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INTRINSIC OPENNESS AND ENDOGENOUS INSTITUTIONAL QUALITY

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ABSTRACT

Quality of public institutions has been recognized as a crucial determinant of macroeconomic outcomes. We propose that a country's intrinsic level of openness (due to population size, geography, or exogenous trade opportunities) affects its incentives in investing in better institutions. We present a simple theory and extensive empirical evidence validating the role of intrinsic openness in determining governance quality. This suggests an indirect but important channel for globalization to improve welfare by raising the quality of governance.

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1 Introduction

Institutional quality (e.g., level of bureaucratic corruption, political risk premium, quality of government service, and risk of expropriation) varies widely across countries. It has been regarded as a crucial determinant of a country's economic performance. Mauro (1995) finds that corruption lowers investment, thus growth rate. Murphy, Shleifer and Vishny (1991) argue that rent-seeking activities are detrimental to growth rate. Institutional quality can also affect how economic gains are distributed. Chong and Calderson (2000) find a negative relationship between institutional quality and income inequality. With open economy consideration, Wei (2000) empirically shows that corruption reduces a country's inward FDI. Tamirisa and Wei (2000) show that corruption also deters international trade significantly. Besides, institutional quality is found to affect international trade patterns. Costinot (2009), Levchenko (2007) and Vogel (2007) consider institutional quality as an independent source of comparative advantage. Ju and Wei (2011) conclude that institutional quality affects patterns of both capital flows and trade.

Given the significance of institutional quality, it is important to understand its determinants. We argue in this paper that a country's "intrinsic openness", as given by its population size and geography, is a determinant of institutional quality. The central story is as follows. The amount of resources that a society devotes to building good institutions is endogenous; and depends on a comparison of marginal cost and marginal benefit. Since international traders and investors are more footloose (i.e., have better outside options) than domestic ones, bad governance and bureaucratic corruption in a country reduces international trade and investment more than domestic trade and investment. As a result, a country that is intrinsically more open – based on its population size, geography, and other factors outside its control – would find it more costly if they suffer from bad institutions so they optimally devote more resources to building good institutions. Such economies will display, for example, less corruption and a higher quality of government than intrinsically less open economies.

We will check the plausibility of some key assumptions in our story. For example, do bad institutions reduce international trade more than domestic trade? This would require a way to estimate a country's trade with itself. By using gross output decomposition data from the recent literature on the measurement of global value chains, we can perform such a test and find supportive evidence. We also empirically confirm that, across countries, intrinsic openness (smaller size, shorter distance to the world market, not landlocked, or longer coastline length/area) does lead to greater actual trade openness (trade/GDP).

Importantly, we test and find strong support for the key proposition of our theory: An increase in a country's intrinsic openness indeed reduces corruption, improves government quality, and decreases political risk. In the same exercise, we also find some support for the notion that colonial settlers' mortality rate in the 18th and 19th century, and abundance of natural resources tend to be associated with worse institutions. We do not find robust support for a role of legal origins in determining institutional quality.

Because institutional quality is a slow-moving variable, much of our results will be based on cross-country variations in a given year (2005 is our base year, though we have verified that the same results hold for other years). By necessity, one cannot control for country fixed effects in pure cross-country regressions. This is not unusual for the literature on this topic. For example, Acemoglu, Johnson, and Robinson (2001) and Leite and Weidmann (1999) report only cross-sectional results in testing their theories of settler mortality and natural resource endowment, respectively, as determinants of institutional quality. Since our measures of a country's intrinsic openness are geographic features (such as distance to major economic centers of the world, or coastal length relative to area size) and population size, they are unlikely to be endogenous outcomes of institutional quality. There is therefore less need to worry about endogeneity in our setting than a typical cross-country regression.

Nonetheless, we will also attempt a long-difference exercise by exploring exogenous variations in the level of intrinsic openness experienced by small and medium-sized countries during 2000-2006. A major shock to the global trading environment during that period was China's accession to the World Trade Organization in 2001, and a dramatic and unilateral reductions in China's trade barriers on imports from the rest of the world. While China's GDP roughly doubles once every seven years, China's trade roughly doubles once every four years. Given the size of the Chinese market, its cut in import tariff implies a significant and exogenous change in many countries' overall trading opportunities. Importantly, the changes to intrinsic openness are uneven across countries, partly because of differences in geography (e.g., countries near China might benefit more than those that are far away), and partly because of differences in comparative advantage (e.g., a big reduction in Chinese tariff on automobiles means different things for car-exporting countries versus non-car-exporting countries).

While changes in the Chinese tariff rates were the primary shock, changes in tariffs by other major economies during the same period could matter as well. In our long-difference exercise, we employ changes in import tariffs by big trading nations (China + G7) from 2000 to 2006 as a source of exogenous shock to other countries' intrinsic openness. A key finding will be that greater improvement in governance quality (greater reduction in political risks) is found in those countries that experienced greater relative increase in intrinsic openness. Various robustness checks such as excluding outliers, using 3-year averages, and implementing placebo-tests confirm robustness of our conclusions.

A third type of empirical exercise we do explores cross-product heterogeneity in the reliance on governance institutions. Nunn (2007) makes the point that the same improvement in public institutions might have a greater salubrious effect on the production and trade of what he calls "contract-intensive" products (which are empirically proxied by differentiated goods such as numerically controlled machines) than on "less contract intensive" goods (which are empirically proxied by relatively "homogenous" goods such as iron, steal, and oil). We build on this insight and ask the reverse question: do countries whose comparative advantage is in contract intensive products respond more in governance quality to a given change in intrinsic openness? We find that the answer is a resounding

yes, and take it as a further confirmation of our theory.

We compare our story with the existing literature on the determinants of institutional quality. Acemoglu, Johnson and Robinson (2001) propose that the mortality rate of the European colonizers in the past is a key determinant of a developing country's institutional quality today. By their logic, a higher colonial mortality rate translates into a stronger incentive to set up extractive institutions with less protection for property rights during the colonial years, and the nature of institutions tends to live on even after independence. Engelman and Sokoloff (2002) use the initial factor endowment as an explanation for the difference in institutional quality in the Americas. La Porta, Lopez-de-Silanes and Shleifer (2008) hypothesize that a common law origin is more protective of outside investors than the civil law tradition. Leite and Weidmann (1999) argue that natural resource abundance is related to more rent seeking behavior, resulting in lower economic growth. None of these explanations is based explicitly on open economy concerns.

At least three other papers make a connection between trade and institutional quality. Ades and Di Tella (1999) argue that greater trade openness reduces the amount of rent associated with being in the government and hence reduces the level of corruption. In their theory, the sign of competitiveness' effect on corruption is ambiguous. In their empirical part, they find that a higher import/GDP ratio reduces the level of corruption. Our cross sectional results will show that, after controlling for the import/GDP ratio, there is still ample evidence supporting the role of intrinsic openness in affecting institutional quality. In our framework, it is the intrinsic openness not the actual openness (trade/GDP) that can affect institutional quality. When we let intrinsic openness and residual openness - the part of import/GDP that is not related to geography and country size - compete in explaining institutional quality, intrinsic openness dominates residual openness. In addition, we will explore a natural experiment in which institutional quality responds to changes in export opportunities due to policy changes of partner countries rather than in import competition.

Acemoglu, Johnson and Robinson (2005) attribute part of Western Europe's development after 1500 to institutional improvement after the increase of the Atlantic trade. Because the Atlantic trade enriched merchants, their political demand - stronger protection of property rights - became better met. In comparison, while we also look at the role of trade globalization, we do not rely on changes in political power but differential sensitivity between international and domestic trade to a given change in institutional quality.

For Levchenko (2013), the mechanism for institutional changes is a "race to the top": when the technology difference between two countries is small, after opening to trade, countries upgrade institutional quality in order to specialize in institutionally intensive sectors to extract rents in that sector. But when the technology difference is large enough, the opposite pattern happens - institutional quality deteriorates in order to extract more rents. Therefore, trade openness helps institutional quality only locally. In comparison, we regard bad institutional quality as a tax on trade, and endogenous upgrading of institu-

tional quality is driven by the difference in the effects of institutional quality on international versus trade. In addition, while Levchenko (2013) provides only cross sectional regressions, this paper will also conduct long-difference analysis (that differences out country fixed effects).

The current paper is also related to a growing literature on a "China shock" in trade. Autor, Dorn and Hanson (2013), Acemoglu, Autor, Dorn, Hanson and Price (2016) and Pierce and Schott (2016) study effects of increased China's import competition during 2000-2007 on US local labor markets. Bloom, Draca and Van Reenen (2015) show that offshoring to China may have benefited European firms and their workers by enhancing firms' productivity and innovation activities. Autor, Dorn, Hanson, Mailesi (2016) analyze the role of growing imports from China during 2000-2007 in shaping the polarization of U.S. politics. Wang, Wei, Yu, and Zhu (2017) suggest, once using a supply chain perspective, the negative effects on the US labor market of a China trade shock could be reversed.

Similar to other papers on the China trade shock, some of the empirical exercises in this paper also take advantage of the changes in global trading environment during 2000-2006 that was related to China's accession to the WTO. Different from the existing literature on the China trade shock, we focus on its effect on institutional changes in other countries. Our results suggests an indirect but important beneficial channel for China's rise in word trade: by responding to the changes in the global trading environment by improving their public institutions, many countries' growth prospect in the long run may be brightened. This could be especially important for countries with a low initial level of institutional quality.

The rest of the paper is organized as follows. In Section 2, we propose a simple theory clarifying the logic behind the story. In Section 3, we supply cross-sectional evidence on the relationship between a country's intrinsic openness and its institutional quality. In Section 4, we conduct a long-difference analysis exploring exogenous changes in intrinsic openness experienced by small and medium sizd economies during 2000-2006 due to changes in trade barriers by China and G7 countries. We will also explore cross-product heterogeneity in the reliance on public governance institutions. Finally, in Section 5, we provide concluding remarks and suggest some possible future research. A set of five appendices provide more information on data sources, supplementary empirical work verifying some key assumptions of the theory, and an extension of the model.

2 The Model

2.1 Model Setup

Consider a world with N countries. Country i has a population of L_i and a technology level denoted by A_i. This yields total units of effective labor $E_i = A_i L_i$. Each unit of effective labor produces one unit of good (either a

homogeneous or a differentiated good).

A representative consumer in country i has the following logarithmic utility[1]:

$$u_i = \log H_i$$

with H_i denoting the consumption of the final good, which comes from

$$H_i = Y_i^{\alpha} X_i^{1-\alpha} \tag{1}$$

where $0 < \alpha < 1$. Y_i is an internationally traded homogeneous good, and X_i is an Armington aggregate of differentiated goods from each country described as below:

$$X_i = (\sum_{j \in N} N_j X_{ij}^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}$$

where X_{ij} is the consumption of a differentiated good produced by country j and consumed in country i, and N_j the number of varieties produced in country j. We assume N_j is positively related to the producing country's population: $N_j = M(L_j)$[2]. Parameter $\sigma > 1$ is the elasticity of substitution.

The homogeneous good is taken as the numeraire thus $p_Y = 1$. Since it is tradable across countries, the wage rate of a unit of effective labor is pinned down by $w_i = 1$[3]. Assuming a complete competitive market for each variety, the fob price of each variety must be $p_i = w_i = 1$. Denoting the final good price as P_i, the profit maximization problem of final good producers is

$$\max_{\{Y_i, X_{ij}\}} P_i Y_i^{\alpha} [(\sum_{j \in N} N_j X_{ij}^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}]^{1-\alpha} - p_Y Y_i - \sum_{j \in N} p_i N_j X_{ij} \tau_{ij} \tag{2}$$

where τ_{ij} is an iceberg cost to be specified later. The final good price index is derived as

$$P_i = \alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}[[\sum_{j \in N} N_j \tau_{ij}^{1-\sigma}]^{\frac{1}{1-\sigma}}]^{(1-\alpha)} \tag{3}$$

The indirect utility for a representative agent in country i is, therefore,

$$v_i = \log \frac{A_i}{P_i} = \log(\alpha^{\alpha}(1-\alpha)^{1-\alpha}) + \log(A_i) + \log(\sum_{j \in N} T_{ij})^{\frac{1-\alpha}{\sigma-1}} \tag{4}$$

with $T_{ij} = N_j \tau_{ij}^{1-\sigma}$.

The iceberg trade cost for a given country pair (i, j), τ_{ij}, is assumed to depend on the quality of institutions in the two countries, as well as geographic

[1] The logarithmic utility is for ease of exhibition. All theoretical results apply as long as utility is an increasing function of final good consumption, as one can always equivalently transform the objective function for welfare by a monotonic increasing function.

[2] This shares a feature with the Krugman (1979) model in which the (endogenous) number of varieties is proportional to the population size. For simplicity, we assume a competitive good market. However, our theoretical predictions are preserved if we adopt the monopolistic competition framework of Krugman (1979).

[3] In country i, GDP per capita, i.e. the wage rate of each worker is $A_i w_i = A_i$.

distance d_{ij}. The assumption is meant to capture the idea that bad institutions (e.g. corruption) add to the cost of clearing the customs or uploading or offloading cargos. We specify the following separable functional form for the iceberg cost:

$$\tau_{ij} = d_{ij} f(q_i, q_j) \tag{5}$$

where the first term d_{ij} reflects physical distance and (bilateral) trade policy, and the second term (q_i, q_j) captures the role of the two countries' institutional qualities.

Note that bad institutional quality negatively impacts both domestic and international trade.

Assumption 1. for $i \neq j$, $\frac{\partial f(q_i,q_j)}{\partial q_i} < 0$, $\frac{\partial f(q_i,q_j)}{\partial q_j} < 0$ and for $i = j$, $\frac{\partial f(q_i,q_i)}{\partial q_i} \leq 0$[4].

We further make the following assumption to capture the idea that international traders are more "mobile" than domestic traders.

Assumption 2. $-\frac{\partial \log f(q_i,q_j)}{\partial q_i} > -\frac{\partial \log f(q_i,q_i)}{\partial q_i}$.

That is to say, international trade is more sensitive to domestic institutional quality compared to domestic trade.

The above two assumptions are crucial for the theoretical predictions. In an appendix, we empirically verify these assumptions using an augmented gravity framework. A key ingredient is to measure a country's trade with itself. See Appendix A2 for details.

2.2 Institutional Cost

We now investigate the endogenous determination of institutional quality. To capture the idea that improving institutional quality requires costly investment, we specify a cost function in per capita terms such that the per capita income in the economy net of investment in public institutions is:

$$A_i^e = [1 - \phi(q_i)]A_i$$

where $\phi\prime(q_i) > 0$ so that it is costly to upgrade institutional quality[5].

The indirect utility is then

$$v_i = \log(\alpha^\alpha (1-\alpha)^{1-\alpha} A_i^e (\sum_{j \in N} T_{ij})^{\frac{1-\alpha}{\sigma-1}})$$

$$= \log(\alpha^\alpha (1-\alpha)^{1-\alpha}) + \log([1 - \phi(q_i)]) + \log(A_i) + \log[\sum_{j \in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i, q_j)]^{\frac{1-\alpha}{\sigma-1}} \tag{6}$$

[4] Without risk of confusion, the expression $f(q_i, q_i)$ is always taken as a function of only one variable q_i.

