Institutional Specialization*

Bernardo Guimaraes†
Sao Paulo School of Economics – FGV

Kevin D. Sheedy‡
London School of Economics

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Abstract

This paper presents a theory of institutional specialization in which some countries uphold the rule of law while others choose extractive institutions, even when countries are ex-ante identical. The driving force of specialization is that for incumbents in each country, the first steps to the rule of law have the greatest cost. Good institutions require sharing power and rents, but in places where power is already shared broadly, each power base or branch of government underpinning institutions is individually less important and thus receives lower rents. Countries with diametrically opposed institutions have a symbiotic relationship in the world equilibrium. The transition from sail to steam-powered vessels in 19th-century trade provides suggestive evidence supporting the theory.

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†Sao Paulo School of Economics – FGV. Corresponding author. Email: bernardo.guimaraes@fgv.br

‡LSE and CfM. Email: k.d.sheedy@lse.ac.uk

1 Introduction

In spite of its well-known economic gains, international trade has its critics. Much of the opposition to free trade comes from a sense that some economies end up specializing in the wrong kinds of goods — primary goods — which is detrimental to development. In a famous example, Williamson (2011) shows economic divergence followed the first wave of globalization in the early 19th century when the third world 'fell behind'. But how can opportunities to trade be welfare decreasing?

This paper proposes and investigates an explanation: trade openness leads to specialization in political institutions. The possibility of trade induces rulers in some countries to share power and build institutions with the rule of law allowing for production of institutionally-intensive goods, but incentivizes others to choose extractive institutions with a narrow power base and an economy based on primary goods. This specialization in political institutions results in economic divergence.

Institutional specialization arises in a global model of endogenous institutions and self-interested rulers with one key feature: as the group in power in a country becomes larger, the marginal importance of each group member in buttressing the country's institutions declines. This yields a negative relationship between the number of people in power and the rents each receives. For incumbents, the marginal cost of strengthening property rights is the additional rents paid to those with whom they must share power. Hence, rulers face a decreasing marginal cost of better institutional quality.

The driving force of institutional specialization comes from the shape of the marginal benefit and marginal cost functions of institutional quality. The benefit of institutions protecting property rights is the possibility of producing goods requiring long-term investments that could easily be expropriated. Given imperfect substitutability between these goods and others less sensitive to property rights, their relative price declines when more is produced at the world level. Globally, the marginal benefit of improvements in institutional quality is decreasing, however, for a small open economy that does not affect world prices, the marginal benefit is constant.

With a decreasing marginal cost and a constant marginal benefit of institutional quality at the country level, incentives of those in power push institutions towards the extremes. Countries either uphold the rule of law with full protection of property rights, or consciously choose not to provide security to investors. At the world level, when good institutions are more widespread, prices of goods requiring protection of property rights are lower, so those in power in a given country want weak institutions. This leads to strategic substitutability in rulers' choices of institutions across countries and implies an interconnected world will sustain diametrically opposed systems of government.

The world equilibrium features a symbiotic relationship between rule-of-law economies and authoritarian regimes. The production of rule-of-law intensive goods raises the relative price of other goods such as natural resources, thus increasing incentives for extractive institutions in other countries. Conversely, countries with extractive institutions generate a positive externality in the rest of the world because cheap oil makes the rule of law more attractive elsewhere.

These results are demonstrated in an environment with ex-ante identical countries and no fundamental economic reason for trade. In equilibrium, those in power are indifferent between having the rule of law or extractive institutions, and they always gain from trade with other countries. However, the ensuing institutional specialization leads to economic divergence. The economies that adopt the rule of law become substantially richer than those with extractive institutions. International trade thus benefits some countries but harms others.

This paper provides a way of reconciling the claim that corruption, rent-seeking, and insecure property rights create significant barriers to development in some countries with the fact that history is replete with examples of other countries having overcome precisely these challenges. The paper answers the question of why good institutions have been adopted in some places but not others without resorting to different models or different parameters for particular countries. The polarization of institutions predicted by the model does not depend on ex-ante differences between countries.

Dropping the assumption of ex-ante identical countries merely removes the arbitrariness of which particular countries end up with the rule of law or extractive institutions. Good institutions now emerge in countries with a comparative advantage in rule-of-law intensive goods. A 'natural resource curse' arises owing to the effects of a comparative advantage in natural resources on incentives of those in power to resist institutional reforms that would restrict their ability to extract rents.

The theory has some important lessons on how the problem of authoritarian regimes should be addressed. One prediction is that exogenous improvements in one country's political institutions, perhaps brought about by well-intentioned international pressure or intervention, will be counteracted by stronger incentives for extractive institutions in other countries. However, this does not preclude a role for international policy because the total number of authoritarian regimes in the world is affected by the relative price of rule-of-law intensive goods, which is in turn influenced by patterns of demand. The theory thus suggests that subsidizing rule-of-law intensive goods, for example, channelling resources to the development of technology-intensive alternative fuels, would be more effective than efforts directed to affect the political systems of particular countries.

A key implication of the theory is that an exogenous increase in trade openness leads to greater institutional specialization. This is tested by exploring the transition from sail to steam power for shipping in the second half of the 19$^{\text{th}}$ century. Pascali (2017) shows this technological advance worked as a shock to trade openness that occurred around 1865–1875. He builds a country-level measure of predicted trade based on geographical variables, with the direction of prevailing winds playing a key role. Here, differences in predicted trade in the years before and after the transition are taken as an exogenous shock to trade openness. Importantly, there is large cross-country variation in the magnitude of the shock because wind patterns have a strong effect on shipping times only in the period when sailing vessels were used. Identification comes from countries being more or less exposed to the transition from sail to steam-powered shipping owing to geography.

This paper finds some evidence that the trade-openness shock induced institutional specialization. Institutional quality is measured using the executive constraints index from the Polity IV

Project, a widely employed proxy for power sharing and limits to expropriation. Exposure to a larger trade shock implies a higher expected executive constraints score for countries starting from a relatively good score in the earlier period, but a lower executive constraints score for countries starting from a low score. Given the usual caveats with cross-country studies and the relatively small sample, the results should be treated with caution. But they suggest the channels emphasized in this paper might play an important role in reality, and call for further research.

The plan of the paper is as follows. Related literature is discussed below. Section 2 presents the model. Section 3 analyses the institutional choices of rulers. Section 4 studies the strategic interactions among countries and the equilibrium cross-country distribution of institutions, as well as policy implications and extensions. Section 5 presents the empirical analysis. Section 6 concludes.

Relation to the literature A large field of research is dedicated to studying the determinants of political institutions. A branch of this literature focuses on how those institutions are affected by international trade. For example, in Acemoglu, Johnson and Robinson (2005) and Puga and Trefler (2014), international trade induces institutional change by enriching and empowering merchant groups.[1] Bourguignon and Verdier (2000, 2005) study how trade openness and financial liberalization affect the incentives of a ruling elite to subsidize education for poorer workers. In Zissimos (2017), democracy induces trade liberalization only when the ruling elite owns a relatively scarce factor. In a similar vein, special-interest groups play a key role in Levchenko's (2013) analysis of the impact of international trade on institutional quality.[2]

In that literature, institutions typically depend on the balance of power between groups with different strengths and endowments of resources. Here, instead of focusing on the game between domestic groups, the novelty is to analyse how interactions between countries through trade shape the world distribution of political institutions. And rather than focusing on historical differences between particular countries, here, the nature of the cost function of institutional quality faced by rulers all around the world by itself makes trade a force for political divergence.

A body of research surveyed by Nunn and Trefler (2014) shows that institutional quality has an important role in explaining international trade.[3] That is consistent with the reason why countries trade in the theory proposed here. However, in that literature, institutions are typically taken as given, and the trade resulting from institutional differences is Pareto improving. Here, in contrast, institutions are endogenous, and trade benefits only countries with good institutions in equilibrium.

[1] Acemoglu, Johnson and Robinson (2005) argue that the Atlantic trade led to better institutions in European countries where monarchies were not so strong, while Puga and Trefler (2014) show how empowering merchants in Venice led to important institutional innovations up to the 13$^{\text{th}}$ century, but also to political closure and reduced competition thereafter.

[2] Related to this question in a broader sense, Gancia, Ponzetto and Ventura (2016) study how trade affects the size and number of countries in the world. Milgrom, North and Weingast (1990), Greif (1993), Greif, Milgrom and Weingast (1994), and Greif (2006) combine historical analysis and game theory to understand how institutions in medieval times allowed merchants groups to solve the commitment problems that arise in large-scale international trade.

[3] The literature studies how institutions affect trade flows (for example, Anderson and Marcouiller, 2002), the pattern of comparative advantage (Levchenko, 2007, Nunn, 2007), and its dynamic effects (Araujo, Mion and Ornelas, 2016).

The paper is also related to Acemoglu, Robinson and Verdier (2017), who study specialization in economic systems and also find an asymmetric world equilibrium. But the question there is a very different one: understanding why different types of capitalism can co-exist, in particular, why we cannot all be like Scandinavians as opposed to Americans. Here, the question is why examples of good institutions in some countries co-exist with examples of abject failure in others — why some of us must be Venezuelans. Hence, the model here is completely different from theirs. For example, political power plays a central role here but is absent from their analysis, while this paper abstracts from changes in the world technological frontier, which is central to their paper.

The links between power sharing, rents, and institutions are also the subject of Guimaraes and Sheedy (2017). However, that paper studies how commitment to otherwise time-inconsistent rules can be achieved in a model based on coalition formation and costly conflicts. Here, a simpler model is used to study the marginal cost of institutional quality and strategic interactions among countries.[4]

This paper is also related to the large literature on the 'natural resource curse' working through political institutions.[5] Robinson, Torvik and Verdier (2006) and Mehlum, Moene and Torvik (2006) study the role of institutions in the natural resource curse. While in those papers the curse is a consequence of bad institutions, here the key institutional variable — power sharing — is endogenous, and causation goes from comparative advantage in natural resources to institutions. There are models in which natural resources distort rulers' choices (e.g., Acemoglu, Verdier and Robinson, 2004, Caselli and Cunningham, 2009, Caselli and Tesei, 2016), but one distinguishing and important feature of this paper is that it shows how the equilibrium number of authoritarian regimes is determined for the world as a whole, which depends on factors such as the demand for natural resources.

There is also a large collection of studies based around the idea that trade hurts economies that specialize in primary goods. One possibility is that some sectors give rise to positive externalities on the whole economy or within an industry through knowledge creation.[6] In this paper, trade harms those economies that fail to establish institutions conducive to development, but not because of any intrinsic disadvantage of producing primary goods.[7]

Empirical work on the determinants of political institutions faces formidable obstacles. In particular, clean identification is very difficult to obtain.[8] The strategy proposed by Pascali (2017) — and used here — is one of the very few quasi-experimental settings available in the literature. The

[4] Acemoglu and Robinson (2000), Jack and Lagunoff (2006), and Bai and Lagunoff (2011) also study power sharing, but in the sense of extensions of the democratic franchise. Closer to this paper, power sharing in Guimaraes and Sheedy (2017) is connected to the establishment of the rule of law.

[5] For a discussion of the empirical evidence on the natural resource curse, see Ross (2001), Sachs and Warner (2001), and Van der Ploeg (2011).

[6] See, for example, Krugman (1987), Rodrik (1996), and Melitz (2005).

[7] There is also a large literature in sociology that attempts to explain underdevelopment as the result of rich countries exploiting poor ones, so-called 'dependency theory'. See, for example, Cardoso and Faletto (1979).

[8] The empirical literature on the effects of trade on democracy often runs into this challenge. Some papers study whether trade liberalization leads to democracy (e.g., Giavazzi and Tabellini, 2005), but trade liberalization is in principle endogenous. López-Córdova and Meissner (2008) use the geographical variables proposed by Frankel and Romer (1999) as an instrument for international trade, but these variables have no time variation for most countries.

estimates of the effect of trade on institutional specialization presented in this paper are based on a large exogenous trade shock with heterogeneous impacts on a wide range of countries.

Last, the paper is broadly related to discussions of democratization in the social sciences.[9] Following the demise of the Soviet Union and the end of the cold war in the early 1990s, Fukuyama (1992) famously predicted the 'end of history', arguing that the days of autocratic regimes were numbered. Reality, however, has not been so kind, and Fukuyama has since acknowledged that autocratic regimes have been stubbornly persistent (Fukuyama, 2011).[10] Using methods developed in the literature on testing for convergence in levels of GDP per person across countries, the lack of cross-country convergence in Polity scores has been noted in work by Goorha (2007).[11]

2 The model

The model features a simple economic environment with two goods, several countries that might trade with each other, and the choice of institutional quality by those who hold power in each country.

2.1 Environment: countries, individuals, preferences, and technologies

The world The world comprises a measure-one continuum of countries each with a measure-one continuum of individuals. There is no mobility of individuals between countries. Individuals within a country are indexed by $i \in [0,1]$, countries by $j \in [0,1]$.

There are two goods in the world, an endowment good (E) and an investment good (I). These goods can be exchanged between countries in perfectly competitive world markets, with $x_{\mathrm{E}}(j)$ and $x_{\mathrm{I}}(j)$ denoting country j's net exports of the endowment and investment goods respectively. The relative price π^* of the investment good in world markets adjusts to ensure these markets clear:

$$\int_0^1 x_{\mathrm{E}}(j)\mathrm{d}j = 0 = \int_0^1 x_{\mathrm{I}}(j)\mathrm{d}j. \tag{1}$$

Consumption The names of the endowment and investment goods refer to how they are obtained, but the only use of both is consumption. All individuals throughout the world have preferences

$$C(i) = \frac{c_{\mathrm{E}}(i)^{1-\alpha} c_{\mathrm{I}}(i)^{\alpha}}{(1-\alpha)^{1-\alpha}\alpha^{\alpha}}, \tag{2}$$

where $c_{\mathrm{E}}(i)$ and $c_{\mathrm{I}}(i)$ are individual i's consumption of the two goods (dropping the country index j). The parameter α, satisfying $0 < \alpha < 1$, indicates the relative importance of the investment good.

[9] Huntington (1993) is an influential example.

[10] There is much work in political science on the survival of autocracies (for example, Gandhi and Przeworski, 2007), but which focuses on individual countries, while this paper studies the political equilibrium of the world as a whole.

[11] Alesina, Tabellini and Trebbi (2017) document divergence in the quality of governance and institutions among EU countries, in spite of the incentives for institutional convergence provided by the EU. This is an example where greater economic integration occurs alongside political divergence.

Production In a given country, all individuals exogenously receive a common amount q of the endowment good. A positive fraction γ of individuals receives investment opportunities, each leading to the production of one unit — a normalization — of the investment good if it is undertaken. The stochastic arrival of an investment opportunity is private information to an individual. All investment opportunities entail an effort cost, its size measured by a parameter $\theta > 0$, which is sunk once the investment good becomes available for use. For an individual i receiving an opportunity, the decision to invest is denoted by the binary variable $\kappa(i) \in \{0, 1\}$, and the individual's utility payoff is

$$U(i) = \log C(i) - \kappa(i) \log(1 + \theta). \tag{3}$$

The supply of investment goods produced, referred to as the capital stock, is

$$K = \int_0^1 \kappa(i) \mathrm{d}i, \tag{4}$$

where $\kappa(i) = 0$ for individuals who do not receive investment opportunities. Whether an individual has taken an opportunity is common knowledge when the output is available for consumption.

International trade A country's net exports x_E and x_I of endowment and investment goods must satisfy its international budget constraint

$$x_\mathrm{E} + \pi^* x_\mathrm{I} = 0. \tag{5}$$

2.2 Institutions: the allocation of power and resources

Institutions Institutions allocate power and resources in a country. The distribution of power will be fundamental to the political process described below. Power sharing p is defined as the fraction of the population holding positions of power, a group referred to as the incumbents. This is a parsimonious way to capture the many forms power sharing takes around the world, with common examples being independent courts, parliaments, local governments, police forces, and armies. Institutions also allocate resources between different uses — individuals' consumption, how much is exported or imported — subject to informational and resource constraints.

Incumbents cannot receive investment opportunities, but such opportunities are otherwise randomly distributed among the population. As capital is observable once it is produced, institutions can specify a consumption allocation for some or all individuals that depends on whether an investment opportunity was taken. The fraction of individuals with an investment-contingent consumption allocation is denoted by λ. Someone who has an investment-contingent consumption allocation and who takes an investment opportunity is referred to as an investor. Having consumption be contingent on investment is the key aspect of institutional quality here, which represents protection of the property rights of those who will be both a minority and outside the group in power.

An individual who is neither in power nor an investor is referred to as a worker. Individuals' consumption can depend on whether they are incumbents, investors, or workers. The amounts of the endowment and investment goods assigned to each incumbent are c_{pE} and c_{pI}, to each investor c_{kE} and c_{kI}, and to each worker c_{wE} and c_{wI}. The allocation of goods to international trade is x_{E} and x_{I}.

Formally, institutions $\mathscr{I}$ are defined as a collection $\{p, \lambda, x_{\mathrm{E}}, x_{\mathrm{I}}, c_{\mathrm{pE}}, c_{\mathrm{pI}}, c_{\mathrm{kE}}, c_{\mathrm{kI}}, c_{\mathrm{wE}}, c_{\mathrm{wI}}\}$. Note that institutions directly specify individuals' quantities of consumption of each good rather than assuming a market-based economy.[12] Since an objective of this paper is to study how political power interacts with private property, free exchange is not built in as an assumption.

Incentive compatibility Suppose individual i receives an investment opportunity. If she does not have an investment-contingent consumption allocation, it is not rational for her to invest. If her consumption does depend on investing, let C_{k} and C_{w} denote the consumption payoffs in terms of (2) from investing or not, obtained respectively from $\{c_{\mathrm{kE}}, c_{\mathrm{kI}}\}$ and $\{c_{\mathrm{wE}}, c_{\mathrm{wI}}\}$. According to the utility function (3), the choice of $\kappa(i) = 1$ is rational if the incentive-compatibility condition holds:

$$C_{\mathrm{k}} \geq (1+\theta) C_{\mathrm{w}}. \tag{6}$$

Since γ individuals receive investment opportunities at random, production of capital (4) is

$$K = \begin{cases} \gamma\lambda & \text{if (6) holds} \\ 0 & \text{otherwise} \end{cases}. \tag{7}$$

Feasibility Using K from (7), the sizes of the groups of investors and workers are $k = K$ and $w = 1 - p - K$ respectively. Feasibility of institutions requires that the (non-negative) allocation of consumption goods across groups of individuals satisfies the resource constraints

$$p c_{\mathrm{pE}} + K c_{\mathrm{kE}} + (1-p-K) c_{\mathrm{wE}} + x_{\mathrm{E}} = q, \quad \text{and} \quad p c_{\mathrm{pI}} + K c_{\mathrm{kI}} + (1-p-K) c_{\mathrm{wI}} + x_{\mathrm{I}} = K. \tag{8}$$

Net exports x_{E} and x_{I} must satisfy (5) given the world price π^*. Capital K must satisfy (7).

2.3 The political process and equilibrium institutions

Politics Institutions are chosen to maximize the consumption payoff C_{p} of members of the incumbent group subject to feasibility and to avoiding any successful challenge to those institutions.[13] No successful challenge occurs if institutions give workers a large enough consumption payoff C_{w}:

$$C_{\mathrm{w}} \geq \frac{C}{\beta + \delta p}, \quad \text{where } C = \frac{q + \pi^* K}{\pi^{*\alpha}}. \tag{9}$$

This political constraint captures in a simple way the notion that while incumbents establish institutions, these can always be challenged and replaced through various means if they go too much against the interests of others. Therefore, if incumbents are actually to receive C_{p}, (9) must hold.

[12] A 'primal' approach to analysing institutions is adopted here: institutions are rules allocating resources subject to fundamental constraints. Some specific instruments or arrangements that implement an allocation are discussed later.

[13] For simplicity, all members of the incumbent group receive the same payoff. While this particular assumption could be relaxed, it is important that all members of the group in power obtain some rents.

The political constraint (9) takes the form of a lower bound on workers' consumption C_w that is proportional to C, the value of the economy's production at world prices π^* to those with consumption preferences (2).[14] Since C is the 'pie' that could be reallocated if institutions were challenged, the share C_w/C allocated to a worker cannot be too low. As workers do not produce capital, this can be an impediment to one important aspect of institutional quality because it is harder to satisfy the constraint with institutions granting property rights to a minority of rich investors.[15]

The lower bound on a worker's share implied by (9) is decreasing in power sharing p. This represents the general idea that having more people in positions of power — whether they be members of a parliament, judges, village chiefs, or army officers — makes institutions stronger and better able to resist challenges. While the direct consequence of higher p is the distributional effect of pushing down the minimum worker share C_w/C, it does not follow that power sharing reduces workers' consumption because p is related in equilibrium to institutional quality and the amount of investment.

The functional form in (9) where power sharing p appears linearly in the denominator is not essential to explain institutional specialization. But specialization in institutions requires moving away from the case where the marginal cost of institutional quality is constant, and as will be seen, that case occurs when $\beta = 0$. The linear functional form with $\beta > 0$ is the simplest way to generate a decreasing marginal cost of institutional quality as it permits a closed-form solution of the model.

Parameters β and δ in the political constraint (9) are assumed to satisfy $\delta > 1$, $\beta < 1$, and $\beta > 0$. First, for incumbents to obtain positive rents, it must be possible to push the per-worker share C_w/C below one, which requires $\beta + \delta p > 1$. This is assured for some p by having $\delta > 1$. Second, the restriction $\beta < 1$ is needed to ensure the equilibrium size of the group in power is positive: if $\beta > 1$, a measure-zero incumbent group could still extract positive rents.

Decreasing returns to sharing power While the assumptions $\delta > 1$ and $\beta < 1$ are simply ensuring that incumbents are sufficiently powerful to extract rents but not so powerful as to obtain unbounded payoffs, $\beta > 0$ is the crucial assumption of 'decreasing returns to sharing power'. Returns to sharing power here refers narrowly to the distributional advantage incumbents derive when a larger p lowers the minimum worker share C_w/C consistent with (9). A positive β corresponds to decreasing returns because it means there are some fixed benefits of incumbency independent of p, so each incumbent is individually less important when power is shared more broadly.[16] It will be seen that decreasing returns to pushing down workers' share C_w/C through increasing power sharing p is what explains the decreasing marginal cost of institutional quality and hence specialization in institutions.

[14] An individual with income $Y(i)$ in terms of the endowment good who can trade the two goods at relative price π^* can obtain consumption payoff $C(i) = Y(i)/\pi^{*\alpha}$. See section 3.1 below.

[15] It is natural to focus on workers' payoffs in the constraint (9) because they will have the least stake in the status quo.

[16] A measure of the 'political productivity' of those holding power is the fraction of workers incumbents are able to pacify per unit of goods allocated to workers as a whole. This notion of productivity is the inverse C_w^{-1} of the lower bound in (9). Average productivity C_w^{-1}/p is the number of workers pacified per incumbent, and marginal productivity $\partial C_\text{w}^{-1}/\partial p$ is the extra workers pacified by an additional person holding power. According to (9), the marginal product of an incumbent is independent of p and depends on δ, while the average product is declining in p because $\beta > 0$.

Equilibrium To summarize, equilibrium institutions $\mathscr{I}$ are those maximizing incumbents' payoff C_p among the set of institutions that are feasible and avoid any successful challenge. Formally:

$$\max_{\mathscr{I}} C_p \text{ subject to (5), (7), (8), and (9).} \tag{10}$$

3 The choice of institutions

This section analyses features of the equilibrium institutions that are solutions of (10). To have $K > 0$ the incentive compatibility constraint (6) must be satisfied, while if $K = 0$ then C_k becomes irrelevant. Thus, (6) holds without loss of generality. Owing to the resource constraints in (8), those in power do not want C_k any larger than needed for (6). Similarly, if C_w is larger than needed for the political constraint (9) then the incumbent payoff is reduced, so this also holds with equality. Therefore, the following are binding constraints that shape the equilibrium institutions:

$$C_k = (1+\theta)C_w, \quad C_w = \frac{C}{\beta + \delta p}, \quad \text{and } K = \gamma\lambda. \tag{11}$$

The problem in (10) becomes maximizing C_p subject to (5), (8), and (11), with C from (9).

