International Trade and Institutional Change*

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Abstract

This paper analyzes the impact of international trade on the quality of institutions, such as contract enforcement, property rights, or investor protection. It presents a model in which imperfect institutions create rents for some parties within the economy, and are a source of comparative advantage in trade. Institutional quality is determined as an equilibrium of a political economy game. When countries share the same technology, there is a "race to the top" in institutional quality: irrespective of country characteristics, both trade partners are forced to improve institutions after opening. On the other hand, domestic institutions will not improve in either country when one of the countries has a strong enough technological comparative advantage in the institutionally intensive good. We provide empirical evidence for a related cross-sectional prediction of the model. Countries whose exogenous geographical characteristics predispose them to exporting in institutionally intensive sectors exhibit significantly higher institutional quality.

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1 Introduction

Recent literature on the economics of institutions has established a set of important results. First, institutions matter a great deal for economic performance (La Porta, Lopez-de-Silanes, Shleifer and Vishny, e.g. 1997, 1998, Acemoglu, Johnson and Robinson, e.g. 2001, 2005a, Rodrik, e.g. 2007). Second, in spite of the obvious overall benefits to institutional improvement, institutions are in fact very persistent (Acemoglu and Robinson 2008). Relatedly, episodes of institutional change are rare, and they are typically associated with large and abrupt changes in the economic environment. Finally, institutions are a source of comparative advantage in trade, and the welfare consequences of institutional comparative advantage are often ambiguous (Levchenko 2007, Nunn 2007, Costinot 2009).

This paper analyzes the impact of international trade on economic institutions. This is an important question, because it is widely hoped that greater openness will improve institutional quality through a variety of channels, including reducing rents, creating constituencies for reform, and inducing specialization in sectors that demand good institutions (International Monetary Fund 2005, Johnson, Ostry and Subramanian 2007). Indeed, Rodrik (2000) argues that the greatest growth benefits of trade liberalization may well come not from the conventional channels, but from the institutional reform that trade liberalization can engender. However, no well-accepted theoretical framework or a set of basic results on this question currently exist. This paper is an attempt to fill this gap.

We develop a model in which institutions play two key roles. First, they generate rents for some parties within the economy. Second, they are a source of comparative advantage in trade. Then, we endogenize institutional quality using a simple political economy model in which some groups lobby for rents created by imperfect institutions. When countries share the same technology, trade leads to a "race to the top" in institutional quality. Trading partners improve institutions up to the best attainable level after opening, as they compete to capture the sectors that generate rents. By contrast, when one of the trading partners has a sufficiently strong technological comparative advantage in the rent-generating good, institutions do not improve after trade opening in either country. When other sources of comparative advantage are strong enough, changing institutions will not affect trade patterns, and thus trade does not create an incentive to improve them.

To analyze the effect of trade on institutional quality, we must first build a model of institutions. To do so, this paper uses the insights from the incomplete contracts literature exemplified by Williamson (1985) and Grossman and Hart (1986). The quality of contract enforcement is important because it allows agents to overcome the well-known holdup problem. This modeling approach leads to a concrete interpretation of what constitutes institutional quality, suggested by

Caballero and Hammour (1998): in countries with worse institutions contracts are more incomplete. This framework can be adapted seamlessly and tractably to both trade openness and the political economy of institutions.

An important aspect of the incomplete contracts setup is that some parties to production earn rents. Those parties benefit from making institutions worse, up to a certain point, and thus have an incentive to lobby for imperfect institutions. This feature lends itself naturally to endogenizing institutions in the political economy framework of Grossman and Helpman (1994). We show that equilibrium institutions can be sub-optimal, as the parties benefiting from rents lobby against the first-best level of institutions. Thus, one of the contributions of this paper is to introduce a parsimonious and tractable model of endogenous institutions, that combines the insights from the literatures on both incomplete contracts and political economy.[1]

Under trade, both countries set institutions non-cooperatively as in the two-country model of Grossman and Helpman (1995). The key force driving institutional change is what happens to the rents when countries open to trade. There are several cases to consider. When countries share the same technology, institutional differences are the salient source of comparative advantage. After trade opening, only the country with better institutions produces the institutionally intensive good, which is characterized by rents. By contrast, the rents disappear in the country with inferior institutions.[2] The resulting political economy equilibrium is a "race to the top" in institutional quality: both countries improve institutions up to the best attainable level. This is because rents – the very reason to lobby for bad institutions – cannot be captured unless a country improves institutions to at least the level slightly better than the trading partner's. When both countries set their institutional quality simultaneously and non-cooperatively, equilibrium is characterized by the best attainable institutions, a Bertrand-like outcome.[3] Note that the "race to the top" result is completely due to the changing preferences of the lobby groups regarding the optimal institutions: their political power does not change as a result of trade opening. Nonetheless,

[1] An novel aspect of this paper is that while the large majority of papers employing the Grossman-Helpman framework apply it to fiscal instruments – be it tariffs, taxes, or subsidies – we use it to model the determination of institutions instead.

[2] See Levchenko (2007) for a detailed analysis of this result.

[3] Note that we do not attempt to endogenize trade opening. Endogenous trade policy has been the subject of a large literature, and remains beyond the scope of this paper (see, e.g., Rodrik 1995, Grossman and Helpman 2002). Nonetheless, we believe that our exercise is still well worth pursuing. First, in many instances changes in trade openness have indeed been exogenous, driven by technological shocks or changes in colonial regimes. Second, many other factors besides ensuing institutional change contribute to the formation of trade policy. Thus, it could be that even when trade openness is endogenous, it is driven by factors unrelated to those we are modeling. The policy initiatives promoting unconditional trade liberalization in developing countries are an important example. Finally, in order to analyze trade opening and endogenous institutions simultaneously, it is important to first understand how the former affects the latter. This paper studies that question, and thus can be used as a building block for a more complete analysis. Indeed, our approach can be viewed as complementary to the trade policy literature, which endogenizes openness but assumes that institutions are exogenous and do not change with trade opening.

institutions improve.[4]

Our framework also reveals the circumstances under which this result would fail to obtain. The mechanism driving institutional improvement in this model is that rents disappear as a result of trade opening in the country with inferior institutions. If instead the rents do not disappear, trade no longer creates the incentive to improve institutions. One way this could occur is due to differences in technology. If one of the trading partners has a sufficiently strong comparative advantage in the institutionally intensive good, changing institutions in either country will not affect the specialization patterns. Thus, if technologies in the two countries are sufficiently different, the race to the top will not occur. In fact, in this case trade opening may actually increase rents rather than decrease them, and institutions will deteriorate as a result of trade opening in the country that exports the institutionally intensive good.

Having developed the main intuition regarding the impact of trade opening on institutions, the paper takes it to the data. Our ability to directly test the main prediction of the model – how *changes* in trade openness lead to *changes* in institutions – is severely limited by two mutually reinforcing aspects of the data: lack of sufficient time series information on institutional quality and the extreme long-run persistence of institutions.[5] As a result of these data limitations, it has proven infeasible to detect a statistically significant impact of trade opening on changes in institutions within countries over time. Instead, we provide empirical evidence for a closely related cross-sectional prediction of the model: countries that have a predisposition to export in institutionally intensive sectors will tend to exhibit better equilibrium institutional quality. This is because improving institutions will allow these countries to retain or attract the institutionally dependent sectors. By contrast, countries with a sufficiently strong comparative disadvantage in the institutionally intensive goods have no incentive to improve institutions and thus on average equilibrium institutional quality will tend to be lower in those countries.

To empirically test this prediction, we must first establish which countries would be the most

[4]Thus, in order to observe institutional improvement, trade need not necessarily tip the balance of political power in favor of the "right" groups, as in Acemoglu, Johnson and Robinson (2005b). In our framework, the exact same special interests that perpetuated bad institutions in autarky will favor institutional improvement when the country opens to trade.

[5]There are no reliable datasets on institutional quality with sufficiently long time series to capture enough episodes of institutional change, and especially relate them to episodes of trade opening. Though the International Country Risk Guide (the dataset with the longest available time series on the quality of economic institutions such as rule of law) has observations for several dozen countries going back to 1984, even 20-25 years of data is not enough to exploit the time dimension for econometric estimation, because it is well known that institutions are formed over the long run and are very persistent. The best existing treatments of institutions point out that variables such as settler mortality (Acemoglu, Johnson and Robinson 2001), and Atlantic trade (Acemoglu et al. 2005b) in the 1500s and 1600s still affect institutions in 2000. How long islands have been colonized between the 1500s and 1800s, and by which colonial power, still impacts institutions today as well (Feyrer and Sacerdote 2009). In the world in which institutions are formed and persist over centuries, data for the last two decades of the twentieth century may not contain enough meaningful time variation for statistical testing.

able to attract the institutionally dependent sectors under trade. We develop a measure of predicted comparative (dis)advantage in institutionally intensive sectors following a strategy similar to Do and Levchenko (2007) and di Giovanni and Levchenko (2009). The key idea is to use exogenous geographic variables to predict each country's export pattern, by expanding the methodology of Frankel and Romer (1999). These authors use the gravity model to predict bilateral trade volumes between each pair of countries based on a set of geographical variables, such as bilateral distance, common border, area, and population. Summing up across trading partners then yields, for each country, its "natural openness:" the overall trade to GDP as predicted by its geography. In order to get a measure of predicted trade patterns rather than total trade volumes, Do and Levchenko (2007) and di Giovanni and Levchenko (2009)'s point of departure is to estimate the Frankel and Romer gravity regressions for each industry. This makes it possible to obtain the predicted trade volume not just in each country, but also in each sector within each country. Combining these with an index of "institutional intensity" at industry level from Nunn (2007) yields a measure of *predicted institutional intensity of exports*. In essence, this approach uses exogenous geographical variables, together with information on how those geographical variables affect industries differentially, to construct a measure of how institutionally intensive a country's export pattern is expected to be.

A country's predicted institutional intensity of exports is indeed a robust determinant of institutions in a cross-section of 141 countries. Countries that due to their geography have the potential to export in institutionally intensive sectors have better institutions, all else equal. This result is robust to the inclusion of a variety of controls, use of alternative predicted institutional intensity of exports measures, and subsamples.

It is important to emphasize the tradeoffs associated with our cross-sectional approach. Its main disadvantage is that the findings may be driven by omitted variables. While we do include a large set of controls, adding country variables is inevitably a more limited way of ruling out omitted variables than country fixed effects. In addition, since the cross-sectional results do not directly demonstrate that changes in institutions occur in response to changes in trade openness, they are only suggestive of the mechanisms proposed in the theory. The advantage is that we can exploit the cross-sectional variation in institutional quality. This variation contains valuable information and is much greater than the within-country time variation available in institutional quality data. The cross-sectional approach also allows us to rely on exogenous geographical characteristics to predict a country's predisposition to export in institutionally intensive sectors. Since geography does not change over time, this strategy is only implementable in the cross-section.

This paper is part of a growing literature on the impact of trade openness on domestic institutions. Using different theoretical frameworks, Segura-Cayuela (2006), Stefanadis (2010), and Dal

Bó and Dal Bó (2011) demonstrate that economic institutions and policies can deteriorate as a result of trade opening in countries with weak political institutions. Acemoglu et al. (2005b) argue that in some West European countries, Atlantic trade during the period 1500-1850 engendered good institutions by creating a merchant class, that became a powerful lobby for institutional improvement. Do and Levchenko (2009) develop a model in which trade opening creates incentives to improve institutions, but may also lead to strengthening of elites.[6] This paper is the first to model the effect of trade on institutions using a framework in which institutions matter for trade patterns themselves. Doing so allows us to study this question in a model that features two-way interactions between institutions and trade, and therefore use the insights from the literature on institutional comparative advantage. In addition, this framework has the advantage of tractability while at the same time generating a rich set of comparative statics.