[5] Note that the requirement investment in public institutions is assumed to exhibit no scale effect. In Appendix A4, we use cross-country data to confirm that neither general government expense per capita nor total government employee compensation per capita exhibits a scale effect. One reason might be that, as a country becomes larger, the number of layers of goverments tends to increase as well.

This implies a tradeoff for any country: on one hand, better institutional quality leads to less resource spent on consumption; on the other hand, it reduces transaction costs in trade.

2.3 Optimal Institutional Quality

The optimal institutional quality can be solved from the viewpoint of a social planner, who faces the following problem:

$$\max_{q_i} v_i(q_i)$$

i.e.

$$\max_{q_i} \log \alpha^{\alpha}(1-\alpha)^{1-\alpha} + \log A_i + \log[1-\phi(q_i)] + \frac{1-\alpha}{\sigma-1}\log[\sum_{j\in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i,q_j)] \tag{7}$$

The first order condition of the above problem is

$$\frac{\phi\prime(q_i)}{1-\phi(q_i)} = (1-\alpha)\frac{\sum_{j\in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i,q_j)[-\frac{\partial \log f(q_i,q_j)}{\partial q_i}]}{\sum_{j\in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i,q_j)} \tag{8}$$

The left hand side is the marginal cost of increasing one unit of institutional quality while the right hand side is the marginal benefit. To guarantee uniqueness, we assume that the left hand side is increasing in q_i (convex cost of increasing institutional quality), while the right hand side is decreasing in q_i (diminishing returns to institutional quality). At least one of the two is assumed to be strictly monotonic. For example, $\phi(q) = 1 - e^{-\gamma q}$, $f(q_i,q_j) = e^{\frac{\pi_i}{q_i}} e^{\frac{\pi_j}{q_j}}$, $f(q_i,q_i) = e^{\frac{\pi}{q_i}}$, where $\pi_i > \pi$.

Following the existing trade literature, and for notational convenience, we set $d_{ii} = 1$. The first order condition can be re-written as

$$\begin{aligned}\frac{1}{1-\alpha}\frac{\phi\prime(q_i)}{1-\phi(q_i)} &= -\frac{\partial \log f(q_i,q_i)}{\partial q_i} \\ &+ \frac{\sum_{j\neq i} \frac{N_j}{N_i} d_{ij}^{1-\sigma}[\frac{f(q_i,q_j)}{f(q_i,q_i)}]^{1-\sigma}[-\frac{\partial \log f(q_i,q_j)}{\partial q_i} - (-\frac{\partial \log f(q_i,q_i)}{\partial q_i})]}{1+\sum_{j\neq i} \frac{N_j}{N_i} d_{ij}^{1-\sigma}[\frac{f(q_i,q_j)}{f(q_i,q_i)}]^{1-\sigma}}\end{aligned} \tag{9}$$

Before we proceed to the role of intrinsic openness in determining institutional quality, we note that if institutional quality were to affect international trade and domestic trade equally: $-\frac{\partial \log f(q_i,q_j)}{\partial q_i} = -\frac{\partial \log f(q_i,q_i)}{\partial q_i}$, then the second term of the right hand side is 0, and population and distance would have been irrelevant for determining institutional quality.

Assume that $f(q_i,q_j)$, $i \neq j$ is separable (log-additive[6], or in a two-country setting: home and rest of the world, we don't need this assumption.)

$$f(q_i,q_j) = f_1(q_i) f_2(q_j).$$

[6] In the Appendix, when we test gravity equation with institutional quality, if we include an interaction term $q_i * q_j$, it is hard to reject the coefficient before the interaction term is 0.

Then we have the following

$$\frac{1}{1-\alpha}\frac{\phi\prime(q_i)}{1-\phi(q_i)} = -\frac{\partial \log f(q_i,q_i)}{\partial q_i}$$
$$+\frac{\sum_{j\neq i}\frac{N_j}{N_i}d_{ij}^{1-\sigma}[\frac{f(q_i,q_j)}{f(q_i,q_i)}]^{1-\sigma}}{1+\sum_{j\neq i}\frac{N_j}{N_i}d_{ij}^{1-\sigma}[\frac{f(q_i,q_j)}{f(q_i,q_i)}]^{1-\sigma}}[-\frac{\partial \log f(q_i,q_j)}{\partial q_i} - (-\frac{\partial \log f(q_i,q_i)}{\partial q_i})] \quad (10)$$

See Figure 1 for a numerical example of equilibrium determination. Conducting comparative statics offers the following insights.

Proposition 1 ***(Population)*** *Holding everything else equal, a smaller country (smaller N_i) chooses to invest in better institutional quality.*
Proof. *The second term of the right hand side increases when N_i decreases. Therefore, the marginal return from better institutional quality goes up. In equilibrium, smaller N_i country displays higher institutional quality q_i.* ■

Proposition 2 ***(Geography)*** *Holding everything else equal, a country that is nearer to the rest of the world economy (smaller d_{ij}) tends to choose better institutional quality.*
Proof. *The second term of the right hand side increases when d_{ij} decreases. Therefore, the marginal return from better institutional quality goes up. In equilibrium, smaller d_{ij} country displays higher institutional quality q_i.* ■

The intuition of the above two propositions is as follows: the welfare of an intrinsically more open country (with either a smaller N_i or a smaller d_{ij}) has a larger part coming from international trade. As international trade is more sensitive to institutional quality compared to domestic trade, bad institutional quality will do more damage to such a country. Therefore, an intrinsically more open economy has a stronger incentive to improve institutional quality.

Corollary (**Globalization**) Trade liberalization facilitates institutional quality upgrading.

Proposition 3 ***(Complementarity)*** *Improvement in foreign institutional quality induces improvement in domestic institutional quality.*
Proof. *County j institutional upgrading decreases $f(q_i,q_j)$ thus also increases the second term of the right hand side. In equilibrium, higher q_j increases q_i.* ■

Since those foreign countries that are geographically close have a bigger weight in a country's trade, the above proposition would generate spatial correlation in institutional quality. That is, one tends to see a cluster of adjacent countries with similar quality of institutions.

The assumption that international trade is more sensitive to institutional quality compared to domestic trade is crucial. If we were to reverse this assumption, Proposition 1-3 would have been reversed too. As we show in Appendix A2, data supports the assumption that international trade is more sensitive to institutional quality than domestic trade.

2.4 Political Economy Considerations

The previous propositions are derived from a social planner's optimization problem. Without heterogeneity across agents in a country, everyone would make the same choice as the social planner. To highlight the potential conflict of interest across agents in selecting the quality of institutions, we now introduce capital (as another exogenous element of endowment, in the spirit of the Heckscher-Ohlin model of trade) and inequality of capital endowment. Inequality of capital among individuals or households has been emphasized in the Piketty (2013) book on income inequality.

Suppose the economy has total capital K_i where agent s in country i holds k_i^s and is endowed with a unit of labor as before. Household utility is still assumed to be

$$u_i = \log H_i$$

where H_i is the consumption of final good. The final good consumption is revised to

$$H_i = Y_i^{\alpha} M_i^{1-\alpha}$$

with Y_i the consumption of freely traded homogeneous good and M_i produced by using domestic capital K_i and differentiated good X_{ij} from country j. A continuum of M_i producers master the following production technology

$$M_i = K_i^{\beta}[(\sum_{j \in N} N_j X_{ij}^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}]^{1-\beta} \tag{11}$$

Since Mauro (1995) finds that corruption reduces investment rate, we interpret it as evidence that bad institutions damage capital returns, although we do not model explicitly capital accumulation. To represent this idea, we assume that bad institutional quality imposes a tax on capital income. Formally, good M_i producer's profit maximization problem is

$$\max_{\{K_i, X_{ij}\}} P_{Mi} K_i^{\beta}[(\sum_{j \in N} N_j X_{ij}^{\frac{\sigma-1}{\sigma}})^{\frac{\sigma}{\sigma-1}}]^{1-\beta} - R_i K_i \tau_i^K - \sum_{j \in N} N_j X_{ij} \tau_{ij} \tag{12}$$

where R_i is the return to capital owners but $\tau_i^K R_i \geq R_i$ is the cost to capital users. τ_i^K will be a function of institutional quality just as τ_{ij}.

The total income of the economy is the sum of capital income and labor income

$$R_i K_i + A_i L_i \tag{13}$$

Due to the Cobb-Douglas properties, we know that $(1-\alpha)\beta$ fraction of nominal income is spent on total capital input, so

$$(1-\alpha)\beta[R_i K_i + A_i L_i] = R_i K_i \tau_i^K \tag{14}$$

which solves capital return

$$R_i = \frac{(1-\alpha)\beta A_i}{\tau_i^K - (1-\alpha)\beta} \frac{L_i}{K_i}. \tag{15}$$

Intuitively, when capital is scarce (large $\frac{L_i}{K_i}$ ratio), capital return is high. On the other hand, if the iceberg cost (i.e. τ_i^K) is high, the capital return is low.

It follows that the price index of the final good in this economy is now changed to

$$P_i = \alpha^{-\alpha}(1-\alpha)^{-(1-\alpha)}\{\beta^{-\beta}(1-\beta)^{-(1-\beta)}(R_i\tau_i^K)^{\beta}[\sum_{j\in N} N_j\tau_{ij}^{1-\sigma}]^{\frac{1-\beta}{1-\sigma}}\}^{(1-\alpha)} \quad (16)$$

Therefore, if to obtain a given level of institutional quality q_i, each agent needs to contribute $1-\phi(q_i)$ of her income, agent s' utility after paying for the investment in institutional quality is

$$v_i^s = \log\frac{(R_i k_i^s + A_i)(1-\phi(q_i))}{P_i} = const + \log(1-\phi(q_i)) + \log(R_i k_i^s + A_i)$$

$$-\beta(1-\alpha)\log(R_i\tau_i^K) + \frac{(1-\alpha)(1-\beta)}{\sigma-1}\log(\sum_{j\in N} N_j\tau_{ij}^{1-\sigma}) \quad (17)$$

Note that if $\beta = 0$, we go back to the benchmark model without capital. The first order condition with respect to q_i is

$$\frac{\phi\prime(q_i^s)}{1-\phi(q_i^s)} = (1-\alpha)(1-\beta)\frac{\sum_{j\in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i^s, q_j)[-\frac{\partial \log f(q_i^s, q_j)}{\partial q_i^s}]}{\sum_{j\in N} N_j d_{ij}^{1-\sigma} f^{1-\sigma}(q_i^s, q_j)}$$

$$-\beta(1-\alpha)\frac{\partial \log[\frac{\tau_i^K}{\tau_i^K-(1-\alpha)\beta}]}{\partial q_i^s} + \frac{\partial \log(1+\frac{(1-\alpha)\beta}{\tau_i^K-(1-\alpha)\beta}\frac{k_i^s}{K_i/L_i})}{\partial q_i^s} \quad (18)$$

Inspecting the last term of the equation above reveals that a larger $\frac{k_i^s}{K_i/L_i}$ means a higher marginal return from improving institutional quality. This translates into a preference for better institutional quality.

Because lower institutional quality reduces capital returns, agents with a higher level of capital endowment suffer more from a given level of poor institutional quality. Suppose institutional quality is determined by the median voter, then higher inequality of capital endowment across individuals reduces the median voter's capital endowment, which leads to worse institutional quality. Formally,

Proposition 4 ***(Capital Inequality)*** *Holding everything else equal, a country with a smaller ratio of median voter capital to average capital $\frac{k_i^m}{K_i/L_i}$, displays worse institutional quality chosen by the median voter.*

Proof. *The decrease in the ratio of median voter capital to average capital shifts down the marginal benefit line of institutional quality.* ■

3 Cross-Sectional Evidence

We now turn to empirical evidence, staring with cross-country data patterns. We first look at whether the intrinsic openness explains the institutional quality across countries. These are the key predictions of our story. In this part, we also add various controls which are shown to help explain institutional quality in the existing literature.

We also add inequality of income (Gini coefficient) as a regressor. This is meant to serve two purposes: (a) to check if the data patterns are consistent with the prediction of the political economy extension of the model, and (b) to check if the relationship between intrinsic openness and institutional quality survives after one controls for income inequality. An important caveat is that we do not have an instrumental variable for the Gini coefficient, so this part of the evidence should be treated only as suggestive.

3.1 Data Description

For cross-sectional evidence, we choose the values of institutional quality and other variables in 2005. In general, institutional quality is persistent (the relative ranks across countries exhibit strong persistence). Thus, for cross sectional regressions, it does not matter much which specific year one takes. Year 2005 is chosen so that the key variables are available for a relatively large number of countries.

We drop countries with fewer than 0.5 million population because data quality is often poor for very small countries and measurement errors could be large[7]. We also use two different thresholds: 0.2 million or 1 million, and find that our main results are robust.

Table 1 reports the summary statistics of the variables used in the regressions. We are left with 150 economies although not every country has data for all variables. We explain the data in detail below.

3.1.1 Institutional Quality Measures

We use five measures of institutional quality: (1) political risk index from International Country Risk Guide, abbreviated as ICRG, (2) the corruption perception index from Transparency International, abbreviated as TI, (3) control of corruption from the World Bank's World Governance Indicators, abbreviated as WGI, and (4) government effectiveness from WGI[8], (5) expropriation risk, which is the Investment Profile component of the political risk index. All indices are constructed in such a way that a higher score means better institutional quality.

The political risk index takes on a value between 0 and 100, and is meant to capture eleven aspects of a country's institutional quality: (A) Government

[7] We further drop Serbia, Kosovo, Montenegro, South Sudan, East Timor, and North and South Sudan, as these relatively new countries have a short history and potentially less reliable data. We drop West Bank and Gaza Strip because of a lack of reliable data.

[8] WGI has 6 measures of institutional quality. Other measures such as rule of law and regulatory quality suggest similar empirical results, and are omitted to save space.

Stability, a maximum of 12 points; (B) Socioeconomic 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[9]. The political risk index is the sum of these 11 sub-indices, and covers 140 countries in 2005.

The corruption perception index, constructed by Transparency International, a Berlin-based non-profit organization devoted to fight corruption worldwide, is derived by combining information from polls on corruption by a variety of reputable institutions. For an economy to be included in the CPI data, it needs to be included in a minimum of three data sources[10]. The CPI index in 2005 covers 159 countries.

Control of corruption reflects the extent to which public power is perceived to be exercised for private gains. According to the World Bank Institute, the notion of corruption here includes both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests. This index is also constructed from a variety of available indices[11], and covers 207 economies in 2005.

Government effectiveness by the World Bank Institute is meant to measure quality of public services, quality of the civil service, and the degree of civil services' independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The WGI builds the index from various data sources and covers 208 economies in 2005 (the broadest country coverage among all indices).

Besides these broad indices, we will also examine the role of a narrower indicator - expropriation risk - which is a component of the political risk index. It assigns 12 points to 3 sub-components: (1) Contract Viability/Expropriation, 4 points; (2) Profits Repatriation, 4 points; and (3) Payment Delays, 4 points.

These measures are, unsurprisingly, highly correlated. At the same time, the correlation is less than perfect, reflecting some non-overlapping dimensions of institutional quality that each index aims to capture. Table 2 reports the pairwise correlations among the 5 measures. The lowest correlation is 0.7. In Figure 2, we visualize the relationship among these measures. Each graph plots other institutional quality measures against political risk index.

