

Why Do Nations Trade (So Little)?

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Abstract. There isn't nearly as much trade as standard models suggest there should be. Formal trade barriers and transport costs are too low to account for the difference. The pattern of missing trade has interesting variation across country pairs. These clues suggest the need for theoretical and eventually structural empirical work on the missing transactions costs. This paper reviews recent empirical findings and some promising research directions in search, predation and contract theory. F10, F13.

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RUNNING HEAD: Why Do Nations Trade (So Little)?

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1. Introduction

There isn't nearly as much trade as standard trade models suggest that there should be. Formal trade barriers such as tariffs and quotas are far too low to account for much of the missing trade while changes in tariffs and quotas in the last 50 years explain too little of the growth in trade. Transport costs help explain the missing trade, but distance and other location variables are far too important in their trade suppressing effects to be accounted for by the effect of distance on measurable transport costs. Measured transport costs do not fall so cannot explain the growth in trade. These anomalies have until recently been ignored by the profession, perhaps in the belief that the anomalies were not important, perhaps in the belief that little progress could be made in explaining them. This paper argues that neither reason for a parenthetical treatment of missing trade is valid.

The missing trade anomaly is demonstrated to be important and to have significant patterns which cry out for explanation in Section 2. Sections 3 and 4 discuss some theoretical structures which might be used to achieve a fundamental understanding of the missing transactions costs.

The paper concludes with some promising directions for theoretical and empirical research. Fundamentally satisfactory theoretical structures must be consistent general equilibrium models which incorporate endogenous transactions costs of some type. Empirical work should ultimately be based on such models and test their implications. My discussion here is necessarily speculative and includes some of my own recent work,

about which I am not the best judge. I hope to convince the reader at least that the problem is important and that there are feasible theoretical approaches which can help explain it.

2. Evidence

The huge resistance to trade is observed in a variety of approaches. The theme of this work is that impediments to trade are much larger than the directly measurable transport costs and governmentally imposed trade barriers. These unmeasured barriers move dramatically about across space and time, with interesting patterns which give clues to possible explanations.

There is too little trade

There is an abundance of empirical work, recently renewed, on the effect of distance and borders on trade volume. Some especially interesting work is on trade flows between the US and Canada (McCallum, 1995; Helliwell, 1998). Engel and Rogers (1996) complement these findings with measures of the effect of distance and borders on arbitrage of price differences between US and Canadian cities. Frankel, Stein and Wei (1997) demonstrate the effect of distance, contiguity, continental grouping and regional trade arrangements on trade among major trading countries. They also present evidence on the effect of time on trade patterns, other things equal.

Trade, Distance and Borders: McCallum

McCallum (1995) offers a study of export trade between 30 US states (the 20 largest plus all the border states) and 10 Canadian provinces (along with a Rest Of the World category) for 1988.

McCallum uses the gravity model for his empirical work. The gravity model always gets a good fit, appears relatively stable over time and seems to be the best model for identifying differential resistance to trade across origin-destination pairs. Thus the gravity model underlies several other important empirical studies reviewed here. Anderson (1979) developed the theoretical rationale. Products are assumed to be differentiated by place of origin. Differentiation is usually exogenous but can be endogenously derived in a model of monopolistic competition, as Helpman and Krugman (1985) show. Preferences are identical and homothetic across nations. In the simplest case, Cobb-Douglas preferences are imposed; a more complex version allows more general forms but then must account for local price differences and their effect on expenditure shares. The aggregate trade flow from country i to country j is equal to:

$$X_{ij} = \alpha_i Y_j \text{ where}$$

$$\alpha_i = \text{expenditure share on product type } i$$

$$Y_j = \text{income in country } j.$$

Adding across j ,

$$Y_i = \sum_j X_{ij} = \alpha_i Y^W \text{ where } Y^W \text{ is world income.}$$

Solving for the parameter α_i and substituting into the original demand equation yields the basic gravity equation:

$$X_{ij} = Y_i Y_j / Y^W.$$

Impediments to trade which act bilaterally (i.e., discriminating between trading partners) modify this relationship in a simple multiplicative fashion. More generality allows the trade share, the ratio of trade expenditure to income, to vary as a reduced form function of exogenous variables in the importing country. This interpretation was offered by Anderson but often

ignored in subsequent research; for recent discussion and an application see Anderson and Marcouiller (1999). In this case the elasticities of the income terms are allowed to differ from unity and population and other terms may be added.

Distance

In his basic specification (with coefficients quite robust with respect to variations in specification) McCallum reports a regression as:

$$\log(x_{ij}) = 1.21\log(y_i) + 1.06\log(y_j) - 1.42\log(d_{ij}) + 3.09border$$

(0.03) (0.03) (0.06) (0.13)

where d_{ij} is the distance between region i and j , and $border$ is a dummy variable equal to one if a border lies between i and j and equal to zero otherwise. Standard errors are reported below the coefficient estimates. The adjusted R^2 is equal to 0.81.

