+1)^2\{\beta+\alpha[\beta(\mu-1)+1]\}^2}
\end{aligned}$$

Since $2\alpha(\beta-1)\beta-\beta^2 < 0$ and $\alpha(1-\beta)^2+\beta(1-\beta) > 0$, we have $\frac{d}{\mu}\left(\frac{d\bar{I}}{d\mu}\right) < 0$ on the interval $(0,1)$. Hence, $\ln I(\mu)$ is concave in μ.

Now that $\frac{d\bar{I}}{d\mu}$ is decreasing in $(0,1)$, and $\frac{d\bar{I}}{d\mu}$ achieves its minimum at $\mu = 1$. Hence, $\frac{d\bar{I}}{d\mu}|_{\mu=1} = -\ln\left(\frac{\alpha\beta}{\alpha+\beta}\right) - \frac{\beta^2}{\alpha+\beta} + \ln\beta = -\ln\left(\frac{\alpha}{\alpha+\beta}\right) - \frac{\beta^2}{\alpha+\beta}$, which is decreasing in α. When $\alpha = 1$, $\frac{d\bar{I}}{d\mu}|_{\mu=1} = \ln(1+\beta) - \frac{\beta^2}{1+\beta} > 0$ for any β in $(0,1)$. Hence $\frac{d\bar{I}}{d\mu}|_{\mu=1} > 0$ for any α and β in $(0,1)$.

Therefore, $\frac{d\bar{I}}{d\mu}$ is always positive in $(0,1)$ and $I(\mu)$ is thus increasing in μ.

A.2 Properties of Function $K(\mu)$

We show $K(\mu)$ is increasing in μ and $\ln K(\mu)$ is concave.

Recall $K(\mu) = \left[1-\left(\beta\mu\frac{1-\gamma}{1-\beta+\beta\mu}+\alpha-\alpha\gamma\right)\right]I(\mu)^{\beta}$. Taking log on both sides, we have

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

Therefore,

$$\begin{aligned}
\frac{1-\beta}{\beta}\frac{d\ln K}{d\mu} &= -\frac{\beta(1-\beta)}{(\beta(\mu-1)+1)(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)} - \ln\left(\frac{\alpha\beta}{\alpha+\beta}\right) \\
&\quad -\frac{\beta^2\mu}{(\beta(\mu-1)+1)(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)} \\
&\quad +\ln\frac{\beta(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)}{(\alpha+\beta)(\beta(\mu-1)+1)} \\
&= -\ln\left(\frac{\alpha\beta}{\alpha+\beta}\right) - \frac{\beta}{(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)} + \ln\frac{\beta(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)}{(\alpha+\beta)[\beta(\mu-1)+1]}.
\end{aligned}$$

Note that

$$\frac{d}{d\mu}\left(\frac{1-\beta}{\beta}\frac{d\ln K}{d\mu}\right) = \frac{-\beta^3}{(\beta(\mu-1)+1)(\beta+\alpha(\beta(\mu-1)+1))^2} < 0,$$

we have $\ln K(\mu)$ is concave in μ.

Now that $\frac{d\ln K}{d\mu}$ is decreasing in μ. To show K is increasing in μ, it suffices to show that $\frac{d\ln K}{d\mu}|_{\mu=1} > 0$. Note $\frac{1-\beta}{\beta}\frac{dK}{d\mu}|_{\mu=1} = -\ln\left(\frac{\alpha\beta}{\alpha+\beta}\right) - \frac{\beta}{\alpha+\beta} + \ln\beta = -\ln\left(\frac{\alpha}{\alpha+\beta}\right) - \frac{\beta}{\alpha+\beta}$, which is always positive for any positive α and β in $(0,1)$. Hence,$\frac{1-\beta}{\beta}\frac{dK}{d\mu}|_{\mu=1} > 0$ and $K(\mu)$ is increasing in μ.