All measures are potentially relevant for our story. At the same time, since the political risk index is most comprehensive in capturing different aspects of institutional quality, we will use it as the baseline measure of institutional quality.

[9] See the following link for a more detailed description, including the sub-components of each component https://www.prsgroup.com/wp-content/uploads/2012/11/icrgmethodology.pdf

[10] Please refer to the link below for more details:
http://www.transparency.org/research/cpi/cpi_2005/0/

[11] The link below describes the World Governance Indicators:
http://info.worldbank.org/governance/wgi/#doc

3.1.2 Intrinsic Openness Variables

We consider four aspects of intrinsic openness. The first one is population. Frankel and Romer (1999) document that a larger population reduces actual openness (trade/GDP ratio). One may be concerned about whether population size is "sticky" enough to work as a characteristic of a country. In Figure 3, we plot log(population) in year 2005 against the value in year 1960; one can see a high degree of correlation (>0.97) over this span of 50 years. In other words, the country ranking in terms of population tends to persistent.

The second one is remoteness to the world market (see Wei, 1996, for an early exposition of the concept). We take G7 countries (Canada, France, Germany Italy, Japan, United Kingdom, United States) and China as the world market. The remoteness of a small open economy i is defined as follows:

$$remoteness_i = \sum_{j=1}^{8} w_j \log(d_{ij})$$

where j denotes G7 countries and China. $w_j = \frac{trade_j}{\sum_{k=1}^{8} trade_k}$ is the international trade share of big country j in total international trade volume of G7 and China, where $trade_j = \frac{import_j + export_j}{2}$ and d_{ij} is the great-circle distance between country i and j. Finally, variable landlock dummy=1 if the country is landlocked, otherwise, it takes value 0. Variable coast/area is constructed as coastline length divided by land area. There are overlaps in landlock dummy and coastline length/area as they by and large capture similar geographic characteristics. We also notice that there are only 22 landlocked countries in the sample. Table 3 shows the pairwise correlation matrix between different dimensions of intrinsic openness. The correlations between intrinsic openness variables are in general very low.

3.1.3 Other Control Variables

Following the existing literature, we identify and control for other variables that might affect institutional quality. Legal origin, and having a common law tradition in particular, is said to be associated with stronger protection of property rights than other legal traditions (La Porta, Lopez-de-Silanes, and Shleifer, 2008). We include a dummy for countries with a common law system, which essentially are former British colonies.

Acemoglu, Johnson and Robinson (2001) argue that the mortality rate of European settlers more than a century ago is a key determinant of institutional quality today. So we include mortality rate (its logarithm as they do) as a second control variable. Note that the AJR sample size is small. In order not to lose too much information when we include mortality rate, we define a variable called dummy mortality rate availability which takes value 1 if there exists mortality rate data, otherwise it takes value 0.

Ades and Di Tella (1999) suggest that a higher import/GDP ratio of an economy means more competition and fewer rent seeking opportunities. We will include the import/GDP ratio as a control.

One version of the "natural resource curse" theory hypothesizes that abundance of natural resources provides a strong incentive for "strong men" to seize power and hold onto power via undemocratic means in order to benefit from the wealth associated with the sale of natural resources. Sachs and Warner (1995) confirm a robustly negative association between natural resource abundance and growth. Leite and Weidman (1999) provide evidence that natural resource abundance induces more rent seeking behavior. We use fuel exports as a fraction of total merchandise exports, "fuel export frac," to capture the dominance of natural resources in an economy.

In our theory, both institutional quality and income level (GDP per capita) are determined by intrinsic openness. (We know institutional quality and income are highly correlated.) We decompose income into a component that is a linear function of intrinsic openness and a second component that is orthogonal to intrinsic openness. We will use the orthogonal component of income as a control variable as well.

3.2 Evidence on the Key Predictions

We start with cross-sectional evidence, and our main regressions use the following specification:

$$\begin{aligned} q_i &= \beta_0 + \beta_1 \log(population_i) + \beta_2 remoteness_i + \beta_3 landlock\_dummy_i \\ &\quad + \beta_4 coast/area_i + \delta X_i' + \epsilon_i \end{aligned} \tag{19}$$

where q_i is institutional quality and X' is a set of controls. Tables 4 - 6 report the estimation with 5 institutional quality measures.

In Column 1 of Table 4, we have population and remoteness as the only regressors. Both coefficients on these regressors are negative and statistically significant at the 1% level. A negative coefficient on log population indicates that a larger population is associated with poorer quality of public institutions (or a higher political risk). (Recall that a higher value of the political risk index means a lower level of political risk.). The coefficient on log distance means that a decrease in a country's distance to the world market by one percent is associated with an improvement in political risk by 0.15 percent. For example, should Paraguay (whose remoteness value is 9.48) be relocated to where Republic of Korea is (whose remoteness is 7.96), its political risk index would improve by 23 points, roughly to the level of Spain.

In Columns 2-4 of Table 4, we add a landlock dummy or (and) the ratio of coastline length/area. The signs of the new coefficients are always as expected from the theory, namely, being landlocked is associated with worse institutional quality, and a longer coastline for a given area size is associated with higher institutional quality. While the ratio of coastline length/area is significant at the 10% level, the landlock dummy is not.

In Columns 5-8, we add a common law dummy, mortality rate (or earlier European settlers), import/GDP ratio, and fuel exports (as a fraction of total merchandise exports) as controls. We find that both mortality rate and fuel exports are significantly detrimental to institutional quality (consistent with the arguments in Acemoglu, Johnson, and Robinson, 2001, and Leite and Weidmann, 1999). On the other hand, the common law dummy, suggesting that the legal origin hypothesis is not robustly supported by the data in the context of institutional quality. The ratio of import/GDP is not significant either. Indeed, the negative sign on the import/GDP ratio is not consistent with the prediction of Ades and Di Tella (1999), once a set of measures of a country's intrinsic openness is included.

In Column 9, we include all four control variables together, along with four intrinsic openness variables. Three of the intrinsic openness measures (population size, remoteness, and the landlock dummy) are statistically significant, and all four measures have signs that are consistent with the theoretical predictions. As an illustration of the magnitude of the estimates, if Zambia were not landlocked, its political risk index would have been improved to Romania's score. In this expanded specification, both mortality rate and fuel exports remain significant.

Because intrinsic openness could raise income by improving institutions in our theory, we attempt to extract a part of per capita GDP that is not explained by our intrinsic openness measures and include it as a control variable. In particular, we first regress log GDP per capita on the four measures of intrinsic openness, and denote the residuals from the regression as $e\_log(GDPC)$. We then add this to the list of control variables in the political risk regression, and report the results in Column 10. A positive sign on $e\_log(GDPC)$ suggests that income has an indepdent influence on the quality of public institutions. Perhaps as a country becomes richer, it can better afford to invest in public institutions, including paying civil servants better.

In Tables 5 and 6, we substitute the left hand side variable, the political risk index, by the corruption perception index, control of corruption, government effectiveness, and expropriation risk, respectively. We draw similar conclusions on intrinsic openness measures. Both population and remoteness have the expected signs, and are robustly significant in almost all the columns. The landlock dummy and the ratio of coastline length/area are not always significant, though they almost always have the expected signs. Note that landlocked economies are often small economies with data problems. Among the 22 landlocked economies in the world, 13 of them lack data on institutional quality to be included in our regressions.

When we use control of corruption and government effectiveness as institutional quality measures where we have full coverage of 150 countries, in the columns with a full set of control variables (with or without $e\_log(GDPC)$), both landlock dummy and coastline length/area are statistically significant.

Finally, in Table 5 and Table 6, common law dummy is not robust but its sign is always positive and it sometimes becomes significant. Mortality rate and fuel export fraction decreases institutional quality. But there is no evidence that

larger import/GDP ratio improves institutions.

3.3 Income Inequality and Institutional Quality

In the second part of the theory in Section 2, we presented a political economy extension of the basic model that features heterogeneity in capital endowment (which might be proxied by income or wealth equality). The prediction of the model is that higher inequality leads to worse institutional quality. We now add income inequality as measured by a Gini coefficient of income distribution to the model. (We are not able to use wealth inequality due to a lack of data.)

The results are reported in Table 7. The coefficient on the Gini variable is negative and significant. This is consistent with the theoretical prediction that inequality leads the society to invest less in institutional building. Since inequality could be endogenous and we do not have an instrumental variable strategy for it, this result should only be regarded as suggestive.

Note that the four dimensions of intrinsic openness (population, remoteness, ratio of coastal length/area size, and a landlock dummy) have essentially the same signs and significance levels as before. We thus conclude that the effects of intrinsic openness on institutional quality are not qualitatively affected by the control of income inequality or political economy considerations.

4 Long Differences: Exogenous Changes in Intrinsic Openness

The results reported previously are cross-sectional evidence. By necessity, such analysis cannot control for country fixed effects. This is not unusual in the literature on this topic, since institutional quality does not change at a high frequency. For example, the well-cited work of Acemoglu, Johnson, and Robinson (2003) does not control for country fixed effects. In our case, most dimensions of intrinsic openness are also slow-moving variables, which make it hard to obtain meaningful variations over time. Nonetheless, if we could produce some evidence on time series variations, we could control for country fixed effects and produce a useful complement to the cross-sectional evidence.

We identify changes in the external trading environment during 2000-2006 as a plausible natural experiment. During this period, a significant event is China's accession to the World Trade Organization in 2001. From 2000 to 2006, China's tariffs and non-tariff trade barriers were dramatically slashed according to the terms of its WTO accession (which mandated trade liberalization according to a time schedule). Since policy changes mandated on China are essentially unilateral liberalization (with no required changes in trading partners' policies), this represents an exogenous and watershed shock for most other economies. Indeed, trade between China and the rest of the world exploded afterwards (doubling once every four years on average).

Importantly, the same China trade shock implies heterogeneous effects on the trading opportunities of different countries. For example, a given increase

in China's total imports implies greater benefits to countries that are geographically close to China e.g, Republic of Korea) than those that are far away (e.g., Mexico). Similarly, holding geographic distance constant, reductions in China's trade barriers also translate into different opportunities for different countries depending on how well their export baskets match with China's import need.

The China trade shock has been employed in a booming recent literature to study the effects of international trade on local US labor markets (Autor, Dorn, and Hanson, 2013; Wang, Wei, Yu, and Zhu, 2017), US electoral politics (Autor, Dorn, Hanson and Majlesi, 2016), and productivity and innovation in Europe (Bloom, Draca and Van Reenen, 2015). Note that, for many of the papers in this literature, the period that covers the year before China joined the WTO (e.g., 2000) to the year before the Global Financial Crisis (e.g., 2006 or 2007) is used.

While changes in China's trade barriers were a major source of the change in global trading environment during 2000-2006, policy changes in other major economies during this period such as the United States and the European Union also matter.

We now turn to long-difference evidence exploring exogenous changes in intrinsic openness faced by small and medium sized countries duirng 2000-2006. We first describe the construction of key variables.

4.1 Data Description

As a measure of the change in institutional quality over 2001-2007, we use the change in the political risk index for this period. The political risk index by its nature captures many dimensions of institutional quality such as corruption, impartiality of the legal system, government discretion, and policy uncertainty, and is therefore regarded as a comprehensive measure of public governance. We have a consistent source of the political risk measure for this period. In comparison, other measures of institutional quality (the corruption perception index, control of corruption, and government effectiveness) often change the underlying sources of surveys and the number of underlying surveys in different years, which makes comparions over time less meaningful. Indeed, the world governance indicators including control of corruption and government effectiveness, for example, warn readers from making comparisons in different years. (In any case, in any given year, the political risk index and other proxies of institutional quality are highly correlated. This is confirmed in Figure 2, which presents the scatter plots on the pairwise relations for these variables in 2005.)

We use changes in tariff rates by China's and G-7 advanced economies during 2000-2006 as exogenous shocks to intrinsic openness of other economies. Figure 4 plots the trade weighted average of MFN (most favored nation) import tariff rates by each of these economies (all EU member states have identical tariff rates). Clearly, reductions in China's tariffs in this period dominate tariff changes in other big economies. At the same time, other big economies also have some changes in their tariff rates.

We will relate changes in the institutional quality of a (small and medium

sized) country over 2001-2007 to changes in its intrinsic openness during 2000-2006 that were triggered by changes in trade policies of China or G7.

4.1.1 Weighted Tariff: Country Level

A key component of Country i's external trading environment in year t is the weighted average of the tariff rates of China plus G7 in that year, with weights proportional to the large countries' relative importance in Country i's export bundles:

$$weighted\ tariff_{it} = \sum_{j=1}^{8} w_{ij,t-1} \log(1 + tariff_{jt}) * 100 \tag{20}$$

where $tariff_{jt}$ is country j MFN import tariff[12] in year t and

$$w_{ijt} = \frac{\exp ort_{ijt}}{\sum_{j=}^{8} \exp ort_{ijt}} \tag{21}$$

where $\exp ort_{ijt}$ is country i (merchandise) exports to country j in year t. Index j denotes either China or one of the G7 economies. A change in this measure for country i from 2000 to 2006 represents a change in the external trading opportunity for the country over this period.

In our regression analysis, we will exclude EU member countries from our sample, partly because four EU countries are part of the G7 group, and partly because some of the changes in institutional quality in many new EU members from Central and Eastern Europe are mandated by the EU accession requirement, unrelated to intrinsic openness.

We also exclude Yemen and Mongolia as potential outliers. The shares of exports to China in total exports are the highest for these countries (89% for Yemen, and 67% for Mongolia, respectively). Both predominantly export natural resources to China (oil and oil products for Yemen, and copper ore, gold, and coal for Mongolia, respectively). The Chinese tariff rates on natural resources products were relatively low (4.2% on average in 2000), and did not change much during 2000-2006 (3.3% on average in 2006)[13].

Table 8 Panel A reports summary statistics on changes in key variables over 2000-2006 (tariff variables) or 2001-2007. 102 countries have data on both weighted tariffs and political risk index. One can see that the median change in the weighted tariff is negative (-0.21), suggesting an improvement in intrinsic openness for most countries. In fact, out of 102 countries, 70 countries experienced an improvement in intrinsic openness. The largest drop (minimum

[12] We also look at effectively applied tariff rates instead of the MFN rates, and find our results to be robust.

[13] The average tariff rate over all HS codes for natural resources (ores, slag and ash; and mineral fuels, mineral oils, and products of their distillation, bituminous substances, mineral waxes) is 4.2% in 2000, compared to 17%, the equally weighted average across all HS 6-digit products.

in the table) is 3.45 percentage points deduction in the average of big partner countries' tariff rates. (However, there are also some countries that experienced an increase in partner countries' tariff rates, i.e., a deterioriation in their intrinsic openness). Across countries, the mean and median changes in the tariff rates of big trading partners are a reduction by 0.34 and 0.21 percentage points, respectively.

