Trade, Insecurity, and Home Bias: An Empirical Investigation

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Abstract: Corruption and imperfect contract enforcement dramatically reduce international trade. This paper estimates the reduction using a structural model of import demand in which insecurity acts as a hidden tax. We find that inadequate institutions constrain trade as much as tariffs do. We also find that omitting indexes of institutional quality biases other parameter estimates, obscuring a negative relationship between per capita income and the share of total expenditure devoted to traded goods. Finally, we argue that cross-country variation in the effectiveness of institutions and consequent variation in traded goods prices offer a simple explanation of the observed global pattern of trade, in which high-income, capital-abundant countries trade disproportionately with each other.

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Recent work re-emphasizes an old puzzle: distance and border effects account for far too much of the variation in trade volume across country pairs (Frankel, Stein and Wei 1998; Helliwell 1998; McCallum 1995). Distance is more important than can plausibly be explained by transportation costs (Grossman 1998; but also see Hummels 1999). Borders matter more than can be explained by tariffs, quotas, and formal impediments to trade. Hidden transactions costs may explain these results. This paper examines insecurity as one possible source of hidden costs.

Anecdotal evidence of the importance of insecurity abounds. A survey undertaken by the World Bank between August 1996 and January 1997 summarizes such stories well. Table 1 shows the ranking in order of importance of "the obstacles for doing business," based on responses by 3685 firms located in 69 countries. It is not surprising that firms should complain about taxes; it is remarkable, however, that corruption should rank as the second most important obstacle to business worldwide, with crime and theft not far behind. Complaints about trade regulations, currency and price controls, and labor and environmental regulations appear relatively insignificant.

This paper fits a structural model of insecure trade to import data from 1996. Our results show not only *that* insecurity matters, but how much it matters and to whom it matters. The structural model also offers some insight into *why* insecurity matters.

We model two types of insecurity, one arising from predation, the other arising from imperfect contract enforcement. Each is shown to imply a price markup analogous to a hidden tax on trade. Predation itself can take either of two forms. When predation takes the form of theft, the price markup is determined by the probability that a particular shipment will be hijacked. When predation takes the form of the extortion of bribes by corrupt officials, the markup is equal to the proportion of the value of each shipment which shippers expect to lose. These markups are equivalent when risks can be diversified through insurance or though making a large number of small shipments subject to independent risks. Imperfect contract enforcement leads to a slightly different markup. When entry into the international market involves sunk costs, imperfect contract enforcement exposes shippers to the holdup problem even when the investment is not partner-specific. In this case, the exogenous probability of enforcement determines the size of the price markup. These price markups, in turn, translate into reduced demand for imported goods.

Table 1. Rankings of "Obstacles for Doing Business"

	Worldwide Sample
Tax Regulations or High Taxes	1
Corruption	2
Financing	3
Inadequate Infrastructure	4
Crime and Theft	5
Inflation	6
Uncertainty of Cost of Regulations	7
Policy Instability	8
Labor Regulations	9
Regulations on Foreign Trade	10
Safety or Environmental Regulations	11
Start-up Regulations	12
Foreign Currency Regulations	13
Price Controls	14
Terrorism	15

Source: Brunetti, Kisunko, and Weder, 1997, p. 70.

Fitting the structural model to the data, making use of data on institutional quality compiled by the World Economic Forum, we show that trade expands dramatically when it is supported by strong institutions – specifically, by a legal system capable of enforcing commercial contracts and by transparent and impartial formulation and implementation of government economic policy. We estimate, for example, that if the indexes of institutional quality associated with the Latin American countries in our sample were to improve to the levels associated with the European Union, Latin American trade would expand by 32%, other things equal. This expansion is equivalent to what would be expected from the reduction of Latin American tariffs to US levels. The magnitude of this effect suggests that attention to the costs of insecurity may help in solving Trefler's (1995) "mystery of the missing trade" in embodied factor services.

Empirical models which ignore the security of exchange suffer from an important omitted variables bias. Our model reveals that the share of expenditure devoted to traded goods falls as income per capita rises, holding constant other variables including total income. This effect, which is consistent with anecdotal evidence that the share of income devoted to consumption of nontraded services rises as income per capita rises, does *not* emerge when institutional variables are excluded from the regression, as in most of the existing gravity literature. In the existing literature, the positive impact of strong institutions is misattributed to high income per capita, the included variable with which institutional quality is correlated. The sort of "home bias" reported here, that the share of expenditure devoted to nontraded goods rises as income per capita rises, stands in contrast to recent empirical work which has failed to reject homothetic preferences (Davis and Weinstein 1998; Davis, Weinstein, Bradford and Shimpo 1997). Our work leads us to echo Trefler (1995, p.1043), "the bias is important and must be confronted theoretically and empirically."

The stylized fact that high-income capital-abundant countries trade disproportionately with each other rather than with low-income labor-abundant countries has been used to motivate models based on product differentiation rather than factor endowments, but insecurity provides a simple alternative explanation: that the price effect of good institutional support for trade among high-income countries leads them to trade disproportionately with one another. This argument does not imply, counterfactually, that low-income countries should also trade disproportionately with one another.

This paper begins by modeling the translation of insecurity into a price markup. The second section ties the price markup into import demand. The third section describes the data which are used to estimate the model in the fourth section. The fifth section reports several checks on the robustness of our results.

1. Modeling the Security of Trade

Two types of insecurity can generate price markups equivalent to a hidden tax on international trade. A model of "predation" views shipments as subject to attack by hijackers or corrupt officials. A model of "contractual insecurity" captures the impact of the holdup problem on shippers when fixed costs are associated with entry into the international market and contract enforcement is random. These are complementary rather than competing models. Each leads to a simple price markup which is a reduced form function of exogenous variables. Together they motivate the demand system estimated later in this paper.

Predation

Anderson and Marcouiller (1998) present a complete general equilibrium model of predation, in which utility-maximizing agents rationally allocate their labor across productive and predatory activities, endogenously determining the probability of successful shipment. Here we present a slightly simplified version of the model.

Thieves – or corrupt officials – attack shipments. Any shipment which is defended by less than the customary measures is identifiable as easy prey, attacked with certainty, and completely lost. Under these circumstances, all shippers will take the normal defensive measures and thieves will attack randomly. The probability that a normally defended shipment from country *i* will successfully evade capture is given by the asymmetric contest success function:

$$\pi_i = \frac{1}{1 + \theta \frac{L_i^B}{L_i^D}}, \tag{1.1}$$

a function of total labor devoted to banditry L_i^B, total labor devoted to defense L_i^D, and an exogenous technological parameter θ.[1] The ability to diversify risk makes $(1-\pi)$ equivalent, from the shippers' point of view, to a proportional

[1] The same function has been used in the context of non-anonymous predation by Grossman and Kim (1995).

insecurity tax on the value of every shipment. This tax is bounded on the unit interval, increasing in bandit labor and decreasing in defensive labor.

In this paper we treat defensive arrangements L_i^D as given.[2] We also assume the world's total supply of bandit labor to be exogenously set: $L^B = \sum_i L_i^B$. The endogenous allocation of bandits across countries then determines π_i.

Bandits freely allocate themselves across countries in a competitive equilibrium so as to maximize expected loot $\sum_i \left(1-\pi_i\left(L_i^B, L_i^D, \theta\right)\right) v_i$, where v_i is the volume of trade flowing through the border of country *i*. The reasonable assumption that uncoordinated bandits take trade volumes as given greatly simplifies this problem. Solving the first order conditions gives the allocation of bandit labor to each country:

$$(1.2) \qquad L_i^B = \frac{\pi_i\left(1-\pi_i\right)v_i}{\sum_i \pi_i\left(1-\pi_i\right)v_i} L^B .$$

A bit of algebra produces the reduced form solution for π_i:

$$(1.3) \qquad \pi_i = \left[\frac{L_i^D}{v_i}\right]^{1/2} \frac{\sum_i w_i\left(L_i^D / v_i\right)^{1/2}}{\dfrac{\theta L^B}{\sum_i v_i} + \sum_i w_i\left(L_i^D / v_i\right)}$$

where w_i is country i's share of total world trade.