3.1 Institutions support a market economy

Conditional on production q and K and on power sharing p, the problem in (10) is equivalent to maximizing incumbents' consumption payoff C_p subject to resource constraints (8) and given levels $C_w = C/(\beta + \delta p)$ and $C_k = (1+\theta)C/(\beta + \delta p)$ of workers' and investors' consumption payoffs obtained from (9) and (11). This implies allocative efficiency by definition, and the first-order conditions equate marginal rates of substitution between investment and endowment goods across all individuals. For consumption preferences (2), this requires $c_{pI}/c_{pE} = c_{kI}/c_{kE} = c_{wI}/c_{wE}$.

This paper models institutions in terms of allocations, but it is still possible to describe the instruments that might be used to implement an allocation. In particular, allocative efficiency is achievable by allowing individuals free exchange of goods in competitive markets subject to some given levels of income after taxes and transfers — essentially an application of the second welfare theorem. Equilibrium institutions are thus said to feature a market-based economy.

Suppose individual i can buy or sell investment goods in a competitive market at price π in terms of endowment goods. Faced with a budget constraint $c_E(i) + \pi c_I(i) = Y(i)$, where $Y(i)$ is the individual's post-tax income in terms of the endowment good as numeraire, and choosing $c_E(i)$ and $c_I(i)$ to maximize $C(i)$ from (2), the first-order condition $\alpha c_E(i)/(1-\alpha)c_I(i) = \pi$ equates the marginal rate of substitution between the investment and endowment goods to the relative price π. The resulting demand functions and the maximized consumption payoff are

$$c_E(i) = (1-\alpha)Y(i), \quad c_I(i) = \alpha\frac{Y(i)}{\pi}, \quad \text{and } C(i) = \frac{Y(i)}{\pi^\alpha}. \tag{12}$$

Given production and net exports, markets clear — that is, the resource constraints (8) hold — if the relative price is $\pi = \alpha(q - x_{\mathrm{E}})/((1-\alpha)(K - x_{\mathrm{I}}))$. In addition, if goods can be exchanged in world markets, the domestic price π equals the world price π^*. By using the international budget constraint (5), net exports with free trade are

$$x_{\mathrm{E}} = \alpha q - (1-\alpha)\pi^* K, \quad \text{and } x_{\mathrm{I}} = (1-\alpha)K - \alpha \frac{q}{\pi^*}. \tag{13}$$

Proposition 1 (Market economy) *The equilibrium institutions can be implemented as a market economy fully open to international trade, and the allocation of goods is Pareto efficient. Formally, there are income levels Y_{p}, Y_{k}, and Y_{w} net of taxes and transfers for incumbents, investors, and workers such that consumption of each good by each individual is given by (12) with $\pi = \pi^*$, and net exports are given in (13). Individual incomes satisfy $pY_{\mathrm{p}} + KY_{\mathrm{k}} + (1-p-K)Y_{\mathrm{w}} = Y$, where Y is the market economy's GDP in terms of the endowment good as numeraire:*

$$Y = q + \pi^* K, \quad \text{and } C = \frac{Y}{\pi^{*\alpha}} = \frac{q + \pi^* K}{\pi^{*\alpha}}, \tag{14}$$

with C denoting real GDP (which coincides with C in 9). The economy's real GDP is equal to the sum of all individuals' maximized consumption payoffs, that is, $pC_{\mathrm{p}} + KC_{\mathrm{k}} + (1-p-K)C_{\mathrm{w}} = C$.

PROOF See appendix A.1. ■

The individual incomes Y_{p}, Y_{k}, and Y_{w} can themselves be implemented using taxes and transfers. Everyone pays a tax on their endowment, investors are able to keep their capital but pay a tax that just incentivizes them to produce, and all these tax revenues are shared among those in power.

Even though incumbents care only about their own interests, they are compelled to consider the impact of their choices on others both to avoid challenges to the institutions they establish and to provide incentives to invest. These forces push them to create economically efficient institutions, at least in respect of exchange of goods.

With no exogenous restrictions on taxes and transfers, the political process has not led to any tension between distribution and efficiency so far. For example, opening up to international trade maximizes the value of the pie available for consumption, but also has differential effects on the incomes of investors, workers, and incumbents resulting from the relative price π adjusting to π^*. Efficient institutions that eschew barriers to international trade are adopted by incumbents because taxes and transfers can be used to sterilize the distributional consequences.

3.2 Power sharing and incumbent rents

The distribution of income Let $s_{\mathrm{p}} = Y_{\mathrm{p}}/Y$, $s_{\mathrm{k}} = Y_{\mathrm{k}}/Y$, and $s_{\mathrm{w}} = Y_{\mathrm{w}}/Y$ denote the shares of the national income 'pie' in (14) received by each incumbent, investor, and worker, respectively. Using Proposition 1 and the binding constraints and $K = \gamma\lambda$ from (11), these shares must satisfy

$$ps_{\mathrm{p}} + \gamma\lambda s_{\mathrm{k}} + (1-p-\gamma\lambda)s_{\mathrm{w}} = 1, \quad s_{\mathrm{k}} = (1+\theta)s_{\mathrm{w}}, \quad \text{and } s_{\mathrm{w}} = \frac{1}{\beta + \delta p}, \tag{15}$$

where the first equation states the shares of everyone sum to one, and the second and third equations are the binding incentive (6) and political (9) constraints. These form a system of three linear equations in the three income shares. Solving them, the incumbent share as a function of p and λ is

$$s_{\mathrm{p}}(p,\lambda) = \frac{1}{p}\left(1 - \frac{(1-p+\gamma\theta\lambda)}{\beta+\delta p}\right). \tag{16}$$

From Proposition 1, the incumbent consumption payoff is $C_{\mathrm{p}} = s_{\mathrm{p}}(p,\lambda)C$, and power sharing p does not directly affect the pie C in (14). Conditional on λ, equilibrium institutions (10) must therefore have power shared up to the point where the per-person income share of incumbents is maximized.

Power sharing and incumbent rents Maximizing s_{p} determines equilibrium power sharing p and the rents $R = Y_{\mathrm{p}} - Y_{\mathrm{w}}$ received by incumbents. Rents as a percentage of a worker's income are

$$r = \frac{R}{Y_{\mathrm{w}}} = \frac{Y_{\mathrm{p}} - Y_{\mathrm{w}}}{Y_{\mathrm{w}}}, \quad \text{hence } s_{\mathrm{p}} = (1+r)s_{\mathrm{w}}. \tag{17}$$

The variables p and r are the key 'quantity' and 'price' measures relevant to politics: the number of people in power, and the benefits people in power derive from their positions.

Using (16), the first-order condition $\partial s_{\mathrm{p}}(p,\lambda)/\partial p = 0$ with the definition of r in (17) yields

$$r = \delta(1 - p s_{\mathrm{p}}). \tag{18}$$

The function $s_{\mathrm{p}}(p,\lambda)$ is globally quasi-concave in p, so this first-order condition is necessary and sufficient for an interior solution where $s_{\mathrm{p}}(p,\lambda)C$ is maximized.

The first-order condition (18) is equivalent to $R = \delta(1-ps_{\mathrm{p}})Y_{\mathrm{w}}$. The left-hand side, the rent R, is the marginal cost of sharing power with an extra person from the perspective of existing incumbents — the rent is what that person is paid (the 'price' of sharing power). The right-hand side is incumbents' marginal benefit of having an extra person in power to defend the institutions: the incomes of non-incumbents can be held further down without the institutions facing a successful challenge. The marginal 'political productivity' of an incumbent is $\partial C_{\mathrm{w}}^{-1}/\partial p = \delta/C$ according to (11), which is how many extra workers another incumbent can pacify relative to total consumption allocated to workers. Since all non-incumbents — investors and workers — receive an income proportional to a worker's wage Y_{w}, and as non-incumbents receive $(1-ps_{\mathrm{p}})$ of total consumption C, this benefit is worth $(\delta/C)\times(1-ps_{\mathrm{p}})C\times Y_{\mathrm{w}} = \delta(1-ps_{\mathrm{p}})Y_{\mathrm{w}}$, the right-hand side of the equation.

The binding political constraint (third equation in 15) and (17) imply $s_{\mathrm{p}} = (1+r)/(\beta+\delta p)$. Together with (18), this yields a negative relationship between rents r and power sharing p:

$$r = \frac{\delta-1}{2} + \frac{\beta(1+\delta)}{2(\beta+2\delta p)}. \tag{19}$$

Owing to the decreasing returns to sharing power that come from $\beta > 0$, incumbents command smaller rents as power sharing increases. Intuitively, each person holding power becomes individually less important in supporting the institutions as the group expands, so incumbents are only willing to share power more broadly if rents decline. Observe from (18) and (19), recalling $\delta > 1$, that rents are bounded between the positive numbers $(\delta - 1)/2$ and δ. If β were zero, meaning constant returns to sharing power, then equation (19) shows that rents r would be constant.

A second equation connecting p and r comes from the resource constraint (first equation in 15). This implies $(1 + \gamma\theta\lambda + rp)s_{\mathrm{w}} = 1$ in combination with the incentive constraint (second equation in 15) and the definition (17). Substituting the political constraint (third equation in 15) leads to

$$r = \delta - \frac{1 - \beta + \gamma\theta\lambda}{p}. \tag{20}$$

Given $\beta < 1$, this is a positive relationship between power sharing and rents. Each incumbent receives a rent r as a fraction of a worker's wage that is less than δ. However, holding r constant, $s_{\mathrm{w}}^{-1} = \beta + \delta p$ from (15) implies an additional incumbent reduces the incomes of everyone else by an amount equivalent to δ worker's wages. Since this is less than the remuneration of the marginal incumbent, an expansion of the group in power allows higher rents r to be paid to all incumbents.

Political equilibrium Plotted in Figure 1, equation (19) is a downward-sloping line representing the willingness of incumbents to share power, and equation (20) is an upward-sloping line representing the ability of incumbents to extract rents. Given λ, these jointly determine the unique solution for power sharing p and incumbent rents r. The solution for p is positive according to (20) because $\beta < 1$. To ensure an interior solution for any value of $\lambda \in [0, 1]$, and have $p < 1 - \gamma$ so that there are enough non-incumbents to receive γ investment opportunities, a parameter restriction $\gamma < \overline{\gamma}(\beta, \delta, \theta)$ limiting the number of available investment opportunities is imposed in what follows.[17]

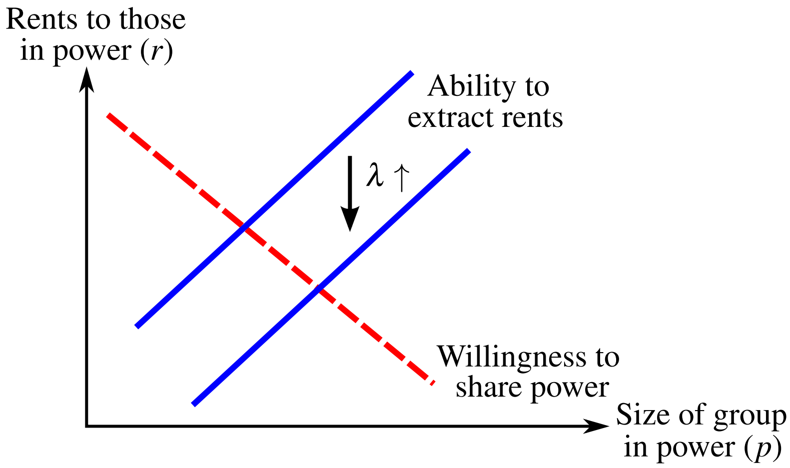
3.3 Property rights, power sharing, and rents

Property rights — meaning how much individuals are allowed to keep of their own production — are crucial for incentives. These are related to the remaining aspect of institutions to be determined, the variable λ, the fraction of individuals with a consumption allocation that depends on whether they produce capital. In the case of $\lambda < 1$, since the incentive-compatibility constraint (6) holds, some individuals face a tax on capital low enough that they still have incentives to take an investment opportunity. Others, though, would have any capital fully expropriated, leaving them with the same consumption as if they had not taken an investment opportunity, and hence will choose not to invest.

The variable λ in the choice of institutions is thus interpretable as the extent of the rule of law or the strength of property rights. If $\lambda = 1$ then institutions feature perfect rule of law in that anyone with an investment opportunity can take it knowing the fruits of the investment will not be confiscated. As the incentive-compatibility constraint (6) binds, investors will pay more tax than workers, but have property rights that shield them from expropriation and allow them to keep enough

[17] Ensuring that $1 - p > \gamma$ for all $\lambda \in [0, 1]$ requires $(1 - \beta + \theta\gamma)/(1 + \delta) < (\beta + \delta(1 - \gamma))/(2\delta + \beta/(1 - \gamma))$. This holds at $\gamma = 0$, but not at $\gamma = 1$. There exists a threshold $\overline{\gamma}(\beta, \delta, \theta)$ such that $\gamma < \overline{\gamma}(\beta, \delta, \theta)$ guarantees this.

Figure 1: *Political equilibrium for power sharing and incumbent rents*



Notes: The dashed downward-sloping line ('willingness to share power') represents equation (19). The solid upward-sloping line ('ability to extract rents') represents equation (20), which shifts downwards if λ increases.

of the proceeds to justify taking investment opportunities. $\lambda < 1$ represents imperfect rule of law in that some individuals would face expropriation while others' property rights are safe.[18] $\lambda = 0$ represents fully extractive institutions where any investments would be seized.

Since there are no exogenous restrictions on tax instruments, anyone who invests has all surplus extracted up to the point where the incentive-compatibility constraint (6) binds. This means there is no trade-off here between raising tax revenue and distorting investment decisions. Hence, weaker rule of law — lower λ — always lowers the tax revenue raised from taxing capital. Why then would institutions ever reduce investment by having $\lambda < 1$?

The key idea is that strengthening property rights matters not only for incentives, but also for politics. Higher λ implies that rewards to investors take up a greater share of the pie, while the presence of extra capital raises output and makes it more difficult to pacify workers who have more to gain from changing the status quo. A successful challenge to institutions with higher λ can only be avoided by increasing the size p of the group in power, or reducing the rents r received by incumbents, or both.

Conditional on p, higher λ means a lower level of r according to equation (20), and this implies a downward shift of the 'ability to extract rents' line in Figure 1. As the 'willingness to share power' line does not change, it follows that for λ to increase, there must be an expansion of power sharing and a decline in the rent received by each incumbent measured relative to a worker's income.

Intuitively, bolstering property rights raises capital and output but requires stronger institutions. That entails an increase in the number of people holding positions of power, and those additional individuals in power must receive rents. Therefore, when it comes to decisions about property rights,

[18] One interpretation of $0 < \lambda < 1$ is a group of potential entrepreneurs with close ties to the group in power.

the political process generates a clash between distribution and efficiency. More investment is good for the economy, but not necessarily for incumbents reluctant to share power and rents more broadly.

Proposition 2 (Political equilibrium and the rule of law) *Conditional on the extent of the rule of law as measured by λ, equilibrium power sharing p and incumbent rents r are characterized by the equations (19) and (20). The solution is $r(\lambda) = \delta - (1+\delta)/(1+\sqrt{1+\beta(1+\delta^{-1})/(1-\beta+\gamma\theta\lambda)})$ and $p(\lambda) = (1-\beta+\gamma\theta\lambda)/(\delta - r(\lambda))$, and these functions satisfy $r'(\lambda) < 0$ and $p'(\lambda) > 0$.*

PROOF See appendix A.2. ■

The finding that institutions with stronger rule of law are accompanied by greater sharing of power and lower rents for those in power has implications for incumbents' choice of institutional quality λ.

3.4 The positive but decreasing marginal cost of institutional quality

Let $\phi(\lambda)$ denote incumbents' per-person share of national income as a function of institutional quality λ, taking account of the equilibrium degree of power sharing $p(\lambda)$ from Proposition 2, that is, $\phi(\lambda) = s_p(p(\lambda), \lambda)$ in terms of $s_{\mathrm{p}}(p, \lambda)$ from (16). The payoff of incumbents is

$$C_{\mathrm{p}} = \phi(\lambda)C, \quad \text{where } \phi(\lambda) = \frac{2}{\beta}\left(r(\lambda) - \frac{\delta - 1}{2}\right), \tag{21}$$

with C being real GDP from (14). The formula for $\phi(\lambda)$ is confirmed below, and since incumbent rents $r(\lambda)$ are decreasing in λ, the incumbent share goes down as institutional quality increases. Hence, there is a trade-off for incumbents between increasing the pie and decreasing their share.[19]

The effect of a marginal improvement in institutional quality λ on the incumbent payoff (21) is

$$\frac{\partial C_{\mathrm{p}}}{\partial \lambda} = \phi(\lambda)\left(\frac{\partial C}{\partial \lambda} - \mu(\lambda)C_{\mathrm{p}}\right), \quad \text{where } \mu(\lambda) = -\frac{\phi'(\lambda)}{\phi(\lambda)^2}. \tag{22}$$

The term $\partial C/\partial \lambda$, representing the effect of greater investment on GDP that occurs when the rule of law is strengthened, is referred to as the marginal benefit of institutional quality. This is multiplied in (22) by $\phi(\lambda)$ to reflect incumbents' share of the total pie. As property rights become stronger, the incumbent share $\phi(\lambda)$ declines. The marginal loss to those in power from higher λ, scaled so that it can be compared to the marginal benefit $\partial C/\partial \lambda$, is $\mu(\lambda)C_{\mathrm{p}}$ in terms of the function $\mu(\lambda)$ defined above in (22). The value of $\mu(\lambda) > 0$ gives the marginal loss to incumbents as a fraction of C_{p}, which is referred to as the marginal cost of institutional quality. There is a positive cost from the perspective of incumbents, though not from the perspective of the country as a whole.

[19] In respect of the choice to permit free exchange, incumbents establish efficient institutions because they can sterilize the distributional consequences using a full set of tax instruments, so there is no interaction with politics. In contrast, stronger property rights that compensate investors for sunk effort costs make it harder to pacify those who do not own capital and would gain from being able to reallocate it. To put it differently, restrictions on economic activity might arise if the set of tax instruments were limited (see, for example, Zissimos, 2017), but inefficiencies due to the link between institutional quality, political power, and rents are a more fundamental problem because they occur even without any exogenous restrictions on taxes and transfers.

Since $\phi(\lambda) = s_{\mathrm{p}}(p(\lambda), \lambda)$, the envelope theorem applied to (16) yields $\phi'(\lambda) = -\gamma\theta s_{\mathrm{w}}/p$ and $\mu(\lambda) = \gamma\theta/((s_{\mathrm{p}}/s_{\mathrm{w}})(ps_{\mathrm{p}}))$ using equations (21) and (22). The marginal cost $\mu(\lambda)$ of institutional quality can then be expressed as a function of incumbent rents r using (17) and (18).

Proposition 3 (The diminishing marginal cost of institutional quality) *The incumbent share of income $\phi(\lambda)$ is as given in (21) and decreases with institutional quality λ. The implied marginal cost of institutional quality in (22) is positively related to incumbent rents $r(\lambda)$ from Proposition 2:*

$$\mu(\lambda) = \frac{\delta\gamma\theta}{\left(\frac{1+\delta}{2}\right)^2 - \left(r(\lambda) - \frac{\delta-1}{2}\right)^2}. \tag{23}$$

Since incumbent rents fall with institutional quality, the marginal cost of institutional quality is declining, that is, $\mu'(\lambda) < 0$.

PROOF See appendix A.3. ■

The private cost to incumbents of better institutions is the rents the additional members of the group in power receive. However, as institutional improvements jeopardize the rents individual incumbents are able to command, the marginal cost of even better institutions becomes smaller. Intuitively, bad institutions yield high rents because concentrated power makes each individual incumbent very important, and hence sharing power and rents are very costly for incumbents. In contrast, where institutions are already good and power is dispersed, incumbents receive relatively little in rents, and thus do not have as much to lose by improving institutions further.

Since incumbents' marginal cost of more investment through higher λ exceeds the social cost of investors' effort, equilibrium institutions can have inefficiently weak property rights.

Proposition 4 (Inefficiently weak property rights) *Efficient investment needs higher λ if $\partial C/\partial\lambda$ exceeds the marginal cost $\gamma\theta C_{\mathrm{w}}$ of compensating investors implied by (6). Incumbents' cost $\mu(\lambda)C_{\mathrm{p}}$ of higher λ exceeds $\gamma\theta C_{\mathrm{w}}$, with $\mu(\lambda)C_{\mathrm{p}}$ declining relative to $\gamma\theta C_{\mathrm{w}}$ as institutional quality improves.*

PROOF See appendix A.4. ■

Note that the wedge between incumbents' cost of higher λ and the social cost declines as λ rises.

4 The cross-country distribution of institutions

This section characterizes the equilibrium distribution of institutional quality λ across countries. Equilibrium institutional quality λ in a country must maximize $C_{\mathrm{p}} = \phi(\lambda)C$ from (21). The curvature of the incumbent payoff is found by differentiating (22) again and evaluating at a critical point:

$$\left.\frac{\partial^2 C_{\mathrm{p}}}{\partial\lambda^2}\right|_{\frac{\partial C_{\mathrm{p}}}{\partial\lambda}=0} = \phi(\lambda)\left(\frac{\partial^2 C}{\partial\lambda^2} - \mu'(\lambda)C_{\mathrm{p}}\right). \tag{24}$$

The sign of this second derivative determines whether C_{p} is quasi-concave or quasi-convex in λ.

4.1 Institutions in a small open economy

Using real GDP in (14), the marginal benefit of institutional quality is $\partial C/\partial\lambda = \gamma\pi^{*1-\alpha}$. Since a small open economy takes the world price π^* as given, the marginal benefit of institutional quality is independent of λ and is equalized across countries through trade. With $\partial^2 C/\partial\lambda^2 = 0$ and the diminishing marginal cost of institutional quality $\mu'(\lambda) < 0$ from Proposition 3, equation (24) shows that the incumbent payoff is a globally quasi-convex function of institutional quality λ.

Proposition 5 (Institutional specialization) *The incumbent payoff C_p is a strictly quasi-convex function of institutional quality λ. Equilibrium institutions therefore have either $\lambda = 0$ or $\lambda = 1$. Power is more concentrated and incumbent rents higher with institutions $\lambda = 0$ rather than $\lambda = 1$, that is, $p^\dagger = p(0) < p(1) = \bar{p}$ and $r^\dagger = r(0) > r(1) = \bar{r}$. Incumbents choose $\lambda = 1$ if and only if $\gamma\pi^* \geq \xi q$, where $\xi = (r^\dagger - \bar{r})/(\bar{r} - (\delta - 1)/2)$.*

PROOF See appendix A.5. ■

As the objective function of those in power is a quasi-convex function of institutional quality λ, property rights are either so weak that there is no investment ($\lambda = 0$) or sufficiently strong so that all profitable investment opportunities are taken ($\lambda = 1$). These two extremes of institutions are referred to as extractive institutions and the rule of law respectively. Extractive institutions feature concentrated power (low $p^\dagger$) and incumbents who receive large rents (high $r^\dagger$). Institutions with the rule of law have power shared more broadly (high $\bar{p}$) and small rents (low $\bar{r}$) for incumbents.

Why do those in power favour the extremes of institutional quality? The diminishing marginal cost of institutional quality means that on the one hand, the first steps to the rule of law have the greatest private cost to those in power. On the other hand, the marginal benefit of institutional quality does not decline as institutions improve because a small open economy can export more of the institutionally-intensive investment good without affecting world prices.[20] Therefore, for those in power, it makes sense either to go all the way to the best institutions and establish the rule of law, thereby obtaining a smaller share of a larger pie, or never to take the first steps and remain with extractive institutions that allow them to appropriate a larger share of a smaller pie.