4.1.2 Weighted Tariff: HS6 Level

As a robustness check, we also construct countries' weighted average of tariffs at the more disaggregated HS6 level:

$$weighted\ tariff_{it} = \sum_{j=1}^{8} \sum_{k} w_{ijk,t-1} \log(1 + tariff_{jkt}) * 100 \tag{22}$$

where $tariff_{jkt}$ is country j MFN import tariff in year t for product k and

$$w_{ijkt} = \frac{\exp ort_{ijt}}{\sum_{j=1}^{8} \sum_{k} \exp ort_{ijkt}} \tag{23}$$

where where $\exp ort_{ijt}$ is country i export to country j of product k in year t (merchandise export) where the data is from Comtrade. Index j denotes G7 countries and China.

Changes in intrinsic openness measured by big partners' product-level tariffs have the advantage of being more precise. On the other hand, since bilateral product level trade data, needed to compute the weights in the openness measure, are often missing, the new measure is available for a smaller sample of countries (70 countries now versus 102 for the previous measure).

We exclude agriculture products from our calculation since many agriculture products face quota constraints or receive domestic price support for which we do not have systematic data. As before, we also exclude EU countries, Mongolia, and Yemen.

Table 8 Panel B reports the summary statistics. The median in weighted average of big partners' tariff rate is 0.29 percentage points across all small and medium size countries. The largest drop in weighted tariff (minimum in the table) is 7.07 percentage points. 44 out of the 70 countries in the sample faced a reduction in partners' tariff (or an improvement in intrinsic openness). The improvement in intrinsic openness for most countries is driven by a massive reduction in tariff rates by China during this period.

However, some countries may experience a deterioration in their intrinsic openness. First, G7 countries or China may happen to have raised tariff rates on some products that are important for these countries during this period. For example, China raised import tariff on wool tops and combed wool (HS code 510529) from 15% in 2000 to 38% in 2006. This product happens to be an important export item for Uruguay, causing it to experience a decline in the

measure of its intrinsic openness. Second, a country's comparative advantage could have shifted (say, due to differential productivity increases in different sectors) in such a way that the weights in their export bundles happen to have increased for products on which the big partners have a relatively high tariff rate. For example, for Guatemala, the United States is its dominant export destination. Its top two export items used to be candles and tapers, and soaps and soap products, respectively, in 2000, for which the United States had a zero tariff, but changed to women's or girls' cotton knitted blouses and shirts, and women's or girls' non-knitted cotton trousers for which the United States had relatively high tariff rates of 19.7% and 8.15%, respectively, in 2006.

The simple correlation between the two measures of changes in intrinsic openness is 0.35. While there is similarity between the two, they also carry somewhat information. Hence, results from the two measures can complement each other.

4.2 Long Differences

We perform long-difference regressions with variations of the following specification:

$$\Delta q_i = \beta_0 + \beta_1 \Delta weighted\ tariff_i + \Delta X_i' \delta + \varepsilon_i \tag{24}$$

where Δq_i is the change in country i's institutional quality from 2001 to 2007, $\Delta weighted\ tariff_i$ is the change in weighted average of big trading partners' tariff rates facing the exports from country i from 2000 to 2006, $\Delta X_i'$ is changes in other control variables that may be relevant for the institutional quality of country i, such as its import/GDP ratio, and fuel exports as a fraction of total merchandise exports. Note that settler mortality rate in the 18th or 19th century and legal origins are not included since they do not change over time. We maintain that changes in big countries' tariff rates are exogenous to small and medium sized countries. This feature is important for assigning a causal interpretation to the regression estimates.

Table 9 reports the regression results. In Column 1, the coefficient on the change in the weighted average of big partners' tariff is negative and statistically significant (-1.87). This is consistent with the notion that greater intrinsic openness leads to better public institutions. A reduction in the average tariff rate of the big partners by 1 percentage point leads to an improvement in the political risk score by 1.87 points.

One can visualize the regression result via a bin scatter plot (Figure 5). All the observed changes in the partner's average tariff rates during 2000-2006 are divided into 30 equal-sized bins. Within each bin, there can be many observations corresponding to different changes in the political risk index during 2001-2007. (Some bins may be empty.) We plot the mean value of the political risk index across all observations within a bin (on the vertical axis), against the mean value of the change in the partner's tariff rate (on the horizontal axis). The bin scatter plot is a noise reduction technique used in applied microeconomic research. We can see a clear negative relationship between the two variables: a

reduction in big partners' tariff is associated with an improvement in institutional quality. Moreover, we can see that removing one or two data points will not alter the negative slope (though the point estimate could change a bit).

In Column 2, we add change in the import/GDP ratio and change in the fraction of fuel exports in total exports as control variables. The coefficients on the two new regressors are negative but not statistically significant. The coefficient on the change in the partner's tariff rate is still negative and becomes somewhat larger in absolute magnitude.

In Column 3, we also add change in income level as a control variable. The coefficient on change in income is positive and significant: becoming richer is associated with improvement in institutional quality (which is perhaps not surprising). This time, the coefficient on change in the fraction of fuel exports has also become statistically significant. This is consistent with the "natural resource curse" hypothesis: more resource abundance leads to more competition for rents, often associated with a worsening of public institutions. For the purpose of this paper, an important feature to note is that the coefficient on the change in partners' tariff remains negative and statistically significant. That is, our key result is robust - change in intrinsic openness leads to change in institutional quality. Based on the point estimate in Column 3, **a** reduction in the average tariff rate of partner countries by one standard deviation (0.66) leads to an improvement in the political risk score by 1.67 points (=2.536*0.66). (During this period, the average change in the political risk index for all countries in the sample is an improvement by 0.06 point, and the median change is zero. Against these statistics, an improvement in the political risk index by 1.67 points is economically significant.)

We do the same exercise with the second measure of intrinsic openness (with partner countries' product level tariff rates), and report the results in Table 10. The results are qualitatively similar as before. In particular, the coefficient on the change in the partner countries' weight tariff is negative and statistically significant in all three columns. This is again consistent with the notion that greater intrinsic openness leads to greater improvement in institutional quality. Using the point estimate in the last column as an illustration, a reduction in the average tariff rate of partner countries by one standard deviation (3.71) leads to an improvement in the political risk score by 1.00 point (=0.271*3.71).

Figure 6 is a bin scatter plot corresponding to Column 1 of the regression table. We can see clearly a negative relationship between the two variables. The bin on the far right contains a single country (Mali). If we remove that bin, the negative relationship is preserved, and the point estimate would become even bigger.

4.3 Excluding Potential Outliers

We investigate the robustness of our results to removing apparent outliers. When the first measure of intrinsic openness is used, Hong Kong appears to be an outlier in a scatter plot of a change in institutional quality against a change in intrinsic openness (not reported to save space). We investigate the

effect of excluding Hong Kong from the sample and report the new result in the first two columns Table 11. We find that the coefficient on the change in the weighted average tariff of the big trading partners is still negative and statistically significant at the 5% level. Indeed, the point estimate becomes bigger in absolute magnitude. This means that an even greater improvement in institutional quality is revealed in response to a given improvement in intrinsic openness, once Hong Kong is removed from the sample.

When the second measure of intrinsic openness is used, Mali appears as an outlier. We re-do the regressions after excluding Mali from the sample and report the results in the first two columns of Table 12. In this case, the cofficient on a change in trading partners' tariff rates is still negative and statistically significant at the 5% level, and the point estimate becomes larger in absolute magnitude as well. This suggests that removing the most obvious outliers tends to strenghten rather than weaken the main conclusions.

4.4 Noise Reduction by Three Year Averages

The values of either institutional quality or tariff rates could be noisy in any given year. As a check for robustness, we implement another version of long difference regrssions by using three year averages of all key variables at both ends of the interval. The dependent variable is now the difference between the average value of institutional quality over 2005-2007, and the average value of the same variable over 1999-2001. Similarly, the key regressor is now the difference between the average value of intrinsic openness over 2004-2006 and the average value of the same variable over 1998-2000.

We report the new regression results in the last two columns of Tables 11 and 12, respectively. In both cases, the noise reduction procedure makes the key point estimates somewhat bigger, without altering their signs or statistical significance.

4.5 Checking for Pre-trend

Changes in institutional quality might simply follow a trend, and the correlation with changes in intrinsic openness (triggered largely by China's accession to WTO) could be a coincidece.

To check for the validity of this story, we substitute the dependent variable - a change in institutional quality change from 2001 to 2007 - by a change in the same variable from 1995 to 2001 (i.e., before China joined the WTO). Table 13 reports the results of this placebo test (omitting the reporting of other coefficients). The coefficients on the change in intrinsic openness over 2000-2006 are now not different from zero statistically. This suggests that our conclusion is unlikely to be driven by a coincidental correlation between differential trends in the improvement of institutional quality across countries and changes in intrinsic openness.

4.6 Industry-specific Sensitivity to Institutional Quality

The empirical exercise so far treats intrinsic openness in all industries equally. Nunn(2007) makes the point that different industries may have different degrees of sensitivity to institutional quality. Nunn(2007) pioneers two measures of contract intensity (relationship specificity) for each final good using U.S. I-O table. The first measure is the fraction of input that can neither be bought and sold on an exchange nor referenced priced. The second measure also includes reference priced inputs as being relationship-specific. For example, the same level of corruption may damage trade in differentiated goods more than it does trade in homogeneous goods. Combining this insight with our theory on endogenous institutional quality, one might expect intrinsic openness increase in the contract intensive industries will increase institutional quality while intrinsic openness increase in the non-contract intensive industries will not increase institutional quality significantly.

To test this additional prediction, we first group all HS6 products into two categories. One group is contract intensive products, and the other is non-contract intensive products, separated by the median of relationship specificity (or contract intensive) measure across all industries provided in Nunn(2007)[14]. We will employ his first measure of contract intensity in our benchmark regressions and leave the second measure as robustness check. For each product group, we obtain the long difference in weighted tariff as before. We then compute each country's export share (year 2000, 2001 and 2002 three years' average) of contract intensive products Ψ_i and non-contract intensive products $1-\Psi_i$, where i denotes country i. Multiplying the long difference in weighted tariff by the export share of each group, we have two variables $\Delta weighted\ tariff - ci_i$, and $\Delta weighted\ tariff - ni_i$ for contract intensive (abbreviated as "ci") products and non-contract intensive (abbreviated as "ni") products respectively.

Table 14 reports the summary statistics. One can see the median $\Delta weighted\ tariff - ci_i$ and $\Delta weighted\ tariff - ni_i$ are both negative and median Ψ_i is around 0.5. Among the 70 countries in the sample, the smallest three Ψ_i come from Algeria, Azerbaijan and Iran, which are natural resource exporters. The largest two Ψ_i come from Costa Rica and Singpore. Costa Rica's top exports are optical, technical, and medical apparatus. Singapore's main export products are integrated circuits refined petroleum, and computers.

We run the following regressions:

$$\Delta q_i = \beta_0 + \beta_1 \Delta weightedtariff - ci_i + \beta_2 \Delta weightedtariff - ni_i + \Delta X_i'\delta + \varepsilon_i.$$

Table 15 reports the results. In column (1), we only include $\Delta weighted\ tariff - ci_i$ and $\Delta weighted\ tariff - ni_i$ as regressors. The coefficient before $\Delta weightedtariff - ci_i$ is negative and statistically significant, while the coefficient before $\Delta weightedtariff - ni_i$ is not statisticall different from zero. This means that improvement in intrinsic openness on contract intensive products helps to promote more investment in

[14] We use concordance provided by BEA to convert the relationship specificity measure at the NAICS 6-digit level in Nunn (2007) to a corresponding measure at the HS 6 digit.

public institutions, leading to a higher quality of institutions. At the same time, improvement in intrinsic openness on products that are not contract intensive does not do much to alter the incentive to improving institutions.

In colums (2) and (3), we add more control variables as in the previous section. Our results remain robust. In Table 16, we repeat the same exercise, using the second (broader) definition of contractive intensive products in Nunn (2007) in computing changes in intrinsic openness. Again, we see the same patterns on the coefficients, suggesting that our results are robust.

5 Concluding Remarks

We propose a theory that links endogenous institutional quality to a country's intrinsic openness, and provide several pieces of evidence.

Empirical tests confirm that intrinsically more open countries, i.e. countries with a smaller population, geographically closer to the world market, or endowed with a longer coastline, display better institutional quality.

Intrisinc openness is not immutable. Globalization, in particular, changes in trading partners' trade barriers could affect a country's external trading opportunities. Using big economies' import tariff change, especially those associated with China's accession to the WTO in 2001, as a source of variation in intrinsic openness for other economies, we also find evidence that improvement in intrinsic openness leads to improvement in institutional quality.

As Nunn (2007) points out, some products are more sensitive to the soundness of contractual institutions and legal environment than other products. We incorporate this insight to implement a refined test. In particular, we expect institutional improvement to respond more to changes in intrinsic openness triggered by partner countries' changes in trade barriers on contract intensive products, than to changes in tariffs on non-contract intensive products. Our empirical exercise confirms this idea.

One implication of our paper is that globalization can have an indirect but important channel to improve welfare. One country's trade liberalization might create a positive externality by inducing other countries to improving their public institutions. Investigating and quantifying such links might be a fruitful line of future research.

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Table 1: Summary Statistics on Intrinsic Openness and Institutional Quality

Variable	Obs	Mean	Std. Dev.	Min	Max	Median
PR Index	122	66.79	12.55	26	93.5	66.5
CPI	140	3.83	2.03	1.7	9.6	3
ctr corrupt	150	-0.21	0.97	-1.68	2.35	-0.44
gvnment	150	-0.20	0.98	-2.17	2.16	-0.88
exprop risk	122	8.80	2.36	1.5	12	8.75
log(population)	150	16.06	1.38	13.31	20.84	16.02
remoteness	150	8.98	0.30	7.96	9.55	8.98
landlock dummy	150	0.22	0.42	0	1	0
coastline length/area	150	0.038	0.094	0	0.91	0.0059
common law dummy	150	0.26	0.44	0	1	0
mortality rate	59	0.26	0.49	0.00086	2.94	0.078
import/GDP (%)	148	47.32	28.57	9.54	211.27	42.72
fuel export fraction	120	18.56	27.89	0	98.03	5.40
Gini	62	38.93	9.74	16.64	59.51	38.41
GDP per capita	147	10535.98	16398	205.07	88519.09	3517.75
trade/GDP (%)	148	45.22	26.29	13.54	211.17	40.86

Notes: This table reports relevant variables' summary statistics for the sample we use in the cross sectional regressions. It utilizes year 2005 data. PR index is political risk index which falls into [0,100]; CPI is Corruption Perception Index which falls into [0,10]; ctr corrupt is control of corruption which falls into [-2.5,+2.5], gvnment is government effectiveness which falls into [-2.5,2.5]; exprop risk is expropriation risk (investment profile item in Political Risk Index) which falls into [0, 12]; remoteness' unit is km; coastline length/area's unit is km/sq. km^2. Mortality rate (per person) is taken from Acemoglu, Johnson and Robinson (2001). Fuel export fraction is with respect to total merchandise export, computed in WDI using Comtrade data. Gini index is income Gini. GDP per capita is measured at constant 2010 US dollars. We don't find Korea, D.P.R. and Somalia GDP data in year 2005 or around 2005 from WDI, and import/GDP, trade/GDP and GDP per capita data are also missing for these two countries. There is no Syrian GDP per capita in terms of 2010 US dollars data in WDI. Another note is Myanmar import/GDP and export/GDP data experience a more than 100 times jump from before 2011 to after 2012 in World Bank database. The import/GDP and export/GDP are too low before 2011. For example, in 2005, import/GDP is 0.95% and export/GDP is 0.18%. We suspect there is a data error and contact World Bank staff. The problem lies in the fact that they take Myanmar trade data from IMF but there is a huge difference in the exchange rate between the World Bank measure and the IMF measure for Myanmar. In the IMF data, there is a more than around 100 times jump in exchange rate from 2011 to 2012. So here we simply multiply Myanmar import/GDP and export/GDP by 100 in year 2005 as a rough estimate (the minimum of trade/GDP in the table is Myanmar even after we multiply its number by 100.) All our results remain virtually unchanged by excluding Myanmar directly.