Let $\bar{S}_i \equiv \left(L_i^D / v_i\right)^{1/2}$ denote the strength of a country's institutions for the defense of trade. Then:

$$(1.4) \qquad \pi_i = \bar{S}_i \left(\sum_i w_i \bar{S}_i\right) / \left(\frac{\theta L^B}{\sum_i v_i} + \sum_i w_i \bar{S}_i^{2}\right).$$

If the probability of successfully crossing into country *j* is independent of the probability of successfully leaving *i*, the proportion of all shipments from producers in *j* which successfully reach their consumers in *i* is given by:

[2] This is, of course, a major simplification. See Anderson and Marcouiller (1998).

(1.5) $$\pi_{ij} = \pi_i \pi_j = \bar{S}_i \bar{S}_j D, \quad where \quad D \equiv \left(\sum_i w_i \bar{S}_i \right)^2 / \left(\frac{\theta L^B}{\sum_i v_i} + \sum_i w_i \bar{S}_i^{\,2} \right)^2 .$$

The probability of loss on this trade route, $\left(1 - \pi_{ij}\right)$, determines the transactions cost and the corresponding price markup associated with insecurity.

Equation 1.5 can be extended to include other influences on π_{ij}. When the two countries share a common border (represented by a dummy b_{ij}) or a common language (dummy l_{ij}), π_i and π_j may not be independent. The risk of theft might rise as the distance traveled rises, perhaps due to loss of information about ways to avoid hazards.[3] Adding these variables and changing to the considerably simpler relative security form π_{ij} / π_{kj} (the probability of successful shipment between *i* and *j* relative to the probability of successful shipment between *k* and *j*) produces the equation:

(1.6) $$\frac{\pi_{ij}}{\pi_{kj}} = \frac{\bar{S}_i}{\bar{S}_k} \left(\frac{1 + b_{ij}}{1 + b_{kj}} \right)^{\beta_1} \left(\frac{1 + l_{ij}}{1 + l_{kj}} \right)^{\beta_2} \left(\frac{d_{ij}}{d_{kj}} \right)^{\beta_3} .$$

The price markup on imports by country *i* from country *j* relative to the markup on imports by *k* from *j* will reflect this relative probability of successful shipment, as described in Section 2 below.

Contractual Insecurity

Insecurity in the form of imperfect contract enforcement generates a price markup when fixed costs are associated with entry into the international market. Following Anderson and Young (1999), we model a market in which for institutional reasons there is some exogenous probability $(1 - \theta)$ that a given contract may fail to be enforced. When contracts are not enforced, the contracting parties engage in *ex post* bargaining, in which the sunk costs of trade (all handling charges up to the point of sale) are ignored. Foreseeing this possibility, high cost traders are discouraged from entering the market. The

[3] This is the only point at which we mention information costs, but we do not wish to deny their importance. For a provocative model of information costs and trade, see Casella and Rauch (1998).

effect on trade can be modeled as a price markup equivalent to a tariff. The sketch of the model we present here is necessarily cursory, serving only to give the elements which yield a plausible reduced form which we take to our empirical work. See Anderson and Young (1999) for details.

Sunk costs are associated with entry into international trade.[4] International exchange occurs either according to the terms of a contract negotiated prior to incurring the sunk costs or in a non-contracted market into which those whose contracts are not enforced necessarily fall. We allow traders without enforced contracts to match only once per trading period.[5] In the non-contracted market, exchange occurs at the bargained price

$$p^* = \arg\max_p (p-c)^{\omega}(b-p)^{1-\omega} = \omega b + (1-\omega)c$$

where b and c are the exogenously determined outside options (home prices) for the buyer and seller and $\omega \in (0,1)$ is the bargaining strength of the seller.

In these circumstances, it is only by accident that the numbers of buyers and sellers would be equal. Any unmatched trader will return home to exchange at his outside option price. We focus in this development on the excess demand case, in which some potential importers are unable to find exporters with whom to strike a deal.

The actual volume exchanged is that on the short side of the market, read off the supply curve, $s[p^s(p^*,\theta,b)]$, where p^s is the equilibrium value of the certainty equivalent price to suppliers, which can be shown to be a reduced form function of the bargained price, the probability of enforcement and the outside option of the buyers. To obtain the "tariff equivalent" of the imperfect enforcement we first define the hypothetical buyers' price which would clear the market at the actual trade volume:

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[4] In the usual holdup model, these costs are relationship-specific: the exporter designs a product for a particular importer. The outside option of the exporter is whatever resale value this design has for others. Similarly the outside option of the importer is whatever price must be paid for an equivalent design elsewhere. Here, we need not assume that the sunk costs are relationship specific because we assume that search is so expensive that traders match only once.

[5] If rematching were possible, the trader who is faced with returning home to his outside option could offer a better deal than the bargained price to someone about to accept the bargain. That is, the outside option would be endogenous.

$$p^t(p^*, \theta, b) = \{p \mid d[p] = s[p^s(p^*, \theta, b)]\}.$$

Then the ad valorem tariff equivalent is

$$(1.7) \quad T(p^*, \theta, b) = \frac{p^t(p^*, \theta, b)}{p^s(p^*, \theta, b)} - 1$$

The ad valorem tariff equivalent is decreasing in θ (see Anderson and Young, 1999), hence better enforcement increases trade.

In our application, the assumed exogenous θ varies across countries so that country *j*'s exports face different markups in each country *i*. The p* and b arguments of $T()$ are handled as follows. The bargained price p* is a weighted average of the sellers' and buyers' reservation prices. The seller's reservation price is set at unity by convention and is invariant across buyers. The buyers' reservation price *b* is modeled as a reduced form function of exogenous endowment variables. Finally, the weights in the bargained price are assumed to be equal for all country pairs, because in the absence of a bargaining theory which can discriminate among countries, it seems best to assume that 1-ω is the same across buyers. Under these assumptions, the security data we use as proxies for θ accurately pick up the effect of differing security arrangements on price markups.

2. Import Demand in an Insecure World

The strength of a nation's institutions affects the prices it must pay for traded goods, as shown in the previous section. Import demand depends in turn on these prices and on the division of expenditure between traded and nontraded goods.

We assume two-stage budgeting. Agents first determine the proportion of total expenditure to allocate to traded goods. In a second stage they allocate traded goods expenditure across individual imports, which are differentiated by place of origin.[6] The first-stage preferences are not restricted. Preferences across

[6] Helliwell 1998, p. 10, notes other papers using this Armington assumption.

traded goods are CES and identical across countries. Production is specialized so that each country produces a nontraded good and a unique traded good.

Under these assumptions, the impact of prices on the demand in country *i* for imports from country *j* is given by:

(2.1) $m_{ij} = \alpha_j p_{ij}^{-\sigma} P_i^{\sigma-1} x_i$

where x_i is country *i*'s total expenditure on traded goods, p_{ij} is the price of *j*'s good in *i* with producer prices p_{jj} normalized to one, $P_i = \left[\sum_j \alpha_j p_{ij}^{1-\sigma}\right]^{1/(1-\sigma)}$ is the CES price index for traded goods in *i*, σ is the elasticity of substitution among traded goods, and α_j is that parametric expenditure share on *j*'s product which is common to all importers.

The country's total expenditure on traded goods, x_i, is some fraction φ of the country's total income. The traded goods expenditure share (φ) is modeled as a reduced form function of the country's income, population and traded goods price index. A variety of static structural models yield such a function.[7] Anderson (1979) rationalized this reduced form with a model of perfect competition and constant returns to scale. Bergstrand (1985, 1989) developed the reduced form from a model with monopolistic competition and economies of scale. The equilibrium price of the nontraded good is a reduced form function in the same variables and is subsumed in the traded goods expenditure share function. Income and population pick up the effect of factor endowments, possible nonhomothetic preferences, and possible scale economies, while the traded goods price index picks up substitution between traded and nontraded goods. Substituting into 2.1:

(2.2) $m_{ij} = \alpha_j p_{ij}^{-\sigma} P_i^{\sigma-1} \varphi(y_i, n_i, P_i) y_i$

where n_i is population and y_i is national income.