The distance finding means that 2 regions separated by 500 miles will trade more than 2.67 times as much as 2 regions separated by 1000 miles, all else equal. McCallum leaves out population, which is often put in the model.

Grossman (in a comment on Frankel, Stein and Wei discussed below) argues that this magnitude of distance effect is *huge*, far beyond what transport costs could reasonably suggest. Deardorff (and Anderson before him) suggested that in a CES preferences structure, the coefficient on distance could be an estimate of the elasticity of substitution. If d is proportional to transport costs and these are of the iceberg melting variety, then the result holds. Iceberg melting costs (loss is proportional to distance) hardly are realistic. Thus Grossman suggests that the transport margin be modeled as

$$\tau_{ij} = \omega d_{ij}^{\alpha}$$

where α represents weight (and other relevant characteristics) and $\alpha < 1$ might be anticipated on prior reasoning about fixed port costs vs. variable shipment costs. This means in a Cobb-Douglas framework that

$$\log x_{ij} / \log d_{ij} = -\alpha \frac{\tau_{ij}}{p_i + \tau_{ij}}.$$

With average transport costs being something like 5% or less of value, Grossman notes that it takes a huge value of α to get us to -1.42. Hummels (1998) collects detailed transport cost data for individual commodities and shows that average transport cost margins are severely biased downward. Using his margins of 40% or more lowers the magnitude of the work to be done by α , but not sufficiently. Reasonable values of α are probably less than one. An elasticity of substitution greater than one helps to reduce the work to be done by α but cannot help enough (replace α with $\sigma\alpha$, where σ is the elasticity of substitution). Specifically, using Hummels' margin of 40%, in order to be consistent with a distance elasticity of -1.42, α must be equal to 4.97. Among finely differentiated products, high elasticities are plausible and confirmed by various empirical studies, but for an empirical model of substitution between aggregates national exports, elasticities are likely to be rather low.

The inescapable conclusion is --- *there must be some other transactions costs. Moreover, the missing transactions costs must be very sensitive to distance, though this could be spurious correlation in a deeper model.* To see this, let the missing cost be τ_{ij} and repeat the exercise of finding the distance elasticity assuming that α is not sensitive to distance:

$$\log x_{ij} / \log d_{ij} = -\alpha \frac{\tau_{ij}}{p_i + \tau_{ij} + \kappa}$$

This only strengthens the case that the distance elasticity is too large, unless is very sensitive to distance.

Border Effect

A far more striking finding of McCallum is the enormous importance of the border. Trade between 2 provinces is more than 20 times larger than trade between a province and a similar sized state located the same distance away. This suggests some powerful international transactions costs at work, since tariffs are minimal between the US and Canada even in 1988. McCallum emphasizes the significance of this by a simple exercise examining the predicted effect on trade of Canadian provinces of removal of the border. It is assumed that the removal of the border does not affect the proportion of trade going to 'own province' or to 'rest of world'. The bracketed figures give the gravity model's predicted flow; the unbracketed figure is the actual flow.

Trade of Canadian Provinces and Removal of the Border

Origin	Shipment (\$ billion)	Destination (percentage of total shipments)			
		Own province	Other provinces	United States	Rest of world
Canada	387	44	23 [4]	24 [43]	9
Atlantic	18	37	29 [12]	19 [36]	15
Quebec	85	47	27 [6]	19 [40]	7
Ontario	179	45	21 [3]	29 [47]	5
Prairie	67	41	28 [9]	18 [37]	13
British Col.	37	43	13 [2]	19 [30]	25

Arbitrage, Distance and Borders: Engel and Rogers

Engel and Rogers analyze the departures from perfect arbitrage between North American cities. They use price data from 23 North American cities and 14 disaggregated consumer price index categories. Prices are converted to US \$ using monthly average exchange rates (standard consumer price series have this monthly averaging property too, in essence).

Pricing model

All goods at retail include some local (nontraded) services, hence the pricing model is assumed to give the price of good i at location j as:

$$p_j^i = \beta_j^i \alpha_j^i (w_j^i)^{\gamma_i} (q_j^i)^{1-\gamma_i},$$

where μ is the markup over cost, θ is the (inverse of) the productivity parameter, α is the cost share of the nontraded input, w is the price of the nontraded input and q is the price of the traded input. The traded input price can vary across locations due to transport costs and other effects of distance. Thus q_j^i / q_k^i will deviate from 1 as j is further from k . Also, it is possible that the nontraded input prices w may vary more between more distant locations w_j^i / w_k^i varies as j is further from k . Finally, the productivity parameters may differ with distance. The arbitrage pricing hypothesis is that the volatility of relative prices is related to distance and the border effect.

The measure of price volatility is based on:

$$P_{j,k}^i = \log(p_j^i / p_k^i)_t - \log(p_j^i / p_k^i)_{t-2}$$

Here t is monthly (and 2 month difference is needed due to US data constraints). The standard deviation of P is the measure of volatility.