Table 2: Pairwise Correlation Matrix: Institutional Quality

	PR index	CPI	ctr corrupt	gvnment	exprop risk
PR index	1.0000				
CPI	0.8072	1.0000			
ctr corrupt	0.8592	0.9556	1.0000		
gvnment	0.8857	0.9163	0.9454	1.0000	
exprop risk	0.8622	0.7040	0.7679	0.8099	1.0000

Notes: this table reports the summary statistics of pairwise correlation between 5 institutional quality measures. Variables PR index, CPI, ctr corrupt, gvnment, and exprop risk represent five measures of institutional quality by order: Political Risk index, Corruption Perception Index, Control of Corruption, Government Effectiveness and Expropriation Risk.

Table 3: Pairwise Correlation Matrix: Intrinsic Openness

	log(population)	remoteness	landlock	coast/area
log(population)	1.0000			
remoteness	-0.1181	1.0000		
landlock	-0.1144	0.0274	1.0000	
coast/area	-0.2137	-0.1470	-0.2129	1.0000

Notes: this table reports the summary statistics of pairwise correlation between 4 intrinsic openness measures. Variable remoteness is weighted log distance to G7 and China, landlock is landlock dummy, and variable coast/area is coastline length divided by land area.

Table 4: Intrinsic Openness and Political Risk Index

	(1) PR index	(2) PR index	(3) PR index	(4) PR index	(5) PR index	(6) PR index	(7) PR index	(8) PR index	(9) PR index	(10) PR index
log(population)	-3.041***	-3.103***	-2.792***	-2.858***	-2.882***	-2.792***	-3.190***	-3.105***	-3.192***	-2.457***
	(0.627)	(0.618)	(0.636)	(0.626)	(0.630)	(0.625)	(0.650)	(0.578)	(0.591)	(0.500)
remoteness	-15.268***	-15.156***	-13.977***	-14.007***	-14.882***	-10.843**	-16.759***	-12.303***	-10.426**	-12.797***
	(3.980)	(3.994)	(4.089)	(4.094)	(4.417)	(5.016)	(3.598)	(3.113)	(4.425)	(3.539)
landlock dummy		-2.683		-1.927	-1.958	-1.838	-2.506	-4.380*	-4.595**	-6.458***
		(2.353)		(2.380)	(2.374)	(2.547)	(2.254)	(2.460)	(2.317)	(1.618)
coast/area			17.051*	15.578*	12.989	8.835	17.990**	11.813	13.832	10.572**
			(8.840)	(8.307)	(9.033)	(8.445)	(8.658)	(7.263)	(8.999)	(5.061)
common law dummy					1.966				0.988	1.120
					(2.456)				(2.236)	(1.811)
log(mortality rate)						-4.022***			-3.195**	-0.286
						(1.188)			(1.243)	(1.044)
import/GDP							-0.045		-0.061*	0.007
							(0.035)		(0.031)	(0.020)
fuel export frac								-0.042*	-0.061**	-0.076***
								(0.025)	(0.025)	(0.024)
e_log(GDPC)										5.460***
										(0.580)
mortality rate avail						-11.518***			-11.204***	-1.976
						(3.602)			(3.385)	(3.252)
fuel export frac avail								16.351***	11.902***	6.692***
								(3.212)	(3.128)	(2.394)
Observations	122	122	122	122	122	122	120	122	120	119
R^2	0.232	0.238	0.248	0.251	0.256	0.328	0.314	0.427	0.498	0.720

Robust standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of political risk index against intrinsic openness measures. Variable mortality rate avail equals 1 if there is mortality rate data and equals 0 otherwise. Variable fuel export frac avail equals 1 if there is fuel export fraction (of total merchandise export) data and equals 0 otherwise. Variable $e\_log(GDPC)$ is the residual after projecting log(GDP per capita) on four intrinsic openness variables.

Table 5: Intrinsic Openness and Corruption Perception Index, Control of Corruption

	(1) CPI	(2) CPI	(3) CPI	(4) CPI	(5) ctr corrupt	(6) ctr corrupt	(7) ctr corrupt	(8) ctr corrupt
log(population)	-0.392***	-0.320***	-0.409***	-0.233**	-0.159***	-0.121***	-0.173***	-0.127***
	(0.093)	(0.092)	(0.112)	(0.090)	(0.044)	(0.045)	(0.048)	(0.042)
remoteness	-2.048***	-1.566**	-1.355**	-1.717***	-0.864***	-0.708**	-0.726**	-0.848***
	(0.646)	(0.628)	(0.655)	(0.488)	(0.313)	(0.305)	(0.299)	(0.224)
landlock dummy		-0.430	-0.513	-0.633**		-0.173	-0.289*	-0.329***
		(0.344)	(0.355)	(0.259)		(0.169)	(0.165)	(0.126)
coast/area		6.429***	5.765***	5.131***		2.753***	2.181***	2.149***
		(2.103)	(2.088)	(1.282)		(0.827)	(0.801)	(0.470)
common law dummy			0.297	0.241			0.186	0.142
			(0.312)	(0.225)			(0.151)	(0.114)
log(mortality rate)			-0.600**	-0.112			-0.255**	-0.016
			(0.230)	(0.162)			(0.101)	(0.071)
import/GDP			-0.011	0.002			-0.004	0.001
			(0.007)	(0.004)			(0.003)	(0.002)
fuel export frac			-0.010*	-0.015***			-0.006**	-0.008***
			(0.005)	(0.004)			(0.002)	(0.002)
e_log(GDPC)				1.029***				0.485***
				(0.111)				(0.048)
mortality rate avail			-1.618***	-0.289			-0.681***	-0.047
			(0.494)	(0.391)			(0.228)	(0.175)
fuel export frac avail			1.393***	0.409			0.867***	0.393**
			(0.285)	(0.315)			(0.161)	(0.152)
Observations	140	140	139	138	150	150	148	147
R^2	0.141	0.241	0.386	0.672	0.107	0.189	0.389	0.697

Standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of corruption perception index and control of corruption against intrinsic openness measures. Variable mortality rate avail equals 1 if there is mortality rate data and equals 0 otherwise. Variable fuel export frac avail equals 1 if there is fuel export fraction (of total merchandise export) data and equals 0 otherwise. Variable $e\_log(GDPC)$ is the residual after projecting log(GDP per capita) on four intrinsic openness variables.

Table 6: Intrinsic Openness and Government Effectiveness, Expropriation Risk

	(1) gvnment	(2) gvnment	(3) gvnment	(4) gvnment	(5) exprop risk	(6) exprop risk	(7) exprop risk	(8) exprop risk
log(population)	-0.095**	-0.060	-0.128***	-0.080**	-0.474***	-0.431***	-0.543***	-0.396***
	(0.043)	(0.043)	(0.044)	(0.034)	(0.128)	(0.126)	(0.133)	(0.119)
remoteness	-1.122***	-0.975***	-1.150***	-1.265***	-2.227***	-1.947**	-2.159**	-2.590***
	(0.327)	(0.324)	(0.279)	(0.194)	(0.754)	(0.774)	(0.990)	(0.877)
landlock dummy		-0.198	-0.338**	-0.381***		-0.359	-0.715	-1.079**
		(0.165)	(0.153)	(0.101)		(0.572)	(0.565)	(0.475)
coast/area		2.578***	1.606*	1.564***		3.496**	2.997	2.342
		(0.913)	(0.864)	(0.504)		(1.441)	(2.181)	(1.733)
common law dummy			0.293**	0.247***			0.561	0.577*
			(0.137)	(0.088)			(0.420)	(0.346)
log(mortality rate)			-0.269***	-0.030			-0.353*	0.203
			(0.086)	(0.053)			(0.201)	(0.187)
import/GDP			-0.004	0.001			-0.013*	0.000
			(0.003)	(0.001)			(0.008)	(0.006)
fuel export frac			-0.007***	-0.009***			-0.008	-0.010
			(0.002)	(0.002)			(0.008)	(0.008)
e_log(GDPC)				0.482***				1.042***
				(0.037)				(0.148)
dummy mortality rate			-0.615***	0.008			-1.036	0.703
			(0.211)	(0.149)			(0.649)	(0.721)
dummy fuel export frac			0.963***	0.492***			1.664**	0.671
			(0.154)	(0.132)			(0.716)	(0.543)
Observations	150	150	148	147	122	122	120	119
R^2	0.124	0.199	0.468	0.778	0.149	0.174	0.317	0.545

Standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of government effectiveness and expropriation risk against intrinsic openness measures. Variable mortality rate avail equals 1 if there is mortality rate data and equals 0 otherwise. Variable fuel export frac avail equals 1 if there is fuel export fraction (of total merchandise export) data and equals 0 otherwise. Variable $e\_log(GDPC)$ is the residual after projecting log(GDP per capita) on four intrinsic openness variables.

Table 7: Gini and Institutional Quality

	(1) PR index	(2) PR index	(3) CPI	(4) CPI	(5) ctr corrupt	(6) ctr corrupt	(7) gvnment	(8) gvnment	(9) exprop risk	(10) exprop risk
log(population)		-2.412***		-0.230**		-0.126***		-0.076**		-0.393***
		(0.499)		(0.089)		(0.044)		(0.034)		(0.115)
remoteness		-9.851***		-1.198**		-0.652***		-1.046***		-2.062**
		(3.371)		(0.477)		(0.242)		(0.200)		(0.819)
landlock dummy		-6.542***		-0.602**		-0.308**		-0.359***		-1.105**
		(1.579)		(0.259)		(0.123)		(0.104)		(0.472)
coast/area		11.121**		5.253***		2.140***		1.641***		2.308
		(4.700)		(1.320)		(0.479)		(0.513)		(1.682)
common law dummy		0.054		0.040		0.067		0.204**		0.327
		(1.966)		(0.227)		(0.116)		(0.092)		(0.370)
log(mortality rate)		-0.446		-0.148		-0.036		-0.054		0.179
		(1.074)		(0.151)		(0.065)		(0.050)		(0.188)
import/GDP		0.008		0.002		0.001		0.001		0.001
		(0.020)		(0.004)		(0.002)		(0.001)		(0.006)
fuel export frac		-0.076***		-0.015***		-0.008***		-0.009***		-0.011
		(0.022)		(0.004)		(0.002)		(0.002)		(0.007)
Gini	-0.627***	-0.320***	-0.093***	-0.057***	-0.044***	-0.025***	-0.048***	-0.023***	-0.103***	-0.063***
	(0.130)	(0.092)	(0.028)	(0.020)	(0.013)	(0.008)	(0.012)	(0.007)	(0.024)	(0.023)
e_log(GDPC)		5.582***		1.026***		0.486***		0.474***		1.079***
		(0.555)		(0.112)		(0.049)		(0.038)		(0.134)
mortality rate avail		-0.859		-0.128		0.021		0.043		0.954
		(3.338)		(0.376)		(0.167)		(0.144)		(0.713)
fuel export frac avail		7.151***		0.474		0.416***		0.473***		0.820
		(2.597)		(0.316)		(0.149)		(0.130)		(0.588)
Gini avail		11.532***		2.055**		0.892**		0.922***		2.105**
		(3.779)		(0.855)		(0.373)		(0.300)		(0.912)
Observations	58	119	62	138	62	147	62	147	58	119
R^2	0.292	0.742	0.173	0.694	0.186	0.716	0.237	0.793	0.245	0.572

Standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of institutional quality measures against Gini coefficients. Variable mortality rate avail equals 1 if there is mortality rate data and equals 0 otherwise. Variable fuel export frac avail equals 1 if there is fuel export fraction (of total merchandise export) data and equals 0 otherwise. Variable Gini avail equals 1 if there is income Gini data and equals 0 otherwise.

Table 8: Summary Statistics

Panel A: Using Country Level Tariff						
Variable	Obs	Mean	Std. Dev.	Min	Max	Median
diff political risk	102	0.06	5.74	-16	16.5	0
diff weighted tariff	102	-0.34	0.66	-3.49	0.71	-0.21
diff import/GDP	97	0.07	0.24	-0.37	2.05	0.05
diff fuel export frac	86	1.79	8.09	-36.33	25.09	0.95
diff log(GDP per capita)	99	0.20	0.20	-0.52	1.00	0.20

Panel B: Using HS6 Product Level Tariff						
Variable	Obs	Mean	Std. Dev.	Min	Max	Median
diff political risk index	70	-0.70	5.97	-16	16.5	-1.25
diff weighted tariff	70	0.25	3.71	-7.07	21.07	-0.29
diff import/GDP	68	0.05	0.12	-0.34	0.61	0.05
diff fuel export frac	66	2.90	6.45	-9.93	25.09	1.28
diff log(GDP per capita)	70	0.21	0.17	-0.08	1.00	0.19

Notes: this table's Panel A and Panel B report the summary statistics of variables for "China shock" regressions where weighted tariff is constructed using G7+China country level and HS6 product level import tariff information, respectively. Korea, D.P.R., Somalia and Syria GDP per capita data is missing. The text "diff" means the difference between year 2007 and 2001, except variable diff weighted tariff means the difference of weighted tariffs between year 2006 and 2000.

Table 9: Change in Weighted Tariff Using Country Level Tariff Information and Change in Political Risk Index

	(1)	(2)	(3)
Dependent variable: change in PR index			
change in weighted tariff	-1.868***	-2.539***	-2.536***
	(0.688)	(0.841)	(0.797)
change in import/GDP		-5.730	-3.036
		(6.595)	(6.718)
change in fuel export frac		-0.077	-0.160**
		(0.089)	(0.067)
e_change in log(GDP per capita)			5.878*
			(3.28)
Observations	102	84	83
R^2	0.046	0.081	0.172

Robust standard errors in parentheses
*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Notes: this table reports the regression results of long difference in political risk index (year 2001-2007) against long difference of weighted tariff constructed using G7+China country level import tariff information (year 2000-2006). Variable *e_change* in log(GDP per capita) is the residual after projecting change in log(GDP per capita) on change in weighted tariff.

Table 10: Change in Weighted Tariff Using HS6 Product Level Tariff Information and Change in Political Risk Index

	(1)	(2)	(3)
Dependent Variable: change in PR index			
change in weighted tariff	-0.238*	-0.303 **	-0.271*
	(0.122)	(0.152)	(0.137)
change in import/GDP		-3.996	-1.540
		(8.233)	(7.466)
change in fuel export frac		-0.176*	-0.120
		(0.092)	(0.084)
e_change in log(GDP per capita)			11.079***
			(4.007)
Observations	70	64	64
R^2	0.022	0.064	0.151

Robust standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of long difference in political risk index against long difference of weighted tariff constructed using G7+China HS6 level import tariff information. Variable *e_change* in log(GDP per capita) is the residual after projecting change in log (GDP per capita) on change in weighted tariff.