Empirical studies by Ades and Di Tella (1997), Rodrik, Subramanian and Trebbi (2004), and Rigobon and Rodrik (2005) find that overall trade openness has a positive effect on institutional quality in a cross-section of countries. Giavazzi and Tabellini (2005) demonstrate that institutional quality rises following trade liberalization episodes. This paper focuses on predicted institutional intensity of trade patterns, and shows that it has much greater explanatory power than the overall trade openness.

The rest of the paper is organized as follows. Section 2 lays out the production and trade side of the model, deriving the autarky and trade equilibria at each exogenously given level of institutional quality of the trading partners. Section 3 endogenizes institutions in a political economy framework with lobbying, and presents the main analytical results of the paper. Section 4 describes the empirical strategy and results. Section 5 concludes. Proofs of Propositions are collected in the Appendix.

2 A Model of Institutions, Production, and Trade

This section briefly lays out the Levchenko (2007) model of production and trade in the presence of institutional comparative advantage. There are two factors, capital (K) and entrepreneurs (H), and three goods. The K-good and the H-good require only one factor, with one unit of capital producing a units of the K-good, and one unit of H producing b units of the H-good. Profit maximization and constant returns to scale imply that

$$p_K a = r \qquad \text{and} \qquad p_H b = w, \tag{1}$$

where r is the return to capital, w is the return to entrepreneurs, and p_K and p_H are goods prices.

[6] Also related is the literature on the impact of trade on natural resource extraction and the tragedy of the commons (see, among others, Tornell and Lane 1999, Copeland and Taylor 2009).

The third good, M, is produced with a Leontief technology that combines one unit of H and x units of K to produce y units of the M-good. Production of M requires relationship-specific investments, and thus the quality of a country's institutions matters in this sector. When contracts are incomplete, the presence of relationship-specific investments leads to the well-known holdup problem, and distorts resource allocations in the economy.[7] Following Caballero and Hammour (1998), we assume that when H and K form a production unit in the M-sector, a fraction ϕ of K's investment becomes specific to the relationship.[8] The parameter ϕ captures the quality of contract enforcement, with lower values of ϕ corresponding to better institutions. When contracts are well-enforced, a lower fraction of K's investment is subject to holdup. In other words, contracts are less incomplete in countries with better institutions. When $\phi = 0$, institutions are perfect and the environment is frictionless.

How does imperfect institutional quality affect the production allocations? Once K forms a production unit with H, it can only recover a fraction $(1-\phi)$ of its investment. For capital to operate in the M-sector, it must be compensated with a share of the surplus, defined as the revenue minus the *ex post* opportunity costs of the factors: $s = p_M y - w - r(1-\phi)x$. Assuming for simplicity that each party receives one half of the surplus through *ex post* Nash bargaining, K will only enter the M-sector if its individual rationality constraint is satisfied: $r(1-\phi)x + \frac{1}{2}s \geq rx$. Rearranging leads to a joint restriction on the prices p_M, w, and r that must hold for production to occur in the M-sector:

$$p_M y \geq w + (1+\phi)rx. \tag{2}$$

To complete the description of the setup, it remains to specify the demand side. Utility is Cobb-Douglas in the three goods, $U(C_K, C_H, C_M) = C_K^{\alpha} C_H^{\beta} C_M^{1-\alpha-\beta}$, with α, β, and $1-\alpha-\beta$ positive. Letting the numeraire be the ideal price index associated with Cobb–Douglas utility, consumer optimization then leads to the familiar first-order conditions:

$$p_K = \alpha \frac{C_K^{\alpha} C_H^{\beta} C_M^{1-\alpha-\beta}}{C_K}, \quad p_H = \beta \frac{C_K^{\alpha} C_H^{\beta} C_M^{1-\alpha-\beta}}{C_H}, \quad \text{and} \quad p_M = (1-\alpha-\beta)\frac{C_K^{\alpha} C_H^{\beta} C_M^{1-\alpha-\beta}}{C_M}. \tag{3}$$

2.1 Autarky Equilibrium

In order to characterize the autarky equilibrium, we must impose market clearing. Let E be the share of H employed in the M-sector. Then, production of the M-, H-, and K-goods is yEH,

[7] The important landmarks in the literature on relationship specificity and incomplete contracts include, among others, Klein, Crawford and Alchian (1978), Williamson (1985), Grossman and Hart (1986), and Hart and Moore (1990).

[8] For concreteness, in this model H can be thought of as managers or inside capital, while K would be the outside, or unorganized capital. This interpretation would be in line with the La Porta, Lopez-de-Silanes, Shleifer and Vishny (1998)'s emphasis of the role of institutions in the market for external finance. However, it is important to emphasize that this modeling approach is more general and applies to many kinds of production relationships.

$b(1-E)H$, and $a\left(\frac{K}{H}-xE\right)H$, respectively. The goods market clearing conditions are then given by:

$$C_K = a\left(\frac{K}{H}-xE\right)H, \quad C_H = b(1-E)H, \quad \text{and} \quad C_M = yEH. \tag{4}$$

The autarky equilibrium is a set of prices and the resource allocation $\{p_K, p_H, p_M, r, w, E\}$ that satisfies equations (1) through (4).[9]

The key consequence of imperfect institutions in this model is that in equilibrium one of the factors is segmented: its rewards differ across sectors. Using equation (2), we can show that the reward to a unit of H employed in the M-sector is:

$$w + \frac{1}{2}\left[p_M y - w - (1-\phi)rx\right] = w + \phi rx. \tag{5}$$

Each unit of H employed in the M-sector receives its *ex post* opportunity cost w, and in addition earns rents of size ϕrx.[10]

It is also well-known that contracting imperfections lead to the equilibrium that is inefficient: the M-sector is too small, and w and r are too low compared to the efficient case. This is because imperfect institutions make it harder to induce capital to enter the M-sector. Relative to the frictionless case, w and r must be depressed, and p_M increased to satisfy the individual rationality condition for K, (2). In equilibrium, that means reducing the size of the M-sector, which simultaneously increases production in the K- and H-sectors, lowering w and r and raising p_M. The effect is monotonic in ϕ: higher values of ϕ imply lower equilibrium E, w, and r.

2.2 Trade Equilibrium and Institutional Comparative Advantage

Suppose that there are two countries, A and B, and that international trade is costless. Let $\overline{V} = (\overline{K}, \overline{H})$ be the vector of the world factor endowments, and $(V^A, V^B) = \left[(K^A, H^A), (K^B, H^B)\right]$ be the vector of country endowments, so that $\overline{K} = K^A + K^B$ and $\overline{H} = H^A + H^B$. In order to endogenize institutions in the next section, we must first understand what happens in this model at any given level of institutional differences. Suppose that country c's institutions are given by ϕ^c, $c = A, B$. In addition, let there be a Ricardian productivity difference in the M-sector: $y_A \neq y_B$.

The trade equilibrium can be analyzed by first constructing the integrated equilibrium: the resource allocation that results under perfect factor mobility. The key intuition is that if one

[9] Notice that in equilibrium, condition (2) will hold with equality.

[10] Even though entrepreneurs are strictly better off in the M-sector, we assume that they do not expend real resources competing to be allocated there. Allowing for rent dissipation does not qualitatively alter any of the results below as long as it is not complete, and the total resources wasted by competing agents are less than the total size of the M-sector rents. Complete rent dissipation can be ruled out by some relatively innocuous assumptions. For example, rents are not completely dissipated when agents are risk averse, or when agents differ in how much they value being in the M-sector. Hillman (1989, pp. 58-72) provides a detailed discussion of conditions under which complete rent dissipation does not occur.

country can produce one of the goods more cheaply than the other at a common set of factor prices, in the integrated equilibrium only that country's production process will be used to produce that particular good. Facing the same factor prices w and r, country A can produce the M-good at a price of $p_M = \frac{w+(1+\phi^A)rx}{y_A}$. Country B can deliver the M-good at the price equal to $\frac{w+(1+\phi^B)rx}{y_B}$. Thus, in the integrated equilibrium, only the country in which this value is lowest will produce the M-good. Without loss of generality, suppose that country A can produce the M-good more cheaply:

$$\frac{w+(1+\phi^A)rx}{y_A} < \frac{w+(1+\phi^B)rx}{y_B}. \tag{6}$$

The trade pattern is described by the following Definition and Proposition (see Helpman and Krugman 1985, Davis 1995, Levchenko 2007).[11]

Definition 1 *Let η_{ic} denote the share of the integrated equilibrium production of good i that comes from country c. Then, the* ***Factor Price Equalization (FPE) set*** *under equation* (6) *is a set of partitions of the world factor endowments into countries defined by:*

$$\begin{aligned} FPE \;=\; & \{\left(V^A, V^B\right) \mid \exists \eta_{K,A}, \eta_{H,A}, \eta_{K,B}, \eta_{H,B} \geq 0, \textit{such that} \\ & \eta_{K,A} + \eta_{K,B} = 1,\ \eta_{H,A} + \eta_{H,B} = 1,\ \eta_{M,A} = 1, \eta_{M,B} = 0, \\ & V^c = \sum_i \overline{V}(i) \textit{ for } c = A, B\}. \end{aligned}$$

where $\overline{V}(i)$ is the integrated equilibrium use of the factors in industry $i = H, K, M$.

According to Definition 1, countries' factor endowments belong to the FPE set when i) country A has enough of both factors to produce the entire integrated equilibrium world quantity of the M-good; and ii) the integrated equilibrium production of the K- and H-goods can be allocated between the two countries while keeping all factors fully employed.

Proposition 1 *When equation* (6) *is satisfied, and $\left(V^A, V^B\right) \in FPE$, the trade equilibrium world resource allocation, factor prices, and goods prices replicate those of the integrated equilibrium. Therefore, in the trade equilibrium, only country A produces the M-good.*

For the purposes of endogenizing institutions, the most important result is that the M-sector disappears following trade opening in country B. As a result, the rents H was earning in the M-sector disappear upon trade opening as well. Returns to H in country B in autarky can be expressed as:

$$w^B H^B + \phi^B r^B x E^B H^B,$$

[11] There is a theoretical possibility that for a given combination of (y_A, y_B) and $\left(\phi^A, \phi^B\right)$ equation (6) holds for some values of w, r, but not for others. It will only arise if the country with higher productivity is also the one with inferior institutions: $y_A > y_B$ and $\phi^A > \phi^B$, and can always be ruled out by assuming that x is sufficiently low.

while under trade they are simply $w^T H^B$. Note that this does not have unambiguous implications for aggregate welfare, or even overall returns to H in country B: though H formerly employed in the M-sector loses rents, the base return to H, w, may go up as a result of trade. What matters for the purposes of this paper is that the behavior of rents in autarky and under trade has an important impact on the lobbying game.

Note also that country A can have a comparative advantage in the M-good for two reasons: i) better institutions, $\phi^A < \phi^B$, as in Levchenko (2007); or ii) Ricardian productivity advantage, $y_A > y_B$, as in Davis (1995). Though the precise source of comparative advantage does not affect any of the preceding discussion, as we show below it has primary importance for how trade opening affects institutions in the political economy equilibrium.

3 Political Economy of Institutions

This section asks the central question of this paper: how does opening to trade affect institutional quality? We combine the model of production and trade developed above with the political economy of special interest groups framework of Grossman and Helpman (1995, 2001, ch. 7-8). We first consider equilibrium institutions in autarky, and then describe how these change when two trading countries set domestic institutions while taking into account those of the trade partner.