The basic model is

$$SD(P_{j,k}^i) = \gamma_m D_m + \beta_1^i r_{j,k} + \beta_2^i B_{j,k} + \varepsilon_{j,k}^i$$

Here, D is a city dummy, r is log distance and B is a border dummy. A variety of other specifications were tried: seasonally filtering the price data, quadratic form in distance, and deflating the price data by local CPI or by national CPI. (This latter is an attempt to see if nominal price stickiness in the presence of exchange rate fluctuations is responsible for results.) These make no essential qualitative difference. Finally, a variant plugging in the two month standard deviation of the difference in relative real wage is used, with some difference.

Engel and Rogers report regressions for each of 14 categories, then a combined regression. The data reject a combined regression; however, the coefficients on distance and the border in the combined regression are a convenient summary average of the individual effects used below.

Combined Price Volatility Regressions

	log distance (x10 ⁴)	border (x10 ³)	SD of real wage	US-US volatility	US-Canada volatility
base case	10.6 (3.25)	11.9 (0.42)		0.0321	0.0367
wage dispersion	8.43 (3.22)	11.4 (0.52)	0.18 (0.11)	0.0321	0.0367
city CPI deflation	7.93 (2.68)	5.04 (0.35)		0.0321	0.0367
national CPI deflation	7.76 (2.76)	6.48 (0.36)		0.0321	0.0367

These coefficients can be used to construct estimates of ‘how wide is the border?’. The smallest such number is 575 miles for the city CPI deflation case (form $5.04 \times 10^{-3} / 7.93 \times 10^{-4}$, then exponentiate). The other cases give larger, (usually much larger) numbers for the width of the border.

The border contributes a lot, as does distance, to the dispersion of prices. The border adds in the base case, .0119 to the average US-Canada volatility of 0.0367, or 32.4%. Distance contributes 20.4% on average (the average log distance between US-Canada city pairs is 7.03, times $10.6 / 10^4$).

The Evolution of Trade Flows and Regionalism: Frankel, Stein and Wei

Frankel, Stein and Wei fit a gravity model for major countries over the 3 decades 1970-90, with dummies for language in common, regional grouping, and common border. They also use year dummies and an interactive time trend with regional dummies.

Gravity Estimates of Trade, 1970-1990 by Frankel, Stein and Wei

	Dependent variable: log(Trade)	
Intercept	-9.70*	-9.78*
	(0.27)	(0.27)
1980 dummy	-1.01*	-1.06*
	(0.05)	(0.05)
1990 dummy	-1.29*	-1.37*
	(0.06)	(0.05)
GNP product	0.72*	0.73*
	(0.01)	(0.01)
per capita GNP product	0.23*	0.23*
	(0.01)	(0.01)
Distance	-0.51*	-0.51*
	(0.02)	(0.02)
Adjacency	0.72*	0.72*
	(0.10)	(0.09)
Common language	0.47*	0.47*
	(0.05)	(0.05)
EC bloc	0.31*	0.24*
	(0.06)	(0.09)
East Asia bloc	2.12*	2.26*
	(0.09)	(0.18)
Western hemisphere bloc	0.31*	-0.32*
	(0.08)	(0.10)
EC*trend		0.006
		(0.006)
East Asia*trend		-0.013
		(0.012)
Western Hemisphere*trend		0.063*
		(0.009)

Note: standard errors in parentheses. Trend=Year-1970. * denotes significance at 1% level. $R^2=0.72$.

Their coefficient for distance is much smaller than McCallum's, -.51. Still, this means that countries 500 miles apart do 1.42 ($2^{-.51}$) times as much trade as countries 1000 miles apart, all else equal. Grossman's calculation here would mean that τ would have to be on the order of 10 to explain this coefficient.

However, using Hummels margin of 40% brings the required value of τ to a reasonable range.

language in common increases trade by 60%, cet. par. [$1.6=\exp(.47)$].

adjacency doubles trade [$2.05 = \exp(.72)$].

regional bias: EC trade increases 36% [$1.36 = \exp(.31)$]; Western Hemisphere trade increases 36% and East Asia bloc increases trade 733% [$\exp(2.12) = 8.33$].

The authors report that the findings are pretty robust with respect to various specification searches.

The lesser importance of distance as compared to McCallum, reflected in the dummy variable coefficients, is notable, but it is still too big to reasonably be explained by transport costs. Thus it is consistent with the importance of unmeasured transactions costs. And the dummies for common border and common language probably reflect something about the security of legal arrangements as well as information asymmetries.

The effect on trade of the year dummies and the time trend interacted with regional grouping is enormous if it is to be believed. Controlling for other factors, the passage of time is lowering trade dramatically, by 189% [$2.89 = \exp(1.06)$] to 1980 and by 294% [$3.94 = \exp(1.37)$] to 1990.

