APPROPRIATION, PROPERTY RIGHTS INSTITUTIONS, AND OPENNESS TO INTERNATIONAL TRADE

By

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ABSTRACT: The allocation of society's activity between production and appropriation and the quality of property rights institutions are fundamental causes of economic prosperity. International trade has a favorable effect on activity allocation and institutions in economies that are in a producer-friendly equilibrium and have a strong institutional framework. In predator-friendly economies, however, international trade leads to an institutional deterioration and a more unfavorable activity allocation. Free trade always enhances social welfare in producer-friendly countries. In predator-friendly countries, free trade has ambiguous social welfare effects.

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1. INTRODUCTION

The case for free trade is very strong in economic theory. Developing countries, however, complain that they often fail to realize the impressive gains from trade that economists promise (Stiglitz [2002], Aghion [2003]). As De Soto [2000] points out,

> "Latin Americans do not have to be reminded. On at least four occasions since their independence from Spain in the 1820s, they have tried to become part of global capitalism and failed … At the consumer level, the Latin Americans imported all sorts of goods, from English tweed suits and Church shoes to Model T Fords; they learned English and French by listening to the radio or records; they danced the Charleston and the Lambeth Walk, and chewed Chiclets gums. But they never produced much live capital."[1]

A study of history confirms that international trade may often generate unfavorable effects that are not captured by standard economic theory. A crucial factor in the nature of these effects is the type of domestic property right institutions. In particular, when a country has strong property rights institutions, opening up its borders to international trade may lead to even stronger property rights protection and a shift of domestic talent towards productive activities. When, however, a country is plagued with corruption and weak institutions, openness to international trade may often cause an institutional deterioration and a shift of talent towards unproductive rent seeking.

The rapid globalization in Europe in the 16th century constitutes a good historical example. England, France, the Netherlands, Portugal and Spain utilized new ship technology and geographical discoveries to engage in Atlantic trade, i.e., in international trade with the New World, Africa and Asia via the Atlantic. At the same time, Eastern European countries (e.g., East Elbean Germany, Poland and the Baltic) also experienced a boost in international trade, increasing dramatically their grain exports. The institutional effects of this globalization were largely determined by the type of each country's domestic institutions. In countries with strong property rights protection (e.g., England and the Netherlands), international trade further improved the institutional framework and encouraged a shift of talent toward productive activities (Acemoglu, Johnson and Robinson [2005]). In countries with weak institutions (e.g., most of Eastern

[1] De Soto [2000], p. 208.

Europe), however, the increased volume of international trade was associated with a further institutional deterioration and a so-called "second serfdom," i.e., a reinstatement of serfdom, which is a form of forced labor (Wallerstein [1974], Chirot [1989]).

In another historical example, newly-founded European colonies in the Caribbean established extraordinarily weak property rights institutions and engaged in widespread use of slavery after the 17th century. The Caribbean region has always been very open to international trade (see table 1). A common view among historians is that slavery and extractive labor practices in the Caribbean have been inextricably connected with openness to international trade (Engerman and Sokoloff [1997], Landes [1998], Economist [2005]). For instance, the region's sugar trade is sometimes referred to as a "source of sweetness and slavery" (Economist [2005]).

Although the argument that international trade may lead to significant institutional changes — favorable or harmful — is supported by substantial historical evidence, the way in which trade relates to institutions or to corruption has been relatively unexamined by formal economic theory. In this paper, I provide a theoretical framework for addressing the following and related questions: What is the impact of international trade on domestic property rights institutions? What are the effects of trade on the allocation of domestic talent between constructive production and wasteful appropriation? What are the welfare effects of trade after incorporating institutional and talent allocation parameters? Does trade lead to utility equalization among countries?

The model has two basic ingredients. First, there are increasing returns to scale in production. I adopt the standard monopolistic competition framework (Dixit and Stiglitz [1977]), where consumers value product variety, while firms face increasing returns to scale and manufacture differentiated goods; a larger labor force leads to more product variety for consumers.[2] The second important ingredient is the presence of two types of agents in the population, producers and predators. The two types have different sets of skills. Producers have mainly developed the ability to contribute to manufacturing and provide productive labor. Predators, on the other hand, primarily specialize in appropriation, trying to expropriate the property of producers, and have developed the

[2] The empirical results of Broda and Weinstein [2006] confirm that consumers place a high value on product variety.

relevant skills. An agent makes his aptitude choice — i.e., whether to become a producer or a predator — with perfect foresight and aimed at maximizing his personal utility.

The distribution of the economy's output between producers and predators is determined first, by the strength of society's property rights institutions — i.e., the degree of legal protection that producers enjoy — and second, by the intensity of each producer's individual efforts to privately hide his property from predators. The time that producers spend to either operate society's institutional framework (administrative cost) or privately hide their property from predators (private hiding cost) constitutes time that has been diverted from manufacturing, effectively reducing the size of the economy's manufacturing labor force and the number of domestically manufactured products.

There are two possible equilibria in the model. In the producer-friendly equilibrium the proportion of producers in the population is high, allowing producers to prevail politically and establish strong property rights institutions. In the predator-friendly equilibrium, on the other hand, the group of predators prevails politically and chooses a weak institutional structure. The level of output is higher in the producer-friendly than in the predator-friendly equilibrium because the skills of producers are more conducive to economic prosperity than the skills of predators.

The analysis examines the impact of international trade on the institutional framework and on the allocation of talent between production and appropriation. In the model, an important determinant of the utility of agents (producers or predators) is the extent of available product variety. International trade makes a wide range of foreign goods available at home and thus makes overall product variety less sensitive to the size of the domestic manufacturing labor force or to domestic policy. It is less essential for a country to realize domestic economies of scale and manufacture a wide variety of products. For this reason, in the presence of international trade, when the politically prevalent group — producers or predators — self-servingly chooses the strength of property rights institutions, it is less concerned about the effects of its policies on the effective size of the domestic manufacturing labor force or the extent of domestic product variety.

When the group of producers prevails politically, it always establishes stronger property rights institutions under international trade than in autarky; free trade mitigates

the negative effect of disproportionately high administrative costs on overall product variety. When, on the other hand, the group of predators prevails politically, it always chooses weaker property rights protection under international trade than in autarky; free trade eases the negative effect of disproportionately low administrative costs (and thus disproportionately high private hiding costs) on overall product variety. Furthermore, the rational anticipation of these institutional effects shapes the aptitude choices of agents. International trade raises the proportion of producers in the population in producer-friendly economies and reduces the proportion of producers in the population in predator-friendly economies.

International trade always increases the utility of agents in producer-friendly countries. In predator-friendly countries, on the other hand, the welfare effects of free trade are ambiguous; free trade gives home consumers access to a range of foreign goods, but also causes a deterioration in domestic institutions and allocation of talent. However, at least when consumers place a sufficiently high value on product variety in their utility function, openness to international trade raises social welfare. And international trade does not lead to equalization of utility between producer-friendly and predator-friendly economies — predator-friendly countries cannot catch up without domestic talent allocation and institutional changes.

At an empirical level, the paper proposes a simple explanation of the negative association between institutional quality and international trade in sixteenth-century Eastern Europe and colonial (or even post-colonial) Caribbean. If these regions had been less open to international trade, they would have been forced to produce domestically some of the scale-intensive manufactures that they were importing to achieve a satisfactory degree of product variety for consumers. Such an endeavor would have required a better utilization of domestic productive labor, inducing the predatory elite to adopt less extractive policies to minimize private hiding costs.

Furthermore, in OLS analysis, econometricians often resort to interaction terms to infer how the effect of one independent variable on the dependent variable depends on the magnitude of another independent variable. Thus our model has the empirical implication that the interaction term (volume of international trade x initial institutional quality) has a significant coefficient in an OLS regression where the dependent variable

is subsequent institutional quality, i.e., institutional quality after a country opens up its borders to international trade. This is consistent with the empirical findings of Acemoglu, Johnson and Robinson [2005].

The paper most closely relates to the theoretical literature on rent seeking and property rights institutions (Murphy, Shleifer and Vishny [1991, 1993], Acemoglu [1995, 2005, 2006], Grossman and Kim [2000], Aghion, Alesina and Trebbi [2004, 2007], Acemoglu and Robinson [2006, forth]), which analyzes in detail the pernicious economic effects of appropriation and weak institutions. I extend this literature by introducing international trade and examining the impact of free trade on talent allocation and property rights institutions.

