Essays in the International Economics of Developing Countries

By

Mitchell Patrick Morey

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The dissertation is approved by the following members of the Final Oral Committee:

Robert Staiger, Professor, Economics

Laura Schechter, Associate Professor, Agricultural & Applied Economics

L. Kamran Bilir, Assistant Professor, Economics

Charles Engel, Professor, Economics

Jennifer Alix-Garcia, Assistant Professor, Ag. and Applied Economics

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Abstract

The following essays investigate the role that international markets play in developing countries. Chapter 1 studies consumer behavior with respect to imported and domestically produced goods, finding that consumers inherently prefer goods produced in their own country. Chapter 2 studies the effect of bilateral exports on the incidence of terrorism, finding that exports increase terrorism for some targets and decrease terrorism for other targets.

Chapter 1

Why is there less observed trade than is predicted by neoclassical trade models? A home bias in consumption due to preferences can, in part, explain this. Using data from a randomized controlled trial and survey conducted in Madagascar, respondents' willingness to pay for rice of varying quality and origin is investigated. By imposing a novel structure on traditional valuation collection methods, one can isolate the effect of a good being produced domestically from the effect of quality differences. Consumers will pay approximately 8% more for home grown rice, confirming the existence of a preference-based home bias. This implies at least a 5% reduction in the quantity of imported rice consumed. While preferences explain only a fraction of the total amount of missing trade, this is one piece of the mosaic of factors that

cause disproportionate consumption of domestically produced goods. This paper provides support for structuring trade models to allow for an explicit home bias.

Chapter 2

Terrorism is a geopolitically important phenomenon in modern times. There are many factors that drive the frequency of terrorism. One thing that has been studied is the relationship between trade and terrorism. However, endogeneity has led to conflicting econometric results. This can be remedied through an instrumental variables approach. When instrumenting for bilateral trade and for a country's aggregate trade, unbiased results are generated. Estimated results demonstrate that bilateral exports will actually increase the incidence of terrorism within the exporting country targeting property or citizens of that foreign trade partner. At the same time, as exports to the foreign trade partner increase, foreigners from other nations are attacked less frequently in the exporting country. It may also be the case that attacks on domestic interests become less frequent as total exports increase but those results are not conclusive. This provides an interesting and important perspective on the role that trade plays as a mechanism for global security.

Contents

Chapter 1

Preferences and the Home Bias in Trade

1.1 Introduction

It is commonly accepted that there is significantly less trade than is predicted theoretically. Trefler (1995) concluded that there is roughly 50% less international trade than would be expected based on the neoclassical Heckscher-Ohlin-Vanek (HOV) trade model, a phenomenon he calls "missing trade." A home bias, the preference for domestically produced goods, can arise for a variety of reasons. While many have studied supply side reasons, this paper analyzes a demand side explanation, that individuals have an inherent preference for domestically produced goods even if a foreign-produced alternative were identical in every other way.

This preference-based cause of home bias is identified through a randomized controlled trial conducted in Madagascar in which consumers were randomly allowed to bid for imported or domestically produced rice with varying information regarding origin. For each true origin of production, consumers were either told the origin or the origin was withheld. Through a comparison of willingnesses to pay, the home bias effect can be estimated. Other things equal,

consumers are willing to pay at least 8% more for domestic production, which corresponds to a 5% reduction in quantity consumed of imported rice.

There are multiple ways to think about a home bias in consumption. The focus of this study regards an inherent preference for a good relative to an identical good produced in a foreign country. Another common framework for considering home bias is that consumers prefer the types of goods that are produced domestically to the types of goods that are produced abroad. This phenomenon could coexist with the definition of home bias used presently. This approach, however, does not address the case of identical goods. This paper demonstrates that even with identical goods, consumers still prefer domestic production.

It is likely the case that the degree to which consumers prefer domestically produced goods varies across countries and across sectors. What this paper demonstrates is that consumers in Madagascar prefer items produced in Madagascar. This involves a single country and a single product so it cannot provide definitive evidence that this prevails in other places. That said, the setting of this study, a staple food in a developing country, is sufficiently common that it provides strong *a priori* evidence for a similar home bias in other countries.

This study will be used to reveal developing country preferences for goods imported from an industrialized country. A product's quality and its origin are closely linked in such a way that simple comparisons of rice from different origins would not identify each dimension's effect separately. By randomly providing or withholding origin information, I am able to identify a lower bound for the premium on domestic production. Willingness to pay was collected for domestically produced rice and imported rice in two different ways for each variety: with the origin disclosed to the consumer and with the origin unknown to the consumer. Without knowing the origin, any difference in willingness to pay is based on quality differences. Then, taking that away from the overall difference in willingness to pay, the extra payment for home production can be isolated.

By employing random assignment in experimental methods, I can eliminate the factors that might also cause a domestically produced product to be valued. Other factors affecting

origin operate in the opposite direction of the home bias, driving down estimates so that the values presented are conservative lower bounds for the true home bias. First, knowing a product to be produced in one's country does not only induce a home bias, but it also may reveal information about quality to the consumer that can only be known based on issues related to production origin. Any residual measures of tangible quality that are unobservable to the naked eye systematically favor foreign rice so that a home bias would be mitigated. Second, because consumers may recognize the quality of rice without knowing its origin, the contrast between the origin being disclosed and the origin being undisclosed is diluted. Whereas the unobservable quality effect subtracts from the (predicted positive) home bias, this scales down the resulting estimate.

According to the results presented in Section 2.5, consumers in Madagascar value rice, the staple food, produced domestically and are willing to pay approximately 8% less for rice imported from France. This difference in valuation is attributable to product origin because the experimental design allows for only the origin to vary. This finding is robust to many covariates and is consistently significant.

The simplest of trade models assume homogeneity of goods. This would be the ideal scenario in which to test the hypothesis that consumers prefer domestically produced goods. If there were a truly homogenous item, then any difference in willingness to pay for the same product from different locations would be sufficient to demonstrate a preference for domestically produced goods.

In reality, there are no truly homogenous products as the production processes used in different places will yield differing levels of quality based on the good's origin. As a result, the value placed on the quality of a good and any value placed on the good's origin are not easily separated. The location in which a good was produced may matter to consumers and certain locations may provide greater utility than others for otherwise identical goods.

The context of rice consumption in Madagascar is an ideal scenario to study home bias for several reasons. First, consumption of rice is exceptionally prominent in Madagascar

so all survey respondents will be familiar with it. Second, rice is a relatively homogenous product, which will minimize the dimensions along which it may vary, and a given grain can only be grown in a single country. Third, respondents in this area of Madagascar will have had similar experiences with foreign countries and all would be native to Madagascar.