Part of the explanation for these enormous effects is that Frankel, Stein and Wei omit a variable suggested by the theoretical gravity model: deflation by world income. The coefficients on the 1980 and 1990 dummies should theoretically have the interpretation of minus the log of the ratio of world income in the latter years to that of 1970. The coefficients are too large in absolute value for this interpretation: world income did not triple to 1980 and quadruple to 1990. There is a partial offset of the effect of time in the Western hemisphere, where the interaction with time delivers a net positive effect by 1980 ($-0.32 + 0.063 \cdot 10 = 0.31$) and still more positive by 1990 ($-0.32 + 0.063 \cdot 20 = 0.97$) Even so, the net effect of 20 years passage of time on trade between members of the Western hemisphere is to reduce trade by

49% [$1.49 = \exp(1.37 - 0.97 = 0.40)$]. Accounting for the omitted deflation by world income would, however, push the net effect of time into the positive range.

The globalization story is partly about trade to GDP ratios increasing. This is happening in the data, but if the model is to be believed, it is driven by world economic growth acting through the gravity model's income terms. Essentially, a converging world economy will experience a rise in world trade relative to world income. The pure theoretic gravity model predicts growth in trade to GDP ratios for all countries with below average GDP growth rates and decline in trade to GDP ratios for all countries with above average GDP growth rates. This follows from

$$X_{ij} = \frac{Y_i Y_j}{Y^W}, \text{ hence}$$

$$\frac{X_{ij}}{Y_i} = \frac{Y_j}{Y^W} = 1 - \frac{Y_i}{Y^W}.$$

World trade to world income will rise as countries converge in income levels.

This follows from

$$X_{ij} = \frac{(Y^W)^2 - Y_i^2}{Y^W}, \text{ hence}$$

$$\frac{X^W}{Y^W} = 1 - \frac{n[\text{Var}(Y) + \bar{Y}^2]}{(Y^W)^2}$$

$$= \frac{n-1}{n} - \frac{1}{n}c^2, \text{ where}$$

$c = \sqrt{\text{Var}(Y)/\bar{Y}^2}$, the coefficient of variation of income

n = number of countries

\bar{Y} = average income.

I had anticipated that time dummies in a gravity regression would reveal a further trade increasing effect, to be associated with a fall in transactions costs, including the missing transactions cost. There are mysteries

in the time series to be explained here with a combination of theoretical and empirical work.

The HOV model and missing trade

Another empirical regularity which pushes up the coefficient on distance in effect is that countries trade so much with themselves. This home good bias has received interesting attention from Trefler (1995).

Using the Heckscher-Ohlin-Vanek framework, Trefler reports that net factor content of trade for 33 countries accounting for 3/4 of world trade is an order of magnitude smaller than would be predicted by the factor endowments. This problem persists even when the model is extended to allow for home bias in consumption and technological differences modeled as: (i) Hicks-neutral technological differences between rich and poor combined with (ii) pure factor augmenting technological differences within groups of countries. Davis and Weinstein (1998) argue that technological differences (identified by a new data set which offers internationally comparable technology matrices) combined with a gravity model specification to allow for distance can explain the missing trade in the HOV setting. It still leaves the mystery of the over-importance of distance. And the Davis and Weinstein data is only for the OECD, omitting the dispersion of income per capita which is part of the Trefler home bias finding.

3. Implications

The evidence points to *very large missing transactions costs of international trade*. Moreover, the time series and cross section variation of the missing transactions cost together with clues such as home bias suggests that

these costs are systematic in their variation, and likely to be endogenous with a lot of action in the endogeneity.

What are these missing costs? Here is some speculation:

What the costs are not

Not insurance costs; these are included in cif margins which on average are less than 5%. Even allowing for downward bias in aggregation, there is too much left over resistance to trade for insurance costs to explain.

Not distribution costs; these should as a first approximation affect domestic and foreign goods equally.

What the costs may be

Information costs

Information about markets is not free. The cost of obtaining information is, loosely speaking, like a tax on trade; it depresses volume. Moreover, the cost of information at further distances and across international frontiers is plausibly higher, so there is an explanation here for why international trade in particular is depressed.

Imperfect Contract Enforcement

Costs which must be sunk prior to trade induce contracts to remove or mitigate the holdup problem (ex post bargaining will ignore the sunk costs).

Recently Roberts and Tybout (1997) have documented the significance of sunk costs in the export decisions of Colombian manufacturing firms.

Contracts are usually incomplete¹, hence one party has an incentive to default

¹ This position is controversial because there is a huge complete contracts literature. See Tirole (1999) for a balanced survey. Some interesting work on

when states of nature unfavorable to the contract are realized subsequent to the signing of the contract. Contract enforcement can prevent this opportunistic behavior. Imperfect contract enforcement, being foreseen, causes potential traders to shy away from the expected losses as they face holdup on defaulted contracts. Thus it acts like a tax on trade.

The combination of relatively greater sunk costs for foreign trade than domestic along with more severe holdup problems in foreign trade is a potent explanation for resistance to trade. It predicts patterns in resistance. The difference in development costs between foreign and domestic markets may be lower when linking markets which share language and cultural attributes (see the empirical work of Frankel, Stein and Wei). The holdup problem should be less significant when legal systems are similar or when contract enforcement is powerful and impartial. In disaggregated models of trade flows, goods which are simpler (bulk agricultural commodities such as wheat) should have smaller market development cost differences and fewer contingencies not covered in contracts, hence less significant holdup problems.