In a different vein, in contemporary work, Do and Levchenko [2006], Segura-Cayuela [2006] and Levchenko [2007b] also examine how international trade may generate institutional change.[3] In Do and Levchenko [2006], small firms have a stronger preference for good institutions than large firms. Because international trade causes large firms to become larger and gain more political power, it can worsen institutions. Segura-Cayuela [2006] shows that in a democracy, free trade has no effect on institutions. In a dictatorship, when the product of the elite sector is to some extent complementary with the product of the non-elite sector (i.e., when they are both inputs to the production of a final good), the ability of the political elite to appropriate may be limited; appropriation may distort product prices and reduce the elite's profits. Under free trade, product prices are set outside the domestic economy, allowing the domestic elite to adopt more extractive policies. In Levchenko [2007b], institutions are a source of comparative advantage in trade. When two trading partners have similar technology, international trade leads to a race to the top in institutional quality. When there are pronounced technological disparities, however, international trade may cause an institutional deterioration in the country that exports the institutionally intensive good.

I supplement this contemporary literature by focusing on a different aspect of the link between international trade and institutional change. First, the paper brings out increasing returns to scale in production and product variety as a channel through which

[3] Levchenko [2007a], on the other hand, focuses on the effect of institutions on international trade — i.e., on the reverse of the issue that is examined in this paper — and shows that institutions can be a source of comparative advantage in trade.

international trade affects domestic property rights institutions.[4] It also stresses the crucial role of the costs (administrative and private) of property protection, which is little understood in the literature. Second, the analysis examines the impact of free trade on the allocation of talent between production and appropriation, which is not captured by existing work. Third, the conclusions of the paper about the effects of international trade are significantly different from those of the literature. The direction (positive or negative) of the institutional impact of free trade is determined by a country's own institutional quality, rather than by the technological characteristics of its partners (as in Do and Levchenko [2006] and Levchenko [2007b]) or by the size of its firms (as in Do and Levchenko [2006]). Free trade leads to stronger (weaker) property rights institutions and a more favorable (unfavorable) allocation of talent in countries that have strong (weak) property rights institutions (unlike in Segura-Cayuela [2006] where free trade never improves institutional quality).

The paper consists of seven sections. Section 2 describes the basic model, and section 3 solves for the equilibrium of the basic model. Section 4 extends the basic model to incorporate international trade. Section 5 examines the welfare effects of international trade. Section 6 discusses historical examples and empirical implications. Finally, section 7 presents some conclusions.

2. THE BASIC MODEL

The economy is populated by L agents. There are a large number of goods produced, although smaller than the potential range of products. As in the standard model of monopolistic competition (Dixit and Stiglitz [1977]), it is assumed that all potential goods enter symmetrically into the utility function. All agents have the same utility function

$$U = \sum_i c_i^\rho , \tag{1}$$

[4] In the paper, free trade gives domestic consumers access to a range of new products, which is an important element in the ensuing institutional effects. In a different vein, in Segura-Cayela [2006], free

where c_i is consumption of the i^{th} good and $0 < \rho < 1$.

There is only one factor of production, labor — similarly to Krugman [1979, 1980, 1981], for example. There is free entry of firms, and each firm manufactures one good. All goods face the same cost function

$$l_i = a + \beta x_i, \tag{2}$$

where l_i is the amount of labor that is used in producing the i^{th} good, x_i is the output of the i^{th} good and $a, \beta > 0$. It follows that as in the standard model of monopolistic competition, production entails both a fixed and a variable cost.

Although all agents have the same utility function, they differ in their set of skills. In particular, there are two types of agents in the population, producers (*P*) and predators (*R*). Both producers and predators aim at maximizing their personal utility, but they build up different skills and thus pursue utility maximization in different ways. Producers develop the ability to contribute to the production of goods, but do not have appropriation skills. A producer receives a wage by providing up to one unit of labor. Predators, on the other hand, lack the ability to provide labor or contribute to production; instead, they develop an aptitude for appropriation activities, attempting to expropriate the property of producers.[5]

Appropriation may take several different forms. For example, expropriation may happen through brute force, theft or coercive encroachment (Hirshleifer [1988], Grossman and Kim [2000], Olson [2000]).[6] Predators may also use the government as a means of appropriation; the government may seize producer property through extractive taxation or regulation and redistribute it to predators (who may be government cronies or the bureaucrats and politicians themselves) (Hirshleifer [1988], Olson [2000], Acemoglu

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trade does not increase product variety but exposes existing domestic products to foreign competition. Segura-Cayuela [2006] focuses on price distortions, rather than on product variety.

[5] Murphy, Shleifer and Vishny [1993], Acemoglu [1995], Grossman and Kim [2000] and Anderson and Marcouiller [2005], among others, also construct models where there are both producers and predators in the population.

[6] Olson [2000] uses the term "roving bandits" to describe appropriation through theft or brute force.

and Robinson [2006, forth], De Soto [2000]).[7] Alternatively, predators may appropriate producer property indirectly by preying upon firm revenue through brute force or through the government (Acemoglu [1995, 2006]); such expropriation of firm revenue is passed on to producers by affecting the level of wages and prices.[8] For simplicity, the model assumes that predators prey upon producer property, rather than upon firm revenue. As section 4.2 will explain, our conclusions would remain qualitatively unchanged if firms, rather than producers were preyed upon by predators.

In the model an agent chooses his aptitude type — producer or predator — at the beginning of the game. Agents make their aptitude decisions with perfect foresight, aiming at maximizing their individual expected utility. The acquisition of skills constitutes a long-term training process that can only start early. For this reason, an agent's aptitude decision at the beginning of the game is irreversible and his particular aptitude type characterizes him for the entire game. The long-term nature of skill development in the model and the rather inflexible agent behavior that logically follows is in the spirit of Stigler and Becker [1977] who point out that long-term skills cause rational agents to commit to a rather rigid course of action. Overall, our model follows the standard game theory methodology of perfect foresight and subgame perfection (Fudenberg and Tirole [1991]). With rational expectations about the simultaneous aptitude decisions of other agents and the future effects of these decisions on his payoff, an agent chooses his aptitude type.

In the model, the distribution of the economy's output between producers and predators is determined by two parameters, namely society's property rights institutions and each producer's private protective measures. In particular, society establishes laws and institutions that fix the strength of producer property rights. Strong property rights institutions hinder appropriation, offering greater protection (than weak property rights institutions) to producers against predators. The strength of producer property rights is denoted by d; each producer is granted legal rights to a fraction d of the property that he

[7] De Soto [2000], for example, points out that in Peru it is extremely difficult to obtain formal legal rights to land. This often allows the government to seize the land of disenfranchised citizens and distribute it to predators (i.e., to cronies and corrupt government officials).

[8] In the monopolistic competition framework, there is free entry of firms, which implies that firm profits are driven to zero in equilibrium (Dixit and Stiglitz [1977]). Predators may thus prey only upon firm revenue, rather than upon non-existent firm profits.

buys with his income. A producer, on the other hand, does not have legal property rights to the remaining share $1 - d$ of his purchased belongings, which are vulnerable to appropriation. We have $d \in [0,1]$.

The implementation of society's institutional system entails administrative costs and utilizes productive resources; society needs to rely on producer skills to operate the legal and institutional infrastructure. Specifically, operating an institutional framework that achieves a strength of producer property rights d ($d \in [0,1]$) requires an amount $t(d)$ of each producer's time. We have $\partial t(d)/\partial d > 0$, i.e., administrative costs are increasing in the degree of property protection that the legal system offers. Furthermore, we have $\partial^2 t(d)/\partial d^2 \geq 0$; the convexity of the administrative cost function ensures that second-order conditions are met and is thus necessary for the existence of an interior equilibrium. It would be straightforward to extend the model so that society's institutional system entailed both a fixed cost T and a variable cost $t(d)$ (in the same way that production of a good entails both a fixed and a variable cost). The conclusions would be the same (unless fixed cost T were extremely high so that it totally precluded the establishment of a property rights system). Thus for simplicity and without any loss of generality, it is assumed that T is equal to zero.