An asymmetry in preferences across nations could be the result of any number of things. A strong case for habit formation shaping preferences has been made by Atkin (2013). Individuals may feel some sort of nationalistic pride. Domestically produced items may appear more environmentally sustainable. Individuals may consume domestic products because they believe it will increase the welfare of their country through generating jobs. There are many possibilities compatible with rational behavior but the present purpose is not to identify the mechanism through which individuals develop a home bias. The present purpose is to test for the existence of such a home bias and, if it exists, to attempt to assess the magnitude of this effect. The actual channel of this home bias could be tested in a setting where only a single effect was plausible.

The notion that consumers display a preference for domestically produced goods is not a new observation. Armington (1969) was the first to distinguish among goods by origin of production using a model in which he developed a theoretical structure of demand which reflected the empirical fact that countries consumed a larger share of domestically produced goods than would otherwise be expected if the goods were perfect substitutes. In another significant paper early in the history of the study of home bias, Samuelson (1954) introduces the concept of trade costs as the cause of home bias. This is the first in a long line of literature that explains the prevailing home bias as a result of trade costs. The Ricardian model of trade can also support a home bias in the presence of trade costs (Dornbusch et al. (1977)).

There has been extensive work studying the roll of the supply side of the market. It has been argued that trade costs (Obstfeld and Rogoff (2001)), corruption (Anderson and Marcouiller (2002)), and production structure (Yi (2010)) could generate missing trade.

There has been a small sample of work presenting the case for preferences generating a home bias (Markusen (2013), Evans (2001)). Thus far, however, the sentiment regarding preference can be summarized by Helpman (1999) who argued that a preference-based explanation to be "unappealing" because technology differences are documented across countries whereas there is no such evidence for demand patterns.

Section 1.2 presents a simple quasilinear demand structure and develops a condition for the existence of a home bias and the manner of isolating that effect from quality. Section 1.3 describes the survey instrument used to collect data and presents summary statistics. Section 1.4 discusses the econometric approach and related issues. Section 2.5 presents the estimation results and interpretation. Section 1.6 places the estimates of this paper in the context of missing trade. Section 1.7 concludes.

1.2 Theory

In developing countries, products imported from industrialized nations are often expensive relative to a domestically produced substitute. The first, and most obvious reason, for this phenomenon is that products from an industrialized country often are of higher quality. This may be due to a superior production process, better quality control, or a variety of other reasons. This price gap, however, may be moderated if residents of the developing country have a home bias in consumption, as is often assumed in international trade models. The following section will demonstrate the ability to isolate the effect of such a bias.

Suppose there is a class of goods $X_Q^{C^D}$ endowed with a vector of characteristics. This good represents a variety of rice but could apply to any differentiated good. The good possesses a continuous measure of quality, $Q \in [0, 1]$. Also, suppose the good can be produced in the home country (M) or in the foreign country (F) indexed by $C \in \{M, F\}$, where C is imperfectly observable only through quality. When presented to consumers, the disclosure $D \in \{K, U\}$ of the origin can also vary so that the origin is known (K) or unknown (U).

Assume that consumers are temporarily constrained so that they only can consume one realization of this good. This reflects a constraint that only binds in the short run and better reflects the later empirical application. In the long-run, consumers potentially could consume all four varieties. These theoretical results hold if the consumer could instead purchase all four varieties. The utility derived from the consumption of $X_Q^{C^D}$ is a function of its vector of characteristics (Q, C, D). Consumers within a country are assumed to have identical preferences. If consumers valued quality and home production to varying degrees, it would still be possible to estimate the average value with the below approach. Now, allow the utility for each individual variety of the good to be given by the utility function

$$u(X_Q^{C^D}) = \left(X_Q^{C^D}\right)^{\alpha_0 + \alpha_1 Pr(C = M|Q, C^D) + \alpha_2 Q} + \kappa Y \tag{1.1}$$

where Y is a numeraire wealth good. The available variety of the good $X_Q^{C^D}$ is demanded with concave preferences ensured by the condition $0 < \sum_{n=0}^{2} \alpha_n < 1$. Furthermore, assume that consumers' wealth is sufficient to ensure the consumption of the numeraire good. This implies that this good is consumed before good Y. This aspect of the demand system reflects the assumption that consumers demand food inelastically.

Each of the α_n terms is a different preference shifter that will affect utility derived from the good based on the good's characteristics. α_1 is a home bias parameter indicating a good is produced domestically. α_2 is the preference shifter for responsiveness to quality differences.

For the varieties of goods for which the origin is known $(D = K)$, the probability that the origin is country M will either be 1 if $C = M$ or 0 if $C \neq M$. When the origin is unknown $(D = U)$, the information conveyed by C is moot since it is not actually provided. In that case, only the level of quality Q will determine the probability. The only formal assumption on the formation of the probability value is that consumers' probability function is decreasing in quality. This implies that lower quality rice is perceived as more likely to be from country M. This amounts to consumers imperfectly inferring origin from quality.

Note that this measure of quality, Q, is assumed to be visible to consumers. Unobservable quality that may be correlated with origin could also be revealed or inferred through the knowledge of origin. This will not confound this term if unobservable quality is higher in country F, such that it would take the opposite sign of α_1. If this were not the case, the two effects would be observationally equivalent. For analytical simplicity of the model, all quality is assumed to be visible. This assumption can be relaxed so that unobservable quality enters directly and the results hold as long as the foreign country has higher unobservable quality. Subsection 1.3.2 argues that unobservable quality will pose no problem for the present study.

This quasilinear utility structure allows for the unit willingness to pay to be a linear function of the characteristics of interest. This results in a clean comparison of willingness to pay for different varieties and the ability to identify a home bias using linear estimation methods. This characteristic is robust to different utility structures.[1]

The prediction that α_2 is positive should be uncontroversial as it simply implies that consumers derive greater utility from a good if it is of higher quality. The central prediction for this study is that α_1 is positive, so that consumers in M will value rice more if it is produced in the home country.

There are four potential realizations of rice origin-disclosure: $X_Q^{C^D} \in \{X_Q^{M^K}, X_Q^{F^K}, X_Q^{M^U}, X_Q^{F^U}\}$. For a given sample of rice, the quality can be held constant across D as only the presentation of origin varies. So, allow the quality of origin F to be Q_H and the quality of origin M to be Q_L.