The remarkable finding of McCallum indicates that even for trade between Canada and the US, resistance looms large. If the holdup problem is to explain this, it must be substantially due to contractual incompleteness,

international trade and complete contract structure is McLaren (1999). For our purposes of explaining the variation in trade resistance across countries, the complete contract approach is not much use because the key ingredient in complete contract design is the limit on what is contractible, a limit which is not likely to vary much across countries.

since enforcement costs are unlikely to be very different. This is, however, an empirical question which should be investigated.

Insecurity

Property is not perfectly secure, and not even imperfectly secure without reference to laws and their enforcement. Imperfections in security are especially important when enforcement of property rights is across international borders.

Beside the risk to the fixed cost of market development, trade involves risks to the flow of goods.

Extortion and graft are common in some countries.

Outright theft (piracy) of goods has been common in some times and places.

Endogenous protection is a governmentally generated risk of expropriation.

This risk is uninsurable due to moral hazard in the case of antidumping and due to non-independence of risks in the case of political pressure related to the business cycle.

Nondiversifiable risks

Diversifiable risk is cheap to lay off on insurers, so long as institutions work well. I speculate that the risks to sunk trade costs are frequently nondiversifiable.

(1) In incomplete (or weakly enforceable) contract situations, moral hazard and adverse selection both will make insurance very expensive or unavailable.

(2) Undiversifiable risk like 'country risk' of expropriation, fluctuations in the enforcement of commitments to foreigners or reneging on tax/subsidy commitments cannot be diversified because all traders are affected alike. This

problem affects trade even where contracts may be reasonably complete and enforceable.

(3) Randomness in extortion or graft is uninsurable because the illegality of graft payments makes an insurance contract unenforceable.

(4) Cheap self insurance under independent risks achieves diversification at a scale of trade which may be difficult to attain. A specialized trading firm may be able to achieve the required scale but faces on the one hand additional contract enforcement and incompleteness problems in arms' length transactions with ultimate sellers and ultimate buyers and faces on the other hand monitoring and incentive problems in vertically integrated operations.

Is something still missing?

Research based on information, imperfect contract enforcement and insecurity costs should proceed. But it is surprising that information costs, imperfect contract enforcement costs, or insecurity considerations in combination with nondiversifiability should loom so large in the bilateral trade of the US and Canada, two countries with a long history of amicable relations, convertible currencies with exchange risk cover widely available, a common language, common roots to their legal systems, both devoted to the protection of property with fair and reasonably incorruptible judicial systems, long adherence to GATT/WTO, etc. (NAFTA is too recent to be reflected in the data used in McCallum and Engel&Rogers).

What, if anything, is still missing? I leave this as a question for future researchers.

4. Directions for research

I will discuss promising directions for research in two broad areas, theoretical and empirical. Ultimately, these should be integrated tightly, but an insistence on tight integration now seems likely to limit progress.

Theory

The objective is to build consistent general equilibrium models in which the volume of trade interacts endogenously with the size of the transactions cost. To be useful these must be tractably simple. There is reason to believe we can make progress here.

I will review promising beginnings in four areas: information costs, predation, institutional design and contract design.

Information models

Trade theory in general has made surprisingly little use of information economics, despite its growth and importance in other areas of economics. The most highly developed models of information costs in markets are search models. These are based on agents' rational investment in information on one or both sides of the market, and are most highly developed for the labor market. Trade involves searching in 2 or more separated pools of information linked through general equilibrium interdependence. Nations' natural openness to trade (the degree of international market integration) should be partly explicable in terms of search decisions of agents at home and abroad (and these ultimately on the parameters of technology and preferences).

Cassella and Rauch (1997) offer an interesting start on applying information models to international trade in the form of a matching model. As the model stands, there is no rational search; agents' endowment of

information is exogenous. Nevertheless, their framework may be extensible in a natural way to allow search.

Trade is essentially a match between a producer and a retailer, with consumers pushed into the background. If it is a good match (in terms of quality of differentiated products, say), the agents split the surplus generated by the match.² If it is not a good match, they revert to their next best opportunity. In the case of international trade the next best opportunity is assumed to be at home. All agents are perfectly informed about domestic trading opportunities, agents with group ties (motivated by thinking of the overseas Chinese) are also perfectly informed about their foreign group members, while agents without group ties must randomly match up with foreign agents. In this setup, obviously, the more agents with group ties the larger the volume of trade. Casella and Rauch concern themselves with the distributional implications of group ties, showing that the agents who use group ties gain, society as a whole gains, but the agents without group ties may lose. In Casella and Rauch (1998) they extend the framework to interact with the price system, as international matching allows the labor required for production to be assigned to the lower cost country. Fixed capital in each country implies diminishing marginal product of labor. International matching can equalize wages in the global labor market and hence achieve full efficiency. This possibility is enhanced by group ties. Distributional considerations appear when group ties are unable to achieve full efficiency, in which case non-group members can be harmed by group ties. More interesting, in a 3 country world the existence of group ties between 2 of the

² The surplus split is according to Nash bargaining, with the threat point being the surplus available from the next best match.

countries which overcome informational barriers can have harmful 'trade diverting' effects such that world income declines. The point is familiar in information economics as well --- more information is not always better.