Table 11: Change in Weighted Tariff Using Country Level Tariff Information and Change in Political Risk Index: Robustness Checks

	(1)	(2)	(3)	(4)
Dependent Variable: change in PR index	Excluding Hong Kong		3-Year Average	
change in weighted tariff	-2.610**	-2.795***	-3.093 ***	-3.510***
	(0.985)	(0.908)	(0.986)	(0.900)
change in import/GDP	-5.322	-1.745	-4.744*	-5.546**
	(8.067)	(8.077)	(2.516)	(2.505)
change in fuel export frac	-0.078	-0.164**	-0.126	-0.181*
	(0.090)	(0.067)	(0.126)	(0.096)
e_change in log(GDP per capita)		6.019*		13.091***
		(3.313)		(3.563)
Observations	83	82	73	71
R^2	0.075	0.172	0.095	0.270

Robust standard errors in parentheses
$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports robustness checks of the regression results of long difference in political risk index against long difference of weighted tariff constructed using G7+China HS6 level import tariff information. The first two columns exclude Hong Kong in the sample and the last two columns use 3-year average of long difference in political risk index, and long difference of weighted tariff. Variable *e_change* in log(GDP per capita) is the residual after projecting change in log (GDP per capita) on change in weighted tariff.

Table 12: Change in Weighted Tariff Using HS6 Product Level Tariff Information and Change in Political Risk Index: Robustness Checks

	(1)	(2)	(3)	(4)
Dependent Variable: change in PR index	Excluding Mali		3-Year Average	
change in weighted tariff	-0.475**	-0.430**	-0.891***	-0.873***
	(0.193)	(0.197)	(0.264)	(0.197)
change in import/GDP	-4.265	-1.792	-4.267	-4.738
	(8.254)	(7.587)	(3.585)	(3.554)
change in fuel export frac	-0.174*	-0.121	-0.183	-0.149
	(0.089)	(11.213)	(0.144)	(0.126)
e_change in log(GDP per capita)		10.754**		18.164***
		(4.025)		(5.621)
Observations	63	63	54	54
R^2	0.074	0.155	0.149	0.311

Robust standard errors in parentheses
$^*p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports robustness checks of the regression results of long difference in political risk index against long difference of weighted tariff constructed using G7+China HS6 level import tariff information. The fist two columns exclude Mali in the sample and the last two columns use 3-year average of long difference in political risk index, and long difference of weighted tariff. Variable *e_change* in log(GDP per capita) is the residual after projecting change in log (GDP per capita) on change in weighted tariff.

Table 13: Post-China Joining WTO Change in Weighted Tariff and Pre-China Joining WTO Change in Political Risk Index

	(1)	(2)
Dependent Variable: change in PR index (1995-2001)		
change in weighted tariff, country	0.953	
	(1.491)	
change in weighted tariff, HS6		-0.080
		(0.220)
Observations	94	63
R^2	0.005	0.002

Robust standard errors in parentheses
$^*p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of long difference in political risk index (pre-China joining WTO: 1995-2001) against long difference of weighted tariff (post-China joining WTO: 2000-2006) using country level and HS6 product level tariff information in Column (1) and (2), respectively.

Table 14: Summary Statistics on Change in Weighted Tariff-Contract Intensive and Change in Weighted Tariff-non Contract Intensive

Variable	Obs	Mean	Std. Dev.	Min	Max	Median
diff weighted tariff-contract intensive	70	0.01	2.04	-3.30	6.03	-0.13
diff weighted tariff-non contract intensive	70	0.31	2.92	-6.96	21.16	-0.04
weight of contract intensive products	70	0.48	0.28	0.01	0.93	0.47

Notes: this table reports the summary statistics of variables for the "China Shock" regressions with industry-specific sensitivity to institutional quality. The text "diff" means the difference between year 2006 and 2000. Variable diff weighted tariff-contract intensive represents change in weighted tariff in contract intensive industries multiplied by export share of contract intensive industries. Variable diff weighted tariff-non contract intensive represents change in weighted tariff in non-contract intensive industries multiplied by export share of non-contract intensive industries.

Table 15: Change in Weighted Tariff by Institutional Sensitivity (measure 1) and Change in Political Risk Index

	(1)	(2)	(3)
Dependent Variable: change in PR index			
change in weighted tariff-contract intensive	-0.674**	-0.643**	-0.585*
	(0.314)	(0.320)	(0.312)
change in weighted tariff-non contract intensive	-0.102	-0.158	-0.139
	(0.101)	(0.138)	(0.121)
change in import/GDP		-3.729	-1.260
		(8.103)	(7.435)
change in fuel export frac		-0.150*	-0.107
		(0.088)	(0.082)
e_change in log(GDP per capita)			11.221***
			(4.163)
Observations	70	64	64
R^2	0.030	0.061	0.147

Robust standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of long difference in political risk index against long difference of weighted tariff for contract intensive industries and non-contract intensive industries, constructed using G7+China HS6 level import tariff information and relationship specificity measure 1 in Nunn(2007). Variable change in weighted tariff-ci is change in weighted tariff in the contract intensive industry multiplied by export share of contract intensive industry. Variable change in weighted tariff-ni is change in weighted tariff in the non-contract intensive industry multiplied by export share of non-contract intensive industry. Variable e_change in log(GDP per capita) is the residual after projecting change in log (GDP per capita) on the first two regressors.

Table 16: Change in Weighted Tariff by Institutional Sensitivity (measure 2) and Change in Political Risk Index

	(1)	(2)	(3)
Dependent Variable: change in PR index			
change in weighted tariff-contract intensive	-0.902**	-0.918**	-0.864**
	(0.405)	(0.411)	(0.416)
change in weighted tariff-non contract intensive	-0.150	-0.195	-0.180
	(0.120)	(0.140)	(0.126)
change in import/GDP		-4.213	-1.644
		(8.080)	(7.564)
change in fuel export frac		-0.148*	-0.109
		(0.084)	(0.078)
e_change in log(GDP per capita)			10.765**
			(4.197)
Observations	70	64	64
R^2	0.038	0.074	0.151

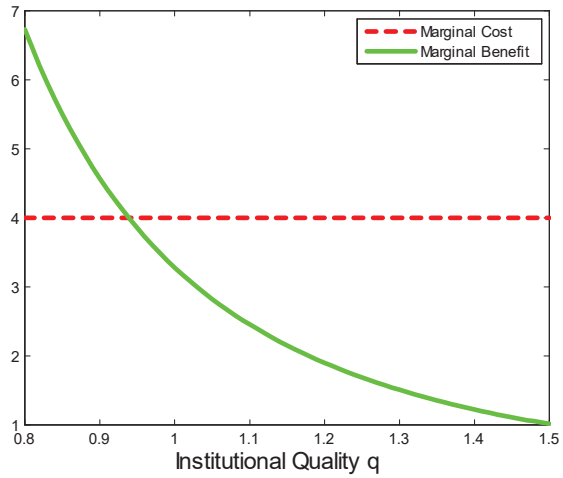
Standard errors in parentheses

Robust standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regression results of long difference in political risk index against long difference of weighted tariff for contract intensive industries and non-contract intensive industries, constructed using G7+China HS6 level import tariff information and relationship specificity measure 2 in Nunn(2007). Variable change in weighted tariff-contract intensive is change in weighted tariff in the contract intensive industry multiplied by export share of contract intensive industry. Variable change in weighted tariff-non contract intensive is change in weighted tariff in the non-contract intensive industry multiplied by export share of non-contract intensive industry. Variable $e_$change in log(GDP per capita) is the residual after projecting change in log (GDP per capita) on the first two regressors.

Figure 1: Determination of Instititutional Quality - Numerical Example



Notes: this figure displays a numerical example of the equilibrium determination of institutional quality. Consider home country i, and the rest of the world j. Institutional quality $q \in (0, +\infty)$. For simplicity, set foreign $q_j = +\infty$.

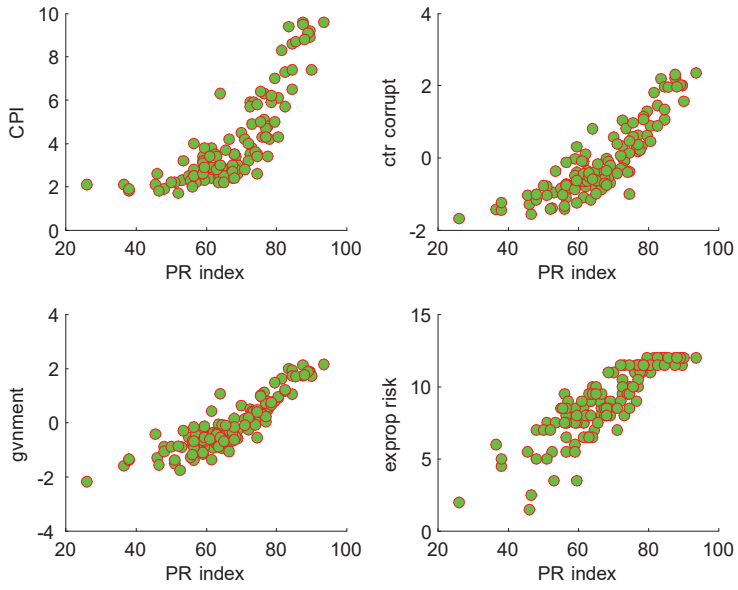
$$\phi(q) = 1 - e^{-\gamma q}, \ f(q_i, q_j) = e^{\frac{\pi_i}{q_i}} e^{\frac{\pi_j}{q_j}}, \ f(q_i, q_i) = e^{\frac{\pi}{q_i}}$$

where $\pi_i > \pi$ to ensure **Assumption 2** is satisfied. The first order condition is then read as

$$\frac{\gamma}{1-\alpha} = e^{\frac{\pi_i}{q_i}} \frac{\pi_i}{q_i^2} + \frac{\frac{N_j}{N_i} d_{ij}^{1-\sigma} e^{\frac{\pi_i - \pi}{q_i}(1-\sigma)}}{1 + \frac{N_j}{N_i} d_{ij}^{1-\sigma} e^{\frac{\pi_i - \pi}{q_i}(1-\sigma)}} [e^{\frac{\pi_i}{q_i}} \frac{\pi_i}{q_i^2} - e^{\frac{\pi}{q_i}} \frac{\pi}{q_i^2}]$$

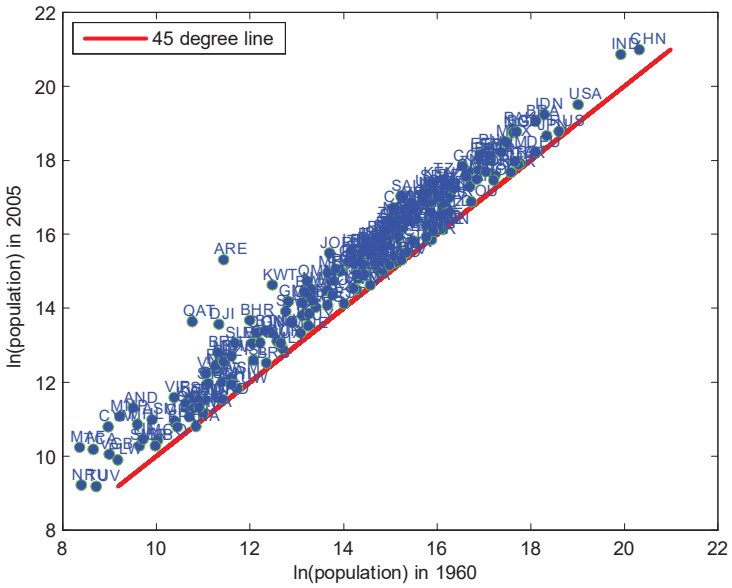
The left hand side is a constant. The right hand side is strictly decreasing if $\frac{N_j}{N_i} d_{ij}^{1-\sigma} e^{\frac{\pi_i - \pi}{q_i}(1-\sigma)}$ or $[e^{\frac{\pi_i}{q_i}} \frac{\pi_i}{q_i^2} - e^{\frac{\pi}{q_i}} \frac{\pi}{q_i^2}]$ is small enough so that the monotonicity of the first term of the right hand side dominates. Parameter values are $\alpha = 0.5, \gamma = 2, \pi_i = 1.05, \pi = 1; N_j = 100, N_i = 1, \sigma = 1.5, d_{ij} = 1.1$.

Figure 2: The Political Risk Index and Other Institutional Quality Measures



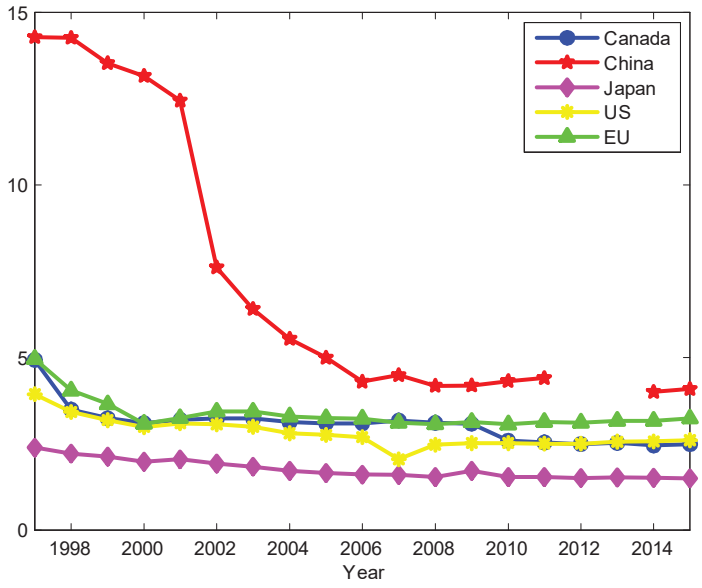
Notes: this figure displays the raw data of other measures of institutional quality against political risk index (year 2005). Each point represents a country. From left to right, top to down, the order is Corruption Perception Index, Control of Corruption, Government Effectiveness and Expropriation Risk, all against Political Risk Index.

Figure 3: Ln(population) in 2005 versus 1960



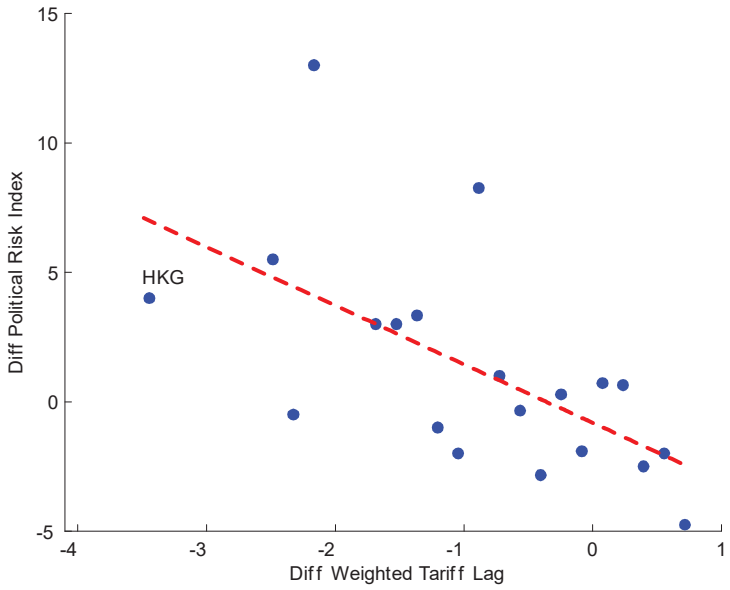
Notes: this figure displays the raw data of ln(population) in year 2005 against that in year 1960. The red line is the 45 degree line. The correlation between ln(population) in year 2005 and 1960 is 0.978. Our cross sectional regressions' results remain valid if we drop the two outliers ARE (United Arab Emirates) and QAT (Qatar) in the above figure.