3.1 Institutions in Autarky

Suppose there is one policymaker and one interest group representing H – the factor that earns rents when institutions are imperfect.[12] The policymaker receives a nonnegative contribution of size θ from the interest group, and sets institutional quality ϕ to maximize its political objective function $G(\phi, \theta)$. We adopt the standard assumption that the policymaker maximizes a weighted sum of the aggregate welfare in the economy, $S(\phi)$, and the political contribution θ:

$$G(\phi, \theta) = \lambda S(\phi) + (1 - \lambda)\theta,$$

where $\lambda \in [0, 1]$. In this formulation, λ can be thought of as parameterizing corruption, and shows the extent to which the policymaker is captive to the interest group. At one extreme, when $\lambda = 1$

[12] This could be because the ownership of H is more concentrated than the ownership of K, and thus H is the only factor that is able to solve the collective action problem associated with forming a lobby group. If all agents in the economy lobbied the policymaker, it is well known that the equilibrium policy maximizes aggregate welfare. In this model, that corresponds to always setting up perfect institutions. Notice that for this reason, some asymmetry in lobby participation is typically assumed. In our case, it is actually not important whether H or K can lobby. As will become clear below, if K were the lobby instead of H, the problem would be symmetric: K would lobby the policymaker to set up institutions such that some of H becomes relationship-specific. In this sense, the assumption in the previous section that some fraction ϕ of K's investment becomes specific to the relationship is not the primitive assumption. The primitive assumption is that H can organize into a lobby, while K cannot.

the policymaker is the benevolent social planner. At the other, when $\lambda = 0$ it cares only about its political contributions, and in effect sets the policy to serve exclusively the special interest.

The interest group influences the policymaker by making its contribution contingent on the government's choice of ϕ. In particular, the interest group confronts the government with a schedule, $\theta = \Theta(\phi)$, specifying the contribution the policymaker will receive for each level of ϕ that it might set. The objective function of the interest group is simply H's total welfare, $S_H(\phi)$, net of the contribution:

$$V(\phi, \theta) = S_H(\phi) - \theta.$$

The timing of the game can be thought of as follows: first, the interest group makes its contribution schedule known to the policymaker. Then the policymaker sets institutional quality ϕ. Given this ϕ, agents make their production and consumption decisions. This last stage is simply the equilibrium outcome of the model in the preceding section. Thus, under the assumptions put on preferences, aggregate welfare equals aggregate real income:

$$S(\phi) = r(\phi)K + [w(\phi) + \phi x r(\phi)E(\phi)]\, H.$$

$S(\phi)$ is maximized when institutions are perfect ($\phi = 0$), and decreases as institutions deteriorate ($\frac{dS}{d\phi} < 0$). This is intuitive, since imperfect institutions introduce a distortion in an otherwise frictionless setting. As discussed in the previous section, the reward to capital, $r(\phi)$, decreases unambiguously in ϕ, as does $w(\phi)$.

Imperfect institutions can arise because the agents extracting rents can lobby the policymaker. The interest group's objective function is entrepreneurs' real income net of the contribution:

$$V(\phi, \theta) = [w(\phi) + \phi x r(\phi)E(\phi)]\, H - \theta.$$

This function makes it apparent why H will lobby for positive ϕ: imperfect institutions allow H to earn rents equal to $\phi x r(\phi)E(\phi)H$. The interest group bribes the policymaker to increase ϕ above the socially optimal value of zero.[13] The contribution must be large enough to compensate the

[13]Strictly speaking, of course, only entrepreneurs in the M-sector earn rents, thus in some sense it would be more natural to take only this subset of H to be the interest group. The problem with this approach is that the fraction of entrepreneurs employed in the M-sector is itself a function of institutions in our model, so the boundaries of the interest group would change with the policy choice. To avoid this problem, we assume that the interest group represents the entire population of entrepreneurs, and choose to ignore disagreements between its different subsets. An alternative would be to assume that the interest group represents only "inside entrepreneurs" H^I, which is the part of H that is employed in the M-sector no matter what the value of ϕ. In that case, we must put a restriction ensuring that $H^I < E_{\min} H$, where $E_{\min}$ is the smallest possible equilibrium size of the M-sector. The analysis under this alternative modeling assumption is qualitatively the same as the one presented in this section. Note that the inside entrepreneurs always prefer higher ϕ than an interest group that maximizes the welfare of overall H. This is because higher ϕ unambiguously hurts the entrepreneurs in the H-sector, which the inside entrepreneurs would not care about.

government for the disutility it suffers from the resulting decrease in aggregate welfare. We now provide the basic definitions and state the main result.

Definition 2 *The policymaker's* ***best-response set*** *to a contribution function* $\Theta(\phi)$ *consists of all feasible policies* ϕ *that maximize* $G(\phi, \theta)$.

Definition 3 *A policy* ϕ_{aut} *and a contribution schedule* $\Theta(\phi)$ *constitute* ***an equilibrium*** *in the lobbying game with a single policymaker and a single interest group if i)* ϕ_{aut} *belongs to the policymaker's best-response set to* $\Theta(\phi)$*; and ii) there exists no other feasible contribution function* $\Theta'(\phi)$ *and policy* ϕ' *such that* ϕ' *is in the policymaker's best response set to* $\Theta'(\phi)$ *and* $V(\phi', \Theta'(\phi)) > V(\phi_{aut}, \Theta(\phi))$.

Proposition 2 *The autarky equilibrium institutional quality* ϕ_{aut} *is given by:*

$$\phi_{aut} = \arg \max_{\phi \in [0,1]} \left\{ \left[w(\phi) + \phi x r(\phi) E(\phi) \right] H + \lambda r(\phi) K \right\}. \tag{7}$$

There exist values of $\lambda \in [0, 1)$ *for which the autarky equilibrium institutions are imperfect:* $\phi_{aut} > 0$.

This Proposition states that the equilibrium value of institutional quality maximizes a weighted sum of all agents' welfare levels, with higher weight given to those belonging to the interest group.[14] Furthermore, for any set of parameters that characterize the production side of the model, if the power of the interest group is sufficiently high, equilibrium institutions will be imperfect. This result captures the notion that in autarky institutions are a function of the country's characteristics, and bad institutions may arise as an equilibrium outcome.

3.2 Institutions under Trade

We can now contrast these conclusions with the outcome under trade. Suppose that, just as in autarky, each country has one interest group representing H, and the policymaker's objective function is unchanged. The timing of events is similar to the autarky case. First, the countries play the contribution game simultaneously and noncooperatively. Then, production and trade take place. Under trade, the interest group in each country must take into account institutional quality of the trading partner. We now state the definitions for the trade game.

Definition 4 *Let* ϕ^{-c} *be an arbitrary institutional quality value of country c's trading partner. Then a feasible contribution schedule* $\Theta(\phi; \phi^{-c})$ *and an institutional quality* ϕ^c *are an* ***equilibrium***

[14] The equilibria described in Proposition 2 as well as in Proposition 3 below are in a strict sense not unique, because there are multiple contribution schedules $\Theta(\phi)$ that the interest group can implement in order to achieve a given outcome. However, as long as equation (7) yields a unique solution for ϕ_{aut} (even if it is not interior), the equlibrium outcome of ϕ_{aut} is unique.

response *to ϕ^{-c} if i) ϕ^c is the policymaker's best response to the contribution schedule $\Theta(\phi;\phi^{-c})$; and ii) there does not exist a feasible contribution schedule $\Theta'(\phi;\phi^{-c})$ and a level of institutions $\phi^{c\prime}$ such that a) $\phi^{c\prime}$ is in the policymaker's best response set to $\Theta'(\phi;\phi^{-c})$ and b) $V(\phi^{c\prime},\Theta'(\phi;\phi^{-c})) > V(\phi^c,\Theta'(\phi;\phi^{-c}))$.*

Definition 5 *A **noncooperative equilibrium** consists of political contribution functions $\Theta(\phi;\phi^{-c})$ for $c = A, B$ and a pair of institutional quality values ϕ^A and ϕ^B, such that $\left[\Theta(\phi;\phi^B),\phi^A\right]$ is an equilibrium response to ϕ^B and $\left[\Theta(\phi;\phi^A),\phi^B\right]$ is an equilibrium response to ϕ^A.*

The following Proposition describes the trade equilibrium.

Proposition 3 *When country factor endowments belong to FPE, the equilibrium institutions in the two countries under trade, ϕ^A and ϕ^B, solve two equations in two unknowns given by*

$$\phi^c(\phi^{-c}) = \arg\max_{\phi^c\in[0,1]} \left\{ w(\phi^c,\phi^{-c})H^c + \phi^c x r(\phi^c,\phi^{-c})E^c(\phi^c,\phi^{-c})\overline{H} + \lambda^c r(\phi^c,\phi^{-c})K^c \right\}, \qquad (8)$$

$c = A, B$.

This Proposition states that institutions under trade are obtained by simultaneously solving the equilibrium response functions of the two countries. What makes the outcomes interesting is that the incentives to change institutions under trade are determined by which country attracts the M-sector, and therefore the rents going to H in that sector. If ever institutions and technology are such that $\frac{w+(1+\phi^c)rx}{y_c} > \frac{w+(1+\phi^{-c})rx}{y_{-c}}$ and country c is at a comparative disadvantage in producing the M-good, $E^c(\phi^c,\phi^{-c}) = 0$ and the rent term $\phi^c x r(\phi^c,\phi^{-c})E^c(\phi^c,\phi^{-c})\overline{H}$ disappears. If that is the case, country c's lobby group in principle has an incentive to lobby for lowering ϕ^c. In order to build intuition for the mechanisms that can drive institutional change, the next two corollaries consider some important special cases, before discussing the kinds of outcomes that can obtain in the general case.

Corollary 1 ***["Race to the Top"]*** *When the technology for producing the M-good does not differ between countries ($y_A = y_B$) and country endowments belong to FPE, the equilibrium is characterized by perfect institutions in both countries, $\phi^A = \phi^B = 0$, and thus the world as a whole reaches the first best allocation.*

Figure 1 illustrates this special case. It gives the equilibrium best responses for the two countries as a function of the trading partner's institutions. Up to a certain level of ϕ, the best response is to set domestic ϕ at a level just below the trading partner's. This allows the country to retain the M-sector, and earn rents. Beyond a certain level of ϕ, it is no longer optimal to raise it further, and

thus as long as a country's institutions are better than the trading partner's, they do not depend on its ϕ. This diagram is reminiscent of the best response functions associated with the Bertrand duopoly model. Just as in the Bertrand duopoly, the equilibrium is to set both ϕ's to zero.

Recalling the analysis of the trade equilibrium, it is easy to see why the outcome is perfect institutional quality. The M-sector can only be located in the institutionally superior country, and only that country's institutions matter in determining the factor prices. If ever $\phi^c \geq \phi^{-c} \geq 0$ with at least one strict inequality, all parties in country c strictly prefer to improve domestic institutions to a level just below ϕ^{-c}. Not only do $w(\phi^c, \phi^{-c})$ and $r(\phi^c, \phi^{-c})$ increase as a result, but country c also captures the worldwide rents associated with locating the M-sector at home.

The mechanisms that made it possible to observe imperfect equilibrium institutions in autarky no longer work in the presence of a trade partner. Notice that the only reason H lobbies to increase ϕ above the socially optimal level of zero is because it can earn rents in the M-sector. But under trade, H will only capture those rents so long as it is the institutionally superior country. In the institutionally inferior country, H will actually have an incentive to lobby for institutional improvement, up to a point at which it has at least slightly better institutions than its trade partner. In effect, competition to capture the rent-bearing M-sector results in a "race to the top" in institutional quality between countries.

What is remarkable about this result is that under trade, the first best institutional quality outcome occurs irrespective of any country characteristics. Both countries can be entirely corrupt ($\lambda^c = 0$), so that the policymakers are completely captive to the special interest group. In autarky, these countries can have very bad institutions. Nevertheless, trade will force institutional improvement even in the most corrupt country.[15]

Corollary 2 ***[Large Technological Differences]*** *Let y_A and y_B be such that:*

$$\frac{w + (1 + \phi^A_{aut})rx}{y_A} < \frac{w + rx}{y_B}, \tag{9}$$

where ϕ^A_{aut} is country A's autarky equilibrium institutions, and let country endowments belong to FPE. Then, in the trade equilibrium $\phi^A_{trade} > \phi^A_{aut}$, ϕ^B is indeterminate, and all of world production of the M-good takes place in A.