Going all the way from extractive institutions to the rule of law adds $\gamma\pi^*$ to national income, but at a cost to incumbents of rents equal to a multiple ξ of initial national income q.

4.2 The world equilibrium

For the marginal cost of institutional quality to be relevant, it is necessary it is not so small that it is below the marginal benefit of institutional quality even if all countries in the world had the best possible institutions ($\lambda = 1$). Formally, this requires $\mu(1)\phi(1) > \alpha$, which is assumed in what

[20] An extension of the model with cartels of countries that affect world prices is presented in section 4.7.

follows.[21] Since both $\mu(1)$ and $\phi(1)$ depend positively on incumbent rents $\bar{r}$, this requires that rents $\bar{r}$ are not too low relative to demand for the investment good as captured by the parameter α.

The key finding in Proposition 5 is that a country j has either $\lambda = 0$ or $\lambda = 1$ in equilibrium, implying either $K(j) = 0$ or $K(j) = \gamma$. Let ω denote the fraction of rule-of-law countries ($\lambda = 1$). By integrating net exports (13) over countries, world market clearing (1) is obtained at price

$$\pi^* = \frac{\alpha q^*}{(1-\alpha)K^*}, \quad \text{where } K^* = \gamma\omega \text{ and } q^* = \int_0^1 q(j)\mathrm{d}j, \tag{25}$$

with q^* and K^* denoting the world supplies of the two goods.

The baseline assumption in what follows is that there are no ex-ante differences between countries. This means all countries share a common supply $q(j) = q = q^*$ of the endowment good.

Proposition 6 *There is strategic substitutability in institutional quality around the world in that the condition for $\lambda = 1$ to be the equilibrium in a given country is equivalent to the fraction ω of other countries with $\lambda = 1$ being sufficiently low, namely $\omega \leq \alpha/((1-\alpha)\xi)$. With ex-ante identical countries, the equilibrium fraction of economies with $\lambda = 1$ is $\omega = \alpha/((1-\alpha)\xi)$, which satisfies $0 < \omega < 1$, and the equilibrium world price is $\pi^* = q\xi/\gamma$. Institutions in countries with $\lambda = 1$ are Pareto efficient, while production of capital is inefficiently low in countries with $\lambda = 0$. Those in power receive the same payoff irrespective of whether $\lambda = 0$ or $\lambda = 1$ is chosen, while real GDP and the payoffs of workers and investors are higher in countries with $\lambda = 1$ than those with $\lambda = 0$.*

PROOF See appendix A.6. ■

While the logic of Proposition 5 pushes individual countries to the extremes of institutional quality, the same reasoning does not apply to the world as a whole. At the global level, prices depend on how much of the investment good is produced and hence on the number of economies with the rule of law. If more economies adopt the rule of law, the price of the investment good π^* falls, and therefore the marginal benefit of institutional quality is diminishing at the world level. This means that choices of institutions are strategic substitutes across countries: an increase in the global prevalence of the rule of law tilts the balance in favour of extractive institutions for others, all else equal.[22]

In equilibrium, the world price adjusts to equate incumbent payoffs under the two institutional extremes. If the rule of law were preferred by incumbents and adopted everywhere, the price π^* would fall, raising incumbents' payoff from extractive institutions until a point of indifference is reached. Consequently, the world equilibrium features a polarized distribution of political institutions. The spread of the rule of law around the world is limited by the size of the global market for institutionally-intensive goods. Even in the absence of any cultural or technological differences, some economies end up with extractive institutions, while others end up with the rule of law.

[21] It is always true that $\mu(1)\phi(1) < 1$, so this condition can only hold if $\alpha < 1$. In particular, there is a threshold $\overline{\alpha} = \phi(1)\mu(1)$ where the condition holds if $\alpha < \overline{\alpha}$.

[22] In equilibrium, the total number of rule-of-law countries could still rise if, for example, the parameter α increases. This could be due to technological progress that raises the importance of capital accumulation.

Although the world has a unique equilibrium distribution of institutional quality, the selection of which countries have $\lambda = 0$ and $\lambda = 1$ is not uniquely determined when they are ex ante identical.[23]

While incumbents are indifferent between $\lambda = 0$ and $\lambda = 1$, these economies are very different. Rule-of-law economies produce $q + \gamma\pi^*$, which is efficient, while economies with extractive institutions only produce q, which is inefficiently low. By engendering institutional specialization, trade leads to economic divergence.

4.3 Understanding institutional specialization

The logic behind institutional specialization can be illustrated by making two changes to the assumptions: first, countries in autarky; and second, an alternative political constraint implying a non-decreasing marginal cost of institutional quality from the perspective of incumbents.

Suppose a country has no access to international markets. Net exports of each good are zero ($x_E = 0$ and $x_I = 0$), which replaces the international budget constraint (5). Real GDP is $C = q^{1-\alpha}\gamma^{\alpha}\lambda^{\alpha}/((1-\alpha)^{1-\alpha}\alpha^{\alpha})$ and the marginal benefit of institutional quality is $\partial C/\partial\lambda = \gamma\pi^{1-\alpha}$, which depends on $\pi = \alpha q/((1-\alpha)\gamma\lambda)$, the market-clearing relative price of the investment good in the absence of international trade (see 12 and 13). Any extra output of the investment good must be sold in domestic markets without the option of exporting at the world price, so π declines as production increases. Since improvements in institutions raise output of the investment good but have no effect on endowments, the country-level marginal benefit of institutional quality is diminishing.

Proposition 7 *In autarky, incumbents' payoff C_p is a strictly quasi-concave function of λ, and the payoff-maximizing value of λ satisfies $0 < \hat{\lambda} < 1$, implying an intermediate degree of power sharing $p^\dagger < \hat{p} < \bar{p}$ and rents $r^\dagger < \hat{r} < \bar{r}$. The equilibrium $\hat{\lambda}$ is independent of q. Those in power would be strictly better off if international trade were possible (for any world price π^*) irrespective of whether $\lambda = 0$ or $\lambda = 1$ would be chosen. If $\lambda = 1$ were chosen with trade, real GDP and payoffs for workers and investors would be higher than under autarky. Access to world markets is Pareto improving for countries that adopt institutions with $\lambda = 1$. At the world level, trade reduces power sharing on average ($p^* = (1-\omega)p^\dagger + \omega\bar{p} < \hat{p}$) and increases incumbent rents ($r^* = (1-\omega)r^\dagger + \omega\bar{r} > \hat{r}$).*

PROOF See appendix A.7 ■

In autarky there is an interior solution $\hat{\lambda}$ for institutional quality. The first improvements to institutions have a very large marginal benefit because the investment good is scarce. As institutional quality rises, the scarcity of the investment good and its value are reduced. The optimal choice of institutional quality for those in power is where the marginal benefit equals the marginal cost.

Equilibrium institutional quality $\hat{\lambda}$ in autarky is not affected by the size of the endowment q because changes in quantities would lead to opposite changes in autarky prices, and total values are what matter to incumbents.

[23] An extension of the model with ex-ante differences between countries is analysed in section 4.6.

The first panel of Figure 2 below shows the consumption of an incumbent in a small open economy and in autarky as functions of institutional quality λ. The open-economy case is depicted for both an arbitrary world price π^* and a world price equal to the autarky equilibrium price $\hat{\pi}$. For an open economy that happens to face the autarky price in world markets and thus does not trade at $\lambda = \hat{\lambda}$, the payoff of incumbents is the same as in autarky. In both the open economy and in autarky, the marginal cost of institutional quality equals its marginal benefit. In autarky, that is the point where the incumbent payoff is maximized, but in an open economy, that is the point at which improvements in institutional quality begin to raise the incumbent payoff.

Figure 2: *Incumbent payoffs in open economies and autarky, and the world equilibrium*

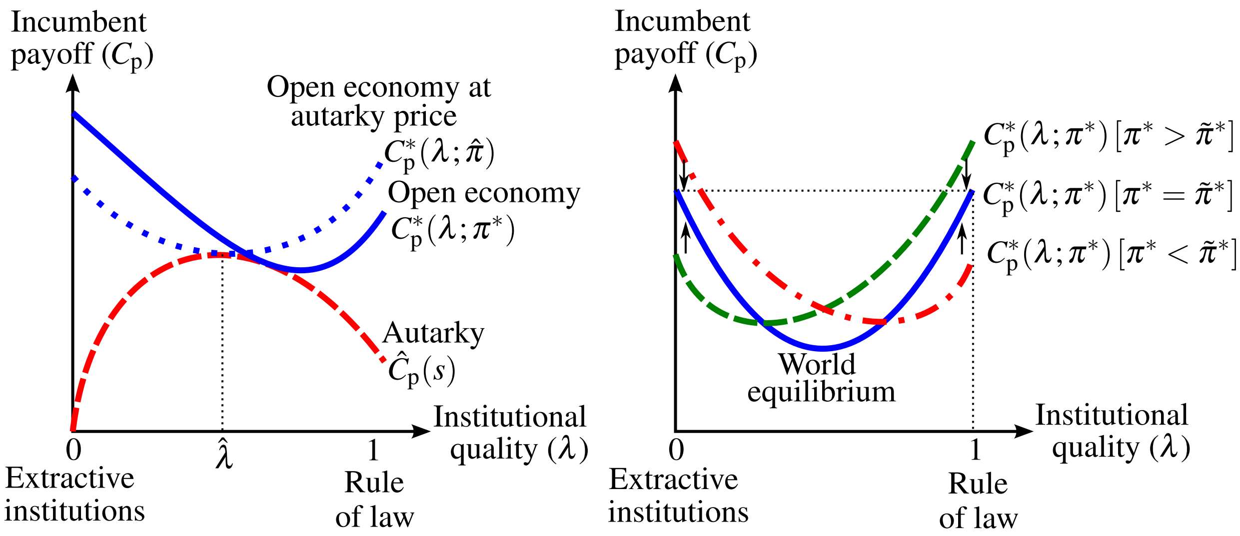


Figure 2 shows that there are gains from international trade for incumbents. This is because trade allows for institutional specialization. Some countries specialize in having the rule of law and gain a comparative advantage in producing institutionally-intensive investment goods. These goods are exported to countries that specialize in having extractive institutions in exchange for their endowment goods. In equilibrium, world markets clear where international prices adjust so that incumbents are indifferent between the two institutional extremes, as illustrated in the second panel of the figure ($\tilde{\pi}^*$ denotes the equilibrium world price). Comparative advantage in institutionally-intensive goods would be seen to explain observed trade flows, consistent with the evidence in Nunn and Trefler (2014). However, the pattern of comparative advantage here does not reflect any intrinsic differences between the countries: it is an endogenous outcome of institutional specialization.

Underlying this institutional specialization is the symbiotic relationship between despots and those in power in rule-of-law economies that arises from international trade. The existence of the rule of law elsewhere in the world allows an authoritarian regime to import what its own institutions preclude it from producing. The existence of extractive institutions elsewhere in the world allows a country with the rule of law to expand the institutionally-intensive sector of its economy because it can capture a greater share of the global market for such goods.

While trade allows institutional specialization, the decreasing marginal cost of institutional quality is what makes this specialization mutually beneficial for incumbents in countries with extractive institutions as well as those with the rule of law. For those in power in countries with weak institutions, improvements in institutional quality are very expensive, so it is mutually beneficial to import the benefits of better institutions from countries where the marginal cost to incumbents is low.

The special case of $\beta = 0$ in (9) is where there are constant returns to expanding the group in power. Using (19), incumbent rents r would be independent of power sharing p and institutional quality λ (see Proposition 2), and according to Proposition 3, the marginal cost of institutional quality would be constant ($\mu'(\lambda) = 0$). In this case, any distribution of institutional quality λ with mean $\hat{\lambda}$ across countries is a world equilibrium, including all countries sharing the same institutional quality $\hat{\lambda}$. If the marginal cost were increasing, $\mu'(\lambda) > 0$, the unique equilibrium would be $\lambda = \hat{\lambda}$.

As in the 'new trade theory' models of Krugman (1979, 1980), the case with a decreasing marginal cost of institutional quality predicts a substantial amount of trade between ex-ante identical economies. Those papers assume production technologies with increasing returns, so countries specialize in different varieties of goods to exploit economies of scale, and trade benefits all countries. Here, there are no increasing returns in production itself. There is a diminishing marginal cost of institutional quality from the perspective of those in power, which leads to specialization in institutions, and trade benefits those in power anywhere in the world irrespective of political system.

However, different from 'new trade theory', not all countries gain from trade here. While countries with $\lambda = 1$ have higher real GDP than in autarky — noting incumbents' share of real GDP declines with improvements in institutional quality — countries with low institutional quality actually lose by trading internationally.[24]

4.4 The effects of trade openness on political institutions

The key prediction of the model is that countries' ability to trade internationally gives rise to institutional specialization. To study how the degree of openness affects political institutions, this section relaxes the assumption that all goods are fully tradable in international markets. Instead, countries have an intermediate degree of openness between the extremes of frictionless trade and autarky.

Let σ be a parameter that represents the fraction of a country's endowment q and potential supply of investment goods γ that is tradable internationally (assumed to be the same for both goods). The remainder of these goods is non-tradable and can be used only for domestic consumption. Formally, net exports x_{E} and x_{I} must satisfy $x_{\mathrm{E}} \leq \sigma q$ and $x_{\mathrm{I}} \leq \sigma \gamma$ in addition to the international budget constraint (5). The parameter σ indexes the degree of openness, with $\sigma = 0$ and $\sigma = 1$ representing

[24] Closer to Krugman (1979), Chatterjee (2017) presents a model where aggregate income is assumed to be a convex function of the government's policy parameters. This implies there is an endogenous source of comparative advantage through differences in policies, but all countries gain from the trade that results.

respectively the special cases of autarky and frictionless international trade.

Proposition 8 *Suppose the partial openness constraints $x_{\mathrm{E}} \leq \sigma q$ and $x_{\mathrm{I}} \leq \sigma\gamma$ must hold:*

(i) If $\sigma < \alpha$ then there is a $\underline{\lambda} > 0$ such that $x_{\mathrm{E}} \leq \sigma q$ binds for $\lambda \in [0, \underline{\lambda})$. If $\sigma < 1 - \alpha(1 + q/(\gamma\pi^*))$ then there is a $\overline{\lambda} < 1$ such that $x_{\mathrm{I}} \leq \sigma\gamma$ binds for $\lambda \in (\overline{\lambda}, 1]$. C_{p} is quasi-convex for $\lambda \in [\underline{\lambda}, \overline{\lambda}]$.

(ii) C_{p} is maximized by a value of λ in $(0, \underline{\lambda})$ or $(\overline{\lambda}, 1)$ if

$$\sigma < \min\left\{\alpha, \frac{\alpha\gamma\pi^*}{\mu(0)\phi(0)q}, 1 - \frac{\alpha}{\mu(1)\phi(1)}, 1 - \alpha\left(1 + \frac{q}{\gamma\pi^*}\right)\right\},$$

where this threshold for σ lies between 0 and 1 for any world price π^* between the unrestricted-trade equilibrium price and the autarky price.

(iii) If $\lambda \in (0, \underline{\lambda})$ maximizes C_{p} then the equilibrium value of institutional quality λ is decreasing in openness σ. If $\lambda \in (\overline{\lambda}, 1)$ maximizes C_{p} then λ is increasing in openness σ.

(iv) If all countries have $0 < \sigma < 1$, where σ can be different across countries, but all have the same endowment q, then the world equilibrium must feature trade between countries and a non-degenerate distribution of institutional quality λ across countries.

PROOF See appendix A.8. ■

Intuitively, a partially open economy with a sufficiently low σ has a payoff C_{p} of those in power that is a quasi-convex function of λ only for a limited range of intermediate λ values where the constraints on trade do not bind. For low or high values of λ, the constraints become binding and the equilibrium values of λ move away from the extremes of 0 and 1 for sufficiently low openness (C_{p} can have a peak to the left and a peak to the right of the range where it is quasi-convex). There is still institutional specialization of countries in the world equilibrium in that some countries will have low λ and others high λ, but there is less polarization than all countries being pushed to 0 or 1. In this case, the proximity of countries to the extremes of institutional quality is increasing in the degree of openness σ. Empirical support for this prediction of the model is presented in section 5.

4.5 Policy implications

The theory of institutional specialization proposed here has some strong implications for how the problem of authoritarian regimes ought to be addressed. Suppose that a benevolent global power aims to improve political and economic outcomes around the world. The first policy instrument considered is the use of force to impose particular institutions on a country, rather than institutional quality λ being chosen by the country's own rulers. Offering aid payments conditional on the adoption of better institutions to persuade rulers to do what the benevolent power wants is another interpretation of this policy instrument — as carrot rather than stick. The second policy instrument considered is the imposition of tariffs τ in a country or countries (creating a wedge $\pi = (1+\tau)\pi^*$), rather than countries' own rulers choosing free trade ($\tau = 0$). Alternatively, this second instrument could be seen as a country or group of countries acting benevolently in choosing their own τ.

Proposition 9 *If a fraction ζ of economies is forced to set $\lambda = 1$ then the equilibrium fraction ω of economies with $\lambda = 1$ is unchanged as long as $\zeta \leq \omega_0$ for the initial ω_0 (if $\zeta > \omega_0$ then only those forced to will have $\lambda = 1$). If a fraction ζ of economies (all with $\lambda = 1$) implements a subsidy ($\tau < 0$) on the investment good then this raises the fraction of economies choosing $\lambda = 1$. If all countries set a subsidy $\tau = -(1 - \alpha/(1-\alpha)\xi)$ then all countries will choose $\lambda = 1$.*

PROOF See appendix A.9. ■

Perhaps surprisingly, direct intervention — even supposing it is feasible — turns out to have no effect whatsoever on the equilibrium fraction of countries with the rule of law, unless a point is reached where every country with good institutions has them imposed by external force. Owing to the strategic substitutability of political institutions, an exogenous shift of a country from authoritarianism to the rule of law must be counteracted in equilibrium by another country moving in the opposite direction. The key point here is that localized interventions are bound to fail owing to the general-equilibrium effects on incumbents' incentives in other countries.[25]

This negative result shifts the focus from 'supply-side' policies to 'demand-side' policies. If a group of benevolent countries were to subsidize consumption of institutionally-intensive goods then, all else equal, this would raise the world relative price of those goods and reduce the incentive for incumbents in other countries to choose extractive institutions.[26] The effects of this policy are analogous to an increase in the demand parameter α for investment goods.

4.6 Ex-ante heterogeneity across countries

The result that specialization in institutions arises without any ex-ante heterogeneity highlights the strength of the proposed mechanism in this paper, but leaves open the path taken by any particular country. This section presents an extension with ex-ante heterogeneity that explains which countries will be the ones to adopt extractive institutions.

Countries differ in their endowments $q(j)$. Given the world supply q^* of the endowment good, the distribution of relative endowments $v(j) = q(j)/q^*$ across countries has a continuous cumulative distribution function $F(v)$ with positive support and a mean of one.

In autarky, heterogeneity in endowments has no effect on either institutional quality or output of the investment good across countries (Proposition 7). Hence, any consequences of ex-ante heterogeneity in a world of open economies must be due to its impact on specialization and trade.

In an open economy, the reason for institutional specialization remains unchanged (Proposition 5). However, the selection of countries having extractive institutions is no longer arbitrary. The criterion in Proposition 5 for $\lambda = 1$ to be chosen by a country's incumbents determines selection with heterogeneity.

[25] A blockade of an authoritarian country, with the effect of returning it to autarky, is another possible policy instrument. However, that would also lead other countries to turn to authoritarianism in equilibrium.

[26] In reality, cartels of high-endowment countries might try to lower this relative price. See section 4.7.

Proposition 10 *There is a threshold $\tilde{v}$ such that those countries with $\lambda = 1$ in equilibrium all have low relative endowments $v \leq \tilde{v}$. There exists a unique equilibrium fraction ω of countries with $\lambda = 1$, which is the solution of the equation $\omega = F(\alpha/(1-\alpha)\xi\omega)$ and satisfies $0 < \omega < 1$. The equilibrium ω lies between the equilibrium with homogeneous endowments $\omega_0 = \alpha/((1-\alpha)\xi)$ and the fraction $\omega^* = F(1)$ of countries with an endowment below the global mean.*

PROOF See appendix A.10. ■

Economies with relatively small endowments attain the rule of law;[27] economies with large supplies of the endowment good are condemned to suffer extractive institutions.[28] As before, the world equilibrium features a mixture of regimes with extractive institutions and rule-of-law economies.

Figure 3 depicts the consumption of incumbents and per-person average consumption within a country for the cross-section of economies. The consumption of incumbents is strictly increasing in the country-specific endowment q, especially so for despots because the gradient reflects the share incumbents receive, which is greater in countries with extractive institutions (see 21). Consumption per person is also increasing in q, controlling for institutions. However, there is a discrete step down at the threshold for q between the rule of law and extractive institutions. Crucially, at least some and possibly all economies with a large endowment are poorer than those with endowments low enough to have the rule of law. The model thus gives rise to a natural resource curse.[29]

The equilibrium fraction of rule-of-law economies could be larger or smaller than in the case of ex-ante identical countries. However, the rule of law is more widespread when endowments are concentrated in a small group of countries.

4.7 A cartel of countries influencing world prices

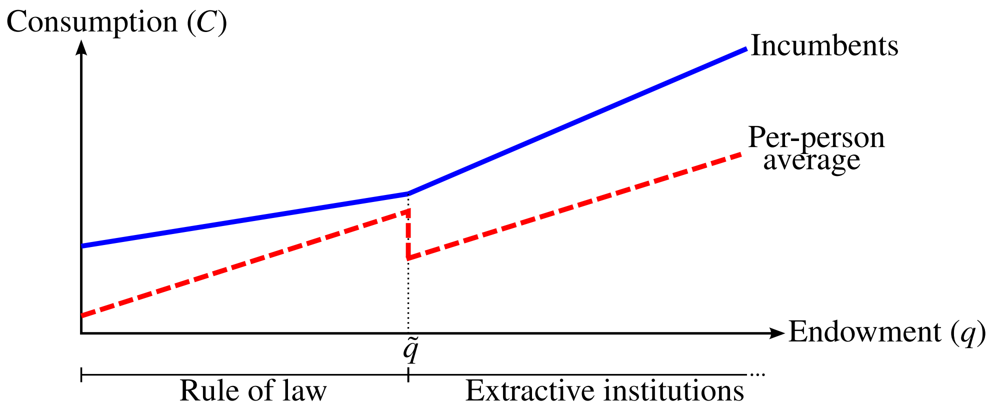
The policy prescriptions in section 4.5 call for subsidies to raise the price of rule-of-law intensive goods in world markets. Implementing this requires some degree of cooperation between countries. Sadly, it is easier to think of examples of international cooperation intended to lower the relative price of rule-of-law intensive goods. A cartel of countries with extractive institutions that exploits its market power to push up the price of natural resources effectively imposes a tariff on rule-of-law intensive goods.

[27]The output from an investment opportunity is normalized to one unit of the investment good, so q can also be interpreted as the size of the endowment relative to the potential production of the investment good in a country.

[28]Empirical studies have shown a link between the abundance of natural resources and extractive institutions. Identifying causality is not an easy task, but Tsui (2011) finds that oil discoveries have a negative effect on governance as measured by Polity scores.

[29]It is also possible to envisage ex-ante differences in the extent of political frictions across countries, as represented by the function $\phi(\lambda)$. In autarky, Proposition 7 shows these would lead to some countries having better institutions than others in equilibrium. These differences in $\hat{\lambda}$ would depend on the extent of the differences in $\phi(\lambda)$. When countries have access to world markets, the analysis is isomorphic to ex-ante differences in endowments. There would be a threshold for the measure of political frictions ξ from Proposition 5, and countries choose either $\lambda = 0$ or $\lambda = 1$ depending on whether they are above or below this threshold. Thus, international trade greatly amplifies even very small initial political and economic differences among countries.