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[7] Our empirical work explains trade in a single year, so static models are appropriate. In reality, balanced trade is rare and the traded goods expenditure share reflects an intertemporal margin of decision-making. We ignore this margin because it is remote from the concerns of our model and seems unlikely to add to its explanatory power. Temporary trade

Insecurity enters the model through its effect on prices. The price of *j* 's product in *i* will exceed the producer's price for three reasons: a tariff if applicable, a transport cost dependent on distance, and an "insurance" markup which captures both the proportion of shipments lost to predators $\left(1-\pi_{ij}\right)$ and the tariff-equivalent markup attributable to insecure enforcement of contracts $\left[\frac{p^t(\beta, b, p^*)}{p^s(\beta, b, p^*)} - 1\right]$. In both models of international insecurity, p_{ij} decreases and m_{ij} increases as the effectiveness of institutions for the defense of exchange improves.

Three additional simplifications have proven enormously helpful in moving toward an estimable model. First, we use loglinear approximations of the basic functions. We approximate the price markup as a log-linear function of distance, security, and the tariff factor, if applicable. (If instead transportation and insurance markups are modeled additively, the model becomes deeply nonlinear.) We also model the reduced form φ function as loglinear.

Second, we focus on m_{ij} / m_{kj}, country *i*'s imports from country *j* relative to country *k*'s imports from country *j*, instead of looking at m_{ij} directly. This makes the model invariant to multiplicative rescaling of the WEF data, and it allows us to cancel some of the nonlinear terms of the π_{ij} function. Moreover, casting the model in terms of relative imports by two different countries from a single exporter eliminates the need to estimate the α_j parameter. Empirical models following Anderson's (1979) rationale for the gravity equation are usually misspecified. The gravity model is derived from the import demand system by imposing the adding up constraint that shipments to the entire world be equal to income, solving that constraint for the expenditure share for each exporter and finally substituting the exporter-specific expenditure share into the import demand equation. Anderson shows that the correct specification of the gravity equation includes a highly nonlinear exporter-specific price index on the right hand side. Nonlinear structural estimation might be possible, but failing

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control measures taken for balance of payments reasons will show up in the traded goods price index.

this, an exporter-specific intercept is indicated. Most gravity models – and our own model if Equation 1.5 is used in non-ratio form – call for the use of exporter-specific variables which cannot be identified simultaneously with an exporter-specific intercept. Focusing on imports by i and k from the same exporter j eliminates this problem.

Imposing loglinearity on the price markup and focusing on relative prices gives us:

$$\ln\left(\frac{p_{ij}}{p_{kj}}\right) = \delta_1 \ln\left(\frac{d_{ij}}{d_{kj}}\right) + \delta_2 \ln\left(\frac{\bar{S}_i}{\bar{S}_k}\right) + \delta_3 \ln\left(\frac{1+b_{ij}}{1+b_{kj}}\right) + \delta_4 \ln\left(\frac{1+l_{ij}}{1+l_{kj}}\right) + \ln\left(\frac{1+(1-a_{ij})t_i}{1+(1-a_{kj})t_k}\right) \tag{2.3}$$

In Equation 2.3, a_{ij} is a dummy variable which takes the value one if the two countries are associated in a free trade agreement, and t_i is the importer's average ad valorem tariff. The unknown elasticity of the price with respect to distance and security is represented by the δ coefficients. The tariff term lacks a δ because an ad valorem tariff raises the price by precisely the amount of the tariff. Through its effect on relative prices, a rise in the contract model's relative probability of enforcement, β_i / β_k, would have an effect similar to that of a rise in the predation model's relative defensive capacity, $\bar{S}_i / \bar{S}_k$.

Using Equation 2.3 and imposing log-linearity on the traded goods expenditure share $\varphi(y_i, n_i, P_i)$, Equation 2.2 implies:

$$\ln\frac{m_{ij}}{m_{kj}} = (1+\gamma_1)\ln\left(\frac{y_i}{y_k}\right) + \gamma_2 \ln\left(\frac{n_i}{n_k}\right) - \sigma\delta_1 \ln\left(\frac{d_{ij}}{d_{kj}}\right) - \sigma\delta_2 \ln\left(\frac{\bar{S}_i}{\bar{S}_k}\right) - \sigma\delta_3 \ln\left(\frac{1+b_{ij}}{1+b_{kj}}\right) - \sigma\delta_4 \ln\left(\frac{1+l_{ij}}{1+l_{kj}}\right) - \sigma \ln\left(\frac{1+(1-a_{ij})t_i}{1+(1-a_{kj})t_k}\right) + (\sigma - 1 + \gamma_3)\ln\left(\frac{P_i}{P_k}\right) \tag{2.4}$$

where P_i / P_k is the relative overall importer-specific traded goods price index.

Our third simplification is to approximate the relative traded goods price index by a version of the Törnqvist index:

$$\ln\left(\frac{P_i}{P_k}\right) = \sum_j w_j \ln\left(\frac{p_{ij}}{p_{kj}}\right) \tag{2.5}$$

where w_j is the average across importers of the share of *j*'s product in import expenditures. Most previous work with gravity models has ignored the price index term, which certainly results in misspecification. Our approximation is an imperfect but sensible and operational measure.

All the major elements of our model are now in place. We have modeled a world in which traded goods are differentiated by place of origin. Differences across importers in demand for a single good have two sources: (a) differences in the price markups associated with insecurity, distance, and tariffs, and (b) differences in the division of expenditure between traded and nontraded goods.

3. Data

The security of transactions depends upon the institutions which structure interaction among private firms and between private firms and the state. We rely on data provided by the World Economic Forum (WEF) to measure the quality of both sets of institutions. The measures are drawn from the WEF 1997 Executive Survey, which was completed by more than 3000 participants distributed across 58 countries (World Economic Forum 1997, p.85). Participants in the WEF survey were asked to assign a score ranging from one (strongly disagree) to seven (strongly agree) to each of the following statements:

- Government economic policies are impartial and transparent (Q 2.07);
- The legal system in your country is effective in enforcing commercial contracts (Q 8.06).

We rescale the mean response for each country to run from zero to one and use the rescaled means as measures of institutional quality, understanding Question 2.07 to gauge primarily the quality of interaction of the private sector with the state and Question 8.06 to gauge institutional support for exchange within the private sector.

Admittedly, these are noisy signals of institutional strength. Expectations differ across countries, so that what counts as "effective" enforcement or "impartial" policy in the Ukraine may differ from what would be similarly classified in Singapore. The respondents to the survey form a selected group –

even if they were randomly selected within a country, they would still represent only those who had chosen not to relocate or to shut down. Moreover, the Forum provides only the mean response for each country; we lack information about within-country variation in responses.

As a check on the robustness of our results, we also use a complementary “composite security” index formed by extracting the first principal factor from answers to the following questions:

- Government economic policies are impartial and transparent (2.07);
- Government regulations are precise and fully enforced (2.08);
- Tax evasion is minimal (2.11);
- Irregular additional payments are not common in business and official transactions (8.03);
- The legal system is effective in enforcing contracts (8.06);
- Agreements and contracts with the government are not often modified due to budget cutbacks, changes in government or changes in government priorities (8.07);
- Private businesses can readily file lawsuits at independent and impartial courts if there is a breach of trust on the part of the government (8.08);
- New governments in your country honor the commitments and obligations of previous regimes (8.09);
- Citizens of your country are willing to adjudicate disputes rather than depending on physical force or illegal means (8.10);
- Your country's police are effective in safeguarding personal security so that this is not an important consideration in business activity (8.15);
- Organized crime does not impose significant costs on business in your country (8.16).

Uniformly positive factor loadings of roughly similar magnitude give us confidence that these questions, as a group, reliably identify an underlying “composite security” factor, although this factor is less precisely defined than our two preferred indicators.

It has been suggested that in empirical work these indexes of institutional quality may act simply as proxies for more traditional measures of barriers to trade. However, tariff barriers and trade preferences enter our model explicitly. Moreover, the correlation coefficient between the nontariff barrier coverage ratio and our index of transparency is only -.32, the correlation with our index of enforceability is -.14, and the correlation with our composite security index is -.15.[8] The signs are those which one might expect from a political economy perspective, but the magnitudes of the correlations are small.

Our data on 1996 bilateral import expenditures are taken from the IMF's *Direction of Trade Statistics*. Most of the DOTS import data are reported c.i.f., although some appear only f.o.b. To avoid as much as possible *ad hoc* adjustments to the data, we generally use the reported c.i.f. figures, adjusting the few f.o.b. figures upward by a factor based on the ratio between the country's total reported c.i.f. imports from the rest of the world and the world's reported exports to that country. Since the f.o.b. figures would be theoretically more appropriate, we also report in an appendix the results of estimating our model over interpolated f.o.b. import flows, applying the same factors of adjustment to deflate the c.i.f. import values to approximate f.o.b. equivalents.