Lemma 1. *Let α_0 be the smaller solution to $(\sqrt{x}+1)\frac{x}{\alpha_0+x} - \ln\left(1+\frac{x}{\alpha_0}\right) = 0$ where $0 \leqslant \beta \leqslant 1$, $\beta \leqslant x \leqslant \frac{\beta}{1-\beta}$. A sufficient condition for the function $K(\mu)^{\frac{1}{\sigma-1}}$ to be concave is that α is greater than the maximum of $\alpha_0(x)$.*

Proof. Let $G = K^{\frac{1}{\sigma-1}}$, and denote $M(\mu) = \frac{d\ln G}{d\mu}$, and $N(\mu) = \frac{d}{d\mu}\left(\frac{d\ln G}{d\mu}\right)$. Then we have $G'' = \left(M^2+N\right)G$. Note both $G(\mu)$ and $G'(\mu) > 0$ from A.2. To show the function $G(\mu)$ is concave is equivalent to show that $M(\mu)^2 < -N(\mu)$, or

$$\ln\left(1+\frac{\beta}{\alpha\beta(\mu-1)+\alpha}\right) < \left[\left(\frac{\beta}{(\beta(\mu-1)+1)}\right)^{\frac{1}{2}}+1\right]\frac{\beta}{(-\alpha\beta+\alpha+\beta+\alpha\beta\mu)}.$$

Let $x = \frac{\beta}{\beta(\mu-1)+1}$. Then we have $\beta \leqslant x \leqslant \frac{\beta}{1-\beta}$ as $0 \leqslant \mu \leqslant 1$.

Let

$$F(\alpha,x) = \left(\sqrt{x}+1\right)\frac{x}{\alpha_0+x} - \ln\left(1+\frac{x}{\alpha_0}\right).$$

To prove $G(\mu)$ is concave is to show $F(\alpha,x) \geqslant 0$ for any α and x.

Note $F(\alpha,x)$ is increasing in α when $\alpha < \sqrt{x}$, and decreasing in α when $\alpha > \sqrt{x}$. Both $F(\sqrt{x},x)$ and $F(1,x)$ are positive for $\beta \leqslant x \leqslant \frac{\beta}{1-\beta}$. Therefore, for any value $x \in [\beta, \frac{\beta}{1-\beta}]$, we can always locate a unique $\alpha_0(x)$ such that $F(\alpha_0,x) = 0$ and $0 < \alpha_0 < \sqrt{x}$. A sufficient condition for the function $G(\mu)$ to be concave is that $\alpha > \max\alpha_0(x)$, where $\beta \leqslant x \leqslant \frac{\beta}{1-\beta}$.

□

A.3 Proof of Proposition 1

Proof. Consider n symmetric countries with population all equal to L and trade costs all equal to τ. Assume country 1's price index is normalized to be 1. By symmetry, the price index will be equal to 1 for any country, the wage is $w = \left(\frac{L\left(1+(n-1)\tau^{1-\sigma}\right)K(\mu)}{f}\right)^{\frac{1}{\sigma-1}}$, and the real market access is $RMA = \frac{MA}{P^\sigma} = \left(L\left(1+(n-1)\tau^{1-\sigma}\right)\right)^{\frac{\sigma}{\sigma-1}}\left(\frac{K(\mu)}{f}\right)^{\frac{1}{\sigma-1}}$.

The government's objective function is

$$\max_{\mu} L^{\frac{\sigma}{\sigma-1}}\left(\frac{\left(1+(n-1)\tau^{1-\sigma}\right)K(\mu)}{f}\right)^{\frac{1}{\sigma-1}} - AL\mu$$

Under the regularity conditions listed in Lemma 1, the function $K(\mu)^{\frac{1}{\sigma-1}}$ is concave. Let $G(\mu, L, n, \tau) = L^{\frac{\sigma}{\sigma-1}} \left(\frac{\left(1+(n-1)\tau^{1-\sigma}\right)K(\mu)}{f} \right)^{\frac{1}{\sigma-1}} - AL\mu$. One sufficient condition for interior solution is $\sigma > 2$ such that $G'(0, L, n, \tau) > 0 > G'(1, L, n, \tau)$. Note $G'(\mu, L, n, \tau)$ is increasing in L, n,and decreasing in τ. Thus, when L or n increases, or τ decreases, that is, the real market access is larger, then the institutional qualityμ will be higher for each country. □

B Empirical Appendix

B.1 Results using the WGI data

We also run the same specification using other dimensions of institution from WGI[16] , as in Table C 2. Government effectiveness and regulatory quality, in particular, are also affected by a country's centrality. Both dimensions tend to link the economic relationship between firms and the government in terms of policy implementation and enforcement. Nevertheless, other dimensions such as voice accountability are not significantly affected by centrality through the channel of market access.