Figure 3: *Ex-ante heterogeneity between countries*



The model is extended to include a positive measure of countries ς that act together as a cartel. To simplify the analysis, it is assumed the cartel acts collectively, abstracting from its internal dynamics. This means the cartel is essentially one large open economy with a government that maximizes the payoff of those in power. Different from before, the cartel knows that its choice of exports affects world prices. Formally, the cartel is a Stackelberg leader playing against an auctioneer who sets the world relative price π^*, with all other countries being price takers in world markets. The cartel moves first in choosing exports of the endowment good. Given this choice and the demand functions of the small open economies, the auctioneer chooses π^* to ensure that world markets clear.

Cartel members have a common endowment. Across the $1-\varsigma$ non-members there is a continuous distribution of relative endowments $v = q/q^*$ with distribution function $F(v)$ as in section 4.6.

Proposition 11 *Suppose the cartel optimally chooses $\lambda = 0$. The cartel's pricing strategy is isomorphic to a tariff on imports of rule-of-law intensive goods ($\pi = (1+\tau)\pi^*$ with $\tau > 0$ in the cartel). If the cartel were broken up and its former members instead acted as small open economies then the equilibrium fraction ω of countries with the rule of law would be higher.*

PROOF See appendix A.11. ■

The cartel's pricing strategy is standard: in order to exploit its market power, the cartel exports less of the endowment good at a higher price. This can be implemented by a tariff on imports of rule-of-law intensive goods. Trade theory points out that tariffs might be optimal for large countries because part of the tax is effectively paid by foreigners. But from the perspective of the world as a whole, tariffs create inefficiencies by inhibiting some mutually beneficial exchanges.

The analysis yields a novel implication: by reducing the relative price of the rule-of-law intensive good in world markets, the presence of the cartel raises incentives for extractive institutions elsewhere, which leads to a smaller fraction of countries with the rule of law in equilibrium. A cartel of countries with large endowments is therefore the exact opposite of the policy implication in Proposition 9 for fostering the rule of law.

5 Evidence from 19$^{\text{th}}$-century winds

International trade was conducted mainly by sailing ships up to 1865, and mainly by steam-powered vessels from 1875 onward, with a transitional period between 1865 and 1875. Exploring this revolution in shipping, Pascali (2017) constructs time series for the predicted volume of trade in many countries based on the interaction between geography and the available shipping technology, with the direction of prevailing winds playing a key role in the era of sail.

Changes in predicted trade can be seen as shocks to trade openness that are exogenous to individual countries.[30] Importantly, the transition from sail to steam affected the trade costs of countries in very different ways because (i) shipping times depend on wind patterns when sailing vessels are used, but not when steam-powered vessels are used, and (ii) the Suez canal, opened in 1869, was more suitable for steam-powered ships than sailing ships. Consequently, the introduction of steam-powered shipping led to large and heterogeneous shocks to trade openness across countries.

A key implication of the theory proposed in this paper is that moving from autarky to free trade engenders institutional specialization. Proposition 8 generalizes the argument to show that increasing the degree of trade openness pushes countries' institutions further towards the extremes. This section attempts to test this prediction using the exogenous shock to trade openness from Pascali (2017).[31]

The quality of countries' institutions is gauged using the Executive Constraints index produced by the Polity IV Project, a score from 1 to 7.[32] This is considered to be one of the leading measures of the extent of investors' protection against expropriation, which is what institutional quality means in the theory.[33] The executive constraints index is also a suitable proxy for power sharing because constraints on those in power can only be imposed by other people who hold power.[34] Recall that protection of property rights and sharing power go hand-in-hand in the model.

Pascali's (2017) predicted-trade data are available at a 5-yearly frequency and Polity data annu-

[30]It could be argued that the reduction in trade costs might also affect migration or even war in addition to its effects on openness to trade. However, these effects are likely to be small for most countries, and the direction of any possible bias this might create is unclear.

[31]The large expansion of Ricardian trade during the 19$^{\text{th}}$ century makes that era a good one to test the theoretical mechanism because the pattern of trade resembles the exchange of endowment/primary goods for investment/industrial goods emphasized in the model.

[32]The minimum score of 1 indicates "unlimited authority: no regular limitations on the executive's actions", a score of 3 indicates some real but limited restraints on the executive, a score of 5 indicates that the executive is subject to substantial constraints by accountability groups, and the maximum score of 7 indicates "executive parity or subordination". The distribution of scores is plotted in appendix B.1, with 1, 3, and 7 being the most common occurrences.

[33]According to Woodruff (2006), "The current measures of choice for broad institutions are the risk of expropriation developed by PRS, and the Polity IV measure of constraints on the executive."

[34]The Polity IV Dataset Users' Manual (Marshall, Gurr and Jaggers, 2016, p. 24) states that executive constraints "refer to the extent of institutionalized constraints on the decision making powers of chief executives, whether individuals or collectivities. Such limitations may be imposed by any accountability groups. In Western democracies these are usually legislatures. Other kinds of accountability groups are the ruling party in a one-party state; councils of nobles or powerful advisors in monarchies; the military in coup-prone polities; and in many states a strong, independent judiciary. The concern is therefore with the checks and balances between the various parts of the decision-making process."

ally. Political institutions, however, change slowly.[35] It therefore makes sense in testing the theory to disregard data for a reasonably long period around the shock to allow time for institutions to adjust. Furthermore, given the persistence in the data, replacing year-by-year observations of executive constraints scores with averages over longer periods more fairly represents the number of independent observations. Averaging also smooths out any short-lived changes in executive constraints.

The baseline specification averages the data over a pre-shock period 1841–1860 and a post-shock period 1881–1900 and discards observations in the intermediate transitional period. Pre- and post-shock periods of 15 or 25 years' length are also considered, as are shorter transitional periods. The sample comprises all countries in Pascali's (2017) data set for which executive constraints scores are available covering the whole period except for at most three years of missing data.[36] Note that the Polity IV Project only evaluates independent countries, so no colonies appear in the sample. A list of countries together with a full description of the data is found in appendix B.1.

Let $P_{i,b}$ and $P_{i,a}$ denote averages of the executive constraints scores of country i in the periods before and after the shock respectively. These provide measures of pre- and post-shock institutional quality. The log difference between post- and pre-shock predicted trade for country i is X_i, which is a measure of the size of the trade shock. Fortunately for the empirical analysis, there is substantial heterogeneity in X_i. In the baseline specification, X_i varies from less than 0.6 in Chile, Ecuador, El Salvador, and Peru to more than 1.25 in Morocco, Portugal, and Russia.

The empirical specification regresses $P_{i,a}$ on $P_{i,b}$, X_i, and the interaction between $P_{i,b}$ and X_i:

$$P_{i,a} = \psi_0 + \psi_1 P_{i,b} + \psi_2 X_i + \psi_3 P_{i,b} X_i + \varepsilon_i, \tag{26}$$

where ε_i is an error term. Assuming some inertia in political institutions or some heterogeneity as in section 4.6, the specialization due to trade predicted by the model translates into a positive coefficient ψ_3 of the interaction term. The trade shock would boost institutional quality in countries with relatively good institutions initially but hold back progress in countries with a bad start.

The regression (26) is estimated by (i) simple OLS; (ii) a Tobit regression where the upper limit of 7 on $P_{i,a}$ is imposed;[37] and (iii) a Probit regression where the dependent variable is replaced by an indicator of 1 for an improved score ($P_{i,a} > P_{i,b}$) and 0 otherwise.[38] The estimation results for the baseline specification are shown in Table 1.

The coefficient of the interaction term is positive and statistically significant at the usual levels in all of the OLS, Tobit, and Probit regressions. The results for different lengths of the transitional and pre- and post-shock periods are reported in appendix B.2. There, in the OLS and Tobit regressions,

[35] In the sample used here, the probability of a change in a country's executive constraints score from one year to the next is smaller than 4%. The low number of transitions in Polity IV data is consistent with strategic substitutability in the choice of institutions, but poses a challenge in empirical work.

[36] Specifications covering different time periods might therefore comprise slightly different countries.

[37] When the Tobit regression has a lower limit of 1 as well, statistical significance is typically lost because many countries have a score equal to 1 throughout the whole sample. But since there is a substantial improvement in the average executive constraints score during this period, a lower limit seems less important than an upper limit.

[38] Countries where the executive constraints score is at the maximum in the pre-shock period are excluded in (iii).

Table 1: *Baseline regression results*

Executive constraints (post-shock)	Pre: 1841–1860	Post: 1881–1900	
	OLS	Tobit	Probit
Constant	3.38	3.59	3.51
	(2.32) [0.15]	(2.61) [0.18]	(2.52) [0.16]
Executive constraints (pre-shock)	−0.43	−0.51	−2.21
	(0.69) [0.54]	(0.96) [0.60]	(1.00) [0.03]
Trade shock	−2.44	−3.37	−4.73
	(2.32) [0.30]	(2.61) [0.21]	(2.90) [0.10]
Executive constraints (pre-shock)	1.55	2.10	2.84
× Trade shock	(0.71) [0.04]	(1.04) [0.05]	(1.17) [0.02]
Countries	36	36	34

Notes: Standard errors are in parentheses and *p*-values are in brackets under the coefficients.

the interaction coefficient is usually positive, but it is statistically significant only in some cases. In the Probit regressions, the coefficient is always positive and usually statistically significant.

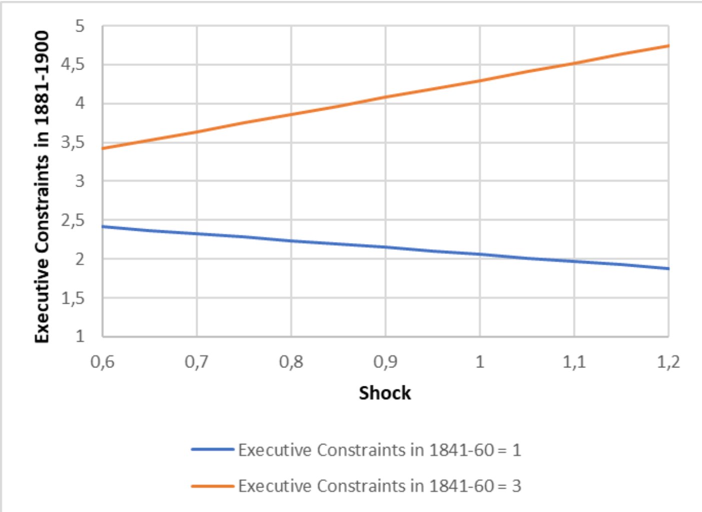
Figure 4 shows the post-shock executive constraints score predicted by the OLS regression for countries respectively with pre-shock scores of 1 and 3.[39] It reveals a pattern of institutional specialization for countries exposed to larger trade shocks. Among countries that have a large trade shock, those with an initial score of 1 show little improvement, whereas those with a score of 3 typically improve substantially. Things look very different for countries hit by small shocks: those with a initial score of 1 experience larger improvements, possibly owing to mean reversion.[40]

Figure 5 illustrates the polarizing effect of the trade shock on institutional quality. It plots weighted cumulative distribution functions of executive constraints scores for the pre-shock period 1841–1860 in the left panel and the post-shock period 1881–1900 in the right panel. Countries are divided into a small-shock group and a large-shock group based on whether their trade shocks are below or above the mean trade shock. Countries' executive constraints scores are weighted by the absolute distance between their trade shocks and the mean trade shock. Roughly speaking, this weighting reflects how each data point would affect the estimated coefficient of the trade shock in a regression. In the figure, a degenerate distribution would appear as a vertical line, while complete

[39]Predictions using the Tobit regression results are very similar.

[40]These empirical findings and the model in this paper imply that the trade shock is predicted to boost GDP in countries with higher executive constraints scores, but reduce GDP for those with low scores. That is exactly what Pascali (2017) finds. This paper thus provides a rationale for his empirical results.

Figure 4: *Marginal effects of the trade shock for countries with different initial conditions*



Notes: The graph shows predicted executive constraints scores according to the OLS estimation in Table 1.

polarization would appear as a horizontal line.

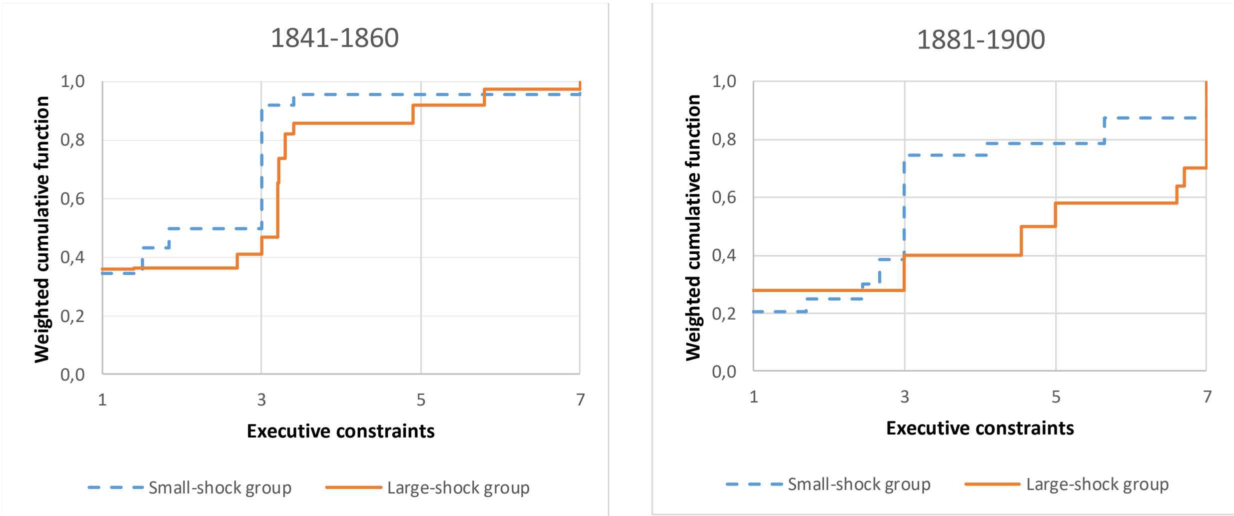
In the 1841–1860 period, the group of countries that will subsequently receive a large trade shock has a slightly better distribution of executive constraints scores than the group that will receive a small shock, but neither group appears to be more institutionally specialized than the other. However, by the 1881–1900 period, the distribution of executive constraints scores became noticeably more polarized for the large-shock group of countries than the small-shock group.[41]

While there is a strong case that the trade shock used here is exogenous, as in Pascali (2017) and other cross-country studies, it is not possible to rule out stories based on alternative shocks specific to a set of countries. For example, geographically close countries might be hit by similar shocks and move in the same direction for other reasons. Hence, the results should be treated with caution, providing suggestive but not conclusive evidence that the channels developed in the theoretical model might be playing an important role.

It is instructive to dig down into the experiences of particular countries. Very different countries on all continents remain with scores of 1 for the whole period: China, Haiti, Mexico, Morocco, Nicaragua, Oman, the Ottoman Empire, Persia, Russia, Siam, and Uruguay. Those transitioning from a score of 1 to intermediate scores are mostly Latin American countries in the small-shock group, with Austria-Hungary in the large-shock group as the main exception. Moreover, many countries remain with intermediate scores close to 3 for the whole period. Those that specialize in

[41]Unfortunately, it is difficult to investigate any pre-trends in Polity IV scores prior to 1840 owing to the scarcity of data covering the early 19th century.

Figure 5: *Weighted cumulative distribution functions of executive constraints*



Notes: The two panels depict the weighted CDFs of executive constraints for two groups of countries in the pre-shock and post-shock sub-periods. Executive constraints are weighted by the absolute distance between a country's trade shock and the mean trade shock. The small-shock and large-shock groups of countries comprise those with trade shocks below and above the mean, respectively. Trade shocks and weights are reported in appendix B.1.
Sources: Predicted trade data from Pascali (2017); Executive Constraints data from the Polity IV Project, Center for Systemic Peace (`http://www.systemicpeace.org/inscrdata.html`).

good institutions and attain high scores are mostly European countries in the large-shock group, with Costa Rica, Japan, and Chile (to an extent) as exceptions.

Russia, a relatively prosperous country in the 18th century that lost ground with the first wave of globalization, is a particularly interesting case in the large-shock group.[42] During the 18th and early 19th centuries, Russia was a powerful European country that went through modernizing reforms both in the reign of Peter the Great and in the age of the Russian Enlightenment.[43] However, in the 19th century, Russian rulers chose to remain with despotic institutions, and by the end of the century, Russia was one of the poorest countries in Europe (Nafziger, 2008). In contrast to the expansion of power sharing in other European countries at the time, Russia went through the whole 19th century without any kind of elected parliament and the lowest possible score for executive constraints.[44]

[42] Nafziger (2008) claims that "understanding what inhibited Russian economic development in the nineteenth century is an important task for economic historians."

[43] The expansion of the Russian empire was a sign of its power and development at the time. In the early 19th century, the Russians colonized Alaska and even founded settlements in California. Among other notable Russian sea exploration voyages, in 1820, a Russian expedition discovered the continent of Antarctica.

[44] Nicholas I ruled between 1825 and 1855, the time when Russian exports were becoming more expensive. He resisted any kind of power sharing and concentrated his existing powers even more, crushing demonstrations demanding power sharing and abolishing several areas of local autonomy (Bessarabia, Poland, and the Jewish Qahal).

6 Concluding remarks

For social scientists grappling with the welter of autocratic regimes around the world, one particular fact is noteworthy: the stubborn resistance to adopting the rule of law in spite of its proven success elsewhere. An important policy question is what can be done to bring about positive political change. The literature in political science has focused on country-specific factors that are seen as barriers to progress such as culture and history. This paper highlights the importance of thinking about the problem in general equilibrium at the world level.

The adoption of the rule of law increases output of goods that require strong protection of property rights and thus reduces their relative price. This increases incentives for those in power in other countries to choose autocracy. Whether or not this results in institutional specialization depends on the nature of the cost function faced by rulers when choosing institutional quality. This paper argues that the first steps to the rule of law have the greatest cost for rulers. The crucial cost associated with better institutions is the need to share power and rents. In places where power is shared more widely, each power base or branch of government buttressing the institutions is individually less important and thus receives lower rents. Hence the marginal cost associated with sharing power and strengthening institutions is smaller where institutional quality is already high.

This paper thus offers a theory of institutional specialization that implies globalization has fostered institutional development in many countries, but at the same time and for the same reason, has held down the Venezuelas and Nigerias of the world. The importance of this point cannot be exaggerated.

References

ACEMOGLU, D., JOHNSON, S. AND ROBINSON, J. (2005), "The rise of Europe: Atlantic trade, institutional change, and economic growth", *American Economic Review*, **95(3)**:546–579 (June). 3

ACEMOGLU, D. AND ROBINSON, J. A. (2000), "Why did the West extend the franchise? Democracy, inequality, and growth in historical perspective", *Quarterly Journal of Economics*, **115(4)**:1167–1199 (November). 4

ACEMOGLU, D., ROBINSON, J. A. AND VERDIER, T. (2017), "Asymmetric growth and institutions in an interdependent world", *Journal of Political Economy*, **125(5)**:1245–1305 (October). 4

ACEMOGLU, D., VERDIER, T. AND ROBINSON, J. A. (2004), "Kleptocracy and divide-and-rule: A model of personal rule", *Journal of the European Economic Association*, **2(2–3)**:162–192 (April–May). 4

ALESINA, A., TABELLINI, G. AND TREBBI, F. (2017), "Is Europe an optimal political area?", *Brookings Papers on Economic Activity*, **2017**:169–213 (Spring). 5

ANDERSON, J. E. AND MARCOUILLER, D. (2002), "Insecurity and the pattern of trade: An empirical investigation", *Review of Economics and Statistics*, **84(2)**:342–352 (May). 3

Araujo, L., Mion, G. and Ornelas, E. (2016), "Institutions and export dynamics", *Journal of International Economics*, **98**:2–20 (January). 3

Bai, J. H. and Lagunoff, R. (2011), "On the Faustian dynamics of policy and political power", *Review of Economic Studies*, **78(1)**:17–48. 4

Bourguignon, F. and Verdier, T. (2000), "Is financial openness bad for education? A political economy perspective on development", *European Economic Review*, **44(4–6)**:891–903 (May). 3

——— (2005), "The political economy of education and development in an open economy", *Review of International Economics*, **13(3)**:529–548 (August). 3

Cardoso, F. H. and Faletto, E. (1979), *Dependency and Development in Latin America*, University of California Press. 4

Caselli, F. and Cunningham, T. (2009), "Leader behaviour and the natural resource curse", *Oxford Economic Papers*, **61(4)**:628–650 (October). 4

Caselli, F. and Tesei, A. (2016), "Resource windfalls, political regimes, and political stability", *Review of Economics and Statistics*, **98(3)**:573–590 (July). 4

Chatterjee, A. (2017), "Endogenous comparative advantage, gains from trade and symmetry-breaking", *Journal of International Economics*, **109**:102–115 (November). 20

Frankel, J. A. and Romer, D. H. (1999), "Does trade cause growth?", *American Economic Review*, **89(3)**:379–399 (June). 4

Fukuyama, F. (1992), *The End of History and the Last Man*, Free Press. 5

——— (2011), *The Origins of Political Order: From Prehuman Times to the French Revolution*, Farrar, Straus and Giroux. 5

Gancia, G., Ponzetto, G. A. M. and Ventura, J. (2016), "Globalization and political structure", working paper 22046, NBER. 3

Gandhi, J. and Przeworski, A. (2007), "Authoritarian institutions and the survival of autocrats", *Comparative Political Studies*, **40(11)**:1279–1301 (November). 5

Giavazzi, F. and Tabellini, G. (2005), "Economic and political liberalizations", *Journal of Monetary Economics*, **52(7)**:1297–1330 (October). 4

Goorha, P. (2007), "Polarized futures", *Kyklos*, **60(1)**:65–75 (February). 5

Greif, A. (1993), "Contract enforceability and economic institutions in early trade: The Maghribi traders' coalition", *American Economic Review*, **83(3)**:525–548 (June). 3

——— (2006), *Institutions and the Path to the Modern Economy: Lessons from Medieval Trade*, Cambridge University Press. 3

Greif, A., Milgrom, P. and Weingast, B. R. (1994), "Coordination, commitment, and enforcement: The case of the merchant guild", *Journal of Political Economy*, **102(4)**:745–776 (August). 3

Guimaraes, B. and Sheedy, K. D. (2017), "Guarding the guardians", *Economic Journal*, **127(606)**:2441–2477 (November). 4

Huntington, S. (1993), *The Third Wave: Democratization in the Late Twentieth Century*, University of Oklahoma Press. 5

Jack, W. and Lagunoff, R. (2006), "Dynamic enfranchisement", *Journal of Public Economics*, **90(4–5)**:551–572 (May). 4

Krugman, P. R. (1979), "Increasing returns, monopolistic competition, and international trade", *Journal of International Economics*, **9(4)**:469–479 (November). 20

——— (1980), "Scale economies, product differentiation, and the pattern of trade", *American Economic Review*, **70(5)**:950–959 (December). 20

——— (1987), "The narrow moving band, the Dutch disease, and the competitive consequences of

Mrs. Thatcher: Notes on trade in the presence of dynamic scale economies", *Journal of Development Economics*, **27(1–2)**:41–55 (October). 4

LEVCHENKO, A. A. (2007), "Institutional quality and international trade", *Review of Economic Studies*, **74(3)**:791–819 (July). 3

——— (2013), "International trade and institutional change", *Journal of Law, Economics, & Organization*, **29(5)**:1145–1181 (October). 3

LÓPEZ-CÓRDOVA, J. E. AND MEISSNER, C. M. (2008), "The impact of international trade on democracy: A long-run perspective", *World Politics*, **60(4)**:539–575 (July). 4

MARSHALL, M. G., GURR, T. R. AND JAGGERS, K. (2016), *Polity IV Project Dataset Users' Manual*, Center for Systemic Peace. 25