Perhaps even more important than society's institutions are the private activities in which producers engage to protect their property from predators (De Meza and Gould [1992], Murphy, Shleifer and Vishny [1993], Grossman [2001]). As, for example, Grossman [2001] points out, "even with an advanced modern state and legal system, the single most important action that one takes to secure property is probably the purely private activity of locking one's doors."[9] Thus in our model, producers have the opportunity to hide some of their purchased belongings to prevent their appropriation. A producer may spend an amount of time e on privately hiding (and thus protecting) his property from predators, where $0 \leq e \leq 1$. An amount of time e that is allocated to hiding efforts allows a producer to conceal a fraction $z(e)$ of his property from predators. Predators are unable to locate and claim such hidden belongings even if a producer does not have legal property rights to them.

[9] Grossman [2001], p. 347.

We have $\partial z(e)/\partial e > 0$, i.e., a producer is able to conceal a larger fraction of his property as he increases the time that he spends on hiding activities. Furthermore, it is assumed that $\partial^2 z(e)/\partial e^2 \leq 0$ (i.e., $z(e)$ is concave), $\partial^3 z(e)/\partial e^3 \geq 0$ (which guarantees the convexity of the private cost function $e(d)$) and $(\partial z^3(e)/\partial e^3)(\partial z(e)/\partial e) \geq (\partial z^2(e)/\partial e^2)^2 - \left|(\partial z^2(e)/\partial e^2)(\partial z(e)/\partial e)\right|$ (which guarantees the convexity of the composite function $z(e(d))$). These assumptions ensure that second-order conditions are met and are thus necessary for the existence of an interior equilibrium. It would be straightforward to extend the model so that private hiding activities entailed both a fixed and a variable cost (in the same way that production entails both a fixed and a variable cost); when a producer incurred a fixed cost E and a variable cost e, he could conceal a fraction $z(e)$ of his property from predators. The conclusions would be the same (unless fixed cost E were extremely high so that it totally precluded private hiding activities). Thus for simplicity and without any loss of generality, it is assumed that E is equal to zero.

Because a producer has only one unit of time available, he provides manufacturing with $1-e-t$ units of productive labor when he spends a time e on property hiding and a time t on operating the country's institutional infrastructure.[10] Overall, a producer successfully protects from predators a fraction $d+z(e)$ of the property that he purchases with his income — the property to which he has legal rights and the property that he manages to privately conceal. The remaining fraction $1-d-z(e)$ is equally distributed among all predators.[11]

When society sets the level of d, it needs to convince each producer to spend the necessary amount of time $t(d)$ to complete his institutional assignment. A producer will divert time from manufacturing (where he earns a wage) to operate society's institutions only if the wage rate that he receives for performing institutional tasks is equal to the manufacturing wage rate. The model adopts a very simple compensation mechanism for institutional tasks. In particular, compensation for institutional tasks takes place through

[10] Predators, on the other hand, always spend their entire time on trying to appropriate producer property.
[11] The assumption that each predator obtains an equal share of the total appropriated output is standard in the literature and can be made for simplicity and without loss of generality. A similar assumption is made, for example, by Murphy, Shleifer and Vishny [1993] and Grossman and Kim [2000].

firms (as compensation for manufacturing tasks also takes place through firms). A firm is required to compensate its producer employees for the time that they spend on institutional tasks; the firm pays a producer the manufacturing wage rate *w* both for his manufacturing and institutional activities. When a producer provides several firms with manufacturing labor, his compensation for institutional activities is proportionately divided among his employers based on the amount of manufacturing labor that each employer receives from the producer.

Given the very long-term nature of aptitude choices — an agent starts developing the skills that are relevant to his aptitude type at the beginning of the game (a la Stigler and Becker [1977]) — decisions about the legal system in the model are made after agents have chosen their aptitude types. The two groups — producers and predators — engage in a political battle to impose self-serving legal rules for the strength of producer property rights *d*. The prevailing group chooses the level of *d* in the economy. In the political contest between producers and predators strength lies in numbers. Specifically, producers cooperatively determine the economy's legal system, — i.e., the level of *d* — if the fraction of producers in the population is above a threshold value $\overline{\theta}$ ($\theta^P \geq \overline{\theta}$), where $0 < \overline{\theta} < 1$. If, on the other hand, $\theta^P < \overline{\theta}$, the legal system is cooperatively selected by predators. This process is in the spirit of the social conflict literature (e.g., Acemoglu [2005, 2006], Acemoglu and Robinson [2006, forth]), which stresses that an economy's legal and institutional structure is determined by the prevalent social group — either the group of producers or predators in our model.[12]

We have a five-stage game:

Stage 1: Each agent chooses his aptitude type — producer or predator — and begins acquiring the skills relevant for his type.

Stage 2: The population sets up a legal system that determines the strength of producer property rights *d*.

Stage 3: Each producer chooses the amount of time *e* that he will spend on privately hiding his property.

[12] In practice, the level of political threshold $\overline{\theta}$ is also affected by a country's factor endowments, such as a country's climate and soil conditions. Certain types of factor endowments facilitate the efforts of producers to prevail politically, leading to a lower $\overline{\theta}$ (Engerman and Sokoloff [1997]).

Stage 4: Production takes place. Producers use their income to buy goods.

Stage 5: Predators try to appropriate the goods that producers have bought.

3. EQUILIBRIUM OF THE BASIC MODEL

To solve for the subgame-perfect equilibrium, I proceed by backward induction.

3.1. Production Decisions

In stage 4, a producer maximizes his utility function subject to his budget constraint

$$\underset{c_i}{Max} \sum_i \{[d + z(e)]c_i\}^{\rho} + \lambda[(1-e)w - \sum_i p_i c_i] \Rightarrow$$

$$p_i = \rho\lambda^{-1}[d + z(e)]^{\rho} c_i^{\rho-1}, \tag{3}$$

where p_i is the price of good i, c_i is the amount of good i that is bought by the producer, w is manufacturing wage rate and λ is the marginal utility of income.

Because all producers are identical, the market demand for the i^{th} good in stage 4 is

$$p_i = \rho\lambda^{-1}[d + z(e)]^{\rho} (\frac{x_i}{\theta^P L})^{\rho-1}, \tag{4}$$

where x_i is the output of the i^{th} good. It follows that each firm i faces a demand curve with an elasticity ε of $1/(\rho-1)$.

A firm maximizes its profit when its marginal revenue is equal to its marginal cost. A firm's marginal cost also includes the firm's obligation to compensate its producer employees for their institutional activities. A producer spends a time $t(d)$ on institutional activities and a time $1-e-t(d)$ on manufacturing; as a result, for every unit of a producer's manufacturing time that a firm utilizes, the firm compensates the producer for institutional activities that occupy a time $t(d)/[1-e-t(d)]$. Thus, marginal

cost being equal to marginal revenue implies that $p_i = \rho^{-1}\beta(1-e)w/[1-e-t(d)]$. Furthermore, given that ρ, β, w, e and $t(d)$ are the same for all firms, all goods i have the same price p, i.e., $p_i = p$.

As in the standard monopolistic competition model, given that entry is free, in equilibrium each firm earns a zero profit (Dixit and Stiglitz [1977]). It follows that

$$x_i = \frac{a\rho}{\beta(1-\rho)}. \tag{5}$$

Because a and β are the same for all firms, each firm i produces the same output x, i.e., $x = x_i$.

Finally, the full employment condition states that

$$(1-e-t)\theta^P L = \sum_{i=1}^{n} a + \beta x_i. \tag{6}$$

From (5) and (6) it follows that

$$n = \frac{(1-e-t)\theta^P L}{a+\beta x} = \frac{(1-e-t)\theta^P L(1-\rho)}{a}. \tag{7}$$

3.2. Choice of *e* by Producers

Because the economy's population is large, an individual producer's choice of e has a negligible effect on n and w. Thus a producer's choice of $e(d)$ is

$$e(d) = \arg\max_{e}[d + z(e)](1-e). \tag{8}$$

We have $\partial e(d)/\partial d < 0$. When producer property rights are strong, a producer does not need to spend much time privately hiding his property from predators.