Data on 1996 population and GDP in current dollars are taken from the World Bank's *World Development Indicators* (WDI). We calculate distance from capital city to capital city on the basis of geographical coordinates listed in Fitzpatrick and Modlin (1986); of course, the distance from Washington to Ottawa only roughly captures the average distance traversed by shipments from the United States to Canada. David Tarr and Francis Ng of the World Bank graciously provided us with unweighted average external tariff data; these data are far more complete than the data on import duties as a percentage of import expenditures reported in the WDI.[9] We composed dummy variables to capture sharing a common border, a common language, or common membership in ASEAN, the EU, Mercosur, or NAFTA.

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[8] The nontariff barrier coverage ratios are taken from the WEF's *Global Competitiveness Report 1997*, p.223. They are available for only 37 of our 48 countries.

[9] Even so, not every country has data available for 1996. We have used 1996 data where available, but in other years have used tariff data from 1997, 1995, or 1994. While pair-specific bilateral tariffs would be preferred, compiling the more than 2000 tariffs which would be required surpasses our ability at this time.

Table 2. Importers in the Data Set

IMPORTER	Obs.	IMPORTER	Obs.	IMPORTER	Obs.
Argentina	46	Hungary	47	Russia	47
Australia	47	Iceland	42	Singapore	44
Austria	46	India	47	Slovak Republic	47
Belgium-Luxembourg	47	Indonesia	46	South Africa	47
Brazil	47	Ireland	47	Spain	47
Canada	47	Italy	47	Sweden	47
Chile	36	Japan	47	Switzerland	46
China	47	Jordan	42	Thailand	43
China: Hong Kong	47	Korea	33	Turkey	47
Colombia	46	Malaysia	46	Ukraine	41
Czech Republic	47	Mexico	38	United Kingdom	47
Denmark	47	Netherlands	47	United States	47
Egypt	47	New Zealand	47	Venezuela	45
Finland	47	Norway	46	Zimbabwe	42
France	47	Peru	45		
Germany	47	Poland	47		
Greece	46	Portugal	47	Total	2182

We have complete data on these variables for a total of 2182 import flows distributed across 48 importing countries. For an additional 24 bilateral pairs, no imports were reported.[10] Table 2 shows the importing countries in our data set and the number of positive import flows which we observe for each.

4. Estimation and Results

The analytical model leads to a simple result – relative import demand is a function of relative income, population, distance, tariffs, and variables associated with institutional quality. Estimation of the model in log-linear form supports three contentions:

- By lowering transactions costs, institutional support for secure exchange significantly raises international trade volume;

[10] Actually, in these cases the country pair appears in the DOTS data matrix but the trade volume is given as "." Apparently this represents trade volume less than one significant digit of the units used for reporting (see notes to the yearbook). We interpret these as reports of zero

- Excluding institutional variables obscures a negative relation between income per capita and the share of income spent on traded goods;
- The institutional differences which we model can generate "a disproportionately high volume of trade among high-income countries," a pattern "which happens to accord well with trade patterns in the real world" (Deardorff 1998, p.16).

Equations 2.4 and 2.5 give us the following equation in terms of the underlying parameters of the theoretical model:

$$\begin{aligned}
\ln\frac{m_{ij}}{m_{kj}} = {} & (1+\gamma_1)\ln\left(\frac{y_i}{y_k}\right) + \gamma_2\ln\left(\frac{n_i}{n_k}\right) - \sigma\delta_1\ln\left(\frac{d_{ij}}{d_{kj}}\right) + (\gamma_3-1)\delta_2\rho_1\ln\left(\frac{s_{1i}}{s_{1k}}\right) \\
& + (\gamma_3-1)\delta_2\rho_2\ln\left(\frac{s_{2i}}{s_{2k}}\right) - \sigma\delta_3\ln\left(\frac{1+b_{ij}}{1+b_{kj}}\right) - \sigma\delta_4\ln\left(\frac{1+l_{ij}}{1+l_{kj}}\right) \\
& + (\gamma_3-1)\ln\left(\frac{1+(1-a_{ij})t_i}{1+(1-a_{kj})t_k}\right) + (\sigma-1+\gamma_3)\delta_1\left(\sum_j w_j\ln\left(\frac{d_{ij}}{d_{kj}}\right)\right) \\
& + (\sigma-1+\gamma_3)\delta_3\left(\sum_j w_j\ln\left(\frac{1+b_{ij}}{1+b_{kj}}\right)\right) + (\sigma-1+\gamma_3)\delta_4\left(\sum_j w_j\ln\left(\frac{1+l_{ij}}{1+l_{kj}}\right)\right).
\end{aligned} \tag{4.1}$$

Equation 4.1 includes two dimensions of institutional quality, under the assumption that the "defensive capacity" variable of the predation model, $\bar{S}_i$, is determined by the interaction of institutions protecting commercial contracts and institutions ensuring public impartiality:

$$\frac{\bar{S}_i}{\bar{S}_k} = \left(\frac{s_{1i}}{s_{1k}}\right)^{\rho_1}\left(\frac{s_{2i}}{s_{2k}}\right)^{\rho_2}.$$

The indicators of institutional quality do not vary across exporters for a single importer; the "weighted average" institutional terms in the traded goods price index collapse into the unweighted terms. Therefore, the coefficient on each institutional index includes its effect on the price of *j*'s good in *i*, $\delta_2\rho$, the direct effect of this price on imports of this good, $-\sigma$, and the indirect effect of this price on the traded goods expenditure share through the traded goods price index, $(\sigma-1+\gamma_3)$. Similarly, the "weighted average" tariff markup is nearly identical

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trade. There are a few other cases in which the country pair simply does not appear in the to the unweighted tariff markup, since few of the two thousand observations involve free trade, and these two terms have also been collapsed into a single term.

The weights of the Tornqvist index, w_j, represent the ratio of expenditure on traded good j to total expenditure on all traded goods including the traded good produced at home. It can be shown that:

$$w_{ij} = \frac{p_{ij} m_{ij}}{\sum_{j, j \neq i} p_{ij} m_{ij}} (1 - w_{i\,i}).$$

We use this to construct a set of weights w_j which sum to one and which are constant across consumers for a given producer.

Interpretation is eased by estimating the model in terms of GDP and GDP per capita rather than GDP and population. This final adaptation leaves us with the following equation as the foundation for empirical analysis:

$$\begin{aligned}
\ln \frac{m_{ij}}{m_{kj}} = {} & \beta_0 + \beta_1 \ln\left(\frac{y_i}{y_k}\right) + \beta_2 \ln\left(\frac{y_i / n_i}{y_k / n_k}\right) + \beta_3 \ln\left(\frac{d_{ij}}{d_{kj}}\right) + \beta_4 \ln\left(\frac{s_{1i}}{s_{1k}}\right) + \beta_5 \ln\left(\frac{s_{2i}}{s_{2k}}\right) \\
& + \beta_6 \ln\left(\frac{1 + b_{ij}}{1 + b_{kj}}\right) + \beta_7 \ln\left(\frac{1 + l_{ij}}{1 + l_{kj}}\right) + \beta_8 \ln\left(\frac{1 + (1 - a_{ij}) t_i}{1 + (1 - a_{kj}) t_k}\right) + \beta_9 \left(\sum_j w_j \ln\left(\frac{d_{ij}}{d_{kj}}\right)\right) \\
& + \beta_{10} \left(\sum_j w_j \ln\left(\frac{1 + b_{ij}}{1 + b_{kj}}\right)\right) + \beta_{11} \left(\sum_j w_j \ln\left(\frac{1 + l_{ij}}{1 + l_{kj}}\right)\right) + \upsilon_{ik} + \varepsilon_{ikj}
\end{aligned} \tag{4.2}$$

The error includes two elements. The first captures any disturbance which systematically affects all of country *i*'s imports relative to those of the base country *k*, υ_{ik}, recognizing the panel character of our data. The second element is specific to imports by *i* from *j* relative to imports by *k* from *j*, ε_{ikj}. The base country *k* is held constant. In most cases, we estimate the regression by OLS using Stata's White correction for possible heteroscedasticity with clustering by importer.