Assuming sufficient wealth for the consumption of both goods, $X_Q^{C^D}$ and Y, setting the marginal rate of substitution equal to the price ratio ($w_Q^{C^D}$) yields the following condition

$$\Big(\alpha_0 + \alpha_1 Pr(C = M|Q, C^D) + \alpha_2 Q\Big) X_Q^{C^D} \alpha_0 + \alpha_1 Pr(C = M|Q, C^D) + \alpha_2 Q - 1 = \kappa w_Q^{C^D}$$

Now, suppose that we are focused on the scenario where consumers are inelastically supplied

[1] See Appendix 1.8.1 for alternate possible utility forms.

one unit of rice. In this case, the price the consumer would be willing to pay is

$$w_Q^{C^D} = \frac{1}{\kappa}\Big(\alpha_0 + \alpha_1 Pr(C = M|Q, C^D) + \alpha_2 Q\Big) \tag{1.2}$$

From this structure, we can derive willingnesses to pay from consumers of each of the four varieties as follows

$$\begin{aligned}
w_{Q_L}^{M^K} &= \frac{1}{\kappa}\Big(\alpha_0 + \alpha_1 + \alpha_2 Q_L\Big) \\
w_{Q_H}^{F^K} &= \frac{1}{\kappa}\Big(\alpha_0 + \alpha_2 Q_H\Big) \\
w_{Q_L}^{M^U} &= \frac{1}{\kappa}\Big(\alpha_0 + \alpha_1 Pr(C = M|Q_L, M^U) + \alpha_2 Q_L\Big) \\
w_{Q_H}^{F^U} &= \frac{1}{\kappa}\Big(\alpha_0 + \alpha_1 Pr(C = M|Q_H, F^U) + \alpha_2 Q_H\Big)
\end{aligned}$$

A linear combination of these willingnesses to pay can actually yield a test of whether consumers display a home bias in consumption as follows. First, the difference between $w_{Q_L}^{M^K}$ and $w_{Q_H}^{F^K}$ measures the total gap in willingness to pay for the two versions of the goods when all information is known. Then, the difference between $w_{Q_L}^{M^U}$ and $w_{Q_H}^{F^U}$ measures the gap in willingness to pay due only to quality, since origins are unknown. The difference in differences is a scaled estimate of the home bias term.

$$(w_{Q_L}^{M^K} - w_{Q_H}^{F^K}) - (w_{Q_L}^{M^U} - w_{Q_H}^{F^U}) = \frac{\alpha_1}{\kappa}\underbrace{\left(1 - \Big[Pr(C = M|Q_L, M^U) - Pr(C = M|Q_H, F^U)\Big]\right)}_{\text{Underestimation term}}$$

Thus, using this linear combination of the willingnesses to pay can provide a test of home bias and provide a lower bound on that effect. Estimation would only be able to identify the lower bound due to consumers' ability to potentially infer origin from quality. The underestimation term, which arises because consumers may recognize quality and place a higher probability of home production on the good actually produced in M, scales down the residual value after separating out the quality effect. Furthermore, the actual value that can

be estimated would be scaled by κ. This implies the actual value of α_1 cannot be estimated but this does not alter the estimated sign.

Inference of origin deflates the home bias effect. There are three possible outcomes depending on the ability of consumers to ascertain origin from quality. Each has different implications for the ability to test the sign of α_1.

1. **No insight:** If consumers are unable to predict origin by quality (i.e. $Pr(C = M|Q, M^U) = Pr(C = M|Q', F^U)$ for all $Q \neq Q'$) then the underestimation term will equal 1 and the estimate can be made directly. This is an extreme case and not assumed to be an accurate representation of origin inference.

2. **Imperfect insight:** When faced with an unknown origin, if consumers place a higher probability on the rice being Malagasy when it is of lower quality, then the underestimation term is a positive fraction. Effectively, this term will deflate the true value of the home bias (α_1), so that the estimate yields a lower bound for the premium a consumer places on a good produced at home. This case is assumed to be the prevailing one.

3. **Perfect insight:** Suppose that consumers could determine, with perfect accuracy, the origin of the rice simply by observing the quality. In this case, the probability would be 1 for the variety M^U and would be 0 for variety F^U as consumers can perfectly observe origin via quality so the fact that the origin is undisclosed is irrelevant. As a result, the underestimation term would equal zero and the term α_1's sign could not be estimated. If this were to occur, then it would not be possible to distinguish between perfect insight and a complete lack of a home bias. However, this applies only if the qualities of rice are mutually exclusive by origin which would contradict that a continuum of quality can occur in each country.

To summarize the three possible scenarios, if there is *any* degree of uncertainty regarding the origin of the undisclosed good for even one of the two true origins, it is sufficient for the

ability to test the presence of and provide a lower bound for the actual home bias effect.

Case 1 and Case 2 each represent a scenario in which the home bias can be estimated. It is thus not concerning if either one were to prevail. It would be of great concern if Case 3 were true because the home bias, although existent, could not be identified. Later results, however, indicate that this is not a concern.

As mentioned above, the ideal product to be tested would be one for which the quality of a product truly is homogenous across countries. If this were the case, then the quality terms would be equal, $Q_H = Q_L$. The α_2 and α_3 terms would be cancelled out of the model such that the willingness to pay for the products would differ only by the α_1 term. This would allow for a very simple comparison of the total willingness to pay between products with the origins known. However, absent a product that is truly homogenous, the approach described in the model is the best method of estimating the home bias.

1.3 Empirical Application

1.3.1 Rice in Madagascar

Madagascar is a large island nation near the southeastern coast of Africa. It is a relatively less developed country, with income per capita of $471 in 2013. It is a largely agricultural society with a large fraction of the population involved in agriculture.

Rice is a staple food in Madagascar and is typically consumed three times per day as the primary dietary grain. On average, Malagasy people eat 102 kg of rice per person per year, tenth most in the world.[2] In 2012, Madagascar consumed 2.81 million metric tons of processed rice. In that same year, Madagascar imported 0.25 million metric tons of rice, approximately 9% of consumption.[3] As it is consumed in very large quantities on a daily basis, Malagasy people will be greatly affected by the quality of the rice they consume. When

[2]International Rice Research Institute (IRRI) FAQs, 2007
[3]IRRI, World Rice Statistics

rice is improperly processed, it will be dirty in that there will be many broken grains, intact grain husks, and even small rocks and insects in the rice. There is a winnowing process that can remove many of these impurities, but it is time consuming.