Lemma 1: The time *e* that a producer privately spends to hide his property is decreasing in the strength of producer property rights *d*, i.e. $\partial e(d)/\partial d < 0$.

Proof: The proof is in the appendix.

Stronger property rights institutions — a higher *d* — offer greater legal protection to producers, but also induce producers to reduce their private hiding efforts. Overall, because in private hiding activities the marginal product of time is diminishing ($\partial^2 z(e)/\partial e^2 < 0$), a producer maintains possession of a higher fraction of his property as property rights become stronger, i.e., $\partial[d + z(e(d))]/\partial d > 0$.

Lemma 2: The overall fraction of his property of which a producer maintains possession is increasing in the strength of producer property rights *d*, i.e., $\partial[d + z(e(d))]/\partial d > 0$.

Proof: The proof is in the appendix.

3.3. Choice of *d* by the Population

When the proportion of producers in the population is weakly higher than $\overline{\theta}$, i.e., when $\theta^P \geq \overline{\theta}$, producers prevail politically, and a producer-friendly legal regime is established. Producers cooperatively choose the level of *d* to maximize producer utility, setting *d* equal to *d** where

$$d^* = \arg\max_d \{[d + z(e(d))]\frac{x}{\theta^P L}\}^{\rho} \frac{[1 - e(d) - t(d)]\theta^P L(1-\rho)}{a}. \qquad (9)$$

The interior solution is given by

$$\rho[1 + \frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}][1 - e(d) - t(d)] - [d + z(e(d))][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}] = 0. \qquad (10)$$

As condition (10) implies, producers face a trade-off when they choose the level of d^*. A high level of d has three effects:

(a) Protection effect: It allows producers to maintain possession of a higher fraction of their property (i.e., $\rho[1+(\partial z(e)/\partial e)(\partial e(d)/\partial d)]][1-e(d)-t(d)]>0$ according to lemma 2).

(b) Private hiding cost effect: It induces producers to spend less time to privately hide their property and thus increases the amount of labor that is available for manufacturing ($-[d+z(e)]\partial e(d)/\partial d>0$ according to lemma 1). In this way, the economy enjoys the advantages of large-scale production; the variety of goods that are manufactured in the economy increases.

(c) Administrative cost effect: It induces producers to spend more time to operate the country's institutional infrastructure ($-[d+z(e)]\partial t(d)/\partial d<0$). In this way, the economy incurs the disadvantages of low-scale production; the variety of goods that are manufactured in the economy decreases.

For producers, the protection and private hiding cost effects are favorable, while the administrative cost effect is harmful. Producers weigh all three effects when they chooses the level of d^*.

When, on the other hand, the proportion of producers in the population is lower than $\overline{\theta}$, i.e., when $\theta^P<\overline{\theta}$, predators prevail politically, and a predator-friendly legal regime is established. Predators cooperatively choose the level of d to maximize predator utility, setting d equal to d^{**} where

$$d^{**}=\arg\max_d\{[1-d-z(e(d))]\frac{x}{(1-\theta^P)L}\}^{\rho}\frac{[1-e(d)-t(d)]\theta^P L(1-\rho)}{a}. \qquad (11)$$

As before, a high level of d has a protection, a private hiding cost and an administrative cost effect. The difference is that for predators, the protection effect is harmful; stronger protection of producer property hinders appropriation. Predators weigh all three effects when they choose the level of d^{**}.

Because the protection effect of a high d is favorable for producers and harmful for predators, we have $d^{**} < d^{*}$ in an interior solution.

Proposition 1: The strength of producer property rights d^{*} in the producer-friendly equilibrium is higher than the strength of producer property rights d^{**} in the predator-friendly equilibrium, i.e., $d^{*} > d^{**}$.

Proof: The proof is in the appendix.

Overall, in stage 2, the equilibrium strength of property rights institutions is never optimal from a social standpoint; the politically prevalent group self-servingly chooses the level of d that maximizes the welfare of its members, rather than the welfare of the entire country. In particular, when producers prevail politically (producer-friendly equilibrium), they establish excessively strong property rights institutions from a social standpoint to reduce the transfer of property to predators (lemma 2). When, on the other hand, predators prevail politically (predator-friendly equilibrium), they set up excessively weak property rights institutions from a social standpoint to enhance the transfer of property to predators (lemma 2).

3.4. Agent Type Decisions

There are two subgame-perfect equilibria in the game. In the producer-friendly equilibrium, a proportion $\theta^{P}* = d* + z(e(d*))$ of agents choose to become producers.[13] Then, producers establish producer-friendly property rights institutions, setting d equal to $d*$ in stage 2. The number of goods that are manufactured is $n* = [1 - e(d*) - t(d*)][d* + z(e(d*))]L(1-\rho)/a$, and the utility of each agent in the end of the game is $u* = (x/L)^{\rho} n*$.

[13] In a subgame-perfect equilibrium, no agent has incentive to deviate from his aptitude choice in stage 1 given that the other agents do not deviate (Fudenberg and Tirole [1991]). Thus the expected utility of a producer is equal to the expected utility of a predator; otherwise, agents would have an incentive to deviate.

Similarly, in the predator-friendly equilibrium, the proportion of producers is $\theta^P{}** = d** + z(e(d**))$, where $d** + z(e(d**)) < d* + z(e(d*))$.[14] Predators establish a predator-friendly legal regime, setting d equal to $d**$ in stage 2. The number of products that are manufactured is $n** = [1 - e(d**) - t(d**)][d** + z(e(d**))]L(1-\rho)/a$. The utility of each agent — producer or predator — in the end of the game is $u** = (x/L)^{\rho} n**$.

To ensure the existence of both a producer-friendly and a predator-friendly equilibrium, it is assumed that $d** + z(e(d**)) < \bar{\theta} \leq d* + z(e(d*))$. This implies that when the proportion of producers is $d* + z(e(d*))$, the legal regime and property rights institutions are chosen by producers. Furthermore, when the proportion of producers is $d** + z(e(d**))$, the legal regime is chosen by predators.

Proposition 2: The proportion of producers in the population is $d* + z(e(d*))$ in the producer-friendly equilibrium and $d** + z(e(d**))$ in the predator-friendly equilibrium, where $d* + z(e(d*)) > d** + z(e(d**))$.

I will now derive lemma 3 that is not in itself especially interesting, but will lay the groundwork for the analysis of international trade in the next section.

Lemma 3: In the producer-friendly equilibrium, the absolute value of the marginal administrative cost is always higher than the absolute value of the marginal private hiding cost ($\partial t(d)/\partial d(d = d*) > -\partial e(d)/\partial d(d = d*)$). In the predator-friendly equilibrium, the absolute value of the marginal private hiding cost is always higher than the absolute value of the marginal administrative cost ($\partial t(d)/\partial d(d = d**) < -\partial e(d)/\partial d(d = d**)$).

Proof: The proof is in the appendix.

[14] The derivative of $d + z(e(d))$ with respect to d is always strictly positive. See lemma 2.

Intuitively, lemma 3 is a necessary condition for equilibrium. If lemma 3 did not hold, producers would have an incentive to deviate from d^* and choose a higher d in the producer-friendly equilibrium, and predators would have an incentive to deviate from d^{**} and choose a lower d in a predator-friendly equilibrium.

In stage 2, the politically prevalent group — producers or predators — chooses the strength of producer property rights (and thus the degree of administrative and private hiding costs) that maximizes its own welfare, rather than social welfare. Because, however, in the producer-friendly equilibrium the proportion of producers in the population is higher than in the predator-friendly equilibrium, it can be shown that overall, the size of the manufacturing labor force is larger in the producer-friendly equilibrium; the variety of products that are manufactured in the economy is greater ($n^* > n^{**}$).

Lemma 4: A larger number of products are manufactured in the economy in the producer-friendly than in the predator-friendly equilibrium, i.e., $n^* > n^{**}$.

Proof: The proof is in the appendix.

The producer-friendly equilibrium Pareto dominates the predator-friendly equilibrium. Intuitively, in the producer-friendly equilibrium the allocation of skills in the population is more conducive to economic prosperity (than in the predator-friendly equilibrium). A large number of producers leads to economies of scale and eventually enhances the range of available goods in the economy.