Table 3. Ratios with USA as Base Country

Ratio: USA as Base	Number Observations	Mean	Standard Deviation

DOTS data. We treat these as missing observations.

Import Ratio cif	2135	0.281	0.977
GDP Ratio	2135	0.079	0.173
GDP Per Capita Ratio	2135	0.520	0.441
Distance Ratio	2135	1.204	1.848
Transparency Ratio	2135	1.085	0.370
Enforceability Ratio	2135	0.833	0.226
Composite Security Ratio	2135	0.012	0.981
Common Border Ratio	2135	1.026	0.238
Common Language Ratio	2135	0.948	0.263
Tariff Ratio	2135	1.035	0.068

Table 3 reports summary statistics for the import, GDP, GDP per capita, distance, transparency, enforceability, composite security,[11] adjacency, language, and tariff ratios, as defined above, using the USA as a convenient base country *k*. Robustness of the results with respect to the choice of the base is explored below.

Table 4 reports the results of estimating Equation 4.2 under various restrictions. Results in the first four columns reflect OLS estimation with robust standard errors, estimated using the White correction clustered by importer. We use the c.i.f. import data here; results using constructed f.o.b. data are shown in the Appendix. We also estimate a tobit model in which the twenty-four unreported import flows are taken to be zero.[12] The fifth column presents the tobit results.[13]

Our first point is shown in the third and fourth columns of Table 4: the institutional quality variables have positive and significant coefficients. A few examples shed light on the magnitude of the effects implied by the point estimates of the parameters.

The enforceability of commercial contracts is rated roughly 10% higher in Belgium than in Brazil. Interpreting the estimated coefficient on enforceability as a reduced form elasticity, this difference implies roughly 4% higher imports into Belgium than into Brazil, other things equal.

The mean enforceability rating among the twelve countries at the low end

[11] To avoid problems with the logs of negative numbers, we first form the ratio of country *i*'s score on each survey question to country *k*'s score, then take the logs of the ratios, then find the first principal factor of the logs and score that variable.
[12] With an elasticity of substitution among traded goods which exceeds one, high transactions costs can eliminate trade in some bilateral pairings.

of the distribution is 0.52 (relative, as always, to the rating of the USA). The mean enforceability rating among the twelve countries in the highest quartile of the distribution is 1.08. A country which saw the measure of the enforceability of its commercial contracts rise from 0.52 to 1.08 would see its import volume rise by 33%, other things equal.[14]

Table 4. Relative Import Demand, USA as the Base

Variable	OLS 1	OLS 2	OLS 3	OLS 4	Tobit
Log GDP Ratio	0.837	0.855	0.860	0.866	0.907
	(0.045)	(0.042)	(0.037)	(0.038)	(0.025)
Log GDP Per Capita Ratio	0.141	0.018	-0.206	-0.191	-0.244
	(0.058)	(0.094)	(0.105)	(0.122)	(0.059)
Log Distance Ratio	-1.134	-1.109	-1.097	-1.095	-1.134
	(0.054)	(0.058)	(0.056)	(0.056)	(0.042)
Log Transparency Ratio	.	.	0.530	.	0.620
	.	.	(0.169)	.	(0.104)
Log Enforceability Ratio	.	.	0.385	.	0.307
	.	.	(0.199)	.	(0.133)
Relative Composite Security	.	.	.	0.285	.
	.	.	.	(0.073)	.
Log Border Ratio	0.908	0.794	0.753	0.747	0.668
	(0.140)	(0.155)	(0.160)	(0.163)	(0.193)
Log Language Ratio	0.314	0.327	0.331	0.336	0.349
	(0.081)	(0.080)	(0.082)	(0.082)	(0.112)
Log Tariff Ratio	.	-2.973	-4.753	-4.814	-4.773
	.	(1.992)	(2.146)	(2.343)	(0.926)
Weighted Log Distance Ratio	0.420	0.424	0.382	0.451	0.300
	(0.164)	(0.160)	(0.137)	(0.130)	(0.095)
Weighted Log Border Ratio	-1.807	-1.654	-1.092	-1.391	-0.934
	(1.474)	(1.378)	(1.332)	(1.364)	(0.941)
Weighted Log Language Ratio	1.390	1.438	-0.001	-0.119	0.809
	(1.639)	(1.486)	(1.448)	(1.363)	(0.801)
Constant	0.055	0.076	-0.169	-0.184	-0.142
	(0.158)	(0.146)	(0.135)	(0.147)	(0.104)
Number Observations	2135	2135	2135	2135	2159
R-squared	.69	.69	.70	.70	
Log Likelihood					-3859

Robust standard error with clustering by importer given in parentheses.
Imports are cif, as reported by DOTS. For results using interpolated fob figures, see Appendix.

The elasticity of import demand with respect to the transparency and

[13] In this case, the log of the import ratio, ln(0), was assigned a value 0.1 below the log of the lowest positive import ratio in the data set.

[14] Calculated as exp[.385*(ln(1.08)-ln(0.52))]-1.

impartiality of economic policy is even higher, as well as estimated more precisely. Other things equal, imports into France should be on average about 5% higher than imports into Argentina simply because the transparency rating is about 10% higher in France than in Argentina.

Taking both institutional indicators into account simultaneously, if the seven Latin American countries in our sample (Argentina, Brazil, Chile, Colombia, Mexico, Peru, and Venezuela) were to enjoy the same transparency and enforceability scores as the mean ratings of the members of the European Union, predicted Latin American import volumes would rise 32%.[15] This increase is of roughly the same size as the 35% increase which could be expected from lowering Latin American tariffs to the levels applied by the United States (or by the move to global free trade), holding other things equal.[16] A much greater (54%) increase in average Latin American GDP would be necessary to generate a comparable increase in imports, holding all else equal.[17]

As can be seen from Equation 4.1, these "thought experiments" involve several distinct effects, even when all other independent variables are assumed to be held equal. The calculations take into account the direct effect of insecurity on the "insurance" markup and the substitution effects associated with the change in price, effects which play out not only in substitution among traded goods but also in substitution between traded and nontraded goods. The latter effect requires the explicit inclusion in the regression of the traded goods price index, and our Tornqvist approach includes that index in a simple, easily operationalized way. The coefficients on the Tornqvist terms (the weighted ratios) have plausible signs, implying, with reference to Equation 4.1, that $\gamma_3 < 1$ and $\sigma + \gamma_3 > 1$. The coefficient on the weighted distance term is highly significant. Others have found a "remoteness" indicator to be empirically important in gravity models; our model offers theoretical rationalization for the importance.

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[15] Using the estimated coefficients, the projected rise in the log of the import ratio as the institutional ratings rise to EU levels is .530*(ln(1.19)-ln(.98))+ .385*(ln(.98)-ln(.62)), which equals 0.28. The rise in the average import ratio itself would be exp[0.28]-1.

[16] The percentage increase in the average trade ratio expected when dropping the LA tariff ratio from 1.065 to 1 is given by exp[-4.75*ln(1.065)]-1.

[17] The 0.28 rise in log relative imports (footnore 15) is equivalent to, using the GDP and GDP per capita coefficients, (.860-.206)*ln(1.54), indicative of a 54% increase in relative GDP.

Finally, our model of the impact of the price index on imports implies that $\hat{\beta}_3 / \hat{\beta}_9$, $\hat{\beta}_6 / \hat{\beta}_{10}$, and $\hat{\beta}_7 / \hat{\beta}_{11}$ should all be equal. An F-test on the estimated coefficients does not reject that hypothesis.[18]

These results signal an important impact of institutional quality on trade volume. In fact, in the contemporary world poor institutions appear to constrain trade as much as tariffs do. The estimates justify our first and most important conclusion: by lowering transactions costs, institutional support for secure exchange significantly raises international trade volume.

Our second major finding is that higher income per capita reduces the share of expenditure devoted to traded goods, all else equal. This result, which stands in contrast to earlier results in the gravity literature, is consistent with anecdotal evidence that as income per capita rises, so does the share of expenditure devoted to nontraded services. Previous work with the gravity model usually found an overall income elasticity close to one; so do we, when tariffs and institutions are ignored, as in the first column of Table 4 (.837+.141=.978). However, when all the variables which our theoretical model requires are included, as in the third and fourth columns of Table 4 , we find an overall income elasticity less than 0.7 (.860-.206=.654; .866-.191=.675). Omission by the earlier literature of variables correlated with income per capita biased upward the estimated income effect.