There is a wide variety of rice consumed in Madagascar. There are many varieties and there is a large range of processing qualities. There is also imported rice that is typically of a higher quality than the domestically produced rice. Imported rice in Madagascar is roughly akin to the rice one would purchase in an American grocery store. It is clean and the grains are mostly whole.

For a variety of reasons, a given variety of imported rice is more expensive than domestically produced rice. Some of the price gap can be attributed to higher cost of production and transport for the imported good. However, if consumers have a home bias in consumption, they will be willing to pay less for the imported rice so that the gap in prices between imported and domestic rice will be smaller than would be expected based solely on quality.

Given its vital role for consumption in the Malagasy economy, rice is an ideal commodity for examination in the context of a potential home bias, particularly in Madagascar. As incomes grow, diets typically diversify so that any one product plays a less significant role. It is therefore preferable to examine home bias in a developing country where there may be a single, primary staple.

Its central place in the Malagasy diet would lead consumers to have a visceral reaction to a change in the constitution of their rice. No person would be be indifferent to the consumption of rice as it is so important that many in Madagascar do not believe hunger can be satiated without some consumption of rice. Thus, a group of people surveyed would be sufficiently familiar with rice to provide an informed response.

Aside from any characteristics of Madagascar, rice is a good product on which to test the presence of home bias because it is a relatively homogenous item. As demonstrated later, it is not a purely homogenous item but the methodology used presently can account for differences in quality. However, similarity in the goods from different origins is certainly

desirable and best achieved with a product such as rice.

Finally, home bias in the context of rice in Madagascar is ideal in the sense that there is as little doubt regarding the background of the survey respondents as could be reasonably possible. Every person surveyed was born in Madagascar, a citizen of Madagascar, and very likely has never been outside of Madagascar. However, given that France was once the colonist of Madagascar, each respondent should have the exact same background and very similar experience with other nationalities and their products.

1.3.2 Observable and Unobservable Quality

Throughout the model and in the survey, the only direct measure of quality is that which is observable to respondents. Visible quality certainly should measure a considerable amount of the overall quality as consumers should be able to observe certain aspects of quality visibly. There are tangible qualities to rice that are clearly observable to the naked eye. For example, one need not even be particularly familiar with rice to notice the presence of rocks, broken grains, or remaining husks. All of these are common in Malagasy rice and, to a far lesser extent, imported French rice.

In reality, there are quality characteristics that cannot be known with simple inspection. Because the same variety of rice will be employed for the data collection described in Subsection 1.3.3, the issue of expected taste and nutrition should be constant across varieties. There remains the likelihood that there are unobservable quality differences. For example, rice may have varying levels of proclivity to spoil, there may be invisible toxins, or there may be physical shape and nutritional content characteristics. The two samples of rice employed in this sample were roughly observationally equivalent. A close inspection would reveal the French rice to be freer of impurities but during a cursory inspection they would appear to be identical.

Unobservable dimensions of food, such as resistance to spoiling, presence of toxins, or freshness, are objectively superior in French rice sold in Madagascar compared to Malagasy

rice. Given the more sophisticated production methods and standards, one would expect the French rice to be much safer than the Malagasy rice. Studies of food supply by Oxfam International ranked countries by a variety of categories. The 'Food Quality' category creates a stark contrast between Madagascar and France. Out of 125 countries, France tied for tenth highest food quality while Madagascar finished last out of all countries.[4] This index is a composite of a variety of food quality measures so it has no direct implications for rice quality, but is indicative of overall production processes. To the extent that this quality difference holds for rice, consumers should prefer the unobservable quality of the French product.

There is evidence that this issue is an important one in that consumers do care about unobservable quality. Hoffmann and Gatobu (2014) found that Kenyan consumers would pay more for their staple maize when they were provided information indicating the maize was free of aflatoxin, a visually undetectable and potentially fatal fungal infection. So, consumers will pay more for goods when they have information that alleviates concerns about unobservable low quality.

Mycotoxins resulting from fungi and molds such as aflatoxin are not actively regulated in Madagascar.[5] Rice is primarily grown by small landholders who undergo no inspections for food safety. French rice, on the other hand, is subject to regulation by the European Food Safety Authority. Any rice-borne pathogens would have a non-negative probability of detection in French rice and a zero probability of detection in Malagasy rice. Consumers in Madagascar know that locally produced rice would not have been screened for imperfections that could lead to illness.

A critique of the suggestion that French rice would have higher unobservable quality is that rice from Madagascar may be fresher due to the absence of transport time. This is less of a concern given the type of rice employed in this survey. White rice can store well

[4] "Good Enough to Eat". Oxfam International (2014)

[5] Other toxins such as citrinin, deoxynivalenol, fumonisin, fusarenon-X, nivalenol, ochratoxin A, sterigmatocystin, and zearalenone can be found in rice. The prevalence will be reduced where "moisture content and temperature are regulated." (Tanaka, Kenji et al 1997)

for decades depending on the packaging.[6] French rice is sold in airtight plastic packaging and sold in climate controlled stores primarily in the capital. Domestically produced rice is typically placed in a burlap sack and stored in a mill or store that would offer protection from the elements that is imperfect at best. Due to the superior storage methods for French rice, a consumer should be less willing to pay for Malagasy rice since it will be more likely to spoil.

If the respondents to the survey were aware of and placed significance on the role of unobservable quality, the logical result would be that consumers would pay more for the French rice. The true home bias will be larger since the willingness to pay for French rice is inflated by, if present, greater unobservable quality.

The distinction between quality and preference could become quite fine if someone argued Malagasy rice to be superior in unobservable dimensions. I assume that true measures of unobservable quality could, in principle, be objectively categorized and measured. Any quality difference will follow from a tangible distinction between the rice produced in each origin. Two samples of rice that are the same in all quality and taste-based scientific measurements would be, for the purpose of this study, considered identical. If someone, after knowing the origin were to then profess a preference for the taste or the quality of the domestically produced rice, that would be considered a manifestation of the home bias. Quality and taste must be driven by the actual characteristics of the rice in question.

The econometric results reported in Section 2.5 assuage the concern that unobservable quality or taste are driving the home bias. To preview, it is shown that consumers continue to possess a preference for rice produced in Madagascar even when accounting for the role of taste and quality.

[6]Darrington, Jana, and Brian A. Nummer. White Rice - Food Storage. White Rice. Utah State University Extension, Sept. 2008.

1.3.3 Randomized Controlled Trial

Data regarding willingness to pay for rice of Malagasy or French origin were collected over a two month period in June and July 2013. Villages were selected from rural and semi-rural locations surrounding the capital of Madagascar. All villages hosted weekly or semi-weekly markets, during which a number of vendors and consumers would converge on a prescribed day.