Under condition (9), country A's technological advantage in the M-sector is strong, at least relative to the possible variation in institutions: even if B managed to improve its institutions all the way to the first-best level ($\phi^B = 0$), it would still be unable to attract the M-sector as long as country A

[15]Note that while Corollary 1 holds for all values of λ, trade leads to institutional improvement only in cases for which λ is sufficiently low that institutions are imperfect in autarky to begin with.

retained its autarky institutions. Figure 2 illustrates this outcome. Here, country B's equilibrium best response is irrelevant, while country A's equilibrium best response is defined by a value ϕ^A_{trade}. Institutions deteriorate in country A: $\phi^A_{trade} > \phi^A_{aut}$.

What is the intuition for this result? As long as country A can produce the entire integrated equilibrium world quantity of good M, it is the only country that will produce it under trade. This is because its Ricardian comparative advantage in good M is strong enough to overcome its inferior institutions. The equilibrium best responses for the two countries become:

$$\begin{aligned} \phi^A(\phi^B) &= \arg\max_{\phi^A \in [0,1]} \left\{ w(\phi^A) H^A + \phi^A x r(\phi^A) E^A(\phi^A) \overline{H} + \lambda^A r(\phi^A) K^A \right\}, \qquad (10) \\ \phi^B(\phi^A) &= \arg\max_{\phi^B \in [0,1]} \left\{ w(\phi^A) H^B + \lambda^B r(\phi^A) K^B \right\}. \end{aligned}$$

For both countries, the equilibrium best response expression no longer depends on ϕ^B, since A will produce in the rent-bearing M-sector no matter what country B does with its institutions. Therefore, the "race to the top" result disappears. Country A no longer has an incentive to improve institutions, because it will not lose the rents to country B. Furthermore, it is easy to demonstrate that institutions actually deteriorate in country A after trade opening under these circumstances. Comparing the expressions that define the autarky and trade institutions in country A, (7) and (11), we can see that the only difference between them is the rents term, which increases from $\phi^A x r(\phi^A) E^A(\phi^A) H^A$ in autarky to $\phi^A x r(\phi^A) E^A(\phi^A) \overline{H}$ under trade. Thus, the level of ϕ^A that maximizes (11) is greater under trade than in autarky.

How can we reconcile these two seemingly opposite results? The unifying mechanism driving both of them is that trade opening affects institutions through its impact on the rents in the M-sector, and consequently on H's incentives to lobby. Trade will induce a country to improve institutions if doing so allows it to retain, or bring back, the rent-bearing M-sector. In the "race to the top" example, this mechanism operates most starkly: when there are no technological differences, countries "compete" purely on ϕ in order to attract M. Corollary 2 provides an outcome at the opposite extreme: technological differences are so great that country B cannot attract the M-sector no matter how much it improves institutions. In that case, neither country B nor A have an incentive to lower ϕ. Having conveyed the basic intuition using these two examples, we now describe the equilibrium outcomes in the general case.

Corollary 3 ***[Small Technological Differences]*** *Without loss of generality, suppose that $y_A > y_B$. Equilibrium institutions are given by:*

$$\begin{aligned} \phi^A &= \min\left\{ \frac{y_A - y_B}{y_B} \frac{w + rx}{rx}, \tilde{\phi}^A \right\} \\ \phi^B &= 0, \end{aligned}$$

where $\tilde{\phi}^A$ *solves equation* (8) *for* $\phi^{-c} = 0$.

This Corollary states that when country A's technological advantage is moderate, such that country B can capture the M-sector if it improves institutions to the first-best level, trade opening leads to institutional improvement in country B. Country A sets institutions at the highest ϕ^A such that it can produce in the M-sector when institutions are perfect in B, unless the joint welfare of the policymaker and the lobby is maximized for a value of ϕ^A that is lower. Thus, Corollary 3 demonstrates that the key mechanism highlighted above carries over to the general case: countries will improve institutions when doing so allows them to attract the rent-bearing sector. This will be the case when neither of the trade partners has too strong of a technological advantage in the M-sector.[16]

3.3 Limits to Institutional Improvement

The model can be modified to capture the notion that some countries cannot improve their institutions as efficiently as others. This could be due to inherent geographical or historical differences across countries, for instance. What happens when the best attainable level of institutional quality – let us call it $\underline{\phi}^c$ – is different between countries? The logic of the model remains unchanged, and the equilibrium is still given by equations (8), with only one modification: the arg max is over a range of $\phi^c \in \left[\underline{\phi}^c, 1\right]$ for both countries $c = A, B$. The outcomes then depend on the magnitude of the difference between $\underline{\phi}^A$ and $\underline{\phi}^B$. Suppose, without loss of generality, that $\underline{\phi}^A < \underline{\phi}^B$: country A can attain better institutions than country B. For simplicity, suppose that there are no technological differences: $y_A = y_B$. For $\underline{\phi}^B$ low enough, the outcome is depicted in Figure 3. Intuitively, if one could think of the symmetric equilibrium in Corollary 1 as a Bertrand outcome, this case is something akin to limit pricing: country A will improve institutions to a level just better than $\underline{\phi}^B$. Having worse institutions than $\underline{\phi}^B$ implies that country A loses the M-sector. For low enough $\underline{\phi}^B$, having much better institutions than that does not maximize rents in A. As depicted in the Figure, trade does result in institutional improvement in country A, but to a lesser extent than in the baseline case, as A does not need to go all the way to the best attainable level of institutional quality to retain the M-sector.

It is also clear that if $\underline{\phi}^B$ is high enough, there is no institutional improvement in country A at all, in fact institutions in A may deteriorate as a result of trade opening. This is the case when $\underline{\phi}^B > \phi^A_{aut}$. Under autarky institutions in A, trade opening can never result in the loss of the M-sector, and thus there is no impetus for institutional improvement. In fact, the "limit pricing"

[16] Note that Corollary 1 can be thought of as a special case of Corollary 3 when $y_A = y_B$, while Corollary 2 is the special case such that $\phi^A = \tilde{\phi}^A$.

logic implies that institutions will actually deteriorate, as under trade country A can capture more rents, an intuition similar to that of Corollary 2.

4 Empirical Evidence

Existing empirical studies on the impact of international trade on institutions estimate the simple relationship between institutional quality and measures of overall trade openness. The main theoretical result of the paper is that opening to trade will have a tendency to improve institutions, suggesting that the overall trade openness should indeed play a positive role. However, this effect is also highly conditional on country characteristics, as we just demonstrated with several simple examples. In particular, countries that for some reason cannot capture the institutionally intensive sectors simply by improving their institutions have no incentive to do so. The empirical evidence presented in this section is based on this intuition.

Before describing the empirical strategy and results, the theoretical predictions must be modified appropriately. First, the theoretical results above are predominantly about how opening to trade changes institutions. However, as argued in the introduction, time series data on institutions are only available going back 20-25 years, while at the same time institutions have been repeatedly shown to persist over centuries. Thus, there is simply not enough time variation in available institutional quality data to demonstrate statistically that changes in trade openness lead to changes in institutions within a country over time. On the other hand, the data exhibit a great deal of cross-sectional variation in institutional quality. Thus, we develop a theoretical prediction about how institutional quality is related to institutional comparative advantage in the cross-section of trading countries, and the empirical exercise exploits the cross-sectional variation in the data. Second, the vast majority of countries are small relative to the world economy, which is also characterized by the presence of some 15 or 20 countries with both a very high institutional quality and a high productivity (i.e. the OECD) – the "global institutional and technological frontier."

With these two points in mind, the following Corollary presents the main prediction of the model in the multi-country case:

Corollary 4 ***[Multiple Small Countries]*** *Consider a set of small countries $c = 1, ..., N$, that trade with the world economy and face exogenous world prices of goods p_M^W, p_H^W, p_K^W. The countries are identical except with respect to the productivity in the M-sector, which can take two values, $y_{high} = \left(p_H^W b + p_K^W a x\right)/p_M^W$ and $y_{low} < y_{high}$. Each country sets institutions in the lobbying game between a domestic interest group and the policymaker described in Section 3. Then, institutions are perfect ($\phi = 0$) in all countries characterized by y_{high}, and countries with y_{low} are indifferent*

between any level of institutions $\phi \in [0,1]$.

This Corollary can be thought of as describing a large number of small countries, all facing the global institutional and technological frontier: the rest of the world is characterized by both high productivity in the M-sector, and good institutions. This is the meaning of the restriction on the top level of productivity in this set of countries, $y_{high} = \left(p_H^W b + p_K^W ax\right)/p_M^W$: the world can produce the M-good relatively cheaply.[17]

Corollary 4 formalizes the notion that under trade, countries with sufficient comparative advantage in the institutionally intensive good (y_{high}) will exhibit on average better institutions than countries with a comparative disadvantage in that good (y_{low}). This is the main cross-sectional prediction of the model. It ties comparative advantage to equilibrium institutions in the cross-section of countries.[18]

To test this prediction, this paper builds a measure that captures how likely the country is to export in institutionally intensive sectors, and analyzes how it affects institutions. We thus estimate the following equation in the cross-section of countries:

$$INST_c = \alpha + \beta IIX_c + \boldsymbol{\gamma}\mathbf{Z}_c + \varepsilon_c. \tag{11}$$

The left-hand side variable, $INST_c$, is a measure of a country's quality of institutions, and $\mathbf{Z}_c$ is a vector of controls. The right-hand side variable of interest, IIX_c, is a measure of *predicted institutional intensity of exports:* how easy it is for the country to export in the institutionally intensive sectors under trade. Of course, this variable is constructed without regard for the country's actual institutional quality or actual trade patterns, as explained below. The main hypothesis is that the effect of IIX_c on institutions is positive ($\beta > 0$). Thus, the empirical strategy is based on the view that today's institutions are the result of a long period of evolution and subject to

[17] Though the restriction on productivity stated in terms of the world goods prices may appear unnatural, it is a formulation that contains some important special cases, but at the same time is more general. One special case is that the global institutional and technological frontier is characterized by perfect institutions ($\phi^W = 0$), and productivity $y^W = y_{high}$. But the formulation admits other cases, such that the world with imperfect institutions but higher productivity: $\phi^W > 0$ and $y^W > y_{high}$.

[18] This Corollary helps to sidestep another feature of the two-country model, which is that the country with a very strong technological comparative advantage in the institutionally intensive sector may actually experience a deterioration of institutions as a result of trade opening. In the world comprised of more than a hundred countries, however, it is unlikely that any single country will have such a strong technological advantage in institutionally intensive sectors that it will be able to export in those sectors even if it had bad institutions. That is, in the presence of the large bloc of OECD countries with a high institutional quality and high productivity, it is unlikely that any individual country would be so productive in the institutionally intensive sectors that is would actually find it optimal to *reduce* its quality of institutions after trade opening. We confirmed this intuition by examining whether the relationship between institutional quality and comparative advantage in institutionally intensive sectors is nonmonotonic: positive at lower values of comparative advantage in institutionally intensive sectors, then turning negative for higher ones. There appears to be no evidence of such nonmonotonicity.

influence by countries' comparative advantage and trade, and exploits the variation in predicted comparative advantage as dictated by the countries' exogenous geographical characteristics.

4.1 Predicted Institutional Intensity of Exports

To carry out the analysis, the first step is to construct the predicted institutional intensity of exports, IIX_c, for each country. The strategy in this paper is based on the approach of Do and Levchenko (2007) and di Giovanni and Levchenko (2009), that expands the geography-based methodology of Frankel and Romer (1999, henceforth FR). FR construct predicted trade as a share of GDP by first estimating a gravity regression on bilateral trade volumes between countries using only exogenous geographical explanatory variables, such as bilateral distance, land areas, and populations. From the estimated gravity equation, FR predict bilateral trade between countries based solely on geographical variables. Then for each country they sum over trade partners to obtain the predicted total trade to GDP, or "natural openness."