MEHLUM, H., MOENE, K. AND TORVIK, R. (2006), "Institutions and the resource curse", *Economic Journal*, **116(508)**:1–20 (January). 4

MELITZ, M. J. (2005), "When and how should infant industries be protected?", *Journal of International Economics*, **66(1)**:177–196 (May). 4

MILGROM, P. R., NORTH, D. C. AND WEINGAST, B. R. (1990), "The role of institutions in the revival of trade: The Law Merchant, private judges, and the Champagne fairs", *Economics & Politics*, **2(1)**:1–23 (March). 3

NAFZIGER, S. (2008), "Communal institutions, resource allocation, and Russian economic development: 1861–1905", *Journal of Economic History*, **68(2)**:570–575 (June). 29

NUNN, N. (2007), "Relationship-specificity, incomplete contracts, and the pattern of trade", *Quarterly Journal of Economics*, **122(2)**:569–600 (May). 3

NUNN, N. AND TREFLER, D. (2014), "Domestic institutions as a source of comparative advantage", in E. Helpman, K. Rogoff and G. Gopinath (eds.), *Handbook of International Economics*, vol. 4, Elsevier. 3, 19

PASCALI, L. (2017), "The wind of change: Maritime technology, trade, and economic development", *American Economic Review*, **107(9)**:2821–2854 (September). 2, 4, 25, 26, 27, 28, 29, 46, 48

PUGA, D. AND TREFLER, D. (2014), "International trade and institutional change: Medieval Venice's response to globalization", *Quarterly Journal of Economics*, **129(2)**:753–821 (May). 3

ROBINSON, J. A., TORVIK, R. AND VERDIER, T. (2006), "Political foundations of the resource curse", *Journal of Development Economics*, **79(2)**:447–468 (April). 4

RODRIK, D. (1996), "Coordination failures and government policy: A model with applications to East Asia and Eastern Europe", *Journal of International Economics*, **40(1–2)**:1–22 (February). 4

ROSS, M. L. (2001), "Does oil hinder democracy?", *World Politics*, **53(3)**:325–361 (April). 4

SACHS, J. D. AND WARNER, A. M. (2001), "The curse of natural resources", *European Economic Review*, **45(4–6)**:827–838 (May). 4

TSUI, K. K. (2011), "More oil, less democracy: Evidence from worldwide crude oil discoveries", *Economic Journal*, **121(551)**:89–115 (March). 23

VAN DER PLOEG, F. (2011), "Natural resources: Curse or blessing?", *Journal of Economic Literature*, **49(2)**:366–420 (June). 4

WILLIAMSON, J. G. (2011), *Trade and Poverty: When the Third World Fell Behind*, MIT Press. 1

WOODRUFF, C. (2006), "Measuring institutions", in S. Rose-Ackerman (ed.), *International Handbook on the Economics of Corruption*, Edward Elgar, chap. 3. 25

ZISSIMOS, B. (2017), "A theory of trade policy under dictatorship and democratization", *Journal of International Economics*, **109**:85–101 (November). 3, 14

A Derivations of the theoretical results

A.1 Proof of Proposition 1

Take as given production q and K and the numbers of incumbents p, investors K, and workers $1-p-K$. Suppose there are competitive markets where investment goods can be exchanged for endowment goods at relative price π. Workers have incomes $Y_{\mathrm{w}} = q - T_{\mathrm{q}}$ in terms of the endowment good after a tax T_{q} is levied on the endowment. Investors have incomes $Y_{\mathrm{k}} = (q - T_{\mathrm{q}}) + (\pi - T_{\mathrm{k}})$, where T_{k} is a tax on producing capital. Incumbents have incomes $Y_{\mathrm{p}} = (q - T_{\mathrm{q}}) + R$, where R is a transfer payment to those in power. With these individual incomes $Y(i)$, each person maximizes $C(i)$ from (2) subject to the budget constraint $c_{\mathrm{E}}(i) + \pi c_{\mathrm{I}}(i) = Y(i)$. The first-order condition is $\alpha c_{\mathrm{E}}(i)/((1-\alpha)c_{\mathrm{I}}(i)) = \pi$, and substituting this into the budget constraint yields the demand functions and maximized consumption payoff in (12).

Suppose international trade is conducted by competitive import-export firms that choose x_{E} and x_{I} to maximize their profits subject to the trade budget constraint (5). Allow for a proportional tariff τ (if positive, or subsidy, if negative) imposed on imports of the investment good ($x_{\mathrm{I}} < 0$), which raises revenue $-\tau\pi^* x_{\mathrm{I}}$. The profits of a representative import-export firm are $-\pi x_{\mathrm{I}} + \tau\pi^* x_{\mathrm{I}} - x_{\mathrm{E}}$, which is equal to $((1+\tau)\pi^* - \pi)x_{\mathrm{I}}$ after imposing (5). There is no competitive equilibrium unless

$$\pi = (1+\tau)\pi^*, \tag{A.1}$$

as otherwise profits would be unbounded. Effectively, firms continue to adjust x_{I} until the domestic price π satisfies (A.1) and profits are zero in equilibrium. The tariff drives a wedge between the domestic market-clearing price π and the price π^* in world markets.[45] The government's budget constraint for taxes and transfers τ, T_{q}, T_{k}, and R is $pR = T_{\mathrm{q}} + T_{\mathrm{k}}K - \tau\pi^* x_{\mathrm{I}}$.

The economy's GDP at market prices in terms of the endowment good as numeraire is

$$Y = q + \pi K + (\pi^* - \pi)x_{\mathrm{I}}, \tag{A.2}$$

where the final term accounts for some production x_{I} being exported and sold at world price π^* rather than domestic price π. Observe that $pY_{\mathrm{p}} + KY_{\mathrm{k}} + (1-p-K)Y_{\mathrm{w}} = q + \pi K + pR - T_{\mathrm{q}} - T_{\mathrm{k}}K$ using the individual incomes Y_{p}, Y_{k}, and Y_{w} above. The government budget constraint implies $pY_{\mathrm{p}} + KY_{\mathrm{k}} + (1-p-K)Y_{\mathrm{w}} = q + \pi K - \tau\pi^* x_{\mathrm{I}} = Y$, where final expression uses (A.1) and the definition of GDP from (A.2).

Given production q and K and net exports x_{E} and x_{I}, it is claimed the domestic market-clearing price is

$$\pi = \frac{\alpha(q - x_{\mathrm{E}})}{(1-\alpha)(K - x_{\mathrm{I}})}. \tag{A.3}$$

Using the budget constraint of import-export firms, GDP (A.2) is equal to $Y = (q - x_{\mathrm{E}}) + \pi(K - x_{\mathrm{I}})$. Substituting the formula for π from (A.3) implies $Y = (q - x_{\mathrm{E}})/(1-\alpha)$ and $Y/\pi = (K - x_{\mathrm{I}})/\alpha$. The market-clearing conditions are identical to the resource constraints in (8). Note $pY_{\mathrm{p}} + KY_{\mathrm{k}} + (1-p-K)Y_{\mathrm{w}} = Y$ and use (12) to obtain the total consumption of endowment goods $pc_{\mathrm{pE}} + Kc_{\mathrm{kE}} + (1-p-K)c_{\mathrm{wE}} = (1-\alpha)Y = q - x_{\mathrm{E}}$. Similarly, total consumption of investment goods is $pc_{\mathrm{pI}} + Kc_{\mathrm{kI}} + (1-p-K)c_{\mathrm{wI}} = \alpha Y/\pi = K - x_{\mathrm{I}}$, confirming that markets clear at price (A.3).

Equation (12) shows that the real consumption payoff $C(i)$ from income $Y(i)$ is $C(i) = Y(i)/\pi^\alpha$. Defining real GDP as $C = Y/\pi^\alpha$ using the price deflator π^α, equation (A.3) and $Y = (q - x_{\mathrm{E}})/(1-\alpha)$ imply

$$C = \frac{Y}{\pi^\alpha} = \frac{(q - x_{\mathrm{E}})^{1-\alpha}(K - x_{\mathrm{I}})^\alpha}{(1-\alpha)^{1-\alpha}\alpha^\alpha}. \tag{A.4}$$

It follows immediately from $pY_{\mathrm{p}} + KY_{\mathrm{k}} + (1-p-K)Y_{\mathrm{w}} = Y$ that $pC_{\mathrm{p}} + KC_{\mathrm{k}} + (1-p-K)C_{\mathrm{w}} = C$.

Taking as given production q and K, power sharing p, and net exports x_{E} and x_{I}, the binding constraints in (11) show that the allocation of goods under the equilibrium institutions must maximize incumbents' con-

[45] Since π and π^* are relative prices in terms of the endowment good, the effects of a tariff on the endowment good are equivalent here to subsidizing the investment good, and vice versa.

sumption payoff $C_{\rm p} = c_{\rm pE}^{1-\alpha} c_{\rm pI}^{\alpha}/(1-\alpha)^{1-\alpha}\alpha^{\alpha}$ subject to the resource constraints (8) and workers and investors receiving consumption payoffs $c_{\rm wE}^{1-\alpha} c_{\rm wI}^{\alpha}/(1-\alpha)^{1-\alpha}\alpha^{\alpha} = C/(\beta+\delta p)$ and $c_{\rm kE}^{1-\alpha} c_{\rm kI}^{\alpha}/(1-\alpha)^{1-\alpha}\alpha^{\alpha} = (1+\theta)C/(\beta+\delta p)$ respectively. Note that C from (9) is independent of the allocation, conditional on production. The first-order conditions of this constrained maximization problem are

$$\frac{\alpha c_{\rm pE}}{(1-\alpha)c_{\rm pI}} = \frac{\alpha c_{\rm kE}}{(1-\alpha)c_{\rm kI}} = \frac{\alpha c_{\rm wE}}{(1-\alpha)c_{\rm wI}}, \tag{A.5}$$

which require that the marginal rates of substitution between investment and endowment goods are equalized across all individuals. The resulting allocation of goods across individuals must be Pareto efficient because this is exactly how an efficient allocation of goods is defined. Consumer behaviour (12) in a market economy implies $\alpha c_{\rm E}(i)/((1-\alpha)c_{\rm I}(i)) = \pi$ for all individuals i, so an economy with free exchange implements (A.5).

Given free exchange in domestic markets, the level of any tariff or subsidy τ from (A.1) determines net exports $x_{\rm E}$ and $x_{\rm I}$. Combining the international budget constraint (5), the link between domestic and world prices (A.1), and the domestic market-clearing price (A.3):

$$x_{\rm E} = \frac{\alpha q - (1-\alpha)(1+\tau)\pi^* K}{1+(1-\alpha)\tau}, \quad \text{and } x_{\rm I} = \frac{(1-\alpha)(1+\tau)\pi^* K - \alpha q}{(1+(1-\alpha)\tau)\pi^*}. \tag{A.6}$$

Substituting these into real GDP (A.4) shows that it can be expressed as the value of domestic production at international prices multiplied by a function of τ:

$$C = B(\tau)\frac{(q+\pi^*\gamma\lambda)}{\pi^{*\alpha}}, \quad \text{where } B(\tau) = \frac{(1+\tau)^{1-\alpha}}{1+(1-\alpha)\tau}, \tag{A.7}$$

with $B(\tau)$ representing the effects of any barriers to trade on real GDP.

Using $pC_{\rm p} + KC_{\rm k} + (1-p-K)C_{\rm w} = C$ it follow that $C_{\rm p} = (C - KC_{\rm k} - (1-p-K)C_{\rm w})/p$. Hence, conditional on production q and K and power sharing p, for the given values of $C_{\rm k}$ and $C_{\rm w}$ consistent with the binding incentive and political constraints, the equilibrium institutions must have net exports $x_{\rm E}$ and $x_{\rm I}$ maximize real GDP C subject to the trade budget constraint (5). By varying τ over its maximum range $-1 < \tau < \infty$, (A.6) shows that $x_{\rm E}$ and $x_{\rm I}$ take on the full range of values consistent with (5) and non-negative consumption in the resource constraints (8), so this choice of trade policy is equivalent to choosing τ to maximize C in (A.7), which is efficient. This is in turn equivalent to having τ maximize $B(\tau)$.

Using the expression for $B(\tau)$ from (A.7) yields $B'(\tau) = -\alpha(1-\alpha)(1+\tau)^{-\alpha}\tau/(1+(1-\alpha)\tau)^2$, which is equal to zero only if $\tau = 0$. Evaluating the second derivative at $\tau = 0$ gives $B''(0) = -\alpha(1-\alpha) < 0$, from which it follows that $B(\tau)$ is a strictly quasi-concave function that is maximized at $\tau = 0$ where $B(0) = 1$. The equilibrium institutions can therefore be implemented by allowing unrestricted international trade, resulting in $\pi = \pi^*$ from (A.1). The nominal and real GDP given in (14) then follow from (A.2) and (A.7).

A.2 Proof of Proposition 2

Since $C_{\rm p} = s_{\rm p}(p,\lambda)C$, and C is independent of p for a given value of λ, it follows that the equilibrium value of power sharing p must maximize $s_{\rm p}(p,\lambda)$ from (16). Differentiating with respect to p, holding λ constant:

$$\frac{\partial s_{\rm p}(p,\lambda)}{\partial p} = \frac{1}{p}\left(\frac{1}{\beta+\delta p} + \frac{\delta(1-p+\gamma\theta\lambda)}{(\beta+\delta p)^2}\right) - \frac{1}{p^2}\left(1 - \frac{(1-p+\gamma\theta\lambda)}{\beta+\delta p}\right),$$

and by substituting back $s_{\rm p}(p,\lambda)$ from (16), noting $(1-p+\gamma\theta\lambda)/(\beta+\delta p) = 1 - ps_{\rm p}(p,\lambda)$, leads to

$$\frac{\partial s_{\rm p}(p,\lambda)}{\partial p} = \frac{1}{p}\left(\frac{1+\delta(1-ps_{\rm p}(p,\lambda))}{\beta+\delta p} - s_{\rm p}(p,\lambda)\right). \tag{A.8}$$

Partially differentiating with respect to p again:

$$\frac{\partial^2 s_{\rm p}(p,\lambda)}{\partial p^2} = -\frac{\delta}{p}\left(\frac{s_{\rm p}(p,\lambda) + p\frac{\partial s_{\rm p}(p,\lambda)}{\partial p}}{\beta+\delta p} + \frac{1+\delta(1-ps_{\rm p}(p,\lambda))}{(\beta+\delta p)^2}\right) - \frac{1}{p}\frac{\partial s_{\rm p}(p,\lambda)}{\partial p} - \frac{1}{p}\frac{\partial s_{\rm p}(p,\lambda)}{\partial p},$$

which uses the expression for the first derivative from (A.8). By rearranging this expression:

$$\frac{\partial^2 s_\mathrm{p}(p,\lambda)}{\partial p^2} = -\frac{\delta(1+\delta+\beta s_\mathrm{p}(p,\lambda))}{(\beta+\delta p)^2 p} - \left(\frac{2}{p} + \frac{\delta}{\beta+\delta p}\right)\frac{\partial s_\mathrm{p}(p,\lambda)}{\partial p}, \tag{A.9}$$

and hence evaluating the second derivative at a point where $\partial s_\mathrm{p}(p,\lambda)/\partial p = 0$ implies $\partial^2 s_\mathrm{p}(p,\lambda)/\partial p^2 = -\delta(1+\delta+\beta s_\mathrm{p}(p,\lambda))/((\beta+\delta p)^2 p)$, which is unambiguously negative. This establishes $s_\mathrm{p}(p,\lambda)$ is globally quasi-concave in p for any given value of λ.

As $\beta < 1$, equation (16) shows $s_\mathrm{p}(p,\lambda)$ is negative as p approaches zero, so the global maximum cannot be at $p = 0$. The first-order condition $\partial s_\mathrm{p}(p,\lambda)/\partial p = 0$ is necessary and sufficient for an interior global maximum. Setting (A.8) to zero, cancelling $1/p$, multiplying both sides by $\beta+\delta p$, and rearranging leads to $\delta(1 - p s_\mathrm{p}(p,\lambda)) = (\beta+\delta p)s_\mathrm{p}(p,\lambda) - 1$. Since $\beta+\delta p = 1/s_\mathrm{w}$ and $s_\mathrm{p}/s_\mathrm{w} = 1+r$ according to (15) and (17), this confirms that the first-order condition is equivalent to (18). Using the same pair of equations again from (15) and (17) implies $s_\mathrm{p} = (1+r)/(\beta+\delta p)$ and hence $1 - p s_\mathrm{p} = (\beta+(\delta-1)p - rp)/(\beta+2\delta p)$. Together with the first-order condition (18) it follows that $(\beta+\delta p)r = \delta(\beta+(\delta-1)p-rp)$. Rearranging this equation leads to $(\beta+2\delta p)r = ((\delta-1)/2)(\beta+2\delta p)+\beta(1+\delta)/2$ and dividing both sides by $\beta+2\delta p$ confirms equation (19).

The second equations from (15) and (17) express s_k and s_p relative to the worker share s_w. Substituting into the first equation from (15) implies $(p(1+r)+\gamma\lambda(1+\theta)+1-p-\gamma\lambda)s_\mathrm{w} = 1$, which simplifies to $1+\gamma\theta\lambda+rp = 1/s_\mathrm{w}$. Noting $1/s_\mathrm{w} = \beta+\delta p$ from the third equation in (15), it follows that $(\delta - r)p = 1-\beta+\gamma\theta\lambda$. Dividing both sides by p yields equation (20).

Since $0 < \beta < 1$, equation (19) implies a negative relationship between r and p, while equation (20) implies a positive relationship. Any solution must therefore be unique. With $p = 0$, (19) yields $r = \delta$, and it can be seen that r never declines below the positive number $(\delta-1)/2$, recalling that $\delta > 1$. Equation (20) implies r is negative for p close to zero, and that r never rises above δ as p becomes larger. Any solution must therefore have strictly positive p, and a solution with $p < 1-\gamma$ (to ensure there are sufficient non-incumbents to receive γ investment opportunities) exists for all $\lambda \in [0,1]$ if and only if the value of r implied by (19) is less than that implied by (20) at $p = 1-\gamma$ and $\lambda = 1$. Rearranging that inequality shows it is equivalent to

$$(1+\delta)(\beta+\delta(1-\gamma)) - (1-\beta+\gamma\theta)\left(2\delta + \frac{\beta}{1-\gamma}\right) > 0.$$

The left-hand side is strictly decreasing in γ. It is positive for $\gamma = 0$ because $(1+\delta)(\beta+\delta) - (1-\beta)(2\delta + \beta) = \beta^2 + 3\beta\delta + \delta(\delta-1) > 0$, and negative for γ close to one. It follows that there is a threshold $\overline{\gamma}(\beta,\delta,\theta)$ such that $\gamma < \overline{\gamma}(\beta,\delta,\theta)$ ensures existence of an interior solution for any $\lambda \in [0,1]$.

An increase in λ implies the r from (20) is lower for any given value of p, while it has no effect on the relationship between r and p in (19). Therefore, higher λ leads to lower r and higher p.

To solve for $r(\lambda)$ and $p(\lambda)$ explicitly, note that equation (19) can be written as $\delta - r = (1+\delta)(1 - \beta/(\beta+2\delta p))/2$, which simplifies to $(\delta-r)(2\delta+\beta/p) = \delta(1+\delta)$. Equation (20) can be rearranged to show $1/p = (\delta-r)/(1-\beta+\gamma\theta\lambda)$. Substituting into the earlier equation to eliminate p:

$$\beta(\delta-r)^2 + 2\delta(1-\beta+\gamma\theta\lambda)(\delta-r) - \delta(1+\delta)(1-\beta+\gamma\theta\lambda) = 0. \tag{A.10}$$

This is a quadratic equation in $\delta - r$, with the product of roots equal to $-\delta(1+\delta)(1-\beta+\gamma\theta\lambda)/\beta$. Hence, there is one positive and one negative root. Since r must be less than δ, the solution is the positive root

$$\delta - r = \frac{-\frac{\delta(1+\delta)(1-\beta+\gamma\theta\lambda)}{\beta}}{\frac{-2\delta(1-\beta+\gamma\theta\lambda) - \sqrt{4\delta^2(1-\beta+\gamma\lambda\theta)^2 + 4\beta\delta(1+\delta)(1-\beta+\gamma\theta\lambda)}}{2\beta}} = \frac{1+\delta}{1+\sqrt{1+\frac{\beta(1+\delta)}{\delta(1-\beta+\gamma\theta\lambda)}}},$$

and rearranging leads to the solution that is claimed. The solution for p is then obtained by substituting for r in (20).

A.3 Proof of Proposition 3

The incumbent share as a function of λ is $\phi(\lambda) = s_p(p(\lambda), \lambda)$ in terms of $s_p(p, \lambda)$ from (16) and $p(\lambda)$ from Proposition 2. Using the third equation in (15) and (17) leads to $s_p = (1+r)/(\beta + \delta p)$. Equation (19) implies $1+r = ((1+\delta)/2)(1+\beta/(\beta+2\delta p))$, which simplifies to $1+r = (1+\delta)(\beta+\delta p)/(\beta+2\delta p)$. Combined with the equation for s_p above, this gives $s_p = (1+\delta)/(\beta+2\delta p)$. Equation (19) directly implies $(1+\delta)/(\beta+2\delta p) = (2/\beta)(r-(\delta-1)/2)$, confirming the expression for $\phi(\lambda)$ in (21) when evaluated at $r = r(\lambda)$. Since $r'(\lambda) < 0$, it immediately follows that $\phi'(\lambda) < 0$.

As $p = p(\lambda)$ maximizes the incumbent share $s_p(p, \lambda)$ in (16) for given λ, the envelope theorem implies $\phi'(\lambda) = \partial s_p(p, \lambda)/\partial \lambda = -\gamma\theta/(\beta+\delta p)p$. Equation (22), which follows directly by differentiating (21), gives the definition $\mu(\lambda) = -\phi'(\lambda)/\phi(\lambda)^2$. Equation (15) and $\phi(\lambda) = s_p$ therefore imply that $\mu(\lambda) = \gamma\theta s_w/(p s_p^2)$. Stating this as $\mu(\lambda) = \gamma\theta/((s_p/s_w)(p s_p))$ and using (17) and (18) to write $s_p/s_w = 1+r$ and $p s_p = 1-(r/\delta)$, the marginal cost of institutional quality is

$$\mu(\lambda) = \frac{\gamma\theta}{(1+r)\left(1-\frac{r}{\delta}\right)} = \frac{\delta\gamma\theta}{\delta+(\delta-1)r-r^2} = \frac{\delta\gamma\theta}{\delta+\left(\frac{\delta-1}{2}\right)^2-\left(r-\frac{\delta-1}{2}\right)^2}.$$

These expressions follow by expanding the brackets and completing the square, and confirm (23) by noting $\delta + ((\delta-1)/2)^2 = ((1+\delta)/2)^2$ and evaluating at $r = r(\lambda)$. Equation (23) shows $\mu(\lambda)$ is positively related to $r(\lambda)$ because it is known $r(\lambda) > (\delta-1)/2$. Since Proposition 2 demonstrates $r'(\lambda) < 0$, it follows immediately that $\mu'(\lambda) < 0$.

A.4 Proof of Proposition 4

To determine the conditions for efficiency in production of capital, take a given consumption payoff C_w for workers. With a binding incentive compatibility constraint (6), the consumption of investors must be $C_k = (1+\theta)C_w$ and the number of investors is $K = \gamma\lambda$ (see 11). With an efficient allocation of resources, Proposition 1 shows that the consumption payoffs must satisfy $pC_p + KC_k + (1-p-K)C_w = C$, where C is real GDP from (14). Substituting for C_k and K and solving for the incumbent consumption payoff yields $C_p = (C - (1-p+\gamma\theta\lambda)C_w)/p$. Taking p as given and holding C_w and C_k constant, the effect of changing λ on C_p is $\partial C_p/\partial\lambda = (\partial C/\partial\lambda - \gamma\theta C_w)/p$. Hence, if $\partial C/\partial\lambda > \gamma\theta C_w$ then production of capital is not efficient and λ should be increased if it is less than one.