Eighteen villages were included in the survey. Five were northeast of the capital, five southeast of the capital, three southwest of the capital, and four northwest of the capital. The average distance to the capital was just under 40 kilometers with a minimum and maximum distance of 10.8 and 92.2 kilometers.[7] This province is one of the more agriculturally productive ones in the country.

Upon arriving at a survey market at the beginning of the market day, enumerators would prepare for interviews at the town meeting hall or other municipal building located in the market. Enumerators would use a transect sampling strategy to select respondents. To do this, the enumerator would pick a direction and walk from the survey location, soliciting every fifth adult he passed. In a big crowd, the enumerator would attempt to best proxy every fifth market attendee. In the event a person refused, the enumerator would repeat the transect strategy. Those agreeing to participate would be escorted to the meeting hall to complete the survey. Respondents attending the market, and thus eligible for the survey selection, presumably are involved in commerce as either buyers or sellers. The nexus of this activity was typically the center of the market. The meeting hall was selected as it would be centrally located so that survey participants would be representative of those actually participating in the market. This inherently makes it less likely that individuals who only participated in a marginal way would be sampled. This is an acceptable bias as those engaged in commerce is the ideal population for the study.

The response rate of those approached to participate, based on enumerator estimates, is

[7] See Appendix 1.8.2 for village location details.

approximately one third and there was no qualitative difference between participants and non-participants. The extent to which there was selection into survey participation is not known, since there is no data on non-participants. The actual survey participants can be and are compared to the overall population of the region in what follows. However, the randomization of rice received by respondents was effectively implemented so that identification remains possible.

In order to differentiate between the quality effect and a home bias effect I conducted a survey and experiment that collected data on consumers' willingness to pay as described below.

Prior to survey administration, four mason jars of rice were prepared with a different variety of rice in each jar. The jars were labelled with (1) "French Produced Processed," (2) "Malagasy Produced Processed," (3) "Processed-1," and (4) "Processed-2." The first and second varieties were each of the same variety of rice but from different countries and represent the two known origins. The third variety was entirely the same rice as the first variety except that the origin was unknown. The fourth variety was entirely the same rice as the second variety except the origin was unknown.

Unprocessed rice is put through machinery following harvest so that bran can be polished away. Both Malagasy varieties, (2) and (3), and French varieties, (1) and (4), are refined by machine so that the bran is removed. Being the same variety of white rice, a cursory look at the rice might not reveal the quality differences as they superficially appear the same. Close examination, though, would reveal there to be a greater prevalence of broken grains, small rocks, and sand in the Malagasy rice. For a consumer experienced in rice preparation and consumption, there should be a small but perceptible difference in the quality of the two rice varieties.

There were 510 respondents who began the survey. There were 74 respondents who were assigned a different variety of unprocessed rice and whose responses are therefore uninformative for the present study and are omitted. 63 respondents completed the demographic

component but then could not, or would not, participate in the auction or their answers were not recorded.[8] Among those who attritted after receiving their assigned rice variety, there were four whom were given French rice, one whom was given Malagasy rice, and three whom were given unknown Malagasy rice. Given the small numbers, there is no evidence that respondents were any more likely to withdraw from the auction simply based on the rice they were assigned. From the 373 full participants, some demographic variables are omitted either because the respondent could not or did not provide an answer or it was misrecorded by the enumerator. For the estimations conducted in this paper, there are 365 observations with sufficient data for the preferred specifications.

Survey participants were first asked to provide a collection of demographic data.[9] Enumerators followed a scripted survey in which information was collected regarding characteristics directly affecting rice consumption, such as most recent price paid and home production. During the survey component, though, no questions were asked regarding the import of any good to avoid affecting responses during the experiment component.

Each survey respondent was then given one jar of rice with a randomly assigned origin-disclosure rice sample in it. Survey respondents were equally likely to receive any of the four varieties. The respondents were not shown or told of the other three varieties they could have been given but were not. Respondents were instructed to open the jar and carefully inspect the rice. When the respondent had finished examining the rice, the enumerator carefully explained the mechanics of a Becker, DeGroot and Marschak (1964) (BDM) auction. The respondent was prompted for a bid (willingness to pay) for one cup, the standard unit used in Malagasy markets, of the rice he/she examined. Once that value was recorded, the enumerator randomly drew a price from a distribution of prices from zero to approximately \$0.45 in \$0.02 increments (actual values were in local currency). If the bid was above the price, the respondent was expected to buy the cup of rice for the drawn price, although this could not be enforced. If the bid was below the drawn price, the auction was complete and

[8] See Appendix 1.8.3 for details of respondents who terminated the survey.
[9] Survey available: http://sites.google.com/site/mitchellmorey/OriginSurvey.pdf

a small number of questions related to imported goods were asked before the survey was complete. The valuable characteristic of a BDM auction is that it is incentive-compatible with truthful reporting.

By observing the willingness to pay for rice with and without the consumer knowing the origin, it is possible to determine whether consumers have a home bias. The comparison of willingness to pay between French and Malagasy rice when the origin is unknown will account for quality differences between the two types of rice. This value can be taken away from the overall difference in willingness to pay to get the home bias effect. Thus, by knowing the magnitude of the valuation of rice due to quality, it is possible to determine if a home bias occurs in the rice markets in Madagascar.

While the BDM auction yields truthful responses in a theoretical sense, its actual implementation is more complicated. For reasons related to research ethics, it was not possible to compel respondents to buy the rice if they had the option to do so. When respondents were obligated to purchase the rice (n=103), 56.3% actually paid money to complete the transaction. There is no data regarding the reasons for noncompliance, but there are differences between though who purchased (n=58) and those who did not (n=45) in that non-compliers were more likely to be female and more likely to grow their own rice. Results are summarized in Appendix 1.8.4. When those respondents who failed to comply are dropped from the sample, statistical significance remains and the magnitude is similar. Even when restricting the sample to those who were obligated to purchase the rice and did so, the sign and magnitude hold although it is marginally statistically insignificant (see Appendix 1.8.5). It therefore does not appear that any bias due to non-compliance is driving the findings.

1.3.4 Data

Among those who fully participated in the survey, there is little difference across treatment groups. Summary statistics are presented in Table 1.1. Because there are 4 possible rice treatments, it is possible to make six pairwise comparisons of means for each variable. Hence,

with six variables there are 36 comparisons. Only one of these comparisons of means is statistically significant at the 5% level. This indicates that randomization was effectively implemented since respondents were as similar across treatment groups as would be expected with a random draw.