Do and Levchenko (2007)'s goal is to build a measure of export patterns, not aggregate trade volumes, that is based on exogenous geographical variables. To do this, they extend the FR methodology to industry level. Their procedure generates predicted exports to GDP in each industry i and country c, $\widehat{X}_{ic}$. We refer the reader to Do and Levchenko (2007) and di Giovanni and Levchenko (2009) for the detailed description of implementation and justification for this approach. Armed with predicted sector-level exports, it is straightforward to construct the predicted institutional intensity of exports. This measure weights predicted exports $\widehat{X}_{ic}$ by a sector-level index of institutional intensity, and sums across sectors $i = 1, .., I$:

$$IIX_c = \sum_{i=1}^{I} \widehat{X}_{ic} * Institutional\_Intensity_i. \tag{12}$$

Institutional intensity of each sector is sourced from Nunn (2007). It is defined as the fraction of each industry's inputs not sold on organized exchanges or reference priced, and is constructed based on US Input-Output Tables. The idea behind this measure is that inputs sold in spot markets – those that can be obtained on organized exchanges, for instance – do not require contracts and thus good institutions. However, inputs that cannot be bought this way require relationship-specific investments and thus rely on good contracting institutions being in place. The higher the fraction of such inputs in an industry, the higher is its "institutional intensity."

To summarize, the measure used in the analysis, IIX_c, captures the institutional intensity of exports of each country, as predicted exclusively by its exogenous geographic characteristics. It will be high in a country whose geographical characteristics imply that it is expected to export especially in sectors that rely on institutions. By contrast, countries expected to export in industries that do

not rely on institutions will exhibit lower values of IIX. It is important to stress that IIX does not use any actual data on exports or institutional quality of countries. It is instead constructed using only the exogenous geographical features of countries and their trading partners, and the same sector-level gravity coefficients applied to all countries. The empirical analysis below demonstrates that this geographic predisposition to export in institutionally intensive sectors is strongly positively correlated with actual institutional quality.

4.2 Data Description

The dependent variable, institutional quality, is proxied by the rule of law index from the Governance Matters database of Kaufmann, Kraay and Mastruzzi (2005). The index is normalized to have a mean of zero and a standard deviation of 1. It therefore ranges from about -2.5 (worst) to 2.5 (best). Observations come at biyearly frequency, and we take the average across 1996-2000. The model in this paper is about institutions that govern economic relationships between private parties, such as enforcement of contracts. This, the rule of law subcomponent of the Governance Matters database is the most appropriate index to use.

The main right-hand side variable, IIX_c, is constructed using the estimates of predicted exports as a share of GDP for each industry i in country c, $\widehat{X}_{ic}$, sourced from Do and Levchenko (2007). The construction of $\widehat{X}_{ic}$ is carried out at the 3-digit ISIC revision 2 level for manufacturing trade, yielding 28 sectors. The estimates of $\widehat{X}_{ic}$ are then combined with data on institutional intensity from Nunn (2007) to produce our measures of IIX_c. The list of sectors along with their institutional intensity is presented in Appendix Table A1. The mean share of intermediate inputs not bought on organized exchanges is 0.487, with a standard deviation across sectors of 0.206. According to this measure, the least institutionally intensive sector is Petroleum Refineries, with only 6% of all inputs not bought on organized exchanges. The most institutionally dependent sector is Transport Equipment, with 86% of inputs that are differentiated.

The main controls in estimation include overall trade openness (imports plus exports as a share of GDP) and PPP-adjusted GDP per capita, both of which come from the Penn World Tables (Heston, Summers and Aten 2002). We also use information on countries' legal origin as defined by La Porta et al. (1998), extended to include the socialist legal system. The final sample is a cross-section of 141 countries and, unless otherwise indicated, the variables are averaged over 30 years, 1970-1999.

Appendix Table A2 presents the data on institutional quality, predicted institutional intensity of exports, and overall trade openness for the countries in the sample, along with basic summary statistics. Figure 4 plots institutional quality against the overall trade openness. There is some

positive association between institutions and overall trade openness, but it is not strong, with the simple correlation of 0.16 and the Spearman correlation of 0.18. Figure 5 plots institutions against the predicted institutional intensity of exports instead. There appears to be a closer positive relationship between these two variables, with both simple and Spearman correlation coefficients of around 0.48. We now turn to a regression analysis of the relationship between these two variables.

4.3 Results

Table 1 presents the baseline results of estimating equation (11). The first column regresses institutional quality on simple trade openness. There is a positive and significant relationship, but it is not strong, with an R^2 of 0.03. When instead in column 2 we regress institutions on IIX_c, the R^2 is 0.23, and the variable of interest is significant at the 1% level, with a t-statistic of 6.3. Column 3 includes both the trade openness and IIX. The coefficient on IIX is actually increased, while the coefficient on trade opennes is of the "wrong" sign. Columns 4 and 5 attempt to control for other determinants of institutions. We first include the legal origin dummies from La Porta et al. (1998), and then per capita income. The latter is meant to capture a country's overall level of development. While in both of these specifications the coefficient on IIX_c is somewhat smaller, it nonetheless remains significant at the 1% level. Finally, column 6 includes both the legal origin dummies and per capita income on the right-hand side. The coefficient on the variable of interest is further reduced somewhat, but preserves its significance at the 1% level. The magnitude of the effect is sizeable but not implausibly large. The most conservative coefficient estimates imply that a one standard deviation change in IIX_c is associated with a change in institutional quality equivalent to 0.19 of its standard deviation.

Examining the definition of IIX, (12), it is clear that this variable will have high values either because predicted overall trade $\widehat{X}_{ic}$ is high across all sectors – "natural openness" –, or because the country is predicted to export *relatively* more in the institutionally intensive sectors. As evident from Figure 5, a lot of the variation in IIX is in fact driven by differences in overall "natural openness." Conceptually, the main index of IIX, which combines both of these, is correct: what should matter is the combination of how strong is the disciplining effect of trade – the operall openness – and how easily the country can start exporting in the advantageous sectors if it were to improve institutions. Clearly, in the absence of the former, the latter matters little for the incentive to improve institutions. Nonetheless, we would still like to demonstrate that the results are not driven exclusively by overall openness.

We do this in several ways. As a preliminary point, note that the overall openness is already

controlled for in all specifications.[19] Thus, any effect of IIX is already obtained while netting out the impact of aggregate openness. Following Frankel and Romer (1999), we control for land area and population, since those authors find that natural openness is highly correlated with country size. The results are reported in Column 7 of Table 1. Clearly, including area and population does not affect the coefficient of interest, in fact neither of these two variables is significant. As a second exercise, we construct an alternative index of IIX that is purged of the influence of overall predicted openness:

$$IIX\_SHARES_c = \sum_{i=1}^{I} \widehat{\omega}_{ic}^{X} * Institutional\_Intensity_i.$$

Here, $\widehat{\omega}_{ic}^{X}$ is the predicted share of total exports in industry i in country c, constructed from the predicted exports to GDP ratios $\widehat{X}_{ic}$ in a straightforward manner: $\widehat{\omega}_{ic}^{X} = \frac{\widehat{X}_{ic}}{\sum_{i=1}^{I} \widehat{X}_{ic}}$. This index is driven solely by the predicted differences in sectoral export *shares* across countries. Column 8 of Table 1 uses it instead of the baseline measure. The results are robust to purging the effects of "natural openness:" the coefficient is significant with a p-value of 5.3%, even with income, trade openness, and legal origins as controls.

To further establish that natural openness is not the predominant driving force behind our results, Table 2 determines whether they are driven by outliers and entrepot countries. Column 1 removes the outliers, defined as countries in the top 5 and bottom 5 percent of the IIX distribution, and shows that the results are robust. Some of the countries with the highest values of IIX are also entrepot countries, for which the values of trade openness are high, but much of it is due to re-exports.[20] Column 2 of Table 2 drops these countries, and shows that the coefficient estimates are actually larger and more significant than in the full sample. To summarize, the variety of exercises we perform all support the conclusion that the variation in IIX, and therefore our results, are not driven exclusively by natural openness.

We also check the robustness of the results in several other ways. Table 2 further establishes that the results are not driven by particular subsamples. Column 3 drops the OECD countries.[21] The next column drops the sub-Saharan African countries. The results are not sensitive to the exclusion of this region. The economies sometimes called "Asian tigers" experienced some of the fastest growth of trade and institutional improvement over the postwar period. Column 5 excludes the

[19] The results are robust to controlling for natural openness instead of actual openness.

[20] These economies are Bahrain, China-Hong Kong, Guyana, Malta, and Singapore. The 1970-99 average trade as a share of GDP in these countries ranges from 156 to 340 percent.

[21] OECD countries in the sample are: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, the United Kingdom, and the United States. We thus exclude the newer members of the OECD, such as Korea and Mexico.

Asian tigers, to check that the results are not driven by these particular countries.[22] Column 6 drops Latin America and the Caribbean, showing that the results are robust. Column 7 drops countries that have more than 60% of their exports in Mining and Quarrying, a sector that includes crude petroleum.[23] The results are robust to the exclusion of these countries. Finally, the East European countries of the former Communist bloc, as well as China, have experienced rapid increases in trade openness over this period. To make sure the results are not driven by those countries, column 8 drops former Communist Eastern and Central European countries, countries that belonged to the former Soviet Union, and China. The results are robust to dropping these countries.[24]

Table 3 determines whether the results are sensitive to the inclusion of additional explanatory variables. All of the columns include the most stringent set of controls – trade openness, per capita income, and legal origin dummies – but do not report their coefficients to conserve space. The first column controls for the level of human capital by including the average years of secondary schooling in the population from the Barro and Lee (2000) database. The second column includes distance to the equator.[25] Next, we control for the fraction of the population speaking English as the first language, sourced from Hall and Jones (1999).[26] The fourth column adds the Polity2 index, which is meant to capture the strength of democratic institutions within a country. This index is sourced from the Polity IV database.[27] Column 5 includes an indicator of ethnic fractionalization, based on Easterly and Levine (1997).[28] Column 6 controls for inequality, by including the Gini coefficient of the income distribution sourced from the World Bank's World Development Indicators. Finally, the last column controls for the proportions of the population that is Catholic, Muslim, and Protestant, obtained from La Porta, Lopez-de-Silanes, Shleifer and Vishny (1999). It is clear that the results are robust to the inclusion of all of these additional controls.

[22] In our sample, we consider Asian tigers to be: Indonesia, Korea, Malaysia, Philippines, and Thailand.

[23] These countries are Algeria, Angola, Republic of Congo, Gabon, Islamic Republic of Iran, Kuwait, Nigeria, Oman, Qatar, Saudi Arabia, and Syrian Arab Republic.

[24] The results are equally robust to dropping only China, and dropping only Eastern Europe/former USSR. The dummy for Socialist legal origin has a coefficient in column 8 because Cambodia, Laos, and Vietnam are classified as having a Socialist legal origin. Dropping those countries in addition to China and Eastern Europe/USSR leaves the results virtually unchanged.

[25] Alternatively, we included a tropics indicator, the average number of days with frost, and the mean temperature. The results were robust.

[26] Alternatively, we also controlled for the share of the population speaking a European language, and the indicator for "neo-Europe." The results were robust.

[27] We also used Polity IV's constraint on the executive variable, which is meant to capture the checks placed on the power of the executive branch of government. The results were unchanged.

[28] We also controlled for the ethnic, religious, and linguistic fractionalization using the variables developed by Alesina, Devleeschauwer, Easterly, Kurlat and Wacziarg (2003). The results were unchanged.

5 Conclusion

Recent literature has highlighted the role of the quality of institutions in various aspects of countries' economic performance, including international trade. Given the emerging consensus regarding their primary importance, the crucial question is what are the forces that could drive institutional change. The main goal of this paper is to provide a simple framework for modeling the effect of trade on the political economy of institutions. The building blocks of the analysis are the model of institutional comparative advantage of Levchenko (2007), and the lobbying framework of Grossman and Helpman (1994, 1995).