Proposition 3: The producer-friendly equilibrium Pareto dominates the predator-friendly equilibrium.

4. INTERNATIONAL TRADE

The basic model examined a closed economy. We now extend the analysis to incorporate international trade. The home country trades with an outside world at zero transportation cost. For simplicity, it is assumed that the home country and the outside

world have identical tastes and technologies. Tastes and technologies are the same as in the basic model. As section 4.4 will explain, the conclusions are similar when the home country and the outside world have different tastes, technologies or factor endowments (as in Heckscher-Ohlin trade) so long as production continues to entail increasing returns to scale.

In each country in the world, local predators compete politically with local producers. A country's government establishes national property rights institutions. As in most standard trade theory models — both comparative advantage (Samuelson [1948]) and imperfect competition (Krugman [1979, 1980, 1981]) models — labor cannot move between countries. It follows that predators are unable to appropriate the property of producers in other countries; such producers live in different geographical areas and fall within different institutional jurisdictions. Furthermore, as section 4.2 will explain, our conclusions would be qualitatively similar if predators preyed upon locally generated firm revenue (i.e., upon the revenue that home and foreign firms generated in the domestic market), rather than upon local producer property.

To solve for the equilibrium, I proceed by backward induction.

4.1. Production Decisions and Choice of *e*

By following the same procedure as in the basic model, we can see that each home or foreign firm *i* generates an output *x* that is equal to $a\rho/\beta(1-\rho)$.[15] The number of products that are manufactured in the home country is $(1-e-t)\theta^P L(1-\rho)/\alpha$. In stage 4, if the number of products that are imported from the outside world is n^F, each producer in the home country distributes his expenditure over both the *n* goods that are manufactured in the home country and the n^F goods that are imported from the outside world. Given that in equilibrium that balance of payments must be zero, a proportion $n/(n+n_F)$ of each firm's output *x* is bought by home producers, while a proportion $n_F/(n+n_F)$ is bought by foreign producers.

[15] As in Krugman [1980], each firm produces the same amount of output regardless of whether an economy is open or closed.

The utility of a producer at home thus is $\{[d+z(e)][n/(n+n^F)]x/(\theta^P L)\}^\rho (n+n^F)$, which is equal to $(n+n^F)^{1-\rho}\{n[d+z(e)]x/(\theta^P L)\}^\rho$. Similarly, the utility of a predator at home is $\{[1-d-z(e)][n/(n+n^F)]x/[(1-\theta^P)L]\}^\rho (n+n^F)$, which is equal to $(n+n^F)^{1-\rho}\{n[1-d-z(e)]x/[(1-\theta^P)L]\}^\rho$. Furthermore, in the presence of international trade, a producer's optimization problem regarding the time that he spends on privately hiding his property is described by expression (8), as in the basic model.[16]

4.2. Choice of *d* by the Population

When the proportion of producers in the home population is weakly higher than $\overline{\theta}$, i.e., when $\theta^P \geq \overline{\theta}$, producers prevail politically and establish a producer-friendly legal regime. Producers cooperatively choose the level of *d* to maximize producer utility. We have a $\tilde{d}^*$ where

$$\tilde{d}^* = \arg\max_d \{[d+z(e(d))][1-e(d)-t(d)]\}^\rho \{\frac{[1-e(d)-t(d)]\theta^P L(1-\rho)}{2a} + n^F\}^{1-\rho}. \quad (12)$$

A comparison of conditions (9) and (12) implies that in an interior solution, international trade (where $n^F > 0$) leads to stronger property rights institutions than in autarky (where $n^F = 0$) in producer-friendly countries, i.e., $\tilde{d}^* > d^*$.

Proposition 4: International trade increases the strength of producer property rights in countries with producer-friendly legal regimes, i.e., $\tilde{d}^* > d^*$.

Proof: The proof is in the appendix.

[16] In the presence of international trade, however, the equilibrium level of *e* is not necessarily the same as in autarky because the equilibrium level of *d* can be different (and, as expression (8) shows, *e* is a function of *d*).

When, on the other hand, the proportion of producers in the population is lower than $\bar{\theta}$, i.e., when $\theta^P < \bar{\theta}$, predators prevail politically and establish a predator-friendly legal regime. Predators cooperatively choose the level of *d* to maximize predator utility. We have a $\tilde{d}^{**}$ where

$$\tilde{d}^{**} = \arg\max_d \{[1-d-z(e(d))][1-e(d)-t(d)]\}^{\rho} \{\frac{[1-e(d)-t(d)]\theta^P L(1-\rho)}{a} + n^F\}^{1-\rho}. \quad (13)$$

A comparison of conditions (11) and (13) implies that in an interior solution, international trade (where $n^F > 0$) leads to weaker property rights institutions that in autarky (where $n^F = 0$) in predator-friendly countries, i.e., $\tilde{d}^{**} < d^{**}$.

Proposition 5: International trade reduces the strength of producer property rights in countries with predator-friendly legal regimes, i.e., $\tilde{d}^{**} < d^{**}$.

Proof: The proof is in the appendix.

Intuitively, a crucial parameter that affects the utility of agents (producers or predators) is the extent of available product variety.[17] International trade makes overall product variety less sensitive to the size of the domestic manufacturing labor force or to domestic policy by giving home agents access to a range of foreign goods. The home country is in less need to realize domestic economies of scale and manufacture a wide variety of products. For this reason, in the presence of international trade, when the politically prevalent group — producers or predators — self-servingly makes decisions about the strength of property rights institutions (and thus the distribution of output between itself and the other group), it is less concerned about the effects of such decisions on the effective size of the domestic manufacturing labor force $(1-e-t)\theta^P L$ or the number of domestically manufactured products.

[17] *Supra* note 2.

As a result, when producers prevail politically, they always favor stronger property rights institutions under international trade than in autarky; international trade mitigates the negative impact of disproportionately high administrative costs (which constitute time that has been diverted from manufacturing) on overall product variety. On the other hand, when predators prevail politically, they always set weaker property rights institutions under international trade than in autarky; international trade eases the negative impact of disproportionately low administrative costs (and thus disproportionately high private hiding costs) on overall product variety.

As section 2 explains, in the model, predators prey upon producers directly, rather than indirectly through the expropriation of firm revenue. Our results would be similar qualitatively even if predators expropriated firm revenue, rather than producer property. In particular, assume that the home government expropriates a fraction of the revenue that each firm (home and foreign) generates in the home country. As in the basic model, a firm can allocate the time of its workers between productive and private hiding activities. Then, as in our baseline analysis, international trade makes overall product variety less sensitive to domestic institutional policies. In autarky overall product variety depends entirely on domestic policies, while under free trade overall variety also depends on exogenous foreign policies. It follows that as before, free trade allows a predator-friendly regime to choose weaker property rights institutions and a producer-friendly regime to choose stronger institutions than in autarky.

4.3. Agent Type Decisions

As in the basic model, there are two subgame-perfect equilibria in the game. In the producer-friendly equilibrium, a proportion $\tilde{\theta}^P* = \tilde{d}* + z(e(\tilde{d}*)) > \theta^P*$ of agents choose to become producers, which is higher than the proportion of producers in autarky.[18] In particular, because in stage 2 international trade leads to stronger producer property rights, the rational anticipation of this effect induces a larger number of agents to become producers in stage 1 (compared with autarky). The number of products that are manufactured at home is $\tilde{n}* = [1 - e(\tilde{d}*) - t(\tilde{d}*)][\tilde{d}* + z(e(\tilde{d}*))]L(1-\rho)/\alpha$, and the

[18] *Supra* note 14.

utility of each agent — producer or predator — in the end of the game is $\tilde{u}^* = (\tilde{n}^* x / L)^{\rho} (\tilde{n}^* + n^F)^{1-\rho}$.

Proposition 6: In the producer-friendly equilibrium, international trade increases the proportion of producers in the population, i.e., $\tilde{d}^* + z(e(\tilde{d}^*)) > d^* + z(e(d^*))$.