The survey respondents included in this study are not necessarily representative of the country as a whole nor the rural population from which the respondents were drawn. This is due to the fact that the target of this study is instead the population of people who attend markets and would be likely rice purchasers. This sample differs from the larger population in several ways.[10] Not surprisingly, there is a roughly equal balance between males and females in rural Madagascar, with 98.3 men per 100 women.[11] In this sample, however, roughly 70 percent of respondents are men. This is likely due to the social nature of markets and Malagasy gender dynamics. This is not a perfectly representative sample in that 68.8% of respondents (Std. Dev. = 46%) reported that a female was the primary rice purchaser for their household. However, when restricting the sample by gender, the results hold for both males or females although the level of significance is reduced.

The sample included in this study (41.3 years) also differs from the general population average (32.1 years) by age. This is an artifact of the sampling strategy. Only adults, eighteen years and older, were solicited for participation so there should naturally be an older sample relative to the general population.

These regional hubs, with their relatively educated populations, are likely better candidates for inclusion in a study on the home bias of consumption than individuals in truly rural areas, who may live in relative autarky. The average level of education in the sample (7.9 years) is higher than the national average (5.2 years).[12] Many of the villages that host markets also house county administrative offices and schools. So, the population in these

[10]Note: No tests of statistical significance relative to sample mean are conducted because there is inherently selection into market attendance and one would not expect the sample to match the population.

[11]Unless otherwise noted, all census data from Enquête Périodique Auprès des Ménages 2010, Rapport Principal. Institut National de la Statistique

[12]UN Development Program, International Human Development Indicators. 2012

Table 1.1: Sample Statistics by Treatment Group

	Entire Sample	French	Malagasy	Undisclosed French	Undisclosed Malagasy	Significant Differences
Female	0.300	0.326	0.311	0.28	0.282	0
	(0.459)	(0.471)	(0.465)	(0.405)	(0.451)	
Age	41.331	42.641	40.748	41.076	40.894	0
	(14.055)	(14.116)	(14.622)	(13.497)	(14.041)	
Years of School	7.946	8.165	8.176	7.772	7.61	0
	(3.532)	(3.725)	(3.649)	(3.269)	(3.477)	
Household Size	5.013	5.022	5.029	4.925	5.082	0
	(2.192)	(1.910)	(2.303)	(2.153)	(2.406)	
Rice Self Production	0.825	0.858	0.805	0.796	0.845	0
	(0.380)	(0.350)	(0.397)	(0.405)	(0.363)	
Last Price (MGA)	351.450	336.393	352.805	341.173	376.105	1[†]
	(101.635)	(57.386)	(99.655)	(58.353)	(156.312)	
Weekly Median Income	\$7-\$9	\$4-\$7	\$7-\$9	\$7-\$9	\$4-\$7	
# of Participants	373	92	103	93	85	

Note: Standard deviations in parentheses. The "Significant Differences" column gives the number of pairwise tests between subgroups for which means were statistically significantly different at the 5% level

Note: Comparisons of those who did not participate in the auction and were not assigned a rice variety to the entire sample is provided in Appendix 1.8.3.

[†] Undisclosed Malagasy rice recipients last paid more than French rice recipients.

particular villages are more educated than the country in general.

Household sizes in this sample were reasonably close to the value of the census. In the sample, the average household size was 5.01 people per household. In rural Madagascar, the average household size is actually 4.9. In this sample, 82.5% of respondents' households grow rice. This is larger than the countrywide average of 77.8%, but similar to the average for rural households in the surveyed regions (83.4%). These regions are typically viewed as the most agriculturally productive areas, which could explain the higher rice production. 20.4% of respondents' households were self-sufficient in rice production. These individuals did not purchase rice so they were not asked the price last paid for rice. Rather than dropping their observations, the log of the last price they paid was assigned a value of zero and a dummy ($SelfSuff_{iv}$ in Table 1.3) was given to those individuals to account for variation from both self sufficiency and not having a relevant market price.

Table 1.2: Willingness to Pay by Group

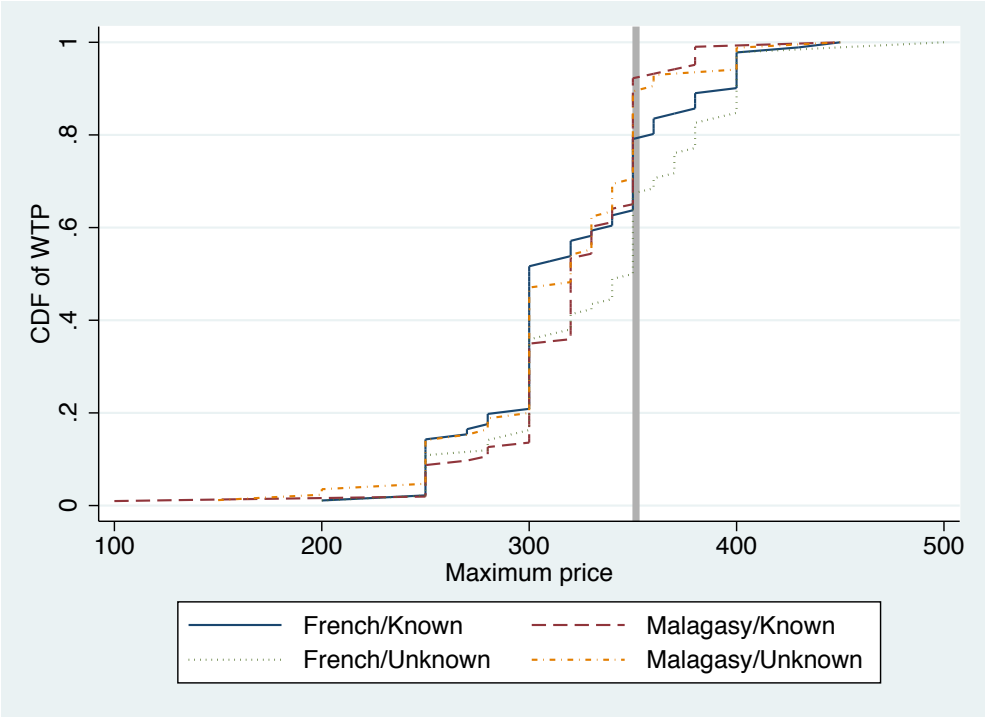
	Malagasy	French	Malagasy Undisclosed	French Undisclosed
w_Q^{CD}	321.3	330.0	316.0	346.0
Std. Deviation	40.98	99.05	47.49	107.72
N	103	92	85	93