Contract Enforcement

Anderson and Young (1999) offer a formal model of the tariff equivalent of imperfect contract enforcement. The enforceability of contracts between foreign and domestic traders varies widely across countries, so it is a likely source of hidden transactions costs. Empirical work by Anderson and Marcouiller (1999) discussed below shows that imperfect contract enforcement is a powerful deterrent to trade.

Enforcement of explicit contracts depends on institutions. These may treat foreigners less fairly than locals, but the degree of bias in enforcement will vary and may be endogenous in interesting ways. Greif, Milgrom and Weingast (1994) analyze how the merchant guild enabled rulers to credibly commit to fair law enforcement in market towns. Guilds could coordinate embargoes to punish expropriation by an opportunistic prince, whereas uncoordinated merchants would have an incentive to break the embargo. Recognizing this role of a countervailing power, rulers encouraged guilds in various ways.

Anderson and Young (1999a) push the behavior of the ruler into the background to focus on opportunistic behavior of traders from both sides of the market. A plausible enabling condition for the rise of an international contract enforcement institution is that it be in the interest of agents from both the strong and weak sides of the market, as in the absence of an international government there is no mechanism of international enforcement. Anderson and Young develop conditions which enable

unanimity on the desirability of enforcement relative to anarchy based on parameters of technology of trade and preferences. Two forms of trading monopoly provide an intermediate position and it is possible for development to be 'stuck' where one side of the market prefers monopoly to the contract enforcement equilibrium.

Anderson and Young (1999b) turn to imperfect contract enforcement, parameterized as the probability that a contract will be enforceable. Improvements in enforcement plausibly require the assent of agents from both sides of the market. Weak parties always gain from better enforcement but strong parties have ambiguous interest. The latter lose as a higher proportion of deals are shifted to contract execution but gain as the better contract enforcement stimulates more deals entered into by the weak side of the market. Multiple equilibria can arise in this model with low enforcement equilibrium where agents from the strong side of the market are against improved enforcement even though a high enforcement equilibrium exists which is better for them. This model may help to explain the wide international differences in security of institutions for traders as reported by the World Economic Forum (1997).

Other Contract Approaches

The type of contract adopted is endogenous to the environment and affects trade volume. Firms can export, license the use of proprietary technology or invest in foreign plants under several possible arrangements. Analysis of this decision has been well researched, with a clear payoff in theory of multinationals. See Markusen (1995) for a survey and Horstmann and Markusen (1996) for theoretical details. The effects on trade volume are subtle because multinationals both substitute for trade and complement

trade. All the considerations which apply to the fixed cost of developing export markets apply with perhaps greater force to the multinational's investment in foreign plant. McLaren (1999) analyzes the desirability of fixed price contracts vs. informal arrangements which are subject to ex post bargaining, all in the context of upstream-downstream firm relations. Informal arrangements have some degree of cost sharing, so preserve individual incentives to innovate, but expose the downstream firm to opportunism in the cost of supply. Contracts freeze the cost of supply, but sacrifice innovation in the quality of inputs. In McLaren's model, the prevalence of informal arrangements rises as trade costs fall.

Recent research in contract theory has emphasized implicit contracts. No contract can ever be complete, so the scope is understood to include a commitment to negotiate reasonably on a wide range of contingencies. Insights from evolutionary economics and cognitive psychology appear to be useful. See MacLeod (1996) for a survey. The relevance to the problem of missing international trade is obvious: it is easier to understand what is implicit in a contract when dealing with a familiar. Moreover, the implicit commitment to be reasonable in renegotiations is more effective, lowering renegotiation cost, with familiars. Finally, the negative social consequences of defections from reasonability will be greater when a familiar is offended --- family, church, school and club restrain opportunistic behavior by setting codes and disciplining deviant behavior through ostracism and communicating loss of reputation. Greif (1993) presents a compelling example of the power of this type of model in a case study of early long distance trade, arguing that the group ties of the Maghribi traders overcame the enforcement difficulties of trade between independent principalities in Northern Africa. Gould (1994) and Head and Ries (1998) find that networks of

recent immigrants help explain trade in the US and Canada respectively with the immigrants' countries of origin. This can be interpreted in an informational context but may also reflect the importance of informal social sanctions as an alternative to weak formal enforcement.

Contractual analysis may have great potential for coming to grips with the missing matter of trade in contemporary economies such as those of the US and Canada. It will not be able to explain trade flows or illuminate trade policy discussions, however, until its insights can be embedded in a more aggregative model capable of dealing with trade flows at national levels. How can detailed models of contractual arrangements be aggregated up to form compact general equilibrium models of trading economies?