In the predator-friendly equilibrium, on the other hand, a proportion $\tilde{\theta}^P{}^{**} = \tilde{d}^{**} + z(e(\tilde{d}^{**})) < \theta^P{}^{**}$ of agents choose to become producers, which is lower than the proportion of producers in autarky.[19] Specifically, in stage 2, international trade leads to weaker producer property rights compared with autarky. The rational anticipation of this effect induces a larger number of agents to become predators in stage 1 (compared with autarky). The number of products that are manufactured at home is $\tilde{n}^{**} = [1 - e(\tilde{d}^{**}) - t(\tilde{d}^{**})][\tilde{d}^{**} + z(e(\tilde{d}^{**}))]L(1-\rho)/\alpha$, and the utility of each agent — producer or predator — in the end of the game is $\tilde{u}^{**} = (\tilde{n}^{**} x / L)^{\rho} (\tilde{n}^{**} + n^F)^{1-\rho}$.

Proposition 7: In the predator-friendly equilibrium, international trade reduces the proportion of producers in the population, i.e., $\tilde{d}^{**} + z(e(\tilde{d}^{**})) < d^{**} + z(e(d^{**}))$.

International trade thus leads to a more favorable allocation of talent in producer-friendly countries. The rational anticipation of stronger property rights institutions (proposition 4) encourages more agents to choose to become producers (rather than predators) under international trade than in autarky. In predator-friendly countries, on the other hand, free trade causes a more unfavorable allocation of talent; the rational anticipation of weaker property rights institutions (proposition 5) induces a smaller number of agents to choose to become producers.

4.4. Comparative Advantage

[19] *Supra* note 14.

The analysis assumes that both the home country and the outside world have the same tastes, technologies and factor endowments; there are no comparative advantages. This assumption is made for simplicity and without any loss of generality. In particular, Krugman [1981] shows that it is straightforward to extend the standard monopolistic competition model of trade to account for comparative advantage. If a country is endowed with a large quantity of specialized inputs for an industry, it becomes a net exporter of the industry's products. Then, there is both inter-industry and intra-industry international trade.[20]

The conclusions of our paper would remain qualitatively similar if the monopolistic competition model were extended to allow trading countries to have different tastes, technologies or factor endowments — as, for example, in Krugman [1980, 1981]. The crucial element that drives our results is the existence of increasing returns to scale in production. As long as production entails increasing returns, it does not matter whether the home country engages in intra-industry or inter-industry trade with the outside world.

5. WELFARE EFFECTS OF INTERNATIONAL TRADE

This section examines the effects of international trade on the utility of agents. International trade increases the utility of agents in a producer-friendly equilibrium. For one thing, as in Krugman [1979, 1980, 1981], a range of foreign products becomes available to agents. Also, the analysis brings out a new effect; international trade increases the proportion of producers in the population, which further raises agent utility.

Proposition 8: In a producer-friendly equilibrium, the utility of home agents is increasing in the extent of international trade, i.e., $\partial \tilde{u}^* / \partial n^F > 0$.

Proof: The proof is in the appendix.

[20] Similarly, Krugman [1980] examines the case where home consumers have different tastes from foreign consumers. When local consumers have a strong preference for an industry's products, the country becomes a net exporter of these products.

Thus when a producer-friendly autarkic country (where $n^F = 0$) opens up its borders to international trade, the utility of home agents increases, i.e., $\partial \tilde{u}^* / \partial n^F (n^F = 0) > 0$. Furthermore, the utility of home agents continues to improve as the number of imported goods (e.g., as the size of the country's trading partners) increases, i.e., $\partial \tilde{u}^* / \partial n^F > 0$.

In a predator-friendly equilibrium, on the other hand, international trade generates two opposing effects. As before, international trade gives home consumers access to a range of products that are manufactured in the outside world. At the same time, however, international trade also leads to a more adverse talent allocation (i.e., a lower proportion of producers) at home. The former effect counters the latter, and the welfare effects of trade are ambiguous.

The utility of home agents in increasing in the extent of international trade — i.e., we have $\partial \tilde{u}^{**} / \partial n^F > 0$ — if

$$1 + \frac{1}{1-\rho} \frac{\partial \tilde{n}^{**}}{\partial n^F} + \frac{\rho}{1-\rho} \frac{\partial \tilde{n}^{**}}{\partial n^F} \frac{n^F}{\tilde{n}^{**}} > 0 . \qquad (14)$$

In this case, international trade enhances social welfare. If, on the other hand, condition (14) is negative, the utility of home agents is decreasing in the extent of international trade — i.e., we have $\partial \tilde{u}^{**} / \partial n^F < 0$. Then, international trade reduces social welfare.

We can show that at least when consumers place a sufficiently high value on product variety in their utility function, — i.e., when ρ is sufficiently low — international trade enhances welfare.

Proposition 9: In a predator-friendly equilibrium, $\exists \overline{\rho} \in (0,1)$ so that at least $\forall \rho \in (0, \overline{\rho}]$, $\partial \tilde{u}^{**} / \partial n^F > 0$, i.e., the utility of home agents is increasing in the extent of international trade.

Proof: The proof is in the appendix.

Thus at least when consumers place a sufficiently high value on product variety in their utility function, the benefits from gaining access to a range of foreign products outweigh the costs of a deterioration in domestic talent allocation. Then, if a predator-friendly autarkic country (where $n^F = 0$) opens up its borders to international trade, the utility of home agents increases, i.e., $\partial \tilde{u}^{**} / \partial n^F (n^F = 0) > 0$. Furthermore, the utility of home agents continues to improve as the number of imported goods (e.g., as the size of the country's trading partners) increases, i.e., $\partial \tilde{u}^{**} / \partial n^F > 0$.

Several theoretical articles in the trade and imperfect competition literature (e.g., Krugman [1979, 1981]) or the trade and comparative advantage literature (e.g., Samuelson [1948]) point out that international trade equalizes utility among countries. This conclusion, however, does not hold after we incorporate institutional and talent allocation effects.[21] To show this, I start by examining the effects of international trade on the number of products that are manufactured domestically. Because agents encounter three different and often opposing effects — the protection, private hiding cost and administrative cost effect — when they choose the level of *d*, the effects of free trade on the number of domestically manufactured products are not obvious at a first glance. It can be shown that international trade increases the number of products that are produced at home when the home country is in a producer-friendly equilibrium, i.e., $\partial \tilde{n}^{*} / \partial n^F > 0$. Furthermore, international trade decreases the range of home products when the home country is in a predator-friendly equilibrium, i.e., $\partial \tilde{n}^{**} / \partial n^F < 0$.

Lemma 5: In a producer-friendly equilibrium, the number of home products is increasing in the extent of international trade, i.e., $\partial \tilde{n}^{*} / \partial n^F > 0$. In a predator-friendly equilibrium, the number of home products is decreasing in the extent of international trade, i.e., $\partial \tilde{n}^{**} / \partial n^F < 0$.

Proof: The proof is in the appendix.

[21] In Do and Levchenko [2006], Segura-Cayuela [2006] and Levchenko [2007a,b], international trade also does not lead to utility equalization among countries.

For any given number of imports n^F, the utility of each agent — producer or predator — is $\tilde{u}^* = (\tilde{n}^* x / L)^{\rho} (\tilde{n}^* + n^F)^{1-\rho}$ in a producer-friendly equilibrium. In a predator-friendly equilibrium, on the other hand, the utility of each agent is $\tilde{u}^{**} = (\tilde{n}^{**} x / L)^{\rho} (\tilde{n}^{**} + n^F)^{1-\rho}$. Furthermore, lemmas 4 and 5 imply that $\tilde{n}^* > \tilde{n}^{**}$. It thus follows that $\tilde{u}^* > \tilde{u}^{**}$; for any given number of imports n^F, the producer-friendly equilibrium Pareto dominates the predator-friendly equilibrium.

Proposition 10: For any given number of imports n^F, the producer-friendly equilibrium Pareto dominates the predator-friendly equilibrium.

Free trade thus does not lead to utility equalization among producer-friendly and predator-friendly countries. Only domestic talent allocation and institutional changes can allow a predator-friendly country to attain a producer-friendly level of welfare.

6. HISTORICAL EXAMPLES AND EMPIRICAL IMPLICATIONS

The insights of the model are consistent with historical evidence. Furthermore, the analysis brings out empirical implications that are insufficiently understood in existing economic theory.

6.1. Historical Examples

Two relevant historical examples are the rapid globalization in Europe in the 16th century and the continuous openness to international trade of most countries in the Caribbean Sea since they were first colonized in the 17th century.