What are the main conclusions from this exercise? The key consequence of bad institutions is the presence of rents that are captured by some parties inside the country. Lobbying can give rise to imperfect institutions because the agents capturing those rents have an incentive to lobby in order to retain them. Under trade, however, those very rents disappear in the institutionally inferior country. In order to regain those rents, the country must improve its institutions vis-à-vis its trading partner. In equilibrium, there is a "race to the top:" both countries adopt the best attainable level of institutional quality. This simple framework captures the key idea that bad institutions are more costly in an open world. However, it is also flexible enough to investigate cases in which institutional improvement does not occur. In particular, if one of the trading partners has a sufficiently strong technological comparative advantage in the institutionally intensive good, institutions will not improve in either country. This is telling about the kinds of circumstances under which trade brings institutional deterioration – namely, when trade increases, rather than decreases rents.

Is it the case empirically that trade improves institutions? Currently we do not have enough time series variation in institutional quality data to examine how changes in trade openness relate to changes in institutions over time. However, we found strong evidence for a related cross-sectional prediction of the model: countries that can expect to capture the institutionally intensive sectors after trade opening tend to exhibit better institutions. While the cross-sectional results are only suggestive of the mechanisms proposed by theory, they nonetheless point to an important connection between international trade and institutional quality.

Appendix A Proofs of Propositions

Proof of Proposition 1: The proof follows the standard treatment, see, among others, Helpman and Krugman (1985, pp. 13-14), Davis (1995), or Levchenko (2007).■

Proof of Proposition 2: Grossman and Helpman (2001, ch. 7) show that the equilibrium policy is jointly efficient, that is, it maximizes the joint welfare of the policymaker and the interest group. The policymaker's outside option is not to deal with the interest group at all. Thus, the interest group must provide the policymaker with a utility level at least as great as what it would achieve without dealing with the interest group, $\overline{G}$, obtained by:

$$\overline{G} = \max_{\phi \in [0,1]} \{\lambda S(\phi)\}$$

Thus, the interest group solves

$$\max_{\phi \in [0,1]} \{[w(\phi) + \phi x r(\phi) E(\phi)] H - \theta\} \tag{A.1}$$

subject to

$$\lambda S(\phi) + (1-\lambda)\theta \geq \overline{G}.$$

Because the interest group has no reason to give the policymaker a utility level higher than $\overline{G}$, the constraint will bind with equality and the political contribution can be backed out:

$$\theta = \frac{1}{1-\lambda}\left[\overline{G} - \lambda S(\phi)\right] \tag{A.2}$$

Plugging the constraint (A.2) back into the optimization problem (A.1) yields the result that the interest group in effect chooses ϕ to maximize a weighted sum of the its own welfare gross of the contribution and the aggregate welfare:

$$\max_{\phi \in [0,1]} \{[w(\phi) + \phi x r(\phi) E(\phi)] H + \lambda S(\phi)\},$$

which is the same as equation (7). Note that in general, there are many possible contribution schedules $\Theta(\phi)$ that can be designed to achieve this outcome.

It remains to show that for low enough values of λ, institutions are imperfect in the autarky equilibrium. We can use the autarky equilibrium conditions (1) through (4) to establish the following result (see also Levchenko 2007):

$$\frac{d}{d\phi}\left[w(\phi) + \phi x r(\phi) E(\phi)\right]\Big|_{\phi=0} > 0.$$

That is, H's welfare is strictly increasing in ϕ when institutions are perfect ($\phi = 0$). This is because while $w(\phi)$ does decrease in ϕ, raising ϕ allows H to earn rents in equilibrium, and for low enough

ϕ the second effect dominates. Thus, the derivative of the first term of the maximand in the expression defining ϕ_{aut}, (7), is positive at $\phi = 0$. The derivative of the second term is negative, but can be made arbitrarily small as $\lambda \to 0$. Thus, there is a value of $\lambda \in [0, 1)$, such that the derivative of the maximand is positive in ϕ at $\phi = 0$. This immediately leads to the conclusion that for those parameter values, $\phi_{aut} > 0$.■

Proof of Proposition 3: The equilibrium responses $[\Theta(\phi^c; \phi^{-c}), \phi^c]$ at each possible value of ϕ^{-c} are constructed in a manner similar to the proof of Proposition 2. In particular, Grossman and Helpman (1995) show that the equilibrium response policy vector in this game must maximize the joint welfare of the lobby group and the policy maker. The equilibrium response value of ϕ^c at each level of ϕ^{-c} is then given by:

$$\phi^c(\phi^{-c}) = \arg \max_{\phi^c \in [0,1]} \left\{ w(\phi^c, \phi^{-c}) H^c + \phi^c x r(\phi^c, \phi^{-c}) E^c(\phi^c, \phi^{-c}) \overline{H} + \lambda^c r(\phi^c, \phi^{-c}) K^c \right\}, \qquad \text{(A.3)}$$

for $c = A, B$. Once again, there are many contribution schedules $\Theta(\phi; \phi^{-c})$ that generate this outcome.■

Proof of Corollary 1: We must show that the equilibrium is characterized by $\phi^c = 0$ for $c = A, B$. From the expression for the equilibrium response institutions, it is clear that $\phi^c(\phi^{-c}) < \phi^{-c}$ for all $\phi^{-c} > 0$. This is because when a country's institutions are inferior to its trading partner's, every term in equation (A.3) will increase as a result of moving ϕ^c below ϕ^{-c}. Thus, it must necessarily be the case that the equilibrium response to any level of the trade partner's institutions is to set better institutions than the trade partner. This implies that there is no equilibrium for which either ϕ^A or ϕ^B is strictly positive.■

Proof of Corollary 2: Follows directly from Proposition 3 and the discussion in the text.

Proof of Corollary 3: As long as $\frac{w+(1+\phi^A)rx}{y_A} > \frac{w+(1+\phi^B)rx}{y_B}$, all parties in country A favor improving institutions – lowering ϕ^A. Thus, the equilibrium best response is given by

$$\phi^A(\phi^B) = \min \left\{ \phi^B \frac{y_A}{y_B} + \frac{y_A - y_B}{y_B} \frac{w + rx}{rx} - \epsilon_A, \tilde{\tilde{\phi}}^A(\phi^B) \right\},$$

where ϵ_A is an infinitesimally small positive number, and $\tilde{\tilde{\phi}}^A(\phi^B)$ is the value of ϕ^A that solves equation (8) given ϕ^B. That is, the equilibrium best response is either the highest value of ϕ^A such that $\frac{w+(1+\phi^A)rx}{y_A} < \frac{w+(1+\phi^B)rx}{y_B}$, or some lower value of ϕ^A that maximizes (8) given a particular ϕ^B, when it is strictly smaller than $\phi^B \frac{y_A}{y_B} + \frac{y_A - y_B}{y_B} \frac{w+rx}{rx}$. The same applies to the equilibrium best response of country B:

$$\phi^B(\phi^A) = \min \left\{ \phi^A \frac{y_B}{y_A} + \frac{y_B - y_A}{y_A} \frac{w + rx}{rx} - \epsilon_B, \tilde{\tilde{\phi}}^B(\phi^A) \right\},$$

where ϵ_B and $\tilde{\tilde{\phi}}^B(\phi^A)$ are defined similarly. Because by construction $\tilde{\tilde{\phi}}^A(\phi^B) < \phi^B \frac{y_A}{y_B} + \frac{y_A - y_B}{y_B} \frac{w+rx}{rx}$, the equilibrium must satisfy the following two inequalities:

$$\begin{aligned} \phi^A(\phi^B) &\leq \phi^B \frac{y_A}{y_B} + \frac{y_A - y_B}{y_B} \frac{w + rx}{rx} \\ \phi^B(\phi^A) &\leq \phi^A \frac{y_B}{y_A} + \frac{y_B - y_A}{y_A} \frac{w + rx}{rx} \end{aligned}$$

It is immediate that these two inequalities do not have an interior solution in ϕ^B, and thus in equilibrium $\phi^B = 0$. The value of ϕ^A could then be either $\frac{y_A - y_B}{y_B} \frac{w+rx}{rx}$, or some smaller $\tilde{\phi}^A$. ■

Proof of Corollary 4: From equations (1) and (2) and the specified value of y_{high}, it is clear that countries characterized by y_{high} will be able to produce the M-good if they improve institutions to the best attainable level ($\phi = 0$). Therefore, both the lobby group and the policymaker in that country will favor setting $\phi = 0$, and that will be the equilibrium level of institutions in the country with y_{high}. Since $y_{low} < y_{high}$, the country with y_{low} will not be able to produce in the M-sector no matter what its institutions are. Thus, both the policymaker and the lobby group are indifferent between any level of institutional quality. ■

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Figure 1. Equilibrium Best Responses and Equilibrium Institutions, Symmetric Case

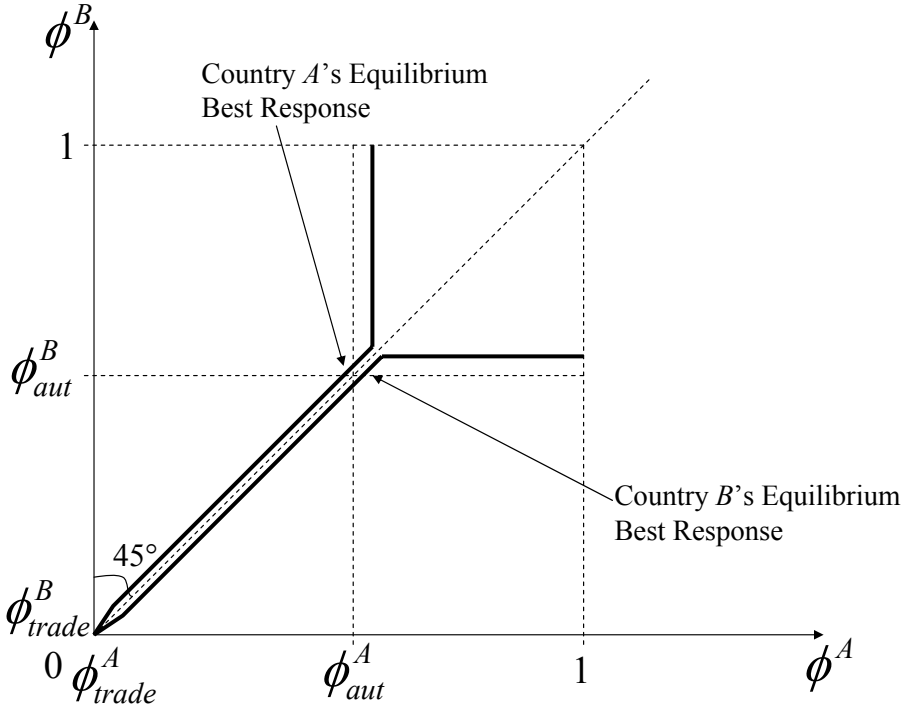


Figure 2. Equilibrium Best Responses and Equilibrium Institutions, Country A has a Strong Technological Advantage in the M-good