Unit of willingness to pay is Malagasy Ariary (1 USD $\approx$ 2250 Ar)

The key result of the experiment is the set of four empirical estimates of willingnesses to pay, $w_{Q_H}^{F^K}$ and $w_{Q_L}^{M^K}$ when the origin was known, and $w_{Q_H}^{F^U}$ and $w_{Q_L}^{M^U}$ when the origin was withheld. The distributions of willingness to pay for each of the types of rice are presented in Figure 1.1 and summarized in Table 1.2. Figure 1.1 shows the cumulative distribution functions for the distributions of willingness to pay for each rice type. The unconditional mean of bids for the rice was \$0.15 (328 MGA) whereas the average price actually paid by these respondents for rice in their last purchase was \$0.16 (351 MGA). This mean value is superimposed over the distributions in Figure 1.1. 68.4% of respondents bid less than the

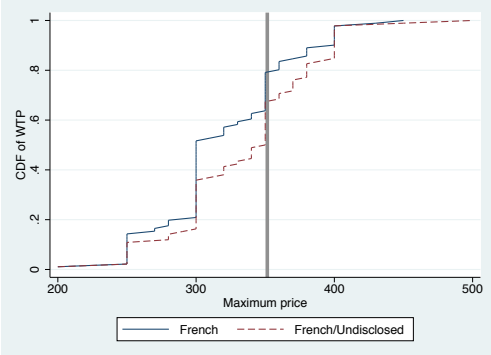
Figure 1.1: Distributions of Willingness to Pay by Type

(a) All Types

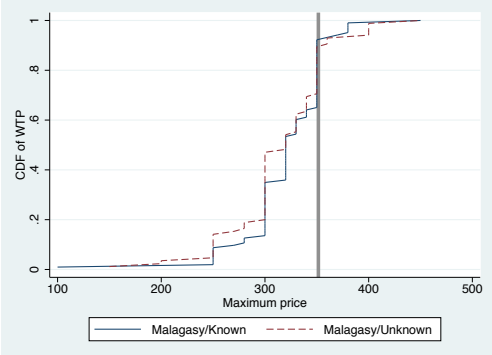


(b) French Rice

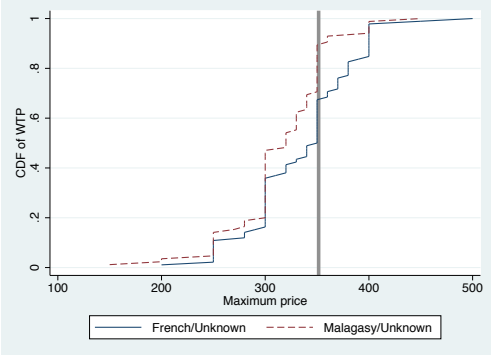
(c) Malagasy Rice

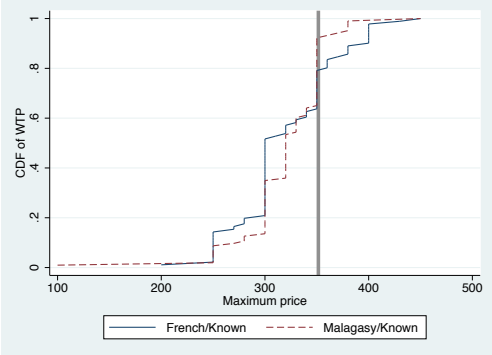


(d) Rice of Undisclosed Origin



(e) Rice of Disclosed Origin





price they last paid for rice. However, the relationship between the bid and the last price they paid is not necessarily informative because the consumer may have bought a different type of rice that was of higher or lower quality than the random sample assigned to them.

As discussed in Section 1.2, perfect insight by consumers would be fatal for the identification of the home bias term. A simple analysis of whether the probabilities associated with the home bias term reflect perfect insight would be tests of the differences of means. But, there is no statistically significant difference between unconditional means of willingness to pay across disclosure for French ($t = 1.05$) and for Malagasy ($t = 0.82$) rice. However, the results of Section 2.5 indicate that there must not be perfect insight because a statistically significant home bias is estimated when other sources of heterogeneity are accounted for.

There is only one unconditional pairwise comparison in which consumers will pay significantly more. When consumers were unaware of the rice's origin ($F^U > M^U$), respondents were willing to pay more for French rice ($t = 2.367$), presumably due to residual visible quality differences. Other relevant comparisons are statistically insignificant although each conforms to a world in which people have a home bias as described in Section 1.2's model. Relative to when they didn't know its origin, respondents were willing to pay more when they knew it was domestically produced ($M^K > M^U$) and were willing to pay less when they knew it was imported ($F^U > F^K$). The French Rice distribution in Figure 1.1 demonstrates that unknown French rice first order stochastically dominates known French rice, indicating that respondents would pay more for French rice when they did not know where it came from. Furthermore, the French rice first order stochastically dominates the Malagasy rice when the origins are undisclosed, indicating that people find French rice to be of higher quality than Malagasy rice. Lastly, rice of disclosed Malagasy origin second order stochastically dominates the same rice when respondents did not know the origin. This implies that there is greater variation in the preference for Malagasy rice, so that there is heterogeneity among individuals.

French rice and rice of an unknown origin are not typically sold in the rural markets

included in this survey. However, Malagasy rice is ubiquitous in this region's rural markets. Consumers had an outside option for the purchase of Malagasy rice, which would suppress the upper end of the distribution of willingness to pay. Since there is a market price known to consumers, there would be no reason to bid over that level since they would be able to buy rice later at that market price. Therefore, to the extent that peoples' true willingness to pay for Malagasy rice is driven down by the market price, so too will the estimate of home bias. Absent the ability to buy the product at the market price, Malagasy rice would be valued at higher levels. Thus, the home bias estimate is even further downwardly biased. This appears to be somewhat true as 80.6% of consumers who knowingly received Malagasy rice bid lower than the price they last paid (321.3 verse 352.8 MGA).

While there is no evidence that it occurred, it is conceivable that respondents purchased rice in the experiment with plans to resell the rice at the market rate. This arbitrage opportunity was significantly limited in that respondents were only offered a small amount of rice, one cup. Furthermore, there would be a larger potential profit from the resale of the French rice. At the market price, one cup of French rice cost 1200 Ariary ($0.55) whereas domestically produced rice cost roughly 350 Ariary ($0.16). Had respondents been interested in resale, that would have mitigated a home bias since there would be far greater profits to be had from purchasing French rice.