6.1.1. Globalization in Europe in the 16th Century

For Europe, the 16th century was a period of rapid globalization. New ship technology and geographical discoveries allowed England, France, the Netherlands, Portugal and Spain to engage in Atlantic trade, i.e., in international trade with the New World, Africa and Asia via the Atlantic (Acemoglu, Johnson and Robinson [2005]). At the same time, Eastern European countries (e.g., East Elbean Germany, Poland and the

Baltic) increased dramatically their grain exports; Spain, Portugal and the Netherlands were among the main importers. The expansion of the grain trade is demonstrated by the rise in the number of vessels passing through the Baltic Sea from approximately 1300 a year in 1500 to approximately 5000 a year in 1600 (North and Thomas [1973]).

The institutional and talent allocation effects of the rapid globalization in sixteenth–century Europe are consistent with our model. In countries with strong property rights institutions, such as England and the Netherlands, international trade led to a further institutional improvement and a shift of talent toward productive activities, such as commerce (Acemoglu, Johnson and Robinson [2005]). Eastern European countries, on the other hand, had weak property rights institutions; the increased volume of international trade was associated with a further institutional deterioration and a so-called "second serfdom" (Wallerstein [1974], Chirot [1989]). Several historians believe that the reinstatement of serfdom, which is a form of forced labor, in Eastern Europe was caused by the region's increased openness to international trade after 1500 (Wallerstein [1974], Chirot [1989]).

6.1.2. The Caribbean Region

Countries in the Caribbean Sea constitute another example in which weak property rights institutions and extensive appropriation are associated with international trade. Countries in the Caribbean are among the most open countries in the world; their ratio of the volume of international trade to the level of GDP is higher than in most developed countries, such as the United States and Japan (see Table 1). At the same time, most of the region exhibits extraordinarily weak property rights institutions and intense appropriation activity. For example, after the Caribbean was colonized by Europeans in the 17th century, the use of slave labor became widespread (Landes [1998]). Even today, most countries in the Caribbean have a high degree of corruption (see Table 1). Several historians and practitioners believe that openness to international trade may be inextricably linked to the emphasis on appropriation and the prevalence of slavery in the region (Engerman and Sokoloff [1997], Landes [1998], Economist [2005]). The Economist [2005], for example, refers to the sugar trade as a source of "sweetness and slavery" for the Caribbean.

6.1.3. Product Variety and Economies of Scale

Our model emphasizes product variety and economies of scale in production as a possible channel through which international trade may affect a country's property rights institutions and allocation of talent. The empirical findings of Broda and Weinstein [2006] confirm that the extent of product variety is an important determinant of consumer welfare in a country; consumers would be willing to pay a significant part of their income to attain access to a wider set of product varieties. Thus, our model implies in a predatory country, ruling predators may transfer part of their income to producers through the establishment of stronger property rights institutions (which reduce appropriation) to induce producers to spend more time on production, rather than on private hiding activities, and produce a wider set of domestic varieties. Such a transfer of income towards producers is more important in closed economies that rely heavily on domestic product variety.

Slavery or serfdom (which is a mild form of slavery) is a characteristic example of an extractive institution that may lead to high private hiding costs.[22] Slaves are poorly motivated to produce, practicing shirking and diverting a substantial amount of time from production towards passive and active resistance activities (Wright [1978], Landes [1998]).[23] Landes [1998], for example, describes the private hiding costs of slavery in the Caribbean:

"It goes without saying that such mistreatment aroused resistance, both passive (suicide, abortions, and infanticide) and active (sabotage, murder, flight to a life of brigandage) … Not good for industry."[24]

Because slavery entails significant private hiding costs, it squanders human capital and may be an unsuitable institution for a country that seeks to produce a wide variety of high-fixed-cost products. Wright [1978], for example, points out that slavery is

[22] Of course, slavery may allow a group of predators to self-servingly extract wealth from a group of slaves, leading to very profitable agricultural enterprises.
[23] According to Fogel and Engerman [1974], on the other hand, slavery was a very efficient labor system.
[24] Landes [1998], p. 123.

incompatible with diversified industrial production; the U.S. South struggled to diversify into industry.

In this regard, openness to international trade may have encouraged predators in sixteenth-century Eastern Europe or in seventeenth-century Caribbean to establish a system of serfdom or slavery. If these regions had remained less open to international trade, they would have been forced to produce domestically some of their high-fixed-cost imports. Many of their imports were manufactures that entailed significant economies of scale in their production (Chirot [1989], Landes [1998]). Landes [1998], for example, explains that in the Caribbean region, the profits from exporting sugar were used to buy a wide variety of foreign manufactures.

"[the planters] … also bought manufactures: cheap cotton textiles and high-fashion silks; copper vessels for boiling shed and still; iron, nails, guns; and machines and parts for the mill." [25]

Local production of some of these high-fixed-cost imports would have required a better utilization of domestic productive labor and a minimization of the amount of human capital that was squandered on private hiding activities. It follows that less openness to international trade — i.e., a reduction in the range of imported varieties — might have induced ruling predators to transfer a larger fraction of their income to producers through stronger property rights institutions to boost domestic product variety.

6.2. Empirical Implications

The empirical literature shows that there is a positive correlation between institutional quality and the volume of international trade (Ades and Di Tella [1999], Treisman [2000]). For example, as Anderson and Marcouiller [2002, 2005] point out, strong property rights institutions facilitate the enforcement of cross-border contracts and augment the security of cross-border transactions, increasing the volume of international trade. Our analysis supplements Anderson and Marcouiller [2002, 2005] by focusing on the reverse issue, i.e., on the impact of international trade on institutions (rather than the impact of institutions on international trade).

[25] Landes [1998], p. 120.

When econometricians seek to infer how the effect of one independent variable on the dependent variable depends on the magnitude of another independent variable, they often estimate interaction terms. An interaction term is the product of two (or more) independent variables and is usually used in addition to the variables themselves. Our analysis thus implies that in an OLS regression where the endogenous variable is subsequent institutional quality, — i.e., institutional quality after a region opens up its borders to free trade, — the interaction term (volume of international trade x initial institutional quality) must have a positive and significant coefficient. The positive correlation between subsequent institutional quality and international trade (which is predicted by Anderson and Marcouiller [2002, 2005]) must be more pronounced in countries with efficient initial institutions; in such countries international trade leads to an institutional improvement, reinforcing the positive correlation. In countries with inefficient initial institutions, on the other hand, international trade leads to an institutional deterioration, mitigating the positive correlation.

This implication is consistent with the empirical findings of Acemoglu, Johnson and Robinson [2005], who study European nations after they started to engage in Atlantic trade (i.e., in international trade via the Atlantic) in 1500. Acemoglu, Johnson and Robinson [2005] demonstrate that the interaction term (volume of Atlantic trade x initial institutional quality) has a positive and significant coefficient in OLS regressions for predicting subsequent institutional quality.[26]

7. CONCLUSION

Despite it being an important policy issue, the impact of international trade on institutional efficiency and on talent allocation is not fully understood. In this paper, I develop a simple model to examine how international trade affects an economy's domestic property rights institutions, as well as the allocation of domestic talent between constructive production and wasteful appropriation. I show that international trade has a favorable effect on talent allocation and on institutions in economies that are in a

[26] Acemoglu, Johnson and Robinson [2005], however, provide a rather different interpretation of their empirical findings, stressing the role of the merchant class (rather than the role of product variety and scale economies). They point out that international trade increases the power of the merchant class in countries with good initial institutions.

producer-friendly equilibrium. In predator-friendly economies, on the other hand, international trade leads to a shift of talent toward appropriation and even weaker property rights institutions. The case for free trade always holds for producer-friendly economies; international trade enhances social welfare. In predator-friendly economies, on the other hand, free trade generates ambiguous social welfare effects.

In general, while the interplay between talent allocation, property rights and international trade is a very broad and contested topic, most of the related discussion lacks formal analysis. Therefore, the study of theoretical models that formalize the issues is a necessary step in gaining a better understanding of this important policy question.