Predation models

Another form of transactions cost is predation. Extortion by middlemen, bureaucrats or politicians is one form, theft is another. An important insight from the biological model of predation is that the size of predator and prey populations is endogenously linked in a general equilibrium model. In an economic model, the agents naturally devote resources to predation, defense or productive activity based on the marginal return; equilibrium being achieved when returns are equalized.

The possibility of risk diversification is critical. Theft is insurable under some circumstances; extortion is not insurable.

Anderson and Marcouiller (1997) analyze a general equilibrium model of predation and specialized exchange. Predation (piracy) is an international free entry activity. Defense is an international public good. The existence of trade is quite delicate in this model. Under anarchy --- no cooperation in defensive action (police forces) or offensive action (triads) and no insurance ---

only a small portion of the possible parameter values for offensive and defensive technology will support trade. Terms of trade effects of predation can be important, and the model shows that one country could even lose from improvements in security as a result.

Allowing for insurance (perfectly enforceable, at no cost) greatly increases the range of possible trading equilibria but still can result in no trade. Cooperation in defense or in offense will obviously also help, but the analysis is left for future work.

The model illuminates some historically important forms of predation and their effect on trade. In its extension to organized predation it may offer still more insight to modern economies with protection money required to do business. With organized defense and offense, it may yield insight into the competition of the state and the triads.

Models like these seem to hold out some promise of insight into trade and endogenous transactions costs for at least some countries. Theft is widespread and often uninsured even in modern economies --- see *World Trade*, (1998) for evidence.

Models of Risk Diversifying Institutions

First, legal institutions matter and can be modeled. Lawful societies may reduce extortion and other forms of uninsurable risk. In contrast, they may also provide legal means of predation, likewise uninsurable. For example, antidumping is in effect a legal form of predation by import-competing firms upon export firms. Antidumping has received considerable attention both theoretically and empirically. See Staiger (1995). I suspect that there may be interesting scope for applying learning-by-doing to models of enforcement and trade.

Second, exchange rate regimes matter and can be modeled. Credibly fixed exchange rates may reduce search costs. They definitely reduce the risk of trade due to the need to cover the fixed costs of setting up trade. While exchange risk cover can be purchased, it is expensive for longer maturities and unobtainable over the horizon of fixed trade costs. Forward cover becomes prohibitively expensive when the risk of devaluation is nontrivial because the distribution of forecast errors widens. Alternatives to devaluation include import restrictions on balance of payments grounds, which have similarly dampens exporters' incentives to absorb fixed trade costs. Here, no insurance is available in practice. There is a large macroeconomic literature on exchange rate determination which can probably be improved on by considering the microeconomic structure of trading firms which face sunk costs.

Third, what Ethier (1998) calls the trade policy system offers compensation for lost export markets. Voluntary Export Restraints (VERs) do so by giving quota rents to exporters who lose sales as a result of the restraint. By making trade less risky, the compensation creates more trade in the periods before the VER than would occur if the trade distortion were a tariff.³

Finally, various private institutions matter. Mafias control predation by limiting entry and can provide some degree of security, replacing an uncertain impost with a certain fee. Associations of traders can coordinate

³ Anderson (1992) shows that this method of compensation induces 'dumped' exports as firms equate marginal cost with the sum of the current price and the value of the implicit option to obtain an export license in the event of a VER.

defensive measures to reduce risk. Specialized agents, either in specialized trading firms or in divisions of larger enterprises, can spread the diversifiable risk over larger volumes of trade. In some cases these institutions can operate at long distance and across international boundaries.

Empirics

Trade costs and firm behavior

One good approach to trade costs is to investigate the trading decisions of firms. The basic difficulty is to get firm level data; privacy regulations often preclude access to what data there is. An exemplary recent study is by Roberts and Tybout, who obtained access to Colombian firms' data. By examining export volumes in a panel data set, they infer the presence of fixed costs which are substantial.

Recent models which explain the lack of response to exchange rate changes have focused on fixed setup costs in trade. Once paid these are sunk costs, so they serve as a barrier to entry to new firms. There may also be exit costs, which serve as a barrier to exit by incumbent firms. These phenomena lead to hysteresis, whereby temporary exchange rate appreciations may lead to permanent increases in imports.

What are these sunk costs? Roberts and Tybout suggest the following possibilities.

- Information costs about prices, potential buyers and product standards or requirements in foreign markets.
- lending practices: no Colombian banks were willing to lend against export orders or letters of credit from purchasers' banks. This is attributed to

banks' inability to judge the likely success of Colombian exporters. It hurt mainly first time sellers (or sellers in new markets).

- regime uncertainty: would exchange rate changes persist.

Dixit (1989) has emphasized the option value of waiting before incurring irreversible costs in the face of uncertainty. Export markets at startup almost by definition are more uncertain than are domestic markets.

Evidence on the importance of sunk costs has mostly been aggregative, mixing together the trade volume in individual firms with entry and exit of firms. The results were mixed in previous empirical studies. Roberts and Tybout use a plant level panel data set on exports to examine the sunk export cost idea. Their data is consistent with sunk costs.