[16]According to the WGI documentation, *Voice and Accountability* captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media; *Political Stability* measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism; *Government Effectiveness* captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies; *Regulatory Quality* captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development; *Corruption Control* captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests.

Table C 1: Effects of Real Market Access on Institutional Quality Rule of Law from WGI)

	Dependant variable: WGI Rule of Law					
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	OLS			IV		
ln(RMA)	0.079***	0.129***	0.120***	0.135***	0.092**	
	(0.014)	(0.014)	(0.018)	(0.033)	(0.042)	
ln(RMA) – lagged 5 years						0.098**
						(0.047)
French legal origin		-0.096***	-0.078***	-0.110***	-0.077***	-0.075***
		(0.023)	(0.023)	(0.023)	(0.023)	(0.024)
German legal origin		-0.037	-0.095***	-0.068	-0.074*	-0.063*
		(0.038)	(0.033)	(0.050)	(0.039)	(0.036)
Scandinavian legal origin		0.193***	0.141***	0.184***	0.159***	0.161***
		(0.027)	(0.035)	(0.041)	(0.038)	(0.038)
ln(population)		-0.050***	-0.032***	-0.045***	-0.025**	-0.025**
		(0.005)	(0.008)	(0.008)	(0.012)	(0.013)
Early disease environment			-0.001		-0.007	-0.006
			(0.018)		(0.022)	(0.023)
Human capital			0.015***		0.019**	0.017**
			(0.006)		(0.007)	(0.008)
First stage F				45.96	50.67	30.63
Observations	193	191	127	188	127	127
R-squared	0.171	0.567	0.662	0.600	0.654	0.658

Note: Bootstrapped standard errors in parentheses (200 replications). The omitted category of legal origin is English legal origin. The data are taken from year 2005. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

Table C 2: Effects of Real Market Access on Other Dimensions of Institutional Quality (WGI)

VARIABLES	(1) voice accountability	(2) political stability	(3) government effectiveness	(4) regulatory quality	(5) corruption control
ln(RMA)	-0.004	0.014	0.077**	0.090***	0.078
	(0.033)	(0.039)	(0.037)	(0.035)	(0.050)
French legal origin	-0.029	-0.006	-0.075***	-0.061***	-0.075***
	(0.030)	(0.029)	(0.021)	(0.022)	(0.024)
German legal origin	0.032	0.087*	-0.082**	-0.063*	-0.091*
	(0.052)	(0.046)	(0.038)	(0.036)	(0.051)
Scandinavian legal origin	0.196***	0.175***	0.156***	0.071*	0.207***
	(0.051)	(0.055)	(0.048)	(0.039)	(0.051)
ln(population)	-0.003	-0.041***	-0.015	-0.024**	-0.028**
	(0.013)	(0.012)	(0.011)	(0.010)	(0.013)
Early disease environment	-0.021	-0.017	-0.026	-0.013	-0.032
	(0.024)	(0.022)	(0.019)	(0.019)	(0.024)
Human capital	0.031***	0.019**	0.023***	0.020***	0.017**
	(0.008)	(0.008)	(0.007)	(0.006)	(0.008)
Observations	127	127	127	127	127
R-squared	0.466	0.473	0.720	0.674	0.645

Note: Bootstrapped standard errors in parentheses (200 replications). The omitted category of legal origin is English legal origin. The data are taken from year 2005. We instrument the *Real Market Access* with countries' geographic centrality. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.

B.2 Additional Tables and Figures

Table D1: PPML Gravity Estimation Results

ldist	border	com_lang	colony	WTO_both	RTA
-0.626***	0.531***	0.131*	0.215*	-0.039	0.540***

Note: Standard errors are clustered by exporter and importer. Here, ***, **, and * denote significance at the 1, 5, and 10% level, respectively.