Equations (15), (16), (22), and $\phi(\lambda) = s_p$ imply $\phi'(\lambda) = -\gamma\theta s_w/p$ and $\mu(\lambda) = \gamma\theta s_w/(p s_p^2)$. Hence dividing $\mu(\lambda)C_p = \gamma\theta C_p/((s_p/s_w)(p s_p))$ by $\gamma\theta C_w$ yields $\mu(\lambda)C_p/\gamma\theta C_w = 1/p s_p$ noting that $C_p/C_w = s_p/s_w$. Using (18) to deduce $p s_p = 1-(r/\delta)$, the ratio of the costs $\mu(\lambda)C_p$ and $\gamma\theta C_w$ is

$$\frac{\mu(\lambda)C_p}{\gamma\theta C_w} = 1+\chi(\lambda), \quad \text{where } \chi(\lambda) = \frac{r(\lambda)}{\delta - r(\lambda)}. \tag{A.11}$$

Since rents $r(\lambda)$ are strictly positive and less than δ, the function $\chi(\lambda)$ is always positive, so $\mu(\lambda)C_p$ is always greater than $\gamma\theta C_w$. With $\chi(\lambda)$ is positively related to rents $r(\lambda)$ and as $r'(\lambda) < 0$, the function $\chi(\lambda)$ is decreasing in institutional quality λ.

A.5 Proof of Proposition 5

With π^* is taken as given by a small open economy, it follows that C in (14) is linear in λ, and thus $\partial^2 C/\partial\lambda^2 = 0$. Using (24), the second derivative of C_p evaluated at a critical point is therefore $-\phi(\lambda)\mu'(\lambda)C_p$, which is strictly positive because $\mu'(\lambda) < 0$ according to Proposition 3. Therefore, C_p is a strictly quasi-convex function of λ, and the maximum value of C_p is found at either $\lambda = 0$ or $\lambda = 1$. The differences between r and p with these two values of λ follow immediately from Proposition 2.

Using (14) and (21), the consumption payoff received by those in power is $C_p = \phi(\lambda)(q+\gamma\pi^*\lambda)/\pi^{*\alpha}$. The value $\lambda = 1$ is optimal if $\phi(1)(q+\gamma\pi^*)/\pi^{*\alpha} \geq \phi(0)q/\pi^{*\alpha}$, which is equivalent to $\gamma\pi^* \geq ((\phi(0) -$

$\phi(1))/\phi(1))q$. Using the formula for $\phi(\lambda)$ in terms of $r(\lambda)$ from (21) and the definitions $r^\dagger = r(0)$ and $\bar{r} = r(1)$ yields the formula for ξ that is claimed.

A.6 Proof of Proposition 6

The equilibrium world price is (25), and endowments are equal across countries, so $q = q^*$. Given a fraction ω of countries where $\lambda = 1$, the world supply of investment goods is $K^* = \gamma\omega$, which implies $\pi^* = \alpha q/((1-\alpha)\gamma\omega)$. Proposition 5 shows that the condition for $\lambda = 1$ to be optimal for those in power is $\gamma\pi^* \geq \xi q$, which is therefore equivalent to $\alpha q/((1-\alpha)\omega) \geq \xi q$. Cancelling q from both sides shows that $\lambda = 1$ is the equilibrium in a country if $\omega \leq \alpha/((1-\alpha)\xi)$.

Now consider the world equilibrium value of ω. The value of λ in each country must be an equilibrium given the world price π^* (λ is either 0 or 1), and world markets must clear given the fraction ω of countries with $\lambda = 1$. There cannot be an equilibrium with $\omega = 0$ because this would satisfy the condition $\omega \leq \alpha/((1-\alpha)\xi)$ for incumbents in all countries to have an incentive to choose $\lambda = 1$, resulting in $\omega = 1$.

If the political friction is relevant there cannot be an equilibrium with $\omega = 1$, and it is claimed this occurs when α is below an upper bound $\overline{\alpha} < 1$ with $\overline{\alpha} = \mu(1)\phi(1)$. The definition of $\mu(\lambda)$ in (22) is equivalent to $\mu(\lambda) = \mathrm{d}\phi(\lambda)^{-1}/\mathrm{d}\lambda$, so it follows that $\int_0^1 \mu(\lambda)\mathrm{d}\lambda = \phi(1)^{-1} - \phi(0)^{-1}$. As $\mu(\lambda)$ is a strictly decreasing function (Proposition 3), $\int_0^1 \mu(\lambda)\mathrm{d}\lambda > \mu(1)$ and thus $\mu(1) < \phi(1)^{-1} - \phi(0)^{-1}$, which implies $\mu(1)\phi(1) < 1 - (\phi(1)/\phi(0)) < 1$. Hence, $\overline{\alpha} = \mu(1)\phi(1) < 1$. The definition of ξ in Proposition 5 is equivalent to $\xi = (\phi(0)/\phi(1)) - 1$ using (21), and hence $1 - (\phi(1)/\phi(0)) = \xi/(1+\xi)$. If $\alpha < \overline{\alpha}$ then $\alpha < 1 - (\phi(1)/\phi(0)) = \xi/(1+\xi)$ and rearranging this implies $\alpha/((1-\alpha)\xi) < 1$. If there were an equilibrium with $\omega = 1$ then this would mean $\omega > \alpha/((1-\alpha)\xi)$, indicating incumbents in all countries have incentives to choose $\lambda = 0$, implying $\omega = 0$.

Finally, consider the possibility of an equilibrium with $0 < \omega < 1$. This requires that incumbents in some countries choose $\lambda = 0$ and others choose $\lambda = 1$. Since incumbents in all ex-ante identical countries share the same optimality condition for $\lambda = 1$, this condition must hold with equality and hence $\omega = \alpha/((1-\alpha)\xi)$, confirming the formula for ω that is given. The earlier inequality for ξ establishes that $0 < \omega < 1$. The equilibrium world price π^* follows from substituting the expression for ω into (25) with $q^* = q$. This is the unique world equilibrium.

Since the optimality condition for $\lambda = 1$ holds with equality, incumbents receive the same payoff from $\lambda = 0$ and $\lambda = 1$ in equilibrium, so $C_\mathrm{p}^\dagger = \bar{C}_\mathrm{p}$. Using (14), the equilibrium levels of real GDP for $\lambda = 0$ and $\lambda = 1$ countries are $C^\dagger = q/\pi^{*\alpha}$ and $\bar{C} = (q + \gamma\pi^*)/\pi^{*\alpha}$, with the latter clearly being larger than the former. Since the incentive constraint is binding (11), the utility (3) of an investor is $\log C_\mathrm{w}$, which moves in line with the consumption of a worker. Using the definition of incumbent rents in (17), $C_\mathrm{w} = C_\mathrm{p}/(1+r)$, so $C_\mathrm{w}^\dagger = C_\mathrm{p}^\dagger/(1+r^\dagger) < \bar{C}_\mathrm{p}/(1+\bar{r}) = \bar{C}_\mathrm{w}$, hence workers and investors in countries with $\lambda = 1$ are strictly better off than workers in $\lambda = 0$ countries (where there are no investors).

Noting $\partial C/\partial\lambda = \gamma\pi^{*1-\alpha}$ from (14) and $\mu(\lambda)C_\mathrm{p} = (1+\chi(\lambda))\gamma\theta C_\mathrm{w}$ from (A.11) in the proof of Proposition 4, the derivative of C_p with respect to λ from (22) can be written as $\partial C_\mathrm{p}/\partial\lambda = \phi(\lambda)(\gamma\pi^{*1-\alpha} - (1+\chi(\lambda))\gamma\theta C_\mathrm{w})$. For $\lambda = 1$ to be optimal in some countries it must be the case that $\partial C_\mathrm{p}/\partial\lambda \geq 0$ at $\lambda = 1$, hence $\gamma\pi^{*1-\alpha} \geq (1+\chi(1))\gamma\theta\bar{C}_\mathrm{w}$. Since Proposition 4 demonstrates $\chi(1) > 0$, it follows that $\partial C/\partial\lambda > \gamma\theta\bar{C}_\mathrm{w}$, confirming $\lambda = 1$ is efficient. Proposition 1 shows the equilibrium institutions achieve efficiency in respect of the allocation of goods. With $\bar{C}_\mathrm{w} > C_\mathrm{w}^\dagger$, it follows that $\partial C/\partial\lambda = \gamma\pi^{*1-\alpha} > \gamma\theta C_\mathrm{w}^\dagger$ in the countries with $\lambda = 0$ because they face the same world price π^*. Therefore, $\lambda = 0$ means that production of capital is inefficiently low.

A.7 Proof of Proposition 7

Using (21) and (22), the derivative of the incumbent payoff with respect to institutional quality is $\partial C_\mathrm{p}/\partial\lambda = \phi(\lambda)(\partial C/\partial\lambda - \mu(\lambda)\phi(\lambda)C)$. In autarky, real GDP is $C = q^{1-\alpha}\gamma^\alpha\lambda^\alpha/((1-\alpha)^{1-\alpha}\alpha^\alpha)$ from (A.4) in the proof of Proposition 1, where that equation does not depend on whether the country trades internationally. This implies that $\partial C/\partial\lambda = \alpha q^{1-\alpha}\gamma^{\alpha}\lambda^{\alpha-1}/((1-\alpha)^{1-\alpha}\alpha^{\alpha})$, or $\partial C/\partial\lambda = \gamma\pi^{1-\alpha}$, where the market-clearing relative price is $\pi = \alpha q/((1-\alpha)\gamma\lambda)$ using (A.3). Since $0<\alpha<1$, as λ approaches zero, $\partial C/\partial\lambda$ is unbounded while C tends to zero. As $\mu(0)$ and $\phi(0)$ are positive and finite, $\partial C_{\mathrm{p}}/\partial\lambda$ is strictly positive in a neighbourhood of $\lambda=0$, so the equilibrium value of $\hat{\lambda}$ must be strictly positive.

Noting the marginal benefit of institutional quality is $\partial C/\partial\lambda = \alpha C/\lambda$, the derivative of the incumbent payoff can be written as $\partial C_{\mathrm{p}}/\partial\lambda = \phi(\lambda)C(\alpha-\lambda\mu(\lambda)\phi(\lambda))/\lambda$, where $\phi(\lambda)$ and C are strictly positive for $\lambda>0$. With the parameter restriction to ensure the political friction is binding, $\alpha<\mu(1)\phi(1)$, and this implies $\partial C_{\mathrm{p}}/\partial\lambda$ is negative in a neighbourhood of $\lambda=1$.

Taking the equation for rents $r(\lambda)$ as a function of λ given in (A.10) from the proof of Proposition 2, the variables r and λ are linked by $\beta(\delta-r)^2+2\delta(1-\beta+\gamma\theta\lambda)(\delta-r)-\delta(1+\delta)(1-\beta+\gamma\theta\lambda)=0$. Since $\delta(1+\delta)-2\delta(\delta-r)=2\delta(r-(\delta-1)/2)$, λ can be expressed as a function of $r(\lambda)$:

$$\lambda = \frac{\beta\left(\delta-r(\lambda)\right)^2-2\delta(1-\beta)\left(r(\lambda)-\frac{\delta-1}{2}\right)}{2\delta\gamma\theta\left(r(\lambda)-\frac{\delta-1}{2}\right)}.$$

The formula for $\mu(\lambda)$ in (23) can be written as $\mu(\lambda)=\delta\gamma\theta/((1+r(\lambda))(\delta-r(\lambda)))$. Together with $\phi(\lambda)$ in terms of $r(\lambda)$ from (21):

$$\lambda\mu(\lambda)\phi(\lambda) = \frac{\beta\left(\delta-r(\lambda)\right)^2-2\delta(1-\beta)\left(r(\lambda)-\frac{\delta-1}{2}\right)}{\beta\left(1+r(\lambda)\right)\left(\delta-r(\lambda)\right)}.$$

Define the following quadratic function of r:

$$Q(r)=\alpha\beta(1+r)(\delta-r)-\beta(\delta-r)^2+2\delta(1-\beta)\left(r-\frac{\delta-1}{2}\right),$$

using which the derivative of the incumbent payoff can be written as $\partial C_{\mathrm{p}}/\partial\lambda = \phi(\lambda)CQ(r(\lambda))/(\beta\lambda(1+r(\lambda))(\delta-r(\lambda)))$. Since all terms are known to be positive for $\lambda>0$ except $Q(r(\lambda))$, the first-order condition $\partial C_{\mathrm{p}}/\partial\lambda=0$ can only be met at a value of λ with $Q(r(\lambda))=0$. Evaluating at a point where the first-order condition holds, the second derivative of the incumbent payoff is $\partial^2 C/\partial\lambda^2 = \phi(\lambda)Cr'(\lambda)Q'(r(\lambda))/(\beta\lambda(1+r(\lambda))(\delta-r(\lambda)))$, which has the same sign as $r'(\lambda)Q'(r(\lambda))$.

Evaluating $Q(r)$ at $r=(\delta-1)/2$ and $r=\delta$ yields $Q((\delta-1)/2)=-(1-\alpha)\beta((1+\delta)/2)^2<0$ and $Q(\delta)=(1-\beta)\delta(1+\delta)>0$. As $Q(r)$ is quadratic, it follows that there is only one root $Q(\hat{r})=0$ for $(\delta-1)/2<r<\delta$, and this root has $Q'(\hat{r})>0$. It is known that $r(\lambda)$ lies between $(\delta-1)/2$ and δ for any $\lambda\in[0,1]$, so $Q'(r(\lambda))>0$ at a critical point of C_{p}. With $r'(\lambda)<0$ (Proposition 2), this establishes that $\partial^2C/\partial\lambda^2<0$ at any critical point, which means the incumbent payoff is a strictly quasi-concave function of λ.

With these findings, there exists an interior solution $0<\hat{\lambda}<1$ where $\partial C_{\mathrm{p}}/\partial\lambda=0$ that maximizes C_{p}. The first-order condition is $\alpha=\hat{\lambda}\mu(\hat{\lambda})\phi(\hat{\lambda})$. Since q does not appear in the first-order condition, the equilibrium value $\hat{\lambda}$ is independent of q.

Now allow for the possibility of trade and take an arbitrary world price π^*. For each $\lambda\in[0,1]$, let the functions $\hat{C}(\lambda)=q^{1-\alpha}\gamma^{\alpha}\lambda^{\alpha}/((1-\alpha)^{1-\alpha}\alpha^{\alpha})$ and $C^*(\lambda)=(q+\gamma\pi^*\lambda)/\pi^{*\alpha}$ respectively denote the level of real GDP in autarky and with free trade in an open economy. Note that in an open economy with a particular λ, it is possible to obtain the same consumption outcomes as autarky (with the same λ) by setting a tariff τ (see A.1) that results in net exports of zero. Using the formulas from (A.6), the required tariff is $\hat{\tau}=\alpha q/((1-\alpha)\gamma\pi^*\hat{\lambda})-1$, which can be written as $\hat{\tau}=(\hat{\pi}/\pi^*)-1$ in terms of the autarky price $\hat{\pi}$. With $x_{\mathrm{E}}=0$ and $x_{\mathrm{I}}=0$ and the same λ and hence same K, real GDP would be equal to its autarky value $\hat{C}(\lambda)$. Real GDP can also be compared to the free-trade ($\tau=0$) open-economy level $C^*(\lambda)$, with (A.7) implying $C=B(\hat{\tau})C^*(\lambda)$. It follows that $\hat{C}(\lambda)=B(\hat{\tau})C^*(\lambda)$, and hence $\hat{C}_{\mathrm{p}}(\lambda)=B(\hat{\tau})C^*_{\mathrm{p}}(\lambda)$, where $\hat{C}_{\mathrm{p}}(\lambda)=\phi(\lambda)\hat{C}(\lambda)$ and $C^*_{\mathrm{p}}(\lambda)=\phi(\lambda)C^*(\lambda)$ are the consumption levels of those in power respectively under autarky and with free trade in an open economy. Since $B(\tau)\leq 1$ for all τ using the properties of $B(\tau)$ from (A.7), this implies $\hat{C}_{\mathrm{p}}(\lambda)\leq C^*_{\mathrm{p}}(\lambda)$ for all $0\leq\lambda\leq 1$. If $\pi^*=\hat{\pi}$ for some particular value of λ then $\hat{\tau}=0$ and $B(\hat{\tau})=1$, in which case $\hat{C}_p(\lambda) = C_p^*(\lambda)$.

Given the strict quasi-convexity of $C_p^*(\lambda)$, the maximal value is $C_p^* = \max\{C_p^*(0), C_p^*(1)\} > C_p^*(\hat{\lambda})$, where $0 < \hat{\lambda} < 1$ is equilibrium value of $\hat{\lambda}$ under autarky. Together with $C_p^*(\hat{\lambda}) \geq \hat{C}_p(\hat{\lambda})$, where $\hat{C}_p = \hat{C}_p(\hat{\lambda})$ denotes the autarky consumption of those in power, it follows that $C_p^* > \hat{C}_p$. Those in power always strictly gain from the ability to trade with the rest of the world irrespective of world prices.

If $\lambda = 1$ is chosen, it must be the case that $\bar{C}_p > \hat{C}_p$. Since $\bar{C}_p = \phi(1)\bar{C}$ and $\hat{C}_p = \phi(\hat{\lambda})\hat{C}$, it follows that $\bar{C} = \bar{C}_p/\phi(1) > \hat{C}_p/\phi(1) = (\phi(\hat{\lambda})/\phi(1))\hat{C} > \hat{C}$ because $\phi(\hat{\lambda}) > \phi(1)$. The real value of the economy's output is increased by trade if those in power choose $\lambda = 1$. Since $\bar{C}_w = \bar{C}_p/(1+\bar{r})$ and $\hat{C}_w = \hat{C}_p/(1+\hat{r})$, it follows that $\bar{C}_w > \hat{C}_w$ because $\bar{C}_p > \hat{C}_p$ and $\bar{r} < \hat{r}$, so workers in economies with $\lambda = 1$ gain from trade. The same is true for investors who receive a utility payoff that moves in line with workers' consumption. As $\bar{p} = p(1) > p(\hat{\lambda}) = \hat{p}$, there are also more members of the group in power, who receive higher payoffs than workers ($C_p > C_w$). Hence, for economies that move to $\lambda = 1$, opening up to trade is a Pareto improvement.

Now consider the overall effects of trade on political variables. Rearranging equation (19) implies that $(2/\beta)(r - (\delta - 1)/2) = (1+\delta)/(\beta + 2\delta p)$, which gives the following alternative expression for $\phi(\lambda)$ from (21) when evaluated at $p = p(\lambda)$:

$$\phi(\lambda) = \frac{1+\delta}{\beta + 2\delta p(\lambda)}.$$

Differentiating the expression for $\phi(\lambda)$ implies $\phi'(\lambda) = -2\delta(1+\delta)p'(\lambda)/(\beta + 2\delta p(\lambda))^2$ and hence $\mu(\lambda) = 2\delta p'(\lambda)/(1+\delta)$ by using (21) and (22) again. It follows that $\mu(\lambda)\phi(\lambda) = p'(\lambda)/(p(\lambda) + (\beta/2\delta))$. The first-order condition determining $\hat{\lambda}$ and hence $\hat{p} = p(\hat{\lambda})$ can therefore be stated as $\hat{\lambda}p'(\hat{\lambda})/(p(\hat{\lambda}) + (\beta/2\delta)) = \alpha$. The function $p(\lambda)$ is strictly increasing in λ (Proposition 2), so it has a well-defined inverse $\Lambda(p)$ satisfying $\Lambda(p(\lambda)) = \lambda$ for all $\lambda \in [0,1]$. Noting that $p'(\lambda) = 1/\Lambda'(p(\lambda))$, the equation for $\hat{\lambda}$ can be stated equivalently as an equation for $\hat{p} = p(\hat{\lambda})$, namely $(\Lambda(\hat{p})/\Lambda'(\hat{p}))/(\hat{p} + (\beta/2\delta)) = \alpha$. The function $p(\lambda)$ is strictly concave because $\mu'(\lambda) < 0$ and $p'(\lambda)$ is proportional to $\mu(\lambda)$, and this implies $\Lambda(p)$ is strictly convex.

After opening up to trade, Proposition 6 shows that the equilibrium fraction ω of countries with $\lambda = 1$ is given by $\omega = \alpha/((1-\alpha)\xi)$, where the constant ξ introduced in Proposition 5 is such that $\xi = (\phi(0) - \phi(1))/\phi(1)$. Rearranging the equation for ω shows that it can be stated as $\alpha = \omega\xi/(1+\omega\xi)$. Using $\phi(0) = (1+\delta)/(\beta + 2\delta p^\dagger)$ and $\phi(1) = (1+\delta)/(\beta + 2\delta\bar{p})$ where $p^\dagger = p(0)$ and $\bar{p} = p(1)$, it follows that $\xi = 2\delta(\bar{p} - p^\dagger)/(\beta + 2\delta p^\dagger)$. Consequently, $\omega\xi/(1+\omega\xi) = \omega(\bar{p} - p^\dagger)/(\omega(\bar{p} - p^\dagger) + p^\dagger + (\beta/2\delta))$. The global average of p is denoted by $p^* = (1-\omega)p^\dagger + \omega\bar{p}$, and hence $\omega(\bar{p} - p^\dagger) = p^* - p^\dagger$. Therefore, it follows that the equation for p^* is $(p^* - p^\dagger)/(p^* + (\beta/2\delta)) = \alpha$. Note that the left-hand side is strictly increasing in p^*.

The values of $\hat{p}$ in autarky and p^* in a world of open economies are determined by equating functions of p to α. Dividing the function used for p^* by the function used for $\hat{p}$ yields a function $A(p) = (p - p^\dagger)\Lambda'(p)/\Lambda(p)$ because the term $p + (\beta/2\delta)$ cancels out. Since $\Lambda(p)$ is a strictly convex function, it follows that for any $p^\dagger < p$, $\Lambda(p^\dagger) < \Lambda(p) - (p - p^\dagger)\Lambda'(p)$. With $\Lambda(p^\dagger) = 0$ because $p(0) = p^\dagger$, this implies $(p - p^\dagger)\Lambda'(p)/\Lambda(p) > 1$. This demonstrates that $A(p) > 1$ for all $p > p^\dagger$. An immediate consequence is that $(\hat{p} - p^\dagger)/(\hat{p} + (\beta/2\delta)) > \alpha$, and hence $p^* < p^\dagger$. Define $r^* = (1-\omega)r^\dagger + \omega\bar{r}$, and note that p and r must satisfy an identical relationship (19) in all countries. This relationship gives r as a strictly decreasing and strictly convex function of p. It is then an immediate consequence of Jensen's inequality that $r^* > \hat{r}$.

A.8 Proof of Proposition 8

The partial openness constraints are the restrictions $x_E \leq \sigma q$ and $x_I \leq \sigma\gamma$ on net exports in addition to the international budget constraint (5), where σ is the openness parameter satisfying $0 \leq \sigma \leq 1$.