Comparison across the columns of Table 4 reveals the bias clearly. Inappropriate exclusion of the tariff and institutional variables leads to the result shown in the first column, with a significantly positive coefficient on GDP per capita. The coefficient becomes insignificantly different from zero when the tariff term is added. Including the institutional variables as well drives the coefficient into the significantly negative range.

Econometrically, these changes are driven by correlation between GDP per capita and the omitted variables. The correlation coefficient between GDP per capita and the tariff ratio is -.62. When the tariff ratio is dropped from the regression, part of the positive effect of lower tariffs on trade is misread as a

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[18] The F-statistic for the joint hypothesis that $\hat{\beta}_3 / \hat{\beta}_9 = \hat{\beta}_6 / \hat{\beta}_{10}$ and $\hat{\beta}_6 / \hat{\beta}_{10} = \hat{\beta}_7 / \hat{\beta}_{11}$ is $F(2,47)=1.08$.

positive effect of higher income per capita on trade. The correlation between GDP per capita and the enforceability ratio is .55, and its correlation with the transparency ratio is .73. [19] When the institutional variables are dropped from the regression, part of the positive effect of security on trade is misattributed to income per capita. Including the theoretically appropriate regressors reveals that GDP per capita actually has a negative effect; other things equal, a rise in income per capita lowers the share of a country's total income which it spends on traded goods.

This interpretation of the income parameters is dictated by our model. Import demand is (Equation 2.2):

$$m_{ij} = \alpha_j p_{ij}^{-\sigma} P_i^{\sigma-1} \varphi(y_i, n_i, P_i) y_i,$$

where traded goods expenditure is:

$$\varphi(y_i, n_i, P_i) y_i = \left(y_i^{\gamma_1} n_i^{\gamma_2} P_i^{\gamma_3}\right) y_i = y_i^{1+\gamma_1+\gamma_2} (y_i / n_i)^{-\gamma_2} P_i^{\gamma_3}.$$

β_1 is the coefficient on income in Equation 4.2, and β_2 is the coefficient on income per capita. Therefore, $-\gamma_2 = \beta_2$ is the reduced form elasticity of the traded goods expenditure share with respect to income per capita, holding total income constant. Similarly, $\gamma_1 + \gamma_2 = \beta_1 - 1$ is the reduced form elasticity of the traded goods expenditure *share* with respect to country size, as measured by GDP, holding GDP per capita constant. Omission of the institutional regressors does not dramatically bias the estimate of the size effect. Regardless of the model chosen, holding GDP per capita and all else constant, a 10% rise in GDP leads to about an 8.5% rise in traded goods expenditure, equivalent to a 1.5% drop in the traded goods expenditure *share*. On the other hand, including the previously omitted variables leads to a dramatic shift in the estimated impact of income per capita. We estimate that a 10% rise in income per capita would lead to a 2% decline in the traded goods expenditure share.

Our home bias result --- other things equal, doubling per capita income reduces the traded goods expenditure share by 20% --- implies a very significant

[19] This correlation is given in the data, but it does not imply that income per capita and institutional quality are necessarily linked, nor does it invalidate the "thought experiment" reported above in which institutions were improved without a corresponding increase in income per capita.

departure from homotheticity. This stands in contrast to the most recent applied trade literature (Davis and Weinstein, 1998; Davis, Weinstein, Bradford and Shimpo, 1997). We coincide with Trefler (1995) in identifying the importance of home bias but diverge from him in tying home bias to income per capita; Trefler uses income per capita as an indicator of factor-augmenting technological differences across countries. Our aggregate results using the reduced form trade expenditure share bear some resemblance to earlier disaggregated work by Hunter and Markusen (1988).

Of course, our model recognizes that the negative effect of income per capita on the trade expenditure share could be offset to some extent by an indirect price effect, since the better institutions and lower tariffs of the high-income countries lower the traded goods price index. Combined income and price effects explain why the data show a small positive correlation (.13) between per capita GDP and total imports divided by GDP.[20]

Our third main contention is that institutional differences can generate "a disproportionately high volume of trade among high-income countries," a pattern "which happens to accord well with trade patterns in the real world" (Deardorff 1998, p.16). Why should high-income countries skew their trade toward imports from other high-income countries – in spite of the presumed similarity of factor endowment? And what answer to the first question can be consistent with the stylized fact that low-income countries do *not* rely disproportionately on imports from other low-income countries?

Several solutions to the puzzle have been proposed (notably Markusen 1986). We offer an explanation based on the price markup associated with insecure trade. Effective institutions in the importing country lower transactions costs, lower the prices of traded goods, and raise imports, *holding constant the characteristics of the exporting country.* The predation model argues that the complete price markup also depends on the quality of institutions in the exporting country. Our empirical results confirm that low security in country i lowers m_{ij} / m_{kj}; the predation model also implies that both m_{ij} and m_{kj} are low when the security of country *j* is low. We cannot estimate this second effect, because the impact of the exporter's security and of the expenditure share α_j are not separately identified. The prediction of the model, however, clearly coincides with the observed pattern of trade. Trade among high-income countries with high-quality institutions ought to be high because the transactions costs associated with insecurity are low; transactions costs impose a double disadvantage on trade among low-income, low-security countries. This solves a problem alluded to in Deardorff's (1998, p.16) informal exposition of an explanation based on identical but non-homothetic preferences. Our story implies disproportionate trade among consumers of the "high-income" good, but it does not imply counterfactually a similarly disproportionate amount of trade among low-income consumers.

5. Robustness

In this section we briefly examine four questions: How do the estimated parameters differ when lagged GDP is used as an instrument for current GDP? How do they differ when the base country is changed? How would they appear if we estimated a model of levels of imports rather than import ratios? Can more general functional forms be estimated?

A more complex model than ours might treat GDP as an endogenous variable. If a single shock can simultaneously shift both GDP and imports, then correlation between the GDP regressor and the error term of the import regression could bias our parameter estimates. With this in mind, we reestimated Equation 4.2 using lagged GDP as an instrument for current GDP.[21]

Table 5. Relative Import Demand, USA as the Base, Lagged GDP

Variable	Base Results	Lagged GDP

[20] The ratio of imports to GDP is not an exact measure of the traded goods expenditure share. It excludes expenditure on the domestically produced tradable good and includes expenditure on goods which are re-exported.

[21] More precisely, using data from *World Development Indicators*, we multiplied the figure for 1995 GDP in current local currency units by the ratio of the country's 1996 GDP deflator to its 1995 GDP deflator and converted that result to 1996 dollars using the official exchange rate.

Log GDP Ratio	0.859	.
	(0.038)	.
Log Instrumented GDP Ratio	.	0.855
	.	(0.038)
Log Per Capita GDP Ratio	-0.202	.
	(0.107)	.
Log Instrumented Per Capita GDP Ratio	.	-0.225
	.	(0.106)
Log Distance Ratio	-1.102	-1.101
	(0.058)	(0.058)
Log Transparency Ratio	0.538	0.578
	(0.171)	(0.171)
Log Enforceability Ratio	0.370	0.411
	(0.204)	(0.208)
Log Border Ratio	0.800	0.791
	(0.174)	(0.174)
Log Language Ratio	0.338	0.339
	(0.083)	(0.083)
Log Tariff Ratio	-4.719	-4.881
	(2.191)	(2.217)
Weighted Log Distance Ratio	0.364	0.369
	(0.138)	(0.140)
Weighted Log Border Ratio	-1.188	-1.103
	(1.416)	(1.472)
Weighted Log Language Ratio	0.042	-0.086
	(1.467)	(1.479)
Constant	-0.185	-0.211
	(0.137)	(0.138)
Number Observations	2042	2042
R-squared	.68	.68

Robust standard error in parentheses, with clustering by importer.

The results, which exclude German trade due to a data problem,[22] are presented in Table 5. The first column is our usual specification, the second uses lagged GDP. The new parameter estimates are well within one standard error of the old and strengthen, if anything, the security and home bias effects.