Figure 4: The MFN Import Tariff Rates (%) of Big Economies 1997-2015



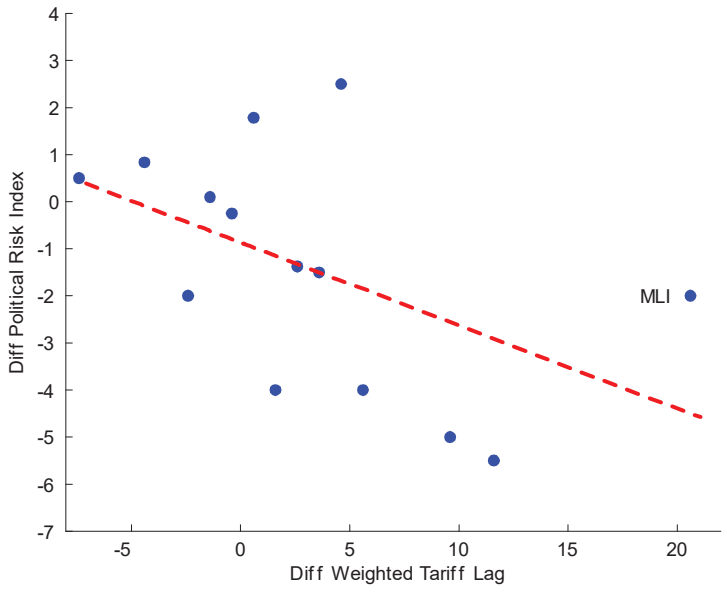
Source: TRAIN Database

Figure 5: The Political Risk Index vs. Trading Partner's Average Tariff Rate



Notes: this figure displays the bin-scatter plot of long difference of political risk index and weighted tariff. We divide long difference of weighted tariff lag into 30 equal-width bins on the x axis. Within each box, we compute the mean value of long difference of political risk index. The resulting mean is plotted against the mid-value of long difference of weighted tariff lag for all boxes.

Figure 6: Weighted Tariff and Political Risk Index: Long Difference, HS6



Notes: This bin scatter plot graphs the change in the political risk index from 2001 to 2007 (on the vertical axis) against the change in the weighted average of product-level tariff rates of big trading partners (on the horizontal axis). All changes in the weighted average tariff rate are placed in 30 equal-width bins on the x axis. The average value of the change in political risk index over all observations within a given bin is used in the plot.

6 Appendices (online posting only)

6.1 A1. Data Sources

Total import, export, GDP, GDP per capita, population, land area, fuel export as a fraction of merchandise export, and income Gini: World Bank, World Development Indicator, available on World Bank DataBank website. In the cross sectional analysis, we fill missing Papua New Guinea import/GDP and export/GDP 2005 data with available 2004 data. Also missing data on total import and export of Ethiopia and Lesotho in year 2005 are substituted by **IMF DOTS** import and export data.
Longitude and latitude: CIA World Factbook, available at
https://www.cia.gov/library/publications/the-world-factbook/fields/2011.html
Coastline length: World Resource Institute, available at
https://web.archive.org/web/20120419075053/http://earthtrends.wri.org/text/coastal-marine/variable-61.html
Bilateral total (merchandised) trade: UNCTAD Statistics.
Political risk index: Political Risk Service Group, December data of each year.
Corruption perception index: Transparency International.
Control of corruption and **government effectiveness**: World Governance Indicators.
Expropriation risk: Political Risk Service Group, December data of each year. It is the Investment Profile component of political risk index.
Legal origin: LaPorta, Lopez-de-Silanes, Shleifer (2008, JEL), available at
http://scholar.harvard.edu/shleifer/publications/economic-consequences-legal-origins.
Mortality rate: Acemoglu, Johnson, and Robinson (2001, AER) Appendix Table A2.
MFN import tariff at country level of G7 and China: UNCTAD Statistics. The data represents MFN (Most Favoured Nation) and effectively applied import tariff rates (weighted average) by individual country (as market economy) on manufactured goods, ores and metals. Average tariff of a market country is calculated by taking those products (at HS 6-digit level) that are imported by the market country from each country so tariff rates for those products that are not traded are not included in the calculation.
MFN import tariffs at HS6 level of G7 and China: WITS (World Integrated Trade Solution). For products with multiple production lines, we take Simple Average directly reported in the dataset.
Export at HS 6 level to G7 and China for each country: UN Comtrade
General Government Expense and Employee Compensation: IMF Government Finance Statistics (GFS)
Industry relationship-specificity measure: Nunn(2007). Data available at
http://scholar.harvard.edu/files/nunn/files/contract_intensity_io_1997.xls
Gross output/GDP in non-service sector: Constructed from GTAP. We take year 2004 data.

6.2 A2. Gravity Equations with Institutional Quality

In this Appendix, we aim to verify a key assumption in our model: better institutional quality promotes international trade more than it does domestic trade.

We augment the standard empirical gravity equation in two ways. First, we expand the sample of bilateral trade to include internal trade (a country's trade with itself) for all countries in the sample. Second, we add by institutional quality, and an interaction term between institutional quality and a dummy for international trade as additional regressors.

A country's internal trade is the difference between the value of its gross output and the value of its international trade (Wei, 1996). Since it is easy to obtain data on the value of bilateral merchandize trade but nearly impossible to obtain data on bilateral service trade, we will focus on merchandize trade. Using the national input-output tables in the GTAP (Global Trade Analysis Project) database, we compute gross output in the non-service sectors for all countries in 2005 by multiplying the value added in the non-service sectors in 2005 with the ratio of gross output/GDP in the non-service sectors in 2004[15]. A country's gross non-service trade with itself is then computed as its gross non-service output minus the sum of all its non-service exports to all other countries. Following Wei (1996), domestic distance for country i, d_{ii}, is proxied by 1/4 of the country's distance to the nearest neighbor.

We perform two sets of empirical regressions. The first empirical setup (no country fixed effect) is

$$\begin{aligned} \log(\exp ort_{ij}) &= \beta_0 + \beta_1 \log(d_{ij}) + \gamma_1 q_i + \gamma_2 q_j + \rho * dummy(i \neq j) * q_i \\ +\lambda * dummy(i &= j) + \upsilon_1 X_i + \nu_2 X_j + \mu q_i q_j + \epsilon_{ij} \end{aligned} \tag{25}$$

where the left hand side is exports from country i to country j, while on the right hand side, d_{ij} is the greater circle distance between countries i and j, q_i denotes institutional quality in country i, X_i includes $log(GDP)$[16], landlock dummy and coastline length/area.

In this specification, the key parameter of interest is ρ. A positive and significant coefficient on the interaction term would validate the idea that the same improvement in a country's institutions would promote more international trade more than it does internal trade.

The regression results are reported in Panel A of Table 17. The standard gravity variables such exporter's log GDP and importer's log GDP are always positive and statistically significant (not reported to save space). A positive and significant coefficient on the dummy(i=j) shows home bias in trade. Most

[15] Because IO tables are not available for every year, we can obtain the ratio for 2004 and 2007 (in the neighborhood of 2005). The ratios in these two years are quite similar.

[16] We notice that when we perform gravity equations with institutional quality and GDP, one problem is that institutional quality could affect trade via its effect on GDP as well. To capture the total effect of institutional quality on trade, we use the predicted value of log(GDP) by log(population) to substitute log(GDP).

important to us, we find that the coefficient on importer's institutional quality (q_j) is positive and significant, and the coefficient on the interaction term ($dummy(i \neq j) * q_i$) is also positive and significant. This means that with an improvement in an importer's institution, there would be more bilateral trade with anyone (including with itself), and the increase in international trade is more than that in internal trade.

In Panel B of Table 17, we instrument a country's institutional quality by settler mortality based on the idea of Acemoglu, Johnson and Robinson (2001). We obtain the same results. In particular, better institutions generate a bigger positive response in international trade than in domestic trade.

In the second specification, we add separate importer fixed effects and exporter fixed effects:

$$\begin{aligned} \log(\exp ort_{ij}) &= \beta_0 + \beta_1 \log(d_{ij}) + \theta_i + \theta_j \\ &+ \rho * dummy(i \neq j) * q_i + \lambda * dummy(i = j) + \mu q_i q_j + \epsilon_{ij} \end{aligned} \tag{26}$$

where θ_i and θ_j are exporter or importer fixed effects. This specification is more general than the first one, and therefore is preferred.

The results are reported in 18. The coefficient, ρ, on the interaction term between a dummy for international trade and the importer's quality of institution is positive and statistically significant. This supports the notion that international trade is more sensitive to domestic institutional quality than internal trade.

Table 17: Gravity Equation with Institutional Quality - No Fixed Effects

Dependent Variable: $\log(export_{ij})$					
Panel A: No IV for Institutional Quality					
	(1)	(2)	(3)	(4)	(5)
$log(d_{ij})$	-1.574***	-1.696***	-1.636***	-1.578***	-1.618***
	(0.028)	(0.028)	(0.027)	(0.027)	(0.030)
q_i	0.015	-0.016	0.015	-0.085	-0.041
	(0.021)	(0.092)	(0.204)	(0.186)	(0.128)
q_j	0.107***	0.554***	1.295***	1.445***	0.582***
	(0.014)	(0.022)	(0.024)	(0.026)	(0.066)
$dummy(i \neq j) * q_i$	0.123***	0.722***	1.630***	1.913***	0.709***
	(0.017)	(0.090)	(0.205)	(0.188)	(0.119)
dummy(i=j)	18.414***	12.627***	9.899***	10.378***	16.227***
	(1.245)	(0.468)	(0.219)	(0.215)	(1.153)
Exporter Fixed Effect	No	No	No	No	No
Importer Fixed Effect	No	No	No	No	No
Institutional quality q measure	PR index	CPI	ctr corrupt	gvnment	exprop risk
N	9045	9702	10197	10197	9045
R^2	0.696	0.697	0.700	0.722	0.640

Panel B: Mortality Rate as IV for Institutional Quality					
	(1)	(2)	(3)	(4)	(5)
$log(d_{ij})$	-2.266***	-2.322***	-2.334***	-2.362***	-2.389***
	(0.079)	(0.075)	(0.079)	(0.074)	(0.108)
q_i	0.100	0.360	0.810	0.744	0.891
	(0.111)	(0.374)	(0.620)	(0.608)	(0.939)
q_j	0.209**	0.864***	1.899***	1.874***	1.563**
	(0.093)	(0.146)	(0.117)	(0.102)	(0.681)
$dummy(i \neq j) * q_i$	0.167***	0.805***	1.752***	1.820***	1.111**
	(0.062)	(0.300)	(0.640)	(0.620)	(0.470)
dummy(i=j)	18.642***	10.581***	7.234***	7.233***	16.925***
	(3.923)	(1.146)	(0.512)	(0.456)	(3.903)
Exporter Fixed Effect	No	No	No	No	No
Importer Fixed Effect	No	No	No	No	No
Institutional Quality q Measure	PR index	CPI	ctr corrupt	gvnment	exprop risk
N	2085	1946	2085	2085	2085
R^2	0.624	0.668	0.621	0.699	0.326

Robust standard errors in parentheses
$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports trade gravity equation with institutional quality and no country fixed effect. Panel A directly uses institutional quality while Panel B uses mortality rate as instrument variable.

Table 18: Gravity Equation - Adding Importer and Exporter Fixed Effects

Dependent Variable: $\log(export_{ij})$					
Panel A: No IV for Institutional Quality					
	(1)	(2)	(3)	(4)	(5)
$log(d_{ij})$	-1.800***	-1.783***	-1.801***	-1.813***	-1.802***
	(0.028)	(0.027)	(0.027)	(0.027)	(0.028)
$dummy(i \neq j) * q_i$	0.127***	0.763***	1.702***	1.983***	0.734***
	(0.019)	(0.103)	(0.216)	(0.214)	(0.102)
dummy(i=j)	17.882***	12.619***	9.374***	9.571***	15.843***
	(1.347)	(0.504)	(0.243)	(0.231)	(0.995)
Exporter Fixed Effect	Yes	Yes	Yes	Yes	Yes
Importer Fixed Effect	Yes	Yes	Yes	Yes	Yes
Institutional quality q_i measure	PR index	CPI	ctr corrupt	gvnment	exprop risk
N	9045	9702	10197	10197	9045
R^2	0.828	0.825	0.821	0.821	0.829

Panel B: Mortality Rate as IV for Institutional Quality					
	(1)	(2)	(3)	(4)	(5)
$log(d_{ij})$	-2.252***	-2.209***	-2.244***	-2.252***	-2.255***
	(0.059)	(0.058)	(0.058)	(0.059)	(0.058)
$dummy(i \neq j) * q_i$	0.161**	0.845**	1.796**	1.789**	1.100**
	(0.073)	(0.366)	(0.823)	(0.722)	(0.495)
dummy(i=j)	18.310***	11.159***	7.536***	7.636***	17.382***
	(4.654)	(1.347)	(0.487)	(0.412)	(4.166)
Exporter Fixed Effect	Yes	Yes	Yes	Yes	Yes
Importer Fixed Effect	Yes	Yes	Yes	Yes	Yes
Institutional Quality q Measure	PR index	CPI	ctr corrupt	gvnment	exprop risk
N	2085	1946	2085	2085	2085
R^2	0.829	0.836	0.830	0.832	0.829

Standard errors in parentheses
$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports trade gravity equation with institutional quality and both exporter and importer fixed effects. Panel A directly uses institutional quality while Panel B uses mortality rate as instrument variable.

6.3 A3: Residual Openness and Institutional Quality

A country's actual openness (e.g., import as a share of GDP) is affected by both intrinsic (exogenous) openness and policies. In this appendix, we undertake a two-step exercise. First, we decompose a country's actual openness into (a) intrinsic openness - the fitted value from regressing the actual openness on the country's geographic features and the population size, and (b) "residual openness" - the residuals from the above regression. Second, we check how much a country's institutional quality could be "explained" by "residual openness" relative to intrinsic openness.

We start with the following regression:

$$\begin{aligned} \log\left(trade/GDP_i\right) &= \gamma_0+\gamma_1\log\left(population_i\right)+\gamma_2 remoteness_i+ \\ &\quad \gamma_3 landlock\_dummy_i+\gamma_4 coast/area_i+\epsilon_i \end{aligned}$$

Table 19 shows that the set of intrinsic openness variables collectively explains about 37% of the actual openness.