(i) Take as given a particular value of λ and hence the supply K of the investment good. Conditional on λ, the choices of net exports x_E and x_I must maximize C_p. Using (21), this is the same as maximizing C because $\phi(\lambda)$ is fixed for a particular value of λ. An expression for C where the resource constraints are substituted into the consumption aggregator is given in (A.4), which is maximized subject to (5) and the partial openness constraints. The Lagrangian for this constrained maximization problem is

$$L = \frac{(q-x_{\mathrm{E}})^{1-\alpha}(K-x_{\mathrm{I}})^{\alpha}}{(1-\alpha)^{1-\alpha}\alpha^{\alpha}} + \nu(x_{\mathrm{E}}+\pi^{*}x_{\mathrm{I}}) + \nu\rho_{\mathrm{E}}(\sigma q - x_{\mathrm{E}}) + \nu\rho_{\mathrm{I}}\pi^{*}(\sigma\gamma - x_{\mathrm{I}}),$$

where ν is the Lagrangian multiplier on the international budget constraint (5), and ρ_{E} and ρ_{I} are the multipliers on the partial openness constraints scaled without loss of generality by ν and $\pi^{*}\nu$ respectively. The first-order conditions for x_{E} and x_{I} are

$$(1-\alpha)\frac{C}{q-x_{\mathrm{E}}} = \nu(1-\rho_{\mathrm{E}}), \quad \text{and} \quad \alpha\frac{C}{K-x_{\mathrm{I}}} = \pi^{*}\nu(1-\rho_{\mathrm{I}}), \tag{A.12}$$

where the expression for C from (A.4) has been used. The Kuhn-Tucker conditions associated with the partial openness constraints are

$$x_{\mathrm{E}} \leq \sigma q, \quad x_{\mathrm{I}} \leq \sigma\gamma, \quad \rho_{\mathrm{E}}\nu \geq 0, \quad \rho_{\mathrm{I}}\pi^{*}\nu \geq 0, \quad \rho_{\mathrm{E}}\nu(\sigma q - x_{\mathrm{E}}) = 0, \quad \rho_{\mathrm{I}}\pi^{*}\nu(\sigma\gamma - x_{\mathrm{I}}) = 0. \tag{A.13}$$

Since C must be positive, which requires $x_{\mathrm{E}} < q$ and $x_{\mathrm{I}} < K$, the first-order conditions (A.12) imply that the Lagrangian multiplier ν must be strictly positive and $\rho_{\mathrm{E}} < 1$ and $\rho_{\mathrm{I}} < 1$ hold. Dividing the second equation in (A.12) by the first and cancelling the positive terms ν and π^{*} from the Kuhn-Tucker conditions (A.13):

$$\frac{\alpha(q-x_{\mathrm{E}})}{(1-\alpha)(K-x_{\mathrm{I}})} = \left(\frac{1-\rho_{\mathrm{I}}}{1-\rho_{\mathrm{E}}}\right)\pi^{*}, \quad \rho_{\mathrm{E}} \geq 0, \quad \rho_{\mathrm{I}} \geq 0, \quad \text{and} \quad \rho_{\mathrm{E}}(\sigma q - x_{\mathrm{E}}) = \rho_{\mathrm{I}}(\sigma\gamma - x_{\mathrm{I}}) = 0. \tag{A.14}$$

By comparing the first equation above to the domestic market-clearing relative price π from (A.3), it can be seen that $\pi = (1+\tau)\pi^{*}$ when $\tau = (\rho_{\mathrm{E}}-\rho_{\mathrm{I}})/(1-\rho_{\mathrm{E}})$. This means the economy's trade can be analysed as if there were a tariff τ (see A.1) equal to an endogenous wedge between the domestic and international relative prices of the investment good that depends on the Lagrangian multipliers ρ_{E} and ρ_{I} (τ must satisfy $-1 < \tau < \infty$ given the bounds on ρ_{E} and ρ_{I}). In particular, net exports x_{E} and x_{I} are given by the formulas in (A.6). The multipliers are themselves determined by the Kuhn-Tucker conditions in (A.14). Note that it is not possible for both constraints to bind simultaneously as this would contradict (5) (except in the trivial case of pure autarky where $\sigma = 0$). Thus, there are three cases to consider. First, both partial openness constraints might be slack ($\rho_{\mathrm{E}} = \rho_{\mathrm{I}} = 0$). Second, the constraint on exporting the endowment good might be binding ($\rho_{\mathrm{E}} > 0$ and $\rho_{\mathrm{I}} = 0$). Third, the constraint for the investment good might be binding ($\rho_{\mathrm{E}} = 0$ and $\rho_{\mathrm{I}} > 0$).

Consider first the case where both constraints are slack, which implies that $\tau = 0$. The levels of net exports from (A.6) are $x_{\mathrm{E}} = \alpha q - (1-\alpha)\pi^{*}\gamma\lambda$ and $x_{\mathrm{I}} = (1-\alpha)\gamma\lambda - \alpha q/\pi^{*}$. For this case to be the relevant one, these levels of net exports must satisfy the partial openness constraints in (A.13), which are equivalent to $(1-\alpha)\gamma\pi^{*}\lambda \geq \alpha q - \sigma q$ and $(1-\alpha)\gamma\lambda \leq \sigma\gamma + \alpha q/\pi^{*}$. These can be rearranged to obtain respectively a lower bound $\underline{\lambda}$ and an upper bound $\overline{\lambda}$ on the value of λ:

$$\underline{\lambda} \leq \lambda \leq \overline{\lambda}, \quad \text{where } \underline{\lambda} = \frac{(\alpha-\sigma)q}{(1-\alpha)\gamma\pi^{*}} \text{ and } \overline{\lambda} = \frac{\sigma + \alpha\frac{q}{\gamma\pi^{*}}}{1-\alpha}. \tag{A.15}$$

Now consider the case where the first constraint in (A.13) is binding, that is, $x_{\mathrm{E}} = \sigma q$. Using the international budget constraint (5), this immediately implies that $x_{\mathrm{I}} = -\sigma q/\pi^{*}$, and hence $\rho_{\mathrm{I}} = 0$. The value of x_{E} is consistent with (A.6) for τ satisfying

$$\frac{\alpha q - (1-\alpha)(1+\tau)\pi^{*}\gamma\lambda}{1+(1-\alpha)\tau} = \sigma q, \quad \text{and hence } \tau = \frac{\gamma\pi^{*}}{\sigma q + \gamma\pi^{*}\lambda}(\underline{\lambda} - \lambda),$$

which uses the expression for $\underline{\lambda}$ from (A.15). But the value of τ must be positive given that $\rho_{\mathrm{E}} > 0$ and $\rho_{\mathrm{I}} = 0$, which is obtained if and only if $\lambda < \underline{\lambda}$. Thus, this case is the relevant one when λ is less than $\underline{\lambda}$.

The remaining case to consider is where the second constraint in (A.13) is binding, that is, $x_{\mathrm{I}} = \sigma\gamma$. The international budget constraint implies $x_{\mathrm{E}} = -\pi^{*}\sigma\gamma$, and hence $\rho_{\mathrm{E}} = 0$. The value of x_{I} is consistent with

(A.6) for some τ, but this value must satisfy $\tau < 0$ given that $\rho_{\mathrm{E}} = 0$ and $\rho_{\mathrm{I}} > 0$. The equation for τ is

$$\frac{(1-\alpha)(1+\tau)\pi^*\gamma\lambda - \alpha q}{(1+(1-\alpha)\tau)\pi^*} = \sigma\gamma, \quad \text{and hence } \tau = -\left(\frac{\lambda - \overline{\lambda}}{\lambda - \sigma}\right),$$

which uses the expression for $\overline{\lambda}$ from (A.15). The implied value of τ is negative if λ is greater than both $\overline{\lambda}$ and σ, or less than both $\overline{\lambda}$ and σ. It can be seen from (A.15) that $\overline{\lambda} > \sigma$, so $\lambda < \sigma$ and $\lambda < \overline{\lambda}$ would imply $\tau < -1$, which is outside the admissible range $(-1,\infty)$ of τ. This means the only way that this case can be the relevant one is if $\lambda > \overline{\lambda}$ (which automatically implies $\lambda > \sigma$).

For there to be values of λ where the first constraint in (A.13) is binding, it must be that $\underline{\lambda} > 0$. From the expression for $\underline{\lambda}$ in (A.15), this occurs if and only if $\sigma < \alpha$. In this case, $x_{\mathrm{E}} \le \sigma q$ binds for all $\lambda \in [0,\underline{\lambda})$. Similarly, there are only λ values where the second partial openness constraint binds if $\overline{\lambda} < 1$. Using (A.15):

$$\frac{\sigma + \alpha\frac{q}{\gamma\pi^*}}{1-\alpha} < 1, \quad \text{which is equivalent to } \sigma < 1 - \alpha\left(1 + \frac{q}{\gamma\pi^*}\right),$$

in which case $x_{\mathrm{I}} \le \sigma\gamma$ is binding if and only if $\lambda \in (\overline{\lambda}, 1]$. If $\lambda \in [\underline{\lambda}, \overline{\lambda}]$ then none of the partial openness constraints is binding and the pattern of trade is the same as what was found in the standard small open economy case. The incumbent payoff C_{p} is therefore the same as found in section 4.1 for values of λ in the range $[\underline{\lambda}, \overline{\lambda}]$. This means that C_{p} is a quasi-convex function of λ in this range following the same proof used for Proposition 5.

(ii) Now the choice of λ to maximize C_{p} is analysed. Suppose σ satisfies the bound

$$\sigma < \overline{\sigma}, \quad \text{where } \overline{\sigma} = \min\left\{\alpha, \frac{\alpha\gamma\pi^*}{\mu(0)\phi(0)q}, 1 - \frac{\alpha}{\mu(1)\phi(1)}, 1 - \alpha\left(1 + \frac{q}{\gamma\pi^*}\right)\right\}. \tag{A.16}$$

This implies $\sigma < \alpha$, so $\underline{\lambda} > 0$, and $\sigma < 1 - \alpha(1 + q/(\gamma\pi^*))$, hence $\overline{\lambda} < 1$. Take any $\lambda \in [0, \underline{\lambda})$. The first constraint in (A.13) is binding and thus $x_{\mathrm{E}} = \sigma q$ and $x_{\mathrm{I}} = -\sigma q/\pi^*$. Substituting these levels of net exports into (A.4) and differentiating with respect to λ to obtain the marginal benefit of institutional quality:

$$C = \frac{(1-\sigma)^{1-\alpha} q^{1-\alpha} \gamma^\alpha \left(\lambda + \sigma\frac{q}{\gamma\pi^*}\right)^\alpha}{(1-\alpha)^{1-\alpha}\alpha^\alpha}, \quad \text{and hence } \frac{\partial C}{\partial \lambda} = \alpha \frac{C}{\lambda + \sigma\frac{q}{\gamma\pi^*}}. \tag{A.17}$$

By substituting the result above for $\partial C/\partial\lambda$ into (22), the derivative of the objective function C_{p} is:

$$\frac{\partial C_{\mathrm{p}}}{\partial \lambda} = \phi(\lambda) C \left(\frac{\alpha}{\lambda + \sigma\frac{q}{\gamma\pi^*}} - \mu(\lambda)\phi(\lambda)\right), \tag{A.18}$$

and this derivative is strictly positive at $\lambda = 0$ when $\sigma < \alpha\gamma\pi^*/(\mu(0)\phi(0)q)$. This condition holds given σ satisfying (A.16). Now take any $\lambda \in (\overline{\lambda}, 1]$. The second constraint in (A.13) is binding, which means $x_{\mathrm{E}} = -\pi^*\sigma\gamma$ and $x_{\mathrm{I}} = \sigma\gamma$. These levels of net exports can be substituted into (A.4), and the marginal benefit of institutional quality is obtained by differentiating with respect to λ:

$$C = \frac{\gamma^\alpha (q + \sigma\gamma\pi^*)^{1-\alpha}(\lambda - \sigma)^\alpha}{(1-\alpha)^{1-\alpha}\alpha^\alpha}, \quad \text{and hence } \frac{\partial C}{\partial \lambda} = \alpha\frac{C}{\lambda - \sigma}. \tag{A.19}$$

By substituting the result above for $\partial C/\partial\lambda$ into (22), the derivative of the objective function C_{p} is:

$$\frac{\partial C_{\mathrm{p}}}{\partial \lambda} = \phi(\lambda) C \left(\frac{\alpha}{\lambda - \sigma} - \mu(\lambda)\phi(\lambda)\right), \tag{A.20}$$

and this derivative is strictly negative at $\lambda = 1$ when $\sigma < 1 - \alpha/(\mu(1)\phi(1))$. Observe that this too holds when σ satisfies (A.16). Hence, for any $\sigma < \overline{\sigma}$, the objective function C_{p} has a positive derivative with respect to λ at $\lambda = 0$, and a negative derivative at $\lambda = 1$.

For all values of λ, net exports are chosen to maximize C subject to the prevailing constraints. Hence, by the envelope theorem, the derivative of C with respect to λ can be obtained from (A.4):

$$\frac{\partial C}{\partial \lambda} = \alpha\gamma \frac{(q - x_{\text{E}})^{1-\alpha}(K - x_{\text{I}})^{\alpha-1}}{(1-\alpha)^{1-\alpha}\alpha^{\alpha}} = \gamma\left(\frac{\alpha(q - x_{\text{E}})}{(1-\alpha)(K - x_{\text{I}})}\right)^{1-\alpha} = \gamma\pi^{1-\alpha},$$

where the final equality uses the expression for the domestic market-clearing price π from (A.3). The equation $\tau = (\rho_{\text{E}} - \rho_{\text{I}})/(1-\rho_{\text{E}})$ implies $\pi = \pi^*$ at $\lambda = \underline{\lambda}$ and $\lambda = \overline{\lambda}$ because the Lagrangian multipliers ρ_{E} and ρ_{I} are zero where the partial openness constraints are on the margin of binding. Comparing the expression for $\partial C/\partial\lambda$ above to $\partial C/\partial\lambda = \gamma{\pi^*}^{1-\alpha}$ which applies for $\lambda \in [\underline{\lambda}, \overline{\lambda}]$ where the partial openness constraints are not binding, it follows that $\partial C/\partial\lambda$ and $\partial C_{\text{p}}/\partial\lambda$ are continuous at $\lambda = \underline{\lambda}$ and $\lambda = \overline{\lambda}$, and therefore continuous on the whole interval $\lambda \in [0, 1]$.

As C_{p} is quasi-convex on $[\underline{\lambda}, \overline{\lambda}]$, it cannot have a maximum in $(\underline{\lambda}, \overline{\lambda})$. The continuity of $\partial C_{\text{p}}/\partial\lambda$ at the boundaries also rules out a maximum at $\lambda = \underline{\lambda}$ or $\lambda = \overline{\lambda}$. Hence, if $\partial C_{\text{p}}/\partial\lambda$ is positive at $\lambda = 0$ and negative at $\lambda = 1$ then C_{p} must be maximized by a value of λ in $(0, \underline{\lambda})$ or $(\overline{\lambda}, 1)$.

The upper bound $\overline{\sigma}$ on σ from (A.16) is the minimum of four numbers. The term $1 - \alpha/(\mu(1)\phi(1))$ is strictly less than 1, so $\overline{\sigma} < 1$ follows immediately. For $\overline{\sigma} > 0$, it must be the case that all four numbers are strictly positive. This is obviously true for α and $\alpha\gamma\pi^*/(\mu(0)\phi(1)q)$. The term $1 - \alpha/(\mu(1)\phi(1))$ is positive when $\mu(1) > \alpha/\phi(1)$, but that must hold because the political friction is assumed to bind. The final term $1 - \alpha(1 + q/(\gamma\pi^*))$ is positive if and only if the world price π^* is such that $\pi^* > \alpha q/((1-\alpha)\gamma)$. Note that the autarky relative price satisfies $\hat{\pi} = \alpha q/((1-\alpha)\gamma\hat{\lambda}) > \alpha q/((1-\alpha)\gamma)$ because $0 < \hat{\lambda} < 1$ (see Proposition 7). The equilibrium world price π^* with fully open homogeneous economies satisfies $\pi^* = q\xi/\gamma > \alpha q/((1-\alpha)\gamma)$ because $\alpha < (1-\alpha)\xi$, as shown in Proposition 6. Given these lower bounds on the relative prices, any world price π^* that lies between the autarky price and the world equilibrium price with fully open economies must satisfy the bound. As a consequence, $\overline{\sigma}$ is strictly positive, and hence it is demonstrated that $0 < \overline{\sigma} < 1$. For all world prices between the extremes of autarky and fully open economies, there exist sufficiently low values of σ where C_{p} is maximized for a value of λ satisfying $0 < \lambda < 1$.

(iii) Take a case where $\lambda \in (0, \underline{\lambda})$ or $\lambda \in (\overline{\lambda}, 1)$ maximizes C_{p}. As an interior solution, it is necessary that $\partial C_{\text{p}}/\partial\lambda = 0$. Totally differentiating this first-order condition gives $\partial\lambda/\partial\sigma = -(\partial^2 C_{\text{p}}/\partial\sigma\partial\lambda)/(\partial^2 C_{\text{p}}^2/\partial\lambda^2)$, which determines the response of the equilibrium value of λ to a change in the parameter σ. To maximize C_{p}, it is necessary that the second-order condition $\partial^2 C_{\text{p}}/\partial\lambda^2 < 0$ holds, so the sign of $\partial\lambda/\partial\sigma$ is the same as $\partial^2 C_{\text{p}}/\partial\sigma\partial\lambda$. When $\lambda \in (0, \underline{\lambda})$, the partial derivative $\partial C_{\text{p}}/\partial\lambda$ is given by (A.18), which satisfies $\partial^2 C_{\text{p}}/\partial\sigma\partial\lambda < 0$. This means that the equilibrium λ when $x_{\text{E}} \leq \sigma q$ binds is decreasing in openness σ. When $\lambda \in (\overline{\lambda}, 1)$, the partial derivative $\partial C_{\text{p}}/\partial\lambda$ is given by (A.20), which satisfies $\partial^2 C_{\text{p}}/\partial\sigma\partial\lambda > 0$. This means that the equilibrium λ when $x_{\text{I}} \leq \sigma\gamma$ is binding increases in openness σ.

(iv) Suppose each economy has $0 < \sigma < 1$, and all have the same value of the endowment q. If there were an equilibrium with no trade, all economies would have $x_{\text{E}} = 0$ and $x_{\text{I}} = 0$ and neither of the partial openness constraints would be binding. Using the formulas for net exports in this case, it can only occur if the world price is $\pi^* = \alpha q/((1-\alpha)\gamma\lambda)$. Using (A.15), at this world price π^*, $\underline{\lambda} = (1 - \sigma/\alpha)\lambda$ and $\overline{\lambda} = \lambda + \sigma/(1-\alpha)$. Consequently, the choice of λ must satisfy $\lambda \in [\underline{\lambda}, \overline{\lambda}]$. However, part (i) above shows that C_{p} is quasi-convex in this range, so C_{p} cannot be maximized at an interior point. This contradiction establishes there cannot be an equilibrium where no trade occurs.

As all countries have the same endowment q, an equilibrium with trade between countries requires there to be a non-degenerate distribution of λ values. The existence of such an equilibrium follows from the same reasoning as in Proposition 6, namely that C_{p} is decreasing in π^* when $x_{\text{I}} < 0$, and is increasing in π^* when $x_{\text{I}} > 0$ (these claims follow from 14, A.17, and A.19).

A.9 Proof of Proposition 9

A fraction ζ of countries is compelled to choose $\lambda = 1$. In the remaining fraction $1-\zeta$ of countries, the value of λ is chosen to maximize the payoff of those in power. For these countries Proposition 5 continues to apply, with either $\lambda = 0$ or $\lambda = 1$ being optimal. It follows that the fraction ω of countries in the world with $\lambda = 1$ must satisfy $\omega \geq \zeta$. For a particular value of ω, Proposition 6 shows that $\lambda = 1$ is optimal if $\omega \leq \alpha/((1-\alpha)\xi)$.

First consider the case where $\zeta \leq \omega_0$, where ω_0 is the equilibrium fraction of countries with $\lambda = 1$ in the absence of any direct intervention, which is $\omega_0 = \alpha/((1-\alpha)\xi) < 1$ according to Proposition 6. If there were an equilibrium with $\zeta \leq \omega < \omega_0$ then it follows that $\lambda = 1$ is optimal, but this would imply $\omega = 1$ because all countries would have $\lambda = 1$, so this cannot be an equilibrium. If there were an equilibrium with $\omega > \omega_0 \geq \zeta$ then it follows that $\lambda = 0$ is optimal, implying $\omega = \zeta$ (because only those countries compelled to would have $\lambda = 1$), which also cannot be an equilibrium. With $\omega = \omega_0 \geq \zeta$, those in power are indifferent between $\lambda = 0$ and $\lambda = 1$, which implies it is possible to have any $\omega \geq \zeta$. Therefore, $\omega = \omega_0$ is the unique equilibrium. Imposing the rule of law on a fraction $\zeta \leq \omega_0$ of countries has no effect on the equilibrium fraction of countries ω with the rule of law.

Next consider the case $\zeta > \omega_0 = \alpha/((1-\alpha)\xi)$. With the requirement $\omega \geq \zeta > \omega_0$, it follows that all countries with a choice have $\lambda = 0$. The unique equilibrium is $\omega = \zeta$, so the only countries with the rule of law are those directly compelled to have it.

Now suppose a fraction ζ of countries imposes a subsidy $\tau < 0$, where the domestic market-clearing price in those countries is $\pi = (1+\tau)\pi^*$, as in (A.1). Assume these countries are drawn exclusively from those with $\lambda = 1$, which requires $\zeta \leq \omega$. With $K = \gamma$ in all these countries, the formula from (A.6) implies each has net exports of the endowment good given by $x_{\text{E}} = (\alpha q - (1-\alpha)\gamma(1+\tau)\pi^*)/(1+(1-\alpha)\tau)$. For the remaining fraction $1-\zeta$ of countries with no tariff or subsidy ($\tau = 0$, hence $\pi = \pi^*$), net exports are $x_{\text{E}} = \alpha q - (1-\alpha)\gamma\pi^*\lambda$. A measure $1-\omega$ of these countries have $\lambda = 0$ and $x_{\text{E}} = \alpha q$, while a measure $\omega - \zeta$ have $\lambda = 1$ and $x_{\text{E}} = \alpha q - (1-\alpha)\gamma\pi^*$. Using these observations, world market clearing (1) requires

$$\zeta\frac{\alpha q - (1-\alpha)\gamma(1+\tau)\pi^*}{1+(1-\alpha)\tau} + (1-\omega)\alpha q + (\omega-\zeta)(\alpha q - (1-\alpha)\gamma\pi^*) = 0.$$

This equation can be solved for the equilibrium world price

$$\pi^* = \frac{\alpha q}{(1-\alpha)\gamma}\left(\frac{1+(1-\alpha)(1-\zeta)\tau}{\alpha\zeta\tau + (1+(1-\alpha)\tau)\omega}\right). \tag{A.21}$$

The condition for optimality of $\lambda = 1$ is $\gamma\pi^* \geq \xi q$ as derived in Proposition 5, noting that it applies even for those countries with $\tau < 0$ because τ has a multiplicative effect on the real value of a country's output at world prices (see A.7). Using (A.21), the optimality of $\lambda = 1$ is equivalent to

$$\frac{\alpha\zeta\tau + (1+(1-\alpha)\tau)\omega}{1+(1-\alpha)(1-\zeta)\tau} \leq \frac{\alpha}{(1-\alpha)\xi}, \tag{A.22}$$

noting that $1+(1-\alpha)(1-\zeta)\tau$ must be a positive number.

There cannot be an equilibrium with $\omega = 0$ because this would imply the left-hand side of (A.22) is strictly negative (since $\tau < 0$), which means that $\lambda = 1$ would be optimal for those in power in all countries. The left-hand side of (A.22) is strictly increasing in ω, so if there is a solution where (A.22) holds with equality and $0 < \omega \leq 1$ then this is the unique equilibrium. If there is no solution in the unit interval then $\omega = 1$ is the unique equilibrium.

Let $\omega_0 = \alpha/((1-\alpha)\xi)$ denote the equilibrium value of ω in the absence of any subsidies (see Proposition 6). If (A.22) is to hold with equality, ω must satisfy

$$\frac{\alpha\zeta\tau + (1+(1-\alpha)\tau)\omega}{1+(1-\alpha)(1-\zeta)\tau} = \omega_0.$$

The unique solution of this linear equation is $\omega = \omega_0 - \zeta\tau(\alpha + (1-\alpha)\omega_0)/(1+(1-\alpha)\tau)$. Consider the case where $\zeta < 1$ and $\tau > -(1-\alpha/((1-\alpha)\xi))$, with larger subsidies considered next. If $\zeta = 1$ then $\omega = 1-(1+\tau-\alpha/((1-\alpha)\xi))/(1+(1-\alpha)\tau)$ by using $\omega_0 = \alpha/((1-\alpha)\xi)$. The bound on τ implies the expression is strictly less than one, and since $\zeta < 1$ means the actual ω is lower than this expression, it follows that $\omega < 1$, with this being the unique equilibrium. The solution has $\omega > \omega_0$ because $\tau < 0$, which demonstrates that the subsidy raises the equilibrium fraction ω of countries with $\lambda = 1$.