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APPENDIX

Proof of Lemma 1

When a producer chooses *e*, his first-order condition is

$$\frac{\partial z(e)}{\partial e}(1-e)-[d+z(e)]=0. \tag{A1}$$

From (A1), we derive $\partial e(d)/\partial d$ through implicit differentiation. We have

$$\frac{\partial e(d)}{\partial d}=[\frac{\partial^2 z(e)}{\partial e^2}(1-e)-2\frac{\partial z(e)}{\partial e}]^{-1}<0. \tag{A2}$$

Proof of Lemma 2

We have

$$\frac{\partial[d+z(e(d))]}{\partial d}=1+\frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}=\frac{\frac{\partial^2 z(e)}{\partial e^2}(1-e)-\frac{\partial z(e)}{\partial e}}{\frac{\partial^2 z(e)}{\partial e^2}(1-e)-2\frac{\partial z(e)}{\partial e}}>0. \tag{A3}$$

Proof of Lemma 3

If $\partial t(d)/\partial d(d=d^*)>-\partial e(d)/\partial d(d=d^*)$ did not hold in an interior solution in the producer-friendly equilibrium, first-order condition (10) would be strictly positive, rather than equal to zero. Similarly, if $\partial t(d)/\partial d(d=d^{**})<-\partial e(d)/\partial d(d=d^{**})$ did not hold in an interior solution in the predator-friendly equilibrium, first-order condition (A6) would be strictly negative, rather than equal to zero.

Proof of Lemma 4

The number of products that are manufactured in the economy as a function of *d* is $n(d)=[1-e(d)-t(d)][d+z(e(d))]L(1-\rho)/\alpha$. We have

$$\frac{\partial n(d)}{\partial d}=\frac{L(1-\rho)}{\alpha}\{[1-e(d)-t(d)][1+\frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}]-[d+z(e(d))][\frac{\partial e(d)}{\partial d}+\frac{\partial t(d)}{\partial d}]\}. \tag{A4}$$

First-order condition (10) is equal to zero for $d = d^*$ and strictly positive for all $d < d^*$. So, at least when $d \le d^*$, we have

$$[1-e(d)-t(d)][1+\frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}]>[d+z(e(d))][\frac{\partial e(d)}{\partial d}+\frac{\partial t(d)}{\partial d}]. \tag{A5}$$

It follows that at least when $d \le d^*$, we have $\partial n(d)/\partial d > 0$. As a result, given that $d^* > d^{**}$, we also have $n^* > n^{**}$.

Proof of Lemma 5

The number of products that are manufactured in the economy as a function of d is $n(d) = [1 - e(d) - t(d)][d + z(e(d))]L(1-\rho)/\alpha$. Expression (A4) defines $\partial n(d)/\partial d$. First-order condition (A8) is equal to zero for $d = \tilde{d}^*$ and strictly positive for all $d < \tilde{d}^*$. So, at least when $d \le \tilde{d}^*$, we have

$$[1 - e(d) - t(d)][1 + \frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}] > [d + z(e(d))][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}]. \qquad \text{(A6)}$$

Given that $\partial n(d/d = \tilde{d}^*)/\partial d > 0$ and also given that $\partial \tilde{d}^*/\partial n^F > 0$ (condition (A8)), it follows that $\partial \tilde{n}^*/\partial n^F > 0$. Furthermore, because $\partial n(d/d = \tilde{d}^{**})/\partial d > 0$ and $\partial \tilde{d}^{**}/\partial n^F < 0$ (condition (A10)), we have $\partial \tilde{n}^{**}/\partial n^F < 0$.

Proof of Proposition 1

When predators cooperatively choose d, the first-order condition is

$$-\rho[1 + \frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}][1 - e(d) - t(d)] - [1 - d - z(e)][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}] = 0. \qquad \text{(A7)}$$

Condition (A7) is negative if d is set equal to d^*. We thus have $d^{**} < d^*$.

Proof of Proposition 4

In the presence of international trade, when producers choose d, the first-order condition is

$$\{\rho[1 + \frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}][1 - e(d) - t(d)] - [d + z(e(d))][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}]\}\{\frac{[1 - e(d) - t(d)]\theta^P L(1-\rho)}{\alpha} + n^F\}$$
$$+(1-\rho)[d + z(e(d))][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}]n^F = 0. \qquad \text{(A8)}$$

If d is equal to d^*, first-order condition (A8) becomes

$$(1-\rho)[d + z(e(d))][\frac{\partial e(d)}{\partial d} + \frac{\partial t(d)}{\partial d}]n^F > 0. \qquad \text{(A9)}$$

Expression (A9) is positive because lemma 3 implies that $\partial t(d)/\partial d(d=d^*) > -\partial e(d)/\partial d(d=d^*)$. As a result, in a producer-friendly economy, international trade leads to stronger producer property rights, i.e., $\tilde{d}^* > d^*$

Proof of Proposition 5

In the presence of international trade, when predators choose *d*, his first-order condition is

$$\{-\rho[1+\frac{\partial z(e)}{\partial e}\frac{\partial e(d)}{\partial d}][1-e(d)-t(d)]-[1-d-z(e(d))][\frac{\partial e(d)}{\partial d}+\frac{\partial t(d)}{\partial d}]\}\{\frac{[1-e(d)-t(d)]\theta^P L(1-\rho)}{\alpha}+n^F\}$$
$$+(1-\rho)[1-d-z(e(d))][\frac{\partial e(d)}{\partial d}+\frac{\partial t(d)}{\partial d}]n^F=0. \quad \text{(A10)}$$

If *d* is equal to *d***, first-order condition (A10) becomes

$$(1-\rho)[1-d-z(e(d))][\frac{\partial e(d)}{\partial d}+\frac{\partial t(d)}{\partial d}]n^F<0. \quad \text{(A11)}$$

Expression (A11) is negative because lemma 3 implies that $\partial t(d)/\partial d(d=d^{**}) < -\partial e(d)/\partial d(d=d^{**})$. As a result, in a predator-friendly economy, international trade leads to weaker producer property rights, i.e., $\tilde{d}^{**} < d^{**}$.

Proof of Proposition 8

When producers cooperatively choose *d* in stage 2, they take parameters n^F and θ^P as given. Furthermore, condition (A8) implies that $\partial\tilde{d}^*/\partial n^F > 0$, which, in turn, implies that $\partial\tilde{\theta}^P{}^*/\partial n^F > 0$. We can thus use the envelope theorem to calculate the derivate of agent utility with respect to the number of imports in the producer-friendly equilibrium. We have

$$\frac{\partial\tilde{u}^*}{\partial n^F}=\frac{1-\rho}{[\tilde{n}^*+n^F]^\rho}[1+\frac{\partial\tilde{\theta}^P{}^*}{\partial n^F}\frac{\tilde{n}^*}{\tilde{\theta}^P{}^*}][\frac{\tilde{n}^* x}{L}]^\rho>0. \quad \text{(A12)}$$

Proof of Proposition 9

Conditions (A7) and (A10) imply that $\lim_{\rho\to 0}\frac{\partial\tilde{d}^{**}}{\partial n^F}=0 \Rightarrow \lim_{\rho\to 0}\frac{\partial\tilde{n}^{**}}{\partial n^F}=0$, i.e., as ρ approaches zero, the number of imports does not affect the choice of *d* by predators. It thus follows that when ρ approaches zero, condition (14) is strictly positive (and equal to 1). As a result, $\exists\overline{\rho}\in(0,1)$ so that at least $\forall\rho\in(0,\overline{\rho}]$ we have $\frac{\partial\tilde{u}^{**}}{\partial n^F}>0$.

Country	Openness to International Trade in 2006	Corruption Perceptions Index in 2006 (1: most corrupt – 10: least corrupt)
Belize	0.91	3.5
Dominican Republic	0.85	2.8
Grenada	0.70	3.5
Jamaica	0.78	3.7
Japan	0.24	7.6
United States	0.22	7.3

Table 1. International trade and corruption in the Caribbean.

Notes: Openness to international trade is (Volume of Exports + Volume of Imports)/GDP.
Sources: 2007 CIA World Factbook (https://www.cia.gov/library/publications/the-world-factbook/geos/ja.html) for openness to international trade and Transparency International (http://www.transparency.org/policy_research/surveys_indices/cpi/2006) for the Corruption Perceptions Index .