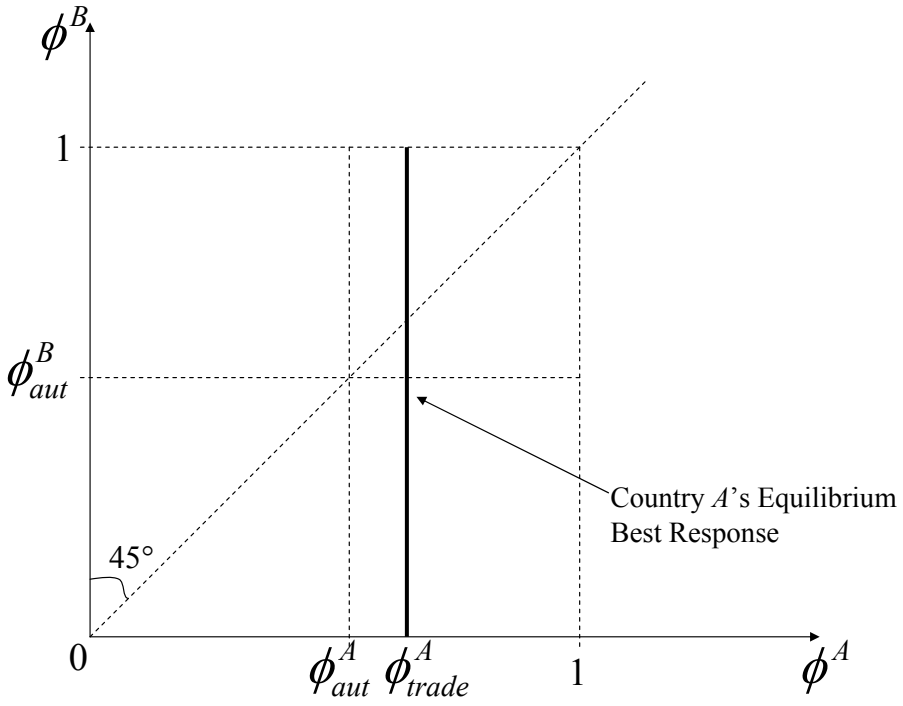


Figure 3. Limits to Institutional Improvement in Country B

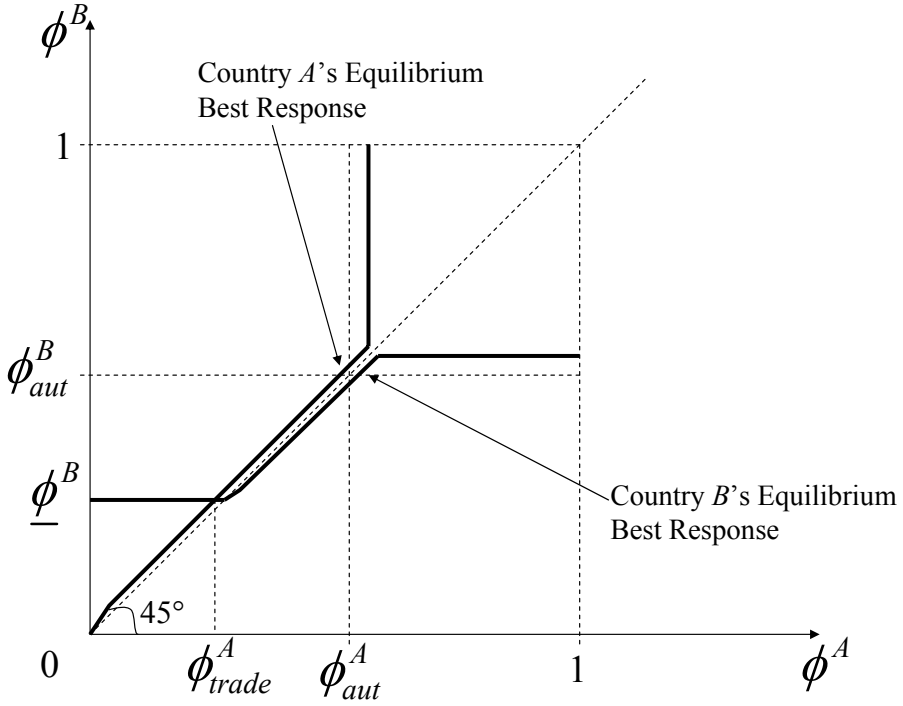
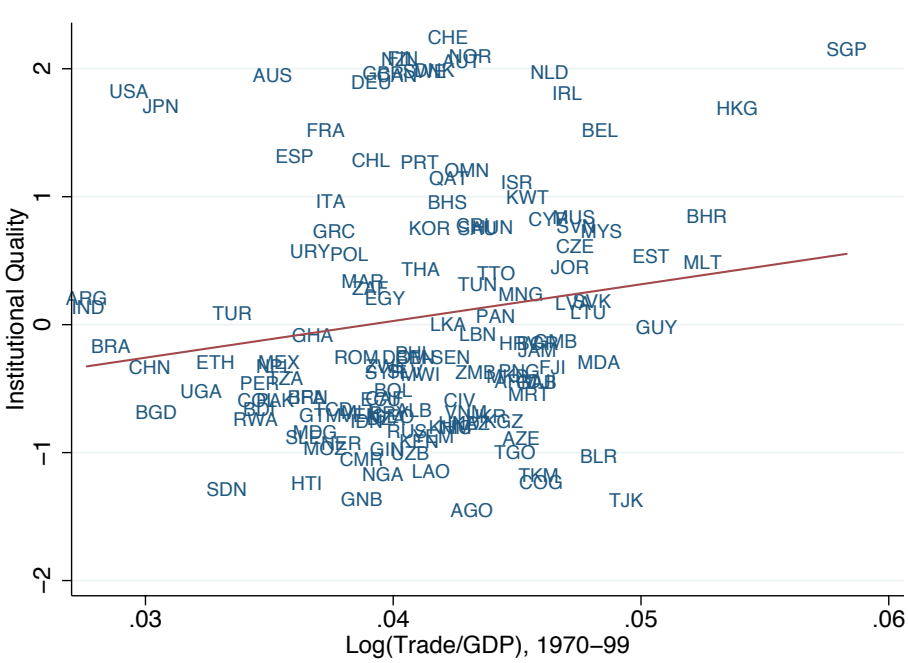
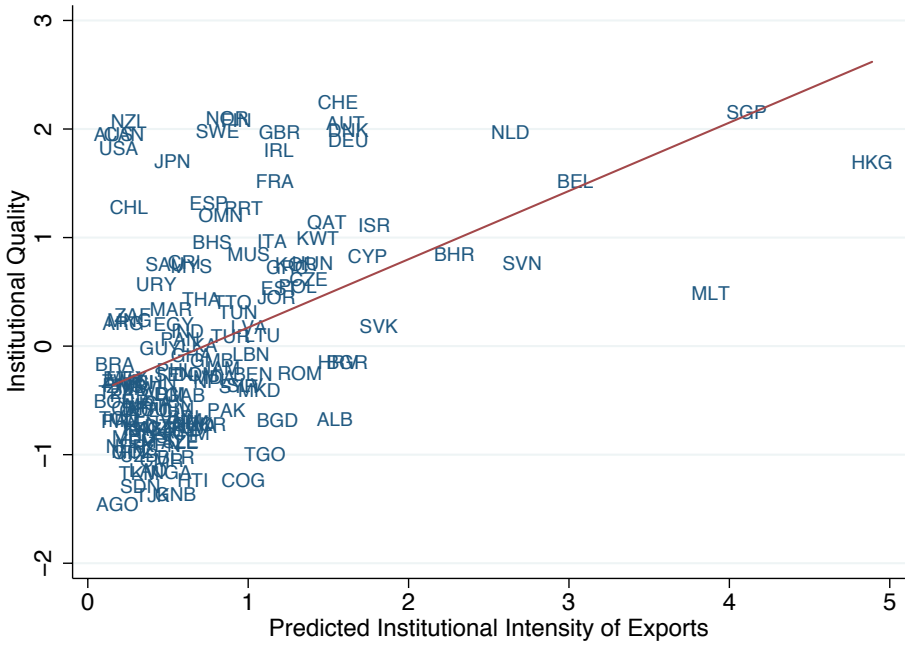


Figure 4. Institutional Quality and Trade Openness



Notes: This figure presents the scatter plot of the quality of institutions, proxied by the Rule of Law index from the Governance Matters database of Kaufmann et al. (2005), against the log of exports plus imports as a share of GDP from the Penn World Tables.

Figure 5. Institutional Quality and Predicted Institutional Intensity of Exports



Notes: This figure presents the scatter plot of the quality of institutions, proxied by the Rule of Law index from the Governance Matters database of Kaufmann et al. (2005), against the predicted institutional intensity of exports, IIX, constructed as described in the main text.

Table 1. Main Estimation Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Dep. Var.: Institutional Quality								
Predicted IIX		0.629***	0.727***	0.599***	0.281***	0.256***	0.275**	
		(0.101)	(0.120)	(0.107)	(0.091)	(0.081)	(0.116)	
Predicted IIX: Shares Based								2.061*
								(1.056)
Log(Trade/GDP)	0.297*		-0.255*	-0.088	-0.268***	-0.142	-0.136	0.065
	(0.154)		(0.151)	(0.153)	(0.102)	(0.096)	(0.123)	(0.089)
French Legal Origin				-0.389**		-0.373***	-0.375***	-0.352***
				(0.194)		(0.106)	(0.112)	(0.106)
German Legal Origin				1.114***		0.409**	0.416**	0.381**
				(0.298)		(0.178)	(0.183)	(0.191)
Scandinavian Legal Origin				1.601***		0.720***	0.716***	0.747***
				(0.198)		(0.144)	(0.148)	(0.143)
Socialist Legal Origin				-0.656***		-0.664***	-0.668***	-0.716***
				(0.167)		(0.122)	(0.123)	(0.130)
Log(Income)					0.693***	0.608***	0.604***	0.659***
					(0.059)	(0.054)	(0.057)	(0.048)
Log(Area)							0.013	
							(0.056)	
Log(Population)							-0.006	
							(0.062)	
Constant	-1.159*	-0.458***	0.513	0.17	-4.827***	-4.335***	-4.407***	-6.233***
	(0.641)	(0.110)	(0.600)	(0.679)	(0.584)	(0.566)	(1.119)	(0.666)
Observations	143	141	141	139	141	139	139	139
R-squared	0.03	0.23	0.24	0.48	0.67	0.76	0.77	0.75

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable, *Institutional Quality* is the index of Rule of Law sourced from Kaufmann et al. (2005); *Predicted IIX* is the predicted instititional intensity of exports; *Log(Trade/GDP)* is log of exports and imports as a share of GDP; *Log(Income)* is log of PPP-adjusted real per capita income from Penn World Tables; these two variables are average values over 1970-99. *French, German, Scandinavian*, and *Socialist Legal Origin* dummies are as defined originally by La Porta et al. (1998); *Log(Area)* is log of the land area of the country; *Log(Population)* is the log of average population over the 1970-99 period. Variable definitions and sources are described in detail in the text.

Table 2. Robustness, Outliers and Subsamples

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Sample	No outliers	No Entrepot Countries	No OECD	No Sub-Saharan Africa	No Asian Tigers	No Latin America /Caribbean	No Mining Exporters	No Fmr. Comm. /China
Dep. Var.: Institutional Quality								
Predicted IIX	0.315**	0.360***	0.314***	0.202**	0.258***	0.235***	0.227***	0.224**
	(0.131)	(0.101)	(0.082)	(0.084)	(0.082)	(0.084)	(0.082)	(0.086)
Log(Trade/GDP)	-0.093	-0.144	-0.031	-0.097	-0.148	-0.217**	-0.091	-0.136
	(0.101)	(0.102)	(0.097)	(0.108)	(0.098)	(0.107)	(0.096)	(0.106)
Log(Income)	0.574***	0.598***	0.428***	0.689***	0.601***	0.643***	0.606***	0.651***
	(0.063)	(0.057)	(0.055)	(0.069)	(0.054)	(0.054)	(0.058)	(0.055)
French Legal Origin	-0.282**	-0.370***	-0.233**	-0.407***	-0.381***	-0.306***	-0.327***	-0.371***
	(0.112)	(0.109)	(0.097)	(0.126)	(0.110)	(0.112)	(0.110)	(0.105)
German Legal Origin	0.494**	0.347*	0.210***	0.336*	0.538***	0.326*	0.416**	0.367**
	(0.193)	(0.180)	(0.079)	(0.175)	(0.147)	(0.180)	(0.183)	(0.173)
Scandinavian Legal Origin	0.815***	0.687***		0.609***	0.725***	0.644***	0.707***	0.661***
	(0.162)	(0.157)		(0.149)	(0.149)	(0.147)	(0.150)	(0.140)
Socialist Legal Origin	-0.621***	-0.695***	-0.480***	-0.676***	-0.669***	-0.673***	-0.699***	-0.411***
	(0.129)	(0.131)	(0.106)	(0.131)	(0.125)	(0.129)	(0.124)	(0.146)
Constant	-4.356***	-4.305***	-3.559***	-5.145***	-4.249***	-4.264***	-4.482***	-4.482***
	(0.580)	(0.590)	(0.542)	(0.730)	(0.573)	(0.579)	(0.599)	(0.599)
Observations	127	134	118	105	134	116	128	113
R-squared	0.75	0.76	0.62	0.77	0.77	0.8	0.77	0.80

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable, *Institutional Quality* is the index of Rule of Law sourced from Kaufmann et al. (2005); *Predicted IIX* is the predicted instititional intensity of exports; *Log(Trade/GDP)* is log of exports and imports as a share of GDP; *Log(Income)* is log of PPP-adjusted real per capita income from Penn World Tables; these two variables are average values over 1970-99. *French, German, Scandinavian*, and *Socialist Legal Origin* dummies are as defined originally by La Porta et al. (1998). Variable definitions and sources are described in detail in the text.