Now consider the case where $\zeta = 1$. Using the formulas above, if the subsidy is set so that $\tau = -(1-\alpha/((1-\alpha)\xi))$ then $\omega = 1$ is the unique equilibrium with all countries having $\lambda = 1$.

A.10 Proof of Proposition 10

The finding of Proposition 5 that the optimal choice of incumbents is either $\lambda = 0$ or $\lambda = 1$ still applies here. Conditional on the fraction ω of countries with $\lambda = 1$, the equilibrium world price π^* from (25) satisfies $\gamma\pi^* = \alpha q^*/((1-\alpha)\omega)$, where q^* is the global mean endowment. If q is an arbitrary country-specific endowment then the condition derived in Proposition 5 shows that $\lambda = 1$ is optimal if $\alpha q^*/((1-\alpha)\omega) \geq \xi q$. This can be stated in terms of the relative endowment $v = q/q^*$ as $v \leq \tilde{v}$, where $\tilde{v} = \alpha/((1-\alpha)\xi\omega)$, confirming the claim.

Since $v < \tilde{v}$ is necessary for $\lambda = 1$, the fraction of countries with $\lambda = 1$ must satisfy $\omega = F(\tilde{v})$. Substituting the expression for $\tilde{v}$ yields an equation $\omega = F(\alpha/((1-\alpha)\xi\omega))$, which can be stated as $G(\omega) = 0$, where $G(\omega) = \omega - F(\alpha/((1-\alpha)\xi\omega))$. The cumulative distribution function $F(v)$ is weakly increasing in v, which implies that the function $G(\omega)$ is strictly increasing in ω. Any solution of the equation $G(\omega) = 0$ must therefore be unique. A property of the cumulative distribution function is $F(\infty) = 1$, which leads to $G(0) = -1$. Proposition 6 establishes that $0 < \alpha/((1-\alpha)\xi) < 1$. As v has mean one and the probability of having v strictly less than the mean must be strictly lower than one, it follows that $F(\alpha/((1-\alpha)\xi)) < 1$. This implies that $G(1) = 1 - F(\alpha/((1-\alpha)\xi)) > 0$. Since v has a continuous distribution, the function $G(\omega)$ must be continuous. With $G(0) < 0$ and $G(1) > 0$, the intermediate value theorem implies there exists a ω such that $G(\omega) = 0$ satisfying $0 < \omega < 1$.

Let $\omega_0 = \alpha/((1-\alpha)\xi)$ denote the equilibrium value of ω with homogeneous endowments across countries (see Proposition 6), and let $\omega^* = F(1)$ denote the fraction of countries with an endowment less than the global mean. Together with the definition of $G(\omega)$, this means $G(\omega_0) = \omega_0 - F(\omega_0/\omega_0) = \omega_0 - F(1) = \omega_0 - \omega^*$ and $G(\omega^*) = \omega^* - F(\omega_0/\omega^*) = F(1) - F(\omega_0/\omega^*)$. As v has a continuous distribution with mean equal to one, there must be some probability mass strictly below and strictly above the mean, implying $F(\omega_0/\omega^*) < F(1)$ if $\omega_0/\omega^* < 1$ and $F(\omega_0/\omega^*) > F(1)$ if $\omega_0/\omega^* > 1$. Together with the expression for $G(\omega_0)$ above, this demonstrates that $G(\omega)$ changes sign between ω_0 and ω^* (irrespective of the ordering of the terms). The unique solution for ω must therefore lie between ω_0 and ω^*.

A.11 Proof of Proposition 11

For the $1-\varsigma$ countries that are price takers in world markets, the condition for $\lambda(j) = 1$ to be the equilibrium in country j is that derived in Proposition 5, namely $\gamma\pi^* \geq \xi q(j)$. This gives a threshold $\tilde{v} = \gamma\pi^*/(\xi q^*)$ for endowments $v = q/q^*$ relative to the global mean q^* such that those countries choosing $\lambda(j) = 1$ are those with $v(j) \leq \tilde{v}$. The small open economies have a continuous probability distribution of relative endowments with cumulative distribution function $F(v)$. Since $\hat{\lambda} = 0$ is assumed to be optimal for the cartel, the fraction of economies with the rule of law is $\omega = (1-\varsigma)F(\tilde{v})$.

The cartel has positive measure ς in world markets and chooses net exports $\hat{x}_{\mathrm{E}}$ of the endowment good. The cartel's endowment is $\hat{q}$, and let $\check{q}$ denote the average endowment of price-taking economies, so the global mean is $q^* = \varsigma\hat{q} + (1-\varsigma)\check{q}$ (the average value of v for small open economies is $\check{q}/q^*$). With net exports given by (13) for the small open economies, and only those economies producing capital, world markets clear (1) if

$$\varsigma\hat{x}_{\mathrm{E}} + \alpha(1-\varsigma)\check{q} - (1-\alpha)\gamma\pi^*\omega = 0.$$

It follows that the threshold $\tilde{v}$ for the choice of $\lambda(j)=0$ or $\lambda(j)=1$ in small open economies is

$$\tilde{v}=\frac{\gamma\pi^*}{\xi q^*}=\frac{1}{\omega}\left(\frac{\varsigma\hat{x}_\text{E}+\alpha(1-\varsigma)\check{q}}{(1-\alpha)\xi q^*}\right), \tag{A.23}$$

and combined with $\omega=(1-\varsigma)F(\tilde{v})$, the equilibrium value of $\tilde{v}$ is therefore determined by

$$\tilde{v}F(\tilde{v})=\frac{\varsigma\hat{x}_\text{E}+\alpha(1-\varsigma)\check{q}}{(1-\alpha)(1-\varsigma)\xi q^*}. \tag{A.24}$$

The implied elasticity of the equilibrium $\tilde{v}$ with respect to the cartel's net exports $\hat{x}_\text{E}$ is

$$\eta=\frac{\partial\tilde{v}}{\partial\hat{x}_\text{E}}\frac{\hat{x}_\text{E}}{\tilde{v}}=\left(\frac{\varsigma\hat{x}_\text{E}}{\varsigma\hat{x}_\text{E}+\alpha(1-\varsigma)\check{q}}\right)\Big/\left(1+\frac{\tilde{v}F'(\tilde{v})}{F(\tilde{v})}\right). \tag{A.25}$$

Since the cartel chooses $\hat{K}=0$, the quantity of investment goods available for consumption is $-\hat{x}_\text{I}=\hat{x}_\text{E}/\pi^*$ using (5). As the cartel cannot choose $\hat{x}_\text{E}<0$, and with $\check{q}>0$ and $0<\varsigma<1$, it follows from (A.23) that π^* must be strictly positive. The cartel must therefore choose $\hat{x}_\text{E}>0$. It further follows from (A.24) that $\tilde{v}$ must be positive and finite, and $F(\tilde{v})$ must be positive. Since v has a continuous probability distribution, $F'(\tilde{v})$ is finite, and together with the other observations, the elasticity in (A.25) therefore satisfies $0<\eta<1$. With (A.23) showing that $\tilde{v}$ and π^* are proportional for given parameters and (A.24) determining $\tilde{v}$ for each $\hat{x}_\text{E}$, it follows that the equilibrium world price is a function $\pi^*(\hat{x}_\text{E})$ of the cartel's net exports, and the elasticity of π^* with respect to $\hat{x}_\text{E}$ is equal to η.

Conditional on $\hat{\lambda}=0$, and hence on an incumbent share of income $\phi(0)$, the cartel's optimal trade policy is to choose $\hat{x}_\text{E}$ and $\hat{x}_\text{I}$ to maximize real GDP from (A.4) subject to its international budget constraint (5), where the world price π^* is now a function of the choice of $\hat{x}_\text{E}$. Substituting the constraint $\hat{x}_\text{I}=-\hat{x}_\text{E}/\pi^*$ to eliminate $\hat{x}_\text{I}$ and noting $\hat{K}=0$, the objective function to maximize is $(\hat{q}-\hat{x}_\text{E})^{1-\alpha}(\hat{x}_\text{E}/\pi^*(\hat{x}_\text{E}))^\alpha/((1-\alpha)^{1-\alpha}\alpha^\alpha)$. The first-order condition with respect to $\hat{x}_\text{E}$ is

$$\frac{\alpha}{\hat{x}_\text{E}/\pi^*(\hat{x}_\text{E})}\left(\frac{1}{\pi^*(\hat{x}_\text{E})}-\frac{\hat{x}_\text{E}\pi^{*\prime}(\hat{x}_\text{E})}{(\pi^*(\hat{x}_\text{E}))^2}\right)-\frac{1-\alpha}{\hat{q}-\hat{x}_\text{E}}=0.$$

The domestic market-clearing price (A.3) in the cartel is $\hat{\pi}=\alpha(\hat{q}-\hat{x}_\text{E})/((1-\alpha)(\hat{x}_\text{E}/\pi^*(\hat{x}_\text{E})))$, and using $\hat{x}_\text{E}\pi^{*\prime}(\hat{x}_\text{E})/\pi^*(\hat{x}_\text{E})=\eta$ from (A.25), the first-order condition can be expressed as

$$\hat{\pi}=\frac{\pi^*(\hat{x}_\text{E})}{1-\eta},\quad\text{and hence (A.1) holds with}\quad\tau=\frac{\eta}{1-\eta}.$$

The cartel's trade policy is therefore equivalent to a positive tariff τ on the investment good since $0<\eta<1$. Substituting into (A.6) with $\hat{K}=0$ shows that $\hat{x}_\text{E}=((1-\eta)/(1-\alpha\eta))\alpha\hat{q}<\alpha\hat{q}$, so the countries of the cartel export less of the endowment good than they would have done as small open economies.

With the cartel, equation (A.23) implies the values of ω and $\tilde{v}$ jointly satisfy $\omega\tilde{v}=(\varsigma\hat{x}_\text{E}+\alpha(1-\varsigma)\check{q})/((1-\alpha)\xi q^*)$. Since $\omega/(1-\varsigma)=F(\tilde{v})$ and $F(v)$ is strictly increasing, it follows that $\tilde{v}=F^{-1}(\omega/(1-\varsigma))$ and hence an equation for ω is

$$\omega F^{-1}\left(\frac{\omega}{1-\varsigma}\right)=\frac{\varsigma\hat{x}_\text{E}+\alpha(1-\varsigma)\check{q}}{(1-\alpha)\xi q^*}. \tag{A.26}$$

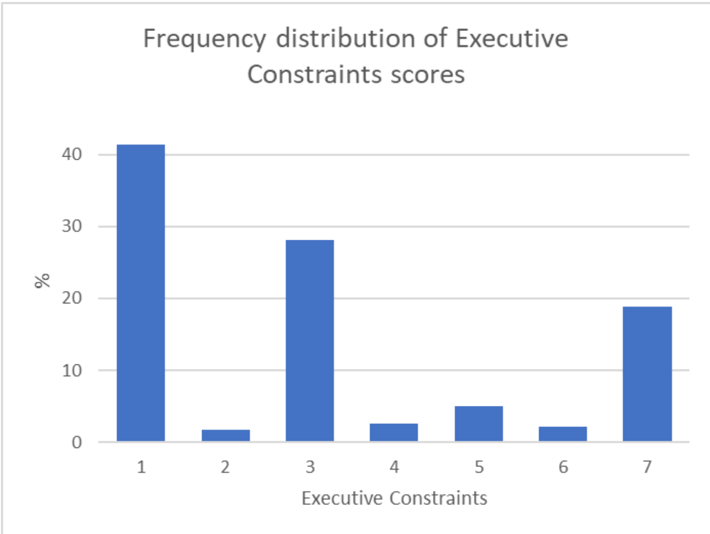
If the cartel were broken up and its members acted instead as small open economies then their optimal trade policy is $\tau=0$, implying net exports would rise to $\alpha\hat{q}$ if a country continued to choose $\lambda(j)=0$. Conditional on the fraction of countries ω choosing the rule of law (which may now include some of the former cartel members), the derivation of equation (A.23) is unaffected. As it possible former cartel members might choose $\lambda(j)=1$ whereas they all previously had $\hat{\lambda}=0$, the fraction of economies with the rule of law now satisfies $\omega\geq(1-\varsigma)F(\tilde{v})$. This implies $\tilde{v}\leq F^{-1}(\omega/(1-\varsigma))$, and therefore the new value of ω must have the left-hand side of (A.26) be no less than the right-hand side. The right-hand side increases as $\hat{x}_\text{E}$ is replaced by $\alpha\hat{q}$, which is more than its previous value. As the left-hand side of (A.26) is a strictly increasing function of ω, it follows that the new equilibrium value of ω must be greater than with the cartel.

B Further information about the empirical analysis

B.1 Description of the data

The empirical analysis uses data from the Center for Systemic Peace's Polity IV Project (http://www.systemicpeace.org/inscrdata.html) on 'Executive Constraints' (XCONST, a score between 1 and 7). Figure 6 plots the frequency distribution of the executive constraint scores after pooling this annual data over the period 1841–1905. Note that approximately 60% of the observations are an extreme classification (1 or 7), and about 88% of all observations are in $\{1,3,7\}$.

Figure 6: *Frequency distribution of executive constraints scores*



The time series of countries' executive constraints scores are very persistent, though the measured degree of persistence depends on exactly how missing data are treated. Since missing data usually reflect some political uncertainty, it is reasonable to treat missing observations as an eighth possible score. Doing this, the probability of a change in the score for a given country from one year to the next is less than 4%. On average, it takes somewhat more than 25 years for there to be a (usually not very large) change in a country's score.

Table 2 gives the list of countries used in the empirical analysis from section 5. The reported executive constraints scores are averages over the 1841–1860 and 1881–1900 sub-periods.

The trade shock for each country is calculated using the predicted trade time series from Pascali (2017), which is available at a 5-yearly frequency. A country's trade shock is defined as the difference between the logarithms of average predicted trade in the two sub-periods. The trade shocks are reported in Table 2, which orders countries by the size of their trade shocks.

The table also reports the numbers used to construct Figure 5. Countries are divided into two groups, small-shock and large-shock, based on whether their trade shocks are respectively below or above the mean. The cumulative distribution functions in Figure 5 weight each observation by the absolute value of the difference between the country's trade shock and the mean trade shock. These weights are normalized to sum to 1 within the two groups of countries.

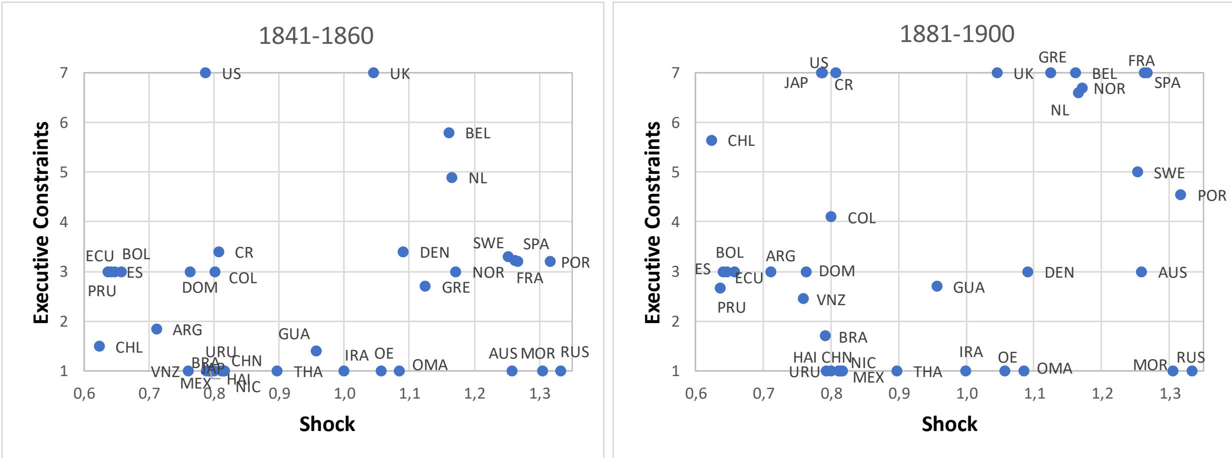
Figure 7 plots the relationship between executive constraints scores and the size of the trade shock before and after the shock. In the pre-shock period 1841–1860, the distribution of Polity scores does not seem to depend on the size of the shock. Several European and Latin American countries have scores around 3, a few European and many Latin American and Asian countries have scores close to 1, and a small number of countries were at the maximum score of 7. Matters look different by the post-shock period 1881–1900. In the set of countries exposed to large shocks, few of them have intermediate scores with most being close to 1 or

Table 2: *Executive constraints scores and trade shocks for countries in the sample*

Country	1841–1860	1880–1900	Trade shock	Weight	Data available
Chile	1.5	5.7	0.574	0.088	1841
Peru	3.0	2.7	0.587	0.084	1841
El Salvador	3.0	3.0	0.591	0.084	1841
Ecuador	3.0	3.0	0.596	0.082	1841
Bolivia	3.0	3.0	0.607	0.079	1841
Argentina	1.8	3.0	0.661	0.064	1841
Venezuela	1.0	2.5	0.710	0.051	1841
Dominican Republic	3.0	3.0	0.713	0.050	1844
United States	7.0	7.0	0.736	0.044	1841
Japan	1.0	7.0	0.737	0.044	1841
Brazil	1.0	1.7	0.742	0.043	1841
Haiti	1.0	1.0	0.743	0.042	1841
Uruguay	1.0	1.0	0.750	0.041	1841
Colombia	3.0	4.1	0.751	0.040	1841
Costa Rica	3.4	7.0	0.757	0.039	1841
Nicaragua	1.0	1.0	0.762	0.037	1841
China	1.0	1.0	0.764	0.037	1841
Mexico	1.0	1.0	0.766	0.036	1841
Siam	1.0	1.0	0.847	0.014	1841
Guatemala	1.4	2.7	0.906	0.002	1841
Persia	1.0	1.0	0.950	0.013	1841
United Kingdom	7.0	7.0	0.995	0.026	1841
Ottoman Empire	1.0	1.0	1.007	0.029	1841
Oman	1.0	1.0	1.035	0.036	1841
Denmark	3.4	3.0	1.041	0.038	1841
Greece	2.7	7.0	1.075	0.047	1841
Belgium	5.8	7.0	1.112	0.057	1841
Netherlands	4.9	6.6	1.116	0.058	1841
Norway	3.0	6.7	1.122	0.060	1841
Sweden	3.3	5.0	1.203	0.082	1841
Austria-Hungary	1.0	3.0	1.208	0.083	1841
France	3.2	7.0	1.212	0.084	1841
Spain	3.2	7.0	1.217	0.086	1841
Morocco	1.0	1.0	1.255	0.096	1841
Portugal	3.2	4.6	1.267	0.099	1841
Russia	1.0	1.0	1.283	0.103	1841
Mean	2.4	3.6	0.900	0.056	1841

7. In contrast, in the set of countries exposed to small shocks, there is a substantial number of countries with scores close to 3.

Figure 7: *Executive constraints and trade shock relationships in the two sub-periods*



Sources: Predicted trade data from Pascali (2017); Executive Constraints data from the Polity IV Project, Center for Systemic Peace (`http://www.systemicpeace.org/inscrdata.html`).

B.2 Robustness exercises

This section repeats the estimation of (26) using different specifications of the pre- and post-shock periods and the transitional period between the two. Table 3 shows specifications with narrower and wider pre- and post-shock periods. Table 4 has specifications with shorter transitional periods. Finally, Table 5 shortens both the transitional and pre- and post-shock periods.

Table 3: *Regression results with narrower and wider pre- and post-shock periods*

$P_{i,a}$	Pre: 1846–1860	Post: 1881–1895		Pre: 1841–1865	Post: 1881–1905	
	OLS	Tobit	Probit	OLS	Tobit	Probit
c	1.79 (1.93) [0.36]	1.58 (2.29) [0.49]	1.78 (1.84) [0.33]	3.47 (2.31) [0.14]	3.60 (2.60) [0.18]	4.71 (2.52) [0.06]
$P_{i,b}$	0.21 (0.57) [0.72]	0.30 (0.82) [0.71]	−1.26 (0.76) [0.10]	−0.41 (0.69) [0.56]	−0.44 (0.98) [0.66]	−2.30 (1.04) [0.03]
X_i	−0.46 (2.44) [0.85]	−0.50 (2.86) [0.86]	−3.33 (2.62) [0.20]	−2.64 (2.40) [0.28]	−3.52 (2.69) [0.20]	−6.22 (3.02) [0.04]
$P_{i,b} \times X_i$	0.84 (0.70) [0.23]	1.00 (1.01) [0.33]	2.13 (1.12) [0.06]	1.58 (0.74) [0.04]	2.09 (1.10) [0.07]	3.07 (1.27) [0.02]
n	37	37	34	36	36	34

Notes: Standard errors are in parentheses and p-values are in brackets under the coefficients.

Table 4: *Regression results with shorter transitional periods*

$P_{i,a}$	Pre: 1846–1865	Post: 1881–1900		Pre: 1846–1865	Post: 1876–1895	
	OLS	Tobit	Probit	OLS	Tobit	Probit
c	2.07 (2.09) [0.33]	1.81 (2.50) [0.48]	2.00 (1.98) [0.30]	1.39 (1.65) [0.40]	1.13 (2.00) [0.58]	1.28 (1.49) [0.40]
$P_{i,b}$	0.14 (0.62) [0.83]	0.26 (0.90) [0.78]	−1.14 (0.82) [0.17]	0.47 (0.48) [0.34]	0.61 (0.72) [0.40]	−0.95 (0.63) [0.13]
X_i	−0.78 (2.69) [0.77]	−0.77 (3.20) [0.81]	−3.77 (2.73) [0.17]	−0.01 (2.54) [1.00]	0.00 (3.05) [1.00]	−2.77 (2.46) [0.26]
$P_{i,b} \times X_i$	0.92 (0.76) [0.23]	1.05 (1.11) [0.35]	2.07 (1.23) [0.09]	0.60 (0.70) [0.40]	0.72 (1.04) [0.50]	1.92 (1.08) [0.08]
n	37	37	34	37	37	34

Notes: Standard errors are in parentheses and p-values are in brackets under the coefficients.

Table 5: *Regression results with narrower transitional and pre- and post-shock periods*

$P_{i,a}$	Pre: 1851–1865 Post: 1876–1890			Pre: 1851–1865 Post: 1881–1895		
	OLS	Tobit	Probit	OLS	Tobit	Probit
c	0.30 (1.44) [0.84]	−0.28 (1.81) [0.88]	−0.51 (1.17) [0.66]	0.65 (1.69) [0.70]	0.04 (2.11) [0.99]	0.30 (1.32) [0.82]
$P_{i,b}$	0.94 (0.41) [0.03]	1.24 (0.62) [0.05]	−0.11 (0.47) [0.81]	0.78 (0.47) [0.11]	1.08 (0.72) [0.15]	−0.31 (0.55) [0.58]
X_i	2.58 (3.10) [0.41]	3.36 (3.89) [0.40]	0.09 (2.25) [0.97]	1.88 (3.19) [0.56]	2.65 (4.00) [0.51]	−1.51 (2.33) [0.52]
$P_{i,b}$ $\times X_i$	−0.31 (0.79) [0.70]	−0.52 (1.18) [0.66]	0.73 (0.91) [0.43]	−0.04 (0.82) [0.96]	−0.23 (1.22) [0.85]	1.09 (1.00) [0.28]
n	37	37	34	37	37	34

Notes: Standard errors are in parentheses and p-values are in brackets under the coefficients.