A summary of the panel data shows that it takes a large and persistent depreciation to raise export participation much.

Colombian Manufactures Exports of 19 three digit ISIC Industries

	1981	1982	1983	1984	1985	1986	1987	1988	1989
exch. rate index	84.0	79.5	80.5	89.8	102.2	113.6	113.7	112.3	115.3
ex. sub. rate	0.055	0.055	0.066	0.099	0.092	0.047	0.047	0.042	0.044
% of plants ex.	0.129	0.128	0.113	0.107	0.117	0.112	0.119	0.124	0.135

Source: Roberts and Tybout

The econometric study is a reduced form estimation of the probability of exporting. This turns out to be significantly affected by recent past exports of the plant. The usefulness of the sunk investment depreciates rapidly, in that after 2 years, a firm which has previously exported is no more likely to export than a firm which never has. For example, for plants at the median in terms of characteristics (age of plant, size of plant, etc.) the probability of exporting as a function of past experience rises from 0.002 to 0.146 as we go from never having exported to having exported last period. (Remember, most plants do not export.) For plants at the 75th percentile in characteristics (but the median in terms of plant 'fixed effects') the probability goes from 0.022 to 0.431.

Unfortunately the data do not permit identifying the magnitude of the sunk cost. However, we can certainly infer a substantial size: a 28% depreciation of the currency only boosted aggregate participation by 2%.

Further work on the empirics of trade costs is important. Case study analyses can turn up direct evidence on fixed trade costs. With a broad enough base of cases, it might be possible to construct some reasonable aggregates to apply to other firms.

It would be very useful to get more firm level data on the actual trade costs. The private nature of firm data makes it difficult for researchers to obtain in any event, but the special difficulty of data on firm level trading costs is that some payments at least are illegal for either the payer or the payee. With proper institutional commitments to protect the privacy of participants, it may be possible to make some progress here. An example is the World Bank (1997), which unfortunately is so limited that only one individual at the Bank is permitted to use the data.

Security and international flows

Less satisfactory but more generally usable is work on industry level flows of investment or trade and their relation to measures of security.

Recent empirical work on the effect of corruption on international investment has turned up significant effects. Using survey data taken from businessmen, Wei (1997) finds that foreign direct investment is substantially deterred by perceived corruption. This work is quite interesting despite the problematic nature of interpreting the survey responses --- corruption in the form of a highly certain graft of 10% may be less deterring to investment than a much less certain graft with mean 5%.

Anderson and Marcouiller (1999) use the same survey data to examine the effect of insecurity on trade flows in a variant of the gravity model setting, augmented by a structural interpretation of the source of insecurity based on their model of endogenous predation combined with Anderson and Young's model of imperfect contract enforcement. This approach yields the conclusion that insecurity is a major part of resistance to trade. For example, one finding is that if the seven Latin American countries in the sample were to enjoy the same institutions as the members of the EU, the Latins' trade would

rise by 32%. This increase is roughly the same size as the 35% increase implied in the model by lowering Latin American tariffs to the level of the US tariffs. Poor institutional quality particularly afflicts low-income countries, so more extreme comparisons are more dramatic still. The positive correlation of institutional quality and income per capita helps explain why rich countries trade disproportionately with each other while no corresponding bias is evident for trade between poor countries.

4.1.1. Information and Trade Flows

A number of recent empirical studies point to the trade-increasing effect of ethnic ties in trade and interpret these as evidence the informational advantages of recent immigrants. Examples are Gould (1994), Head and Ries (1998) and Rauch and Trindade (1999). The latter disaggregate trade into differentiated and homogeneous products. They find that within Southeast Asia the importance of ethnic Chinese ties for differentiated products is much greater than for homogeneous products, whereas elsewhere, while ethnic ties increase trade generally there is no difference in the effect between differentiated and homogeneous products. Rauch (1999) argues that enforcement against opportunistic behavior should be equally important for homogeneous and differentiated products while information should be more important for differentiated products. Thus Rauch and Trindade interpret their finding as evidence for the information story. I think their interesting finding says little about the importance of information vs. security. Opportunism in differentiated products has much wider scope --- quality assessment is more difficult to verify with a third party for example, less is contractible and contracts are more incomplete. The small tightly knit Chinese communities of Southeast Asia function in an environment of weak official

enforcement. (The Rauch and Trindade study did not use survey data on insecurity to control for country differences in formal security as in Anderson and Marcouiller, 1999.)

More work may eventually decompose ethnic ties into information and security components, but this is a subtle matter. Information about aspects of insecurity is obviously important and tends to confound the two explanations at a deep level.

5. Conclusion

I have shown that the missing trade puzzle is important and contains complex patterns: there is massive reduction of trade by distance and by international borders, and this reduction of trade varies over time and space. I have argued that progress on modeling the missing trade is possible. The argument is illustrated with brief reviews of several lines of theory on the one hand and of empirics on the other hand. If none of the attempts at progress is convincing in itself, I hope the reader is stimulated to provide a better alternative.

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