Table 3. Robustness, Additional Controls

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Dep. Var.: Institutional Quality							
Predicted IIX	0.197**	0.221**	0.319***	0.341***	0.215*	0.275***	0.295***
	(0.091)	(0.086)	(0.082)	(0.086)	(0.115)	(0.095)	(0.095)
Secondary Schooling	0.221***						
	(0.082)						
Distance to Equator		0.016***					
		(0.005)					
Fraction English-Speaking			0.664**				
			(0.265)				
Polity2 Index				0.019**			
				(0.007)			
Ethnic Fractionalization					-0.249		
					(0.193)		
Gini Coefficient						-1.511**	
						(0.602)	
Proportion Catholic							-0.354**
							(0.177)
Proportion Muslim							-0.283*
							(0.155)
Proportion Protestant							0.082
							(0.320)
Constant	-4.377***	-3.887***	-3.921***	-4.011***	-4.475***	-4.052***	-4.312***
	(0.696)	(0.593)	(0.542)	(0.577)	(0.696)	(0.695)	(0.541)
Other Controls	Log(Trade/GDP), Log(Income), Legal Origin Dummies						
Observations	96	139	138	136	110	105	136
R-squared	0.82	0.79	0.78	0.78	0.78	0.77	0.77

Notes: Robust standard errors in parentheses; * significant at 10%; ** significant at 5%; *** significant at 1%. Dependent variable, *Institutional Quality* is the index of Rule of Law sourced from Kaufmann et al. (2005); *Predicted IIX* is the predicted instititional intensity of exports; *Log(Trade/GDP)* is log of exports and imports as a share of GDP; *Log(Income)* is log of PPP-adjusted real per capita income from Penn World Tables; these two variables are average values over 1970-99. *French, German, Scandinavian*, and *Socialist Legal Origin* dummies are as defined originally by La Porta et al. (1998). *Secondary Schooling* is the average years of secondary schooling in the total population from Barro and Lee (2000); *Polity2 Index* is an indicator of strength of democratic institutions from the PolityIV database; *Ethnic Fractionalization* is sourced from Easterly and Levine (1997); the *Gini coefficient* of the income distribution is a measure of income inequality, and is sourced from the World Bank's World Development Indicators. Variable definitions and sources are described in detail in the text.

Table A1. The Institutional Intensity Measure

ISIC	Industry Name	Institutional Intensity
311	Food products	0.331
313	Beverages	0.713
314	Tobacco	0.317
321	Textiles	0.376
322	Wearing apparel, except footwear	0.745
323	Leather products	0.571
324	Footwear, except rubber or plastic	0.650
331	Wood products, except furniture	0.516
332	Furniture, except metal	0.568
341	Paper and products	0.348
342	Printing and publishing	0.713
351	Industrial chemicals	0.240
352	Other chemicals	0.490
353	Petroleum refineries	0.058
354	Misc. petroleum and coal products	0.395
355	Rubber products	0.407
356	Plastic products	0.408
361	Pottery, china, earthenware	0.329
362	Glass and products	0.557
369	Other non-metallic mineral products	0.377
371	Iron and steel	0.242
372	Non-ferrous metals	0.160
381	Fabricated metal products	0.435
382	Machinery, except electrical	0.764
383	Machinery, electric	0.740
384	Transport equipment	0.859
385	Professional & scientific equipment	0.785
390	Other manufactured products	0.547
	Mean	0.487
	Standard Deviation	0.206

Notes: Institutional Intensity is the share of intermediate inputs that cannot be bought on organized exchanges and is not reference-priced. Source: Nunn (2007).

Table A2. Countries and Main Variables

Country	IIX	Trade/GDP	Rule of Law	Country	IIX	Trade/GDP	Rule of Law
Algeria	0.474	0.531	-0.735	Ecuador	0.376	0.519	-0.579
Angola	0.185	0.750	-1.453	Egypt	0.535	0.528	0.206
Argentina	0.221	0.159	0.206	El Salvador	0.981	0.573	-0.363
Armenia	0.474	0.896	-0.443	Estonia	1.196	1.546	0.534
Australia	0.160	0.336	1.953	Ethiopia	0.216	0.266	-0.297
Austria	1.606	0.719	2.056	Fiji	0.329	1.038	-0.332
Azerbaijan	0.574	0.915	-0.886	Finland	0.926	0.568	2.083
Bahamas, The	0.776	0.680	0.958	France	1.167	0.416	1.521
Bahrain, Kingdom of	2.285	1.936	0.847	Gabon	0.606	0.973	-0.453
Bangladesh	1.183	0.210	-0.686	Gambia, The	0.774	1.051	-0.126
Belarus	0.550	1.251	-1.028	Georgia	0.657	0.545	-0.716
Belgium	3.040	1.258	1.520	Germany	1.624	0.500	1.897
Benin	1.029	0.597	-0.257	Ghana	0.647	0.394	-0.085
Bolivia	0.157	0.546	-0.511	Greece	1.245	0.430	0.726
Brazil	0.170	0.175	-0.166	Guatemala	0.623	0.407	-0.706
Bulgaria	1.617	0.978	-0.147	Guinea	0.256	0.532	-0.975
Burkina Faso	0.331	0.385	-0.570	Guinea-Bissau	0.548	0.481	-1.368
Burundi	0.597	0.318	-0.659	Guyana	0.452	1.580	-0.020
Cambodia	0.628	0.687	-0.802	Haiti	0.655	0.385	-1.240
Cameroon	0.461	0.480	-1.052	Honduras	0.598	0.713	-0.768
Canada	0.227	0.555	1.948	Hungary	1.401	0.815	0.759
Central African Rep.	0.268	0.527	-0.573	India	0.622	0.159	0.139
Chad	0.193	0.428	-0.660	Indonesia	0.320	0.490	-0.753
Chile	0.257	0.499	1.281	Iran, I.R. of	0.562	0.393	-0.567
China,P.R.: Mainland	0.425	0.204	-0.335	Ireland	1.192	1.102	1.806
China,P.R.:Hong Kong	4.890	2.189	1.692	Israel	1.786	0.899	1.110
Colombia	0.321	0.315	-0.592	Italy	1.149	0.424	0.961
Congo, Republic of	0.970	0.992	-1.232	Jamaica	0.830	0.977	-0.200
Costa Rica	0.603	0.752	0.773	Japan	0.528	0.214	1.706
Croatia	1.560	0.908	-0.145	Jordan	1.177	1.115	0.450
Cyprus	1.744	1.021	0.827	Kazakhstan	0.343	0.748	-0.767
Czech Republic	1.378	1.138	0.615	Kenya	0.458	0.606	-0.911
Cte d'Ivoire	0.546	0.714	-0.590	Korea	1.299	0.632	0.756
Denmark	1.624	0.645	1.991	Kuwait	1.433	0.939	0.993
Djibouti	0.504	0.994	-0.440	Kyrgyz Republic	0.413	0.852	-0.756
Dominican Republic	0.674	0.572	-0.257	Lao People's Dem.Rep	0.378	0.636	-1.145

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Country	IIX	Trade/GDP	Rule of Law	Country	IIX	Trade/GDP	Rule of Law
Latvia	1.004	1.129	0.169	Senegal	0.537	0.689	-0.258
Lithuania	1.088	1.199	0.098	Sierra Leone	0.579	0.380	-0.881
Macedonia, FYR	1.071	0.867	-0.405	Singapore	4.108	3.404	2.154
Madagascar	0.291	0.398	-0.843	Slovak Republic	1.814	1.218	0.185
Malawi	0.339	0.610	-0.391	Slovenia	2.709	1.143	0.767
Malaysia	0.647	1.265	0.732	South Africa	0.280	0.498	0.282
Mali	0.228	0.472	-0.684	Spain	0.755	0.367	1.312
Malta	3.884	1.905	0.490	Sri Lanka	0.696	0.682	0.004
Mauritania	0.359	0.945	-0.541	Sudan	0.327	0.279	-1.290
Mauritius	1.004	1.132	0.843	Sweden	0.810	0.620	1.979
Mexico	0.245	0.344	-0.295	Switzerland	1.560	0.681	2.242
Moldova	0.789	1.252	-0.291	Syrian Arab Republic	0.939	0.527	-0.370
Mongolia	0.261	0.915	0.238	Tajikistan	0.405	1.398	-1.371
Morocco	0.520	0.483	0.342	Tanzania	0.180	0.353	-0.422
Mozambique	0.281	0.414	-0.967	Thailand	0.708	0.610	0.434
Nepal	0.775	0.338	-0.323	Togo	1.104	0.892	-0.997
Netherlands	2.635	1.026	1.973	Trinidad and Tobago	0.903	0.828	0.402
New Zealand	0.256	0.560	2.075	Tunisia	0.936	0.768	0.315
Nicaragua	0.514	0.702	-0.804	Turkey	0.891	0.285	0.090
Niger	0.240	0.443	-0.926	Turkmenistan	0.321	0.982	-1.173
Nigeria	0.520	0.524	-1.166	Uganda	0.392	0.251	-0.523
Norway	0.870	0.745	2.100	Ukraine	0.738	0.794	-0.719
Oman	0.831	0.735	1.210	United Kingdom	1.195	0.525	1.967
Pakistan	0.865	0.339	-0.590	United States	0.192	0.188	1.821
Panama	0.576	0.826	0.063	Uruguay	0.427	0.390	0.574
Papua New Guinea	0.222	0.908	-0.361	Uzbekistan	0.320	0.584	-1.002
Paraguay	0.207	0.537	-0.693	Venezuela, Rep. Bol.	0.323	0.478	-0.707
Peru	0.261	0.318	-0.456	Vietnam	0.583	0.732	-0.682
Philippines	0.544	0.593	-0.222	Yemen, Republic of	0.301	0.642	-0.873
Poland	1.308	0.457	0.553	Zambia	0.243	0.762	-0.374
Portugal	0.972	0.608	1.267	Zimbabwe	0.218	0.532	-0.323
Qatar	1.490	0.683	1.145				
Romania	1.321	0.471	-0.252	Mean	0.823	0.712	0.071
Russia	0.378	0.577	-0.830	Standard Deviation	0.746	0.426	0.979
Rwanda	0.666	0.313	-0.740				
Saudi Arabia	0.482	0.767	0.754				

Notes: *IIX* is the predicted institutional intensity of exports, constructed as described in the text. *Trade/GDP* is exports plus imports as a share of GDP from the Penn World Tables, averaged over 1970-99. *Rule of Law* index is from the Governance Matters database of Kaufmann et al. (2005).