In theory, there is no reason to suspect that the change of the base country k would make any difference to the parameter estimates. In fact, we run into two problems. We have no data on home consumption of the exported good. Therefore, for any base country k, we lack a measure of m_{kk}. Since we have no denominator for the relative import measure m_{ik} / m_{kk}, we can never include any country's imports from the base country in the sample used in estimation. Results could be sensitive to the exclusion of differing sets of 47 import observations. A second problem is tied to measurement error. Many of our independent variables take the form $\ln(x_i / x_k)$. The measurement error associated with x_k depends on the choice of *k*, so the parameter estimates may vary with the choice of the base country.[23]

Table 6 presents the results of estimating the full model with the USA, Brazil, and China as alternative base countries. As usual, these are OLS estimates of the model with robust standard errors generated using panel data techniques (White correction with clustering by importer). The new results are consistent with our conclusions in the previous section. Although the significance of the enforceability measure falls slightly with the alternative bases, the transparency index and the composite security index retain their strong effects. Moreover, as shown in Table 7, regardless of base country, omitting the tariff and security variables from the model generates a positive and significant estimate of the GDP per capita coefficient, implying (misleadingly) that the traded goods expenditure share rises as income per capita rises. However, including all the variables called for by the theoretical model, we find instead a negative relation between income per capita and the traded goods expenditure share (although when China is used as the base country this relationship is significant only at the 10% level).

Table 6. Relative Import Demand, Alternative Base Countries

Variable	USA Base	Brazil Base	China Base	USA Base	Brazil Base	China Base
Log GDP Ratio	0.86	0.86	0.85	0.87	0.86	0.85
	(.04)	(.04)	(.04)	(.04)	(.04)	(.04)
Log GDP Per Capita Ratio	-0.21	-0.19	-0.17	-0.19	-0.17	-0.15
	(.11)	(.09)	(.10)	(.12)	(.10)	(.12)
Log Distance Ratio	-1.10	-0.97	-1.07	-1.10	-0.97	-1.06
	(.06)	(.04)	(.05)	(.06)	(.04)	(.05)
Log Transparency Ratio	0.53	0.51	0.58	.	.	.
	(.17)	(.22)	(.26)	.	.	.
Log Enforceability Ratio	0.39	0.57	0.37	.	.	.
	(.20)	(.35)	(.23)	.	.	.

[22] *World Development Indicators* does not include German GDP deflators.
[23] This is also a loose justification for allowing an intercept.

Relative Composite Security	.	.	.	0.29	0.28	0.26
	.	.	.	(.07)	(.07)	(.07)
Log Border Ratio	0.75	0.93	0.55	0.75	0.92	0.55
	(.16)	(.16)	(.15)	(.16)	(.16)	(.15)
Log Language Ratio	0.33	1.13	0.84	0.34	1.14	0.84
	(.08)	(.12)	(.15)	(.08)	(.12)	(.15)
Log Tariff Ratio	-4.75	-4.42	-3.91	-4.81	-4.80	-4.26
	(2.1)	(1.6)	(1.8)	(2.3)	(1.8)	(2.1)
Wgt. Log Distance Ratio	0.38	0.35	0.49	0.45	0.39	0.53
	(.14)	(.14)	(.15)	(.13)	(.13)	(.14)
Wgt. Log Border Ratio	-1.09	-0.43	-0.21	-1.39	-0.76	-0.48
	(1.3)	(1.2)	(1.2)	(1.4)	(1.2)	(1.2)
Wgt. Log Language Ratio	0.00	-1.01	-1.05	-0.12	-0.63	-0.67
	(1.4)	(0.9)	(1.0)	(1.4)	(0.8)	(0.8)
Constant	-0.17	-0.70	-0.95	-0.18	0.43	0.06
	(.14)	(.30)	(.27)	(.15)	(.12)	(.14)
Number Observations	2135	2135	2135	2135	2135	2135
R-squared	.70	.73	.61	.70	.73	.61

Robust standard errors with clustering by importer in parentheses.

Table 7. Coefficients on Per Capita Income Variable

Variable	USA Base	Brazil Base	China Base
Model excluding tariffs and security	0.141	0.160	0.156
	(.058)	(.057)	(.058)
Full model	-0.206	-0.186	-0.165
	(.105)	(.090)	(.099)

Robust standard errors with clustering by importer in parentheses.

It has been suggested that the large trade volumes of the United States may exercise undue influence on our results. In fact, comparing Table 8 to Table 6 shows that the influence of institutional quality on relative trade volumes is slightly greater when US trade is excluded from the regression (with the Tornqvist weights appropriately recalculated).

Table 8. Relative Import Demand, US Trade Excluded

Variable	Brazil Base	China Base	Brazil Base	China Base
Log GDP Ratio	0.85	0.84	0.86	0.85
	(.04)	(.04)	(.04)	(.04)
Log GDP Per Capita Ratio	-0.21	-0.19	-0.19	-0.16
	(.09)	(.10)	(.10)	(.12)
Log Distance Ratio	-0.96	-1.06	-0.95	-1.05

	(.04)	(.05)	(.04)	(.05)
Log Transparency Ratio	0.55	0.61	.	.
	(.22)	(.27)	.	.
Log Enforceability Ratio	0.64	0.44	.	.
	(.32)	(.22)	.	.
Relative Composite Security	.	.	0.30	0.29
	.	.	(.07)	(.07)
Log Border Ratio	0.99	0.56	0.99	0.56
	(.17)	(.16)	(.16)	(.16)
Log Language Ratio	1.18	0.95	1.19	0.96
	(.12)	(.15)	(.13)	(.14)
Log Tariff Ratio	-4.51	-4.03	-4.91	-4.43
	(1.62)	(1.85)	(1.86)	(2.18)
Wgt. Log Distance Ratio	0.29	0.41	0.31	0.44
	(.13)	(.14)	(.12)	(.13)
Wgt. Log Border Ratio	-0.19	-0.14	-0.79	-0.71
	(1.14)	(1.16)	(1.18)	(1.18)
Wgt. Log Language Ratio	-2.17	-2.57	-1.42	-1.80
	(1.57)	(1.62)	(1.37)	(1.36)
Constant	-0.80	-1.07	0.45	0.07
	(.29)	(.27)	(.13)	(.14)
Number Observations	2042	2042	2042	2042
R-squared	.72	.60	.72	.59

Robust standard errors with clustering by importer in parentheses.

We have argued above that our model of relative imports has many advantages. However, we can also estimate a different model which, while maintaining the same spirit as ours, avoids the problems associated with choice of a base country. We estimate the model in levels rather than in relative form, *including a complete set of exporter dummies* to pick up the exporter-specific α_j terms of Equation 2.2, the exporter-specific $\bar{S}_j D$ of Equation 1.5, whatever constant term may have canceled out of the price markup given by Equation 2.3, and whatever constant term may belong in the traded goods expenditure share function which underlies Equation 2.4. This gives us Equation 5.1:

$$\begin{aligned} \ln m_{ij} = {} & \beta_j + \beta_1 \ln(y_i) + \beta_2 \ln(y_i / n_i) + \beta_3 \ln(d_{ij}) + \beta_4 \ln(s_{1i}) + \beta_5 \ln(s_{2i}) \\ & + \beta_6 \ln(1 + b_{ij}) + \beta_7 \ln(1 + l_{ij}) + \beta_8 \ln(1 + (1 - a_{ij})t_i) + \beta_9 \left(\sum_j w_j \ln(d_{ij}) \right) \\ & + \beta_{10} \left(\sum_j w_j \ln(1 + b_{ij}) \right) + \beta_{11} \left(\sum_j w_j \ln(1 + l_{ij}) \right) + \upsilon_i + \varepsilon_{ij} \end{aligned} \qquad (5.1)$$

where β_j is a vector of 48 exporter dummies.

As Table 9 shows, the results of estimating this "levels" model, apart from the jump in R-squared attributable to the exporter-specific intercepts, are similar to those already presented. The security variables are still estimated to have a positive effect. The point estimates of the coefficients on the institutional variables are similar, and the significance levels are only slightly less. Moreover, the coefficient on the income per capita variable behaves as already described – moving from very significantly positive to marginally significantly negative as the tariff and security variables are added to the model.

Finally, we experimented with more general functional forms. We tried a translog specification of defensive capacity instead of using $\frac{\bar{S}_i}{\bar{S}_k} = \left(\frac{s_{1i}}{s_{1k}}\right)^{\rho_1} \left(\frac{s_{2i}}{s_{2k}}\right)^{\rho_2}$. A Wald test could not reject the hypotheses that the coefficients on all the second order terms were jointly zero, so we returned to the log-linear specification. We also tried to estimate a translog as an approximation to the trade share function $\frac{\varphi(y_i, n_i, P_i)}{\varphi(y_k, n_k, P_k)}$ but found that we could not identify all the necessary parameters with information on 47 countries.