In the second step, we regress institutional quality on both the "residual openness" and the set of intrinsic openness variables. The institutional quality is measured by one of the five indices, respectively: the political risk index, control of corruption (as measured by Transparency International), control of corruption (as measured by the World Bank Institute), government effectiveness (WBI), and expropriation risk (WBI).

$$\begin{aligned} q_i &= \beta_0+\beta_1\log\left(population_i\right)+\beta_2 remoteness_i+\beta_3 landlock\_dummy_i \\ &\quad +\beta_4 coast/area_i+\delta * residual\_open+\xi_i \end{aligned} \tag{27}$$

Table 20 reports the results. We find that residual openness is not statistically significant in any of the regressions, whereas the intrinsic openness variables do seem to matter as in the main text. In particular, a country that is relatively large or far from the world market or have a shorter coastline tends to have worse quality of institutions.

It is striking that "residual openness" is uncorrelated with quality of institutions. It suggests that variations in openness induced by own trade policies that are not explained by intrinsic openness are unlikely to influence institutional quality. (In comparison, our paper has shown that trade liberalization by other countries might very well affect a country's incentive to investing in institutional quality.)

Table 19: Intrinsic Openness and log(trade/GDP)

	(1) log(trade/GDP)	(2) log(trade/GDP)	(3) log(trade/GDP)	(4) log(trade/GDP)	(5) log(trade/GDP)	(6) log(trade/GDP)
log(population)	-0.159***		-0.171***	-0.175***	-0.153***	-0.157***
	(0.025)		(0.024)	(0.024)	(0.021)	(0.022)
remoteness		-0.460***	-0.549***	-0.548***	-0.484***	-0.488***
		(0.131)	(0.113)	(0.113)	(0.104)	(0.105)
landlock dummy				-0.130*		-0.075
				(0.078)		(0.072)
coast/area					1.098**	1.013**
					(0.425)	(0.458)
Observations	148	148	148	148	148	148
R^2	0.214	0.078	0.323	0.336	0.368	0.372

Robust standard errors in parentheses

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$

Notes: this table reports the regressions results of actual openness on intrinsic openness measures. Variable coast/area means coastline length divided by land area.

Table 20: Intrinsic Openness, Residual Openness and Institutional Quality

	(1) PR index	(2) PR index	(3) CPI	(4) CPI	(5) ctr corrupt	(6) ctr corrupt	(7) gvnment	(8) gvnment	(9) exprop risk	(10) exprop risk
log(population)		-2.906***		-0.327***		-0.121***		-0.061		-0.435***
		(0.620)		(0.093)		(0.045)		(0.043)		(0.123)
remoteness		-16.244***		-1.539**		-0.845***		-1.166***		-2.389***
		(3.599)		(0.631)		(0.294)		(0.281)		(0.679)
landlock		-2.745		-0.442		-0.205		-0.243		-0.521
		(2.268)		(0.345)		(0.168)		(0.162)		(0.559)
coast/area		12.021		6.421***		2.618***		2.393***		2.806**
		(7.394)		(2.089)		(0.817)		(0.903)		(1.318)
residual open	0.710	0.510	-0.141	-0.247	-0.009	-0.009	0.168	0.168	0.389	0.356
	(3.263)	(2.878)	(0.557)	(0.435)	(0.243)	(0.204)	(0.251)	(0.213)	(0.696)	(0.665)
Observations	120	120	139	139	148	148	148	148	120	120
R^2	0.000	0.305	0.001	0.243	0.000	0.206	0.004	0.240	0.004	0.215

Robust standard errors in parentheses

$^{*}p < 0.10,\ ^{**}p < 0.05,\ ^{***}p < 0.01$

Notes: this table reports the regressions results of institutional quality on intrinsic openness measures and residual openness. Variable coast/area means coastline length divided by land area.

6.4 A4. A Scale Effect in the Public Sector?

In this appendix, we check if a larger population implies a lower cost in delivering public services as a share of GDP (the scale effect).

The dependent variable is general government expenditure (relative to GDP) from IMF's Government Finance Statistics (GFS). We regress

$$(gov\exp enditure_i/GDP_i) = \alpha_0 + \alpha_1 \log(population_i) + \epsilon_i \tag{28}$$

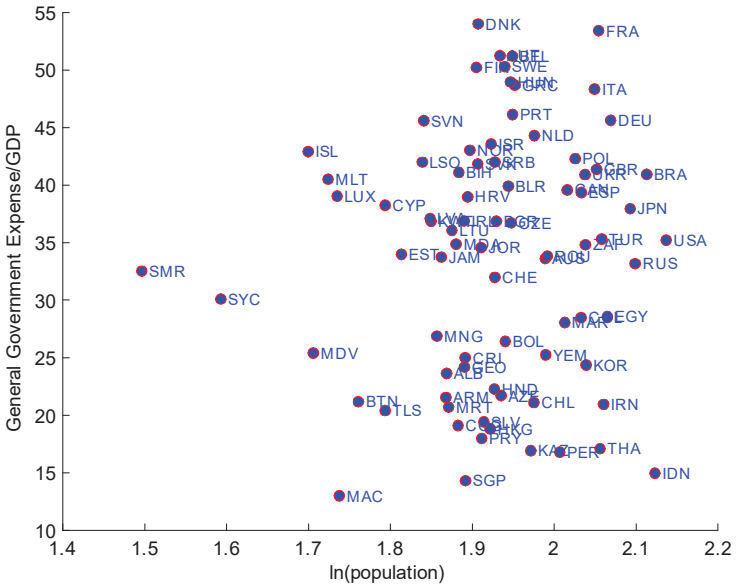
Government expenditure exhibits fluctuations from one year to the next. To reduce noise, the left hand side variable is averaged across all years during 2000-2015. The right hand side variable is log(population) in year 2005. The sample consists of all countries for which the data are available for at least five years during 2000-2015. If there is a scale effect, we would expect to see a negative coefficient on log population.

Figure 7 presents a scatter plot. Contrary to the scale effect hypothesis, there is no discernible negative relationship between the two. The regression confirms this: the slope coefficient is even positive though not statistically significant.

As another check, we replace the dependent variable by public sector payroll as a share of GDP, and present a scatter plot in Figure 8. Again, we do not see a statistically significant relationship between the two variables.

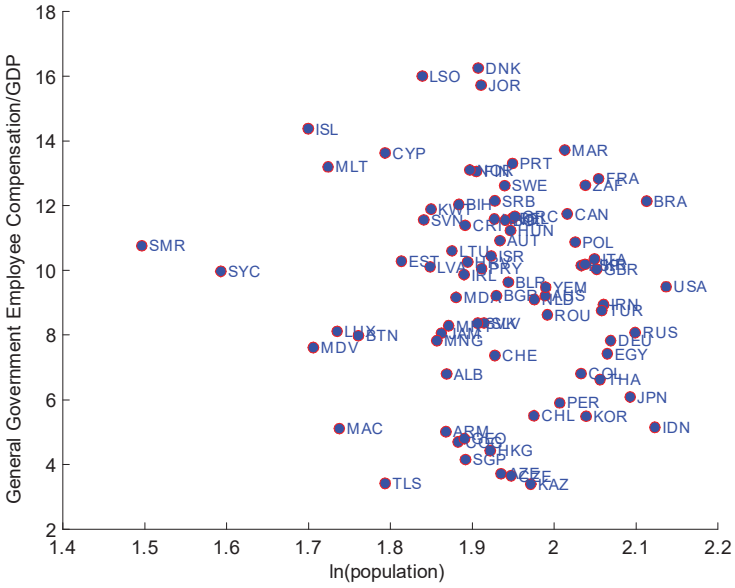
As the population becomes larger, we suspect that the number of layers of government tends to increase also. That may be one reason why the data do not support the notion of a scale effect in public service provision.

Figure 7: General Government Expenditure (% of GDP) and log Population Size



Notes: the OLS regression shows a slope of 1.052 with robust standard error 1.365, not statistically significant.

Figure 8: General Government Employee Compensation and Population



Notes: the OLS regression shows a slope of -0.413 with standard error 0.384, not statistically significant.

6.5 A5: Export Opportunities and Institutional Quality

The benchmark model in the main text leaves out general equilibrium income effect, thus only import trade cost matters. In this appendix, we provide a model featuring export costs and explore how exogenous changes in export opportunities will endogenously affect the institutional quality.

We begin by presenting an economy with a fixed institutional quality and then endogenize institutional quality. The home country productivity is normalized to 1. It imports N^* number of varieties from foreign countries. There are in total N varieties produced domestically with population L. Foreign aggregate demand for each domestic variety is

$$D^*(p\tau_e^*)^{-\sigma}$$

where D^* is taken as exogenous (the numeraire is foreign varity's f.o.b. price $p^* = 1$), τ_e^* is a function of the physical distance, institutional quality and foreign import policy, and p is the f.o.b price of domestic good.

Domestic households utility is

$$u = logH$$

where H is the consumption of final good which is a CES aggregation of both foreign and domestic varieties with elasticity of substitution $\sigma > 1$. The demand function from domestic residents faced by a domestic variety is

$$\frac{\sigma}{\sigma-1} WL(p\tau)^{-\sigma}$$

where W is wage. A labor market clearing condition requires

$$N[\frac{\sigma}{\sigma-1} WL(p\tau)^{-\sigma} + D^*(p\tau_e^*)^{-\sigma}] = L.$$

Assuming that the firms are monopolistically competitive, we obtain

$$p = \frac{\sigma}{\sigma-1} W.$$

This simplifies the labor market clearing condition to yield:

$$N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma} + ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma} = W^\sigma L. \tag{29}$$

This equation implies that a lower τ_e^* means a larger part of domestic income (right hand side) is from foreign markets (second term of the left hand side). Since a change in the wage will affect the domestic market size, this equation gives an implicit function $W(q)$.

We assume $\tau = \tau(q)$, $\tau_m = h_m d\tau^*(q)$, $\tau_e^* = h_e d\tau^*(q)$ where d is physical distance between home and foreign[17], h_m and h_e are foreign trade policy (exogenous to home country), and q is institutional quality. Take log on both sides

[17] The physical distance within home country d_{ii} is normalized to 1.

and take derivative with respect to q:

$$\frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}[\frac{d\log W}{dq}-\sigma\frac{d\log\tau(q)}{dq}]$$
$$+\frac{ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}(-\sigma)\frac{d\log\tau_e^*(q)}{dq} = \sigma\frac{d\log W}{dq}$$

Therefore,

$$\begin{aligned}\frac{d\log W(q)}{dq} &= -\sigma\frac{1}{\sigma-\frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}}[\frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}\frac{d\tau(q)}{dq}\\ &\quad+\frac{ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}\frac{d\log\tau_e^*(q)}{dq}]\\ &= \sigma\frac{1}{\sigma-\frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}}\{-\frac{d\log\tau(q)}{dq}\\ &\quad+\frac{ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}[-\frac{d\log\tau_e^*(q)}{dq}-(-\frac{d\tau(q)}{dq})]\}.\end{aligned}$$

A representative domestic agent's welfare before institutional cost is

$$\log u=\log[\frac{\sigma}{\sigma-1}W/P]$$

where domestic price index is

$$P=[N(p\tau)^{1-\sigma}+N^*(p^*\tau_m)^{1-\sigma}]^{\frac{1}{1-\sigma}}.$$

Now we start to endogenize institutional quality by assuming that there is a per capita cost $\phi(q)$ to maintain level q institutional quality. A representative agent's welfare after deducting the institutional cost is

$$\log u=\log W(q)+\log[1-\phi(q)]+\frac{1}{\sigma-1}\log[N(p\tau(q))^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}].$$

The first order condition with respect to q is

$$\begin{aligned}
\frac{\phi'(q)}{1-\phi(q)} &= \frac{d\log W(q)}{dq} - \frac{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}[\frac{d\log\tau(q)}{dq}+\frac{d\log W}{dq}] \\
&\quad - \frac{N^*(h_m d\tau^*(q))^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}\frac{d\log\tau^*(q)}{dq} \\
&= [1-\frac{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}]\frac{d\log W(q)}{dq} \\
&\quad - \frac{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}\frac{d\log\tau(q)}{dq} \\
&\quad - \frac{N^*(h_m d\tau^*(q))^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}\frac{d\log\tau^*(q)}{dq} \\
&= [1-\frac{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}]\frac{d\log W(q)}{dq} \\
&\quad - \frac{d\log\tau(q)}{dq} + \frac{N^*(h_m d\tau^*(q))^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}[-\frac{d\log\tau^*(q)}{dq}-(\frac{d\log\tau(q)}{dq})]
\end{aligned}$$

We take note of a few implications. First, it is easy to see from equation (29) that fix q, a decline in foreign tariff h_e will decrease τ_e^* and thus W goes up. Therefore, $[1-\frac{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}]$ goes up, and $\frac{N^*(h_m d\tau^*(q))^{1-\sigma}}{N[\frac{\sigma}{\sigma-1}W\tau(q)]^{1-\sigma}+N^*(h_m d\tau^*(q))^{1-\sigma}}$ goes up. It is sufficient to say the right hand side rises when h_e goes down if $\frac{d\log W(q)}{dq}$ also rises.

Notice that foreign sales share

$$\frac{ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}} = 1-\frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{W^\sigma L}$$

will then be raised. Therefore, when $-\frac{d\log\tau_e^*(q)}{dq}-(-\frac{d\tau(q)}{dq})$ is large enough or $\sigma >> \frac{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}$, we conclude that the right hand side of the first order condition to q will shift up, generating a higher institutional quality in equilibrium.

To be more rigorous, denote $x = \frac{ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}{N\frac{\sigma}{\sigma-1}(WL)(\frac{\sigma}{\sigma-1}\tau)^{-\sigma}+ND^*(\frac{\sigma}{\sigma-1}\tau_e^*)^{-\sigma}}$ and re-write

$$\begin{aligned}
\frac{d\log W(q)}{dq} &= \sigma\frac{1}{\sigma-x}\{-\frac{d\log\tau(q)}{dq} \\
&\quad +x[-\frac{d\log\tau_e^*(q)}{dq}-(-\frac{d\tau(q)}{dq})]\}
\end{aligned}$$

A sufficient condition for institutional quality to increase with exogenous trade cost reduction is the cross derivative $\frac{d^2W(q)}{dqdx} > 0$, that is

$$[-\frac{d\log\tau_e^*(q)}{dq} - (-\frac{d\tau(q)}{dq})] > \frac{\sigma}{\sigma-1+x}[-\frac{d\log\tau(q)}{dq}].$$

From the estimates in the gravity equation regressions with institutional quality, the $[-\frac{d\log\tau_e^*(q)}{dq} - (-\frac{d\tau(q)}{dq})]/[-\frac{d\log\tau(q)}{dq}]$ estimate under the comprehensive institutional quality measure, political risk index, is larger than 10. A conservative value for σ is 2, so it is easy to satisfy the above condition empirically.

In sum, with an increase in the exogenous export opportunities, a country will find the marginal benefit of increasing institutional quality to be higher. The intuition is similar to the benchmark version in the main text that focuses on the import side: at a given quality of institutions, the domestic income now has a larger part coming from the export market. If exports are more sensitive to institutions than domestic trade, this generates incentives for the country to upgrade its institutional quality.