Table 9. Alternative Models of Relative Import Demand

Variable	Ratio Form: USA Base	Ratio Form: USA Base	Levels Form	Levels Form
GDP Variable	0.837	0.860	0.878	0.882
	(0.045)	(0.037)	(0.042)	(0.036)
GDP Per Capita Variable	0.141	-0.206	0.140	-0.167
	(0.058)	(0.105)	(0.061)	(0.100)
Distance Variable	-1.134	-1.097	-0.985	-0.930
	(0.054)	(0.056)	(0.053)	(0.053)
Transparency Variable	.	0.530	.	0.519
	.	(0.169)	.	(0.174)
Enforceability Variable	.	0.385	.	0.358
	.	(0.199)	.	(0.219)
Border Variable	0.908	0.753	0.719	0.733
	(0.140)	(0.160)	(0.213)	(0.221)
Language Variable	0.314	0.331	1.145	1.209
	(0.081)	(0.082)	(0.158)	(0.153)
Traiff Variable	.	-4.753	.	-3.809
	.	(2.146)	.	(1.997)

Weighted Distance Variable	0.420	0.382	0.230	0.120
	(0.164)	(0.137)	(0.151)	(0.127)
Weighted Border Variable	-1.807	-1.092	-1.897	-1.775
	(1.474)	(1.332)	(1.331)	(1.255)
Weighted Language Variable	1.390	-0.001	0.480	-0.384
	(1.639)	(1.448)	(0.976)	(0.963)
Constant	0.055	-0.169	*Exporter-*	*Exporter-*
	(0.158)	(0.135)	*specific*	*specific*
Number Observations	2135	2135	2182	2182
R-squared	.69	.70	.997	.998

Robust standard error with clustering by importer given in parentheses.
Columns 1 and 2 repeat results given in Table 4, above.

6. Summary and Conclusion

Abundant anecdotal evidence suggests that transactions costs associated with insecure exchange significantly impede international trade. Predation by thieves or by corrupt officials generates a price markup equivalent to a hidden tax or tariff. Insecure enforcement of contracts can have the same effect. These price markups significantly constrain international trade where legal systems poorly enforce commercial contracts and where economic policy lacks transparency and impartiality.

This paper builds a structural model of import demand in an insecure world and estimates the model using data collected by the World Economic Forum. We find that a 10% rise in a country's index of transparency and impartiality leads to a 5% increase in its import volumes, other things equal. Significant costs are associated with institutional weakness. They beg for serious consideration as we try to solve "the mystery of the missing trade" (Trefler, 1995).

We find that the share of total expenditure devoted to traded goods declines as income per capita rises, other things equal. This result stands in sharp contrast to the frequent practice of using homothetic preferences in trade models and to recent findings that homothetic preferences cannot be rejected by statistical tests. The latter finding is replicated here when tariffs and the institutional variables are excluded. Based on this, we claim that omitted variable bias accounts for others' failure to reject homotheticity. The home bias effect of higher income tends to be counterbalanced by a decline in the price index of traded goods as income per capita rises, so that there is in the end a small positive correlation between income per capita and import expenditure as a share of GDP.

Finally, the paper suggests an explanation for the stylized fact that high-income, capital-abundant countries trade disproportionately with each other. These countries are also, in our data, the countries with strong institutions for the defense of exchange. Since the traded goods price markup depends on the degree of insecurity in both the exporting and the importing countries, trade among the rich countries will be relatively unhampered by security-related transactions costs, while trade among poor countries will be doubly disadvantaged.

Appendix

The following table reports results parallel to those of Table 4 using interpolated f.o.b. import volumes rather than reported c.i.f. volumes:

Appendix Table 1. Relative Import Demand FOB, USA as the Base

Variable	OLS 1	OLS 2	OLS 3	OLS 4	Tobit
Log GDP Ratio	0.860	0.870	0.877	0.882	0.925
	(0.044)	(0.042)	(0.038)	(0.039)	(0.025)
Log GDP Per Capita Ratio	0.126	0.057	-0.196	-0.174	-0.235
	(0.060)	(0.106)	(0.105)	(0.121)	(0.059)
Log Distance Ratio	-1.134	-1.121	-1.106	-1.105	-1.144
	(0.054)	(0.060)	(0.058)	(0.058)	(0.042)
Log Transparency Ratio	.	.	0.651	.	0.743
	.	.	(0.180)	.	(0.105)
Log Enforceability Ratio	.	.	0.362	.	0.283
	.	.	(0.180)	.	(0.134)
Relative Composite Security	.	.	.	0.314	.
	.	.	.	(0.079)	.
Log Border Ratio	0.894	0.830	0.784	0.778	0.698
	(0.140)	(0.155)	(0.159)	(0.161)	(0.194)
Log Language Ratio	0.315	0.322	0.325	0.333	0.343
	(0.082)	(0.081)	(0.082)	(0.082)	(0.112)
Log Tariff Ratio	.	-1.665	-3.688	-3.692	-3.720
	.	(2.140)	(2.131)	(2.320)	(0.932)
Weighted Log Distance Ratio	0.329	0.331	0.272	0.361	0.190
	(0.171)	(0.170)	(0.140)	(0.140)	(0.095)
Weighted Log Border Ratio	-1.812	-1.726	-1.161	-1.436	-1.001
	(1.444)	(1.402)	(1.334)	(1.394)	(0.947)
Weighted Log Language Ratio	1.247	1.274	-0.233	-0.440	0.592
	(1.649)	(1.582)	(1.520)	(1.487)	(0.805)
Constant	0.046	0.057	-0.226	-0.228	-0.198
	(0.158)	(0.153)	(0.144)	(0.157)	(0.105)
Number Observations	2135	2135	2135	2135	2159
R-squared	.69	.69	.70	.70	
Log Likelihood					-3872.

OLS: Robust standard error with clustering by importer given in parentheses.

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Appendix II. The Reduced Form of the Contract Model

Let γ be the probability of a match on the long side of the market. The buyers' and sellers' prices in the absence of an enforced contract are $p^b = \gamma p^* + (1-\gamma)b$ for buyers and p^* for sellers. Let the contract price be denoted p^C. Equilibrium requires that on the long side of the market, traders should be indifferent between having a contract and entering the *ex post* market without a contract. This implies $p^b = \theta p^C + (1-\theta)p^b \quad p^C = p^b$. The certainty equivalent prices are p^b for buyers and $p^s \equiv \theta p^b + (1-\theta)p^*$ for sellers. All traders on the short side of the market accept contracts. The probability that a seller without an enforceable contract can find a buyer in the *ex post* market is equal to

$$(1.7) \quad \gamma = \frac{(1-\theta)s[\theta p^b + (1-\theta)p^*]}{d[p^b] - \theta s[\theta p^b + (1-\theta)p^*]} \text{ where } p^b = \gamma p^* + (1-\gamma)b$$

for excess demand equilibrium. The numerator is the number of traders from the short side whose contracts fail to be enforced. The denominator is the number of traders from the long side who do not have enforced contracts. This model has a unique equilibrium γ and associated buyers' and sellers' prices and volumes for given (θ, p^*, b).

The actual volume exchanged is that on the short side of the market, read off the supply curve at the equilibrium value of the certainty equivalent supply price. $s[p^s(p^*, \theta, b)]$, where $p^s()$ is the expected price to suppliers as reduced form function of the bargained price, the probability of enforcement and the outside option of the buyers. The "tariff equivalent" of the imperfect enforcement is obtained by first defining the hypothetical buyers' price which would clear the market at the actual trade volume:

$$p^t(p^*, \theta, b) = \{p \mid d[p] = s[p^s(p^*, \theta, b)]\}.$$

Then the ad valorem tariff equivalent is

$$(1.8) \quad T(p^*, \theta, b) = \frac{p^t(p^*, \theta, b)}{p^s(p^*, \theta, b)} - 1$$

It is straightforward but tedious to show that the ad valorem tariff equivalent is decreasing in θ, (see Anderson and Young, 1999) hence better enforcement increases trade.