To summarize, the test for the presence of a home bias is essentially revealed through the comparison of the four types of rice. The two dimensions of rice that should affect a consumer's willingness to pay are quality and origin. By comparing rice from France ($w_{Q_H}^{F^K}$) and from Madagascar ($w_{Q_L}^{M^K}$) when the origin is known, the total difference in valuation is identified. Then, by comparing French ($w_{Q_H}^{F^U}$) and Malagasy ($w_{Q_L}^{M^U}$) rice when the origin is unknown, the component of the total gap that is attributable to quality can be identified. After subtracting the quality gap from the total gap, the remaining difference is due to home bias.

1.4 Estimation

The estimation presented here is intended to test the presence of a home bias in favor of Malagasy-produced rice. OLS regression analysis will be used in this estimation. The empirical implementation is actually quite similar to difference in difference methods. One could interpret a treatment group as receiving domestically produced rice and a control group receiving imported rice. Then, a policy intervention of revealing origin to some respondents is implemented.

The primary variables used to explain quality and origin are as follows. A dummy variable, $Home_{iv}$, indicates that respondent i in village v was assigned rice from his or her home country of Madagascar, whether disclosed or undisclosed. If French and Malagasy rice are not of the same quality, this variable will account for it. Another variable, $Disclosed_{iv}$, is a dummy indicating the respondent was told the origin of their assigned rice. This variable provides the value to respondents of finding out whether they were offered imported rice. Finally, the term that actually provides a test of whether consumers have a home bias is an interaction of the two above-described variables. This provides the effect of knowingly paying for domestic rice, as opposed to imported (French) rice.

While testing the statistical significance of knowingly consuming Malagasy rice, the effect of other factors, such as age, gender, or agricultural own-production, could also be investigated. A model of the following form is estimated

$$\log(w_{iv}) = \phi_v + \boldsymbol{\alpha}' Z_{iv} + \widehat{\alpha}_1 Home_{iv} \cdot Disclosed_{iv} + \widehat{\alpha}_2 Home_{iv} + \widehat{\alpha}_3 Disclosed_{iv} + \varepsilon_{iv} \quad (1.3)$$

where w_{iv} is the variable measuring the willingness to pay for individual i in village v, ϕ_v is a village fixed effect, Z_{iv} is a vector of individual characteristics that may affect a respondent's willingness to pay, and ε_{iv} is an error term.

The key result of the estimation of Equation 1.3 is the parameter $\widehat{\alpha}_1$. This measures the effect on willingness to pay of a respondent being assigned Malagasy rice and knowing it to

be Malagasy. A positive term would imply a home bias in consumption.

The parameter $\widehat{\alpha}_1$ of Equation 1.3 is the empirical estimate of the key term in Equation 1.2, α_1, the effect of a home bias. $\widehat{\alpha}_2$ and α_2 each control for the quality differences that inherently occur across origins.

It is useful to recognize that there may be correlation of errors across individuals within a single market. The standard solution to cluster standard errors is not appropriate in this case because the number of groups is significantly below the threshold for efficient asymptotic estimation. This problem has been discussed at length. Cameron, Gelbach and Miller (2008) developed an alternative method of calculating standard errors that corrects for the small number of groups. Referred to as the wild bootstrap clustered standard error, Cameron et al develop a clustered standard error which is efficient even when the numbers are significantly below 30.

Since there are only 18 villages included in this study, the wild cluster bootstrapped standard error must be employed if clustering is desired. Thus, for the results presented in Section 2.5 statistical significance will be presented based on both robust standard errors and wild cluster bootstrapped standard errors.

1.5 Results

The primary results that test the existence of a home bias are the estimates of Equation 1.3. The results are presented in Table 1.3. The results may be interpreted as the percentage change in willingness to pay resulting from a one unit change in the explanatory variable. The first three variables listed are the most relevant for interpretation with respect to a home bias and correspond to $\widehat{\alpha}_1$, $\widehat{\alpha}_2$, and $\widehat{\alpha}_3$, respectively. The key estimates for the test of the home bias are in the first row of the table, the interaction of $Home_{iv}$ and $Disclosed_{iv}$. This variable gives the effect on willingness to pay for a Malagasy consumer knowingly receiving domestically produced rice, while holding constant the quality of the rice. Although the

French and Malagasy rice are of a common variety of rice and nearly equivalent, they are inherently different and may be of slightly different quality. Any visible quality differences are captured by the variable $Home_{iv}$, which indicates that the rice was from Madagascar.

The potential covariates are introduced in stages. $RiceProduction_{iv}$ is an indicator variable that signifies the respondent is self-sufficient in rice production. $Female_{iv}$ is an indicator variable for a female respondent, $Educ_{iv}$ measures the years of respondent education, Age_{iv} measures the respondent's age in years, and $HouseholdSize_{iv}$ gives the number of people who are in the household, as defined by eating from the same pot. $\log(LastPrice_{iv})$ measures the log of the price the respondent paid for rice the last time he or she purchased it. This value was set to zero for respondents who provided all of their own rice. This does not alter interpretation given that $SelfSuff_{iv}$ indicates the respondent produced all the rice consumed by his or her household and therefore did not possess a last price. Respondents' perception of France is controlled for using the variables $Pro-France_{iv}$ and $Anti-France_{iv}$, with the omitted category being those indifferent to France. Tests of the role of other demographic characteristics on views of France are presented in Table 1.9. Nothing is informative for predicting that a respondent views France favorably, but those who are more educated are more likely to dislike France.

Consumers were willing to pay approximately 8-9% more for the quality of the French rice. These results were consistently significant at the 1% or 5% levels for all specifications. Any subsequent difference in willingness to pay will not be caused by the visual difference in quality between French and Malagasy rice. Furthermore, as discussed in Section 1.3, if respondents inferred origin from this quality difference, the true estimates of the home bias will be even greater.

There are neither clear predictions nor conclusions that may be drawn from the willingness to pay for a disclosed French origin. The estimates for $Disclosed_{iv}$ are all negative but statistically insignificant at the 5% level. To the extent that individuals are expected to be less willing to pay when the disclosure of origin indicates it is not domestically produced,

the signs of the terms are reasonable.

The estimates of the interaction term provide results that strongly support the existence of a home bias in consumption by Malagasy respondents. The willingness to pay is approximately 8% higher for rice that is known to be Malagasy when compared to rice that is known to be French. This indicates that consumers are more willing to pay simply based on the fact that the rice was domestically produced, as predicted by the home bias effect. Across specifications, the term is significant at the 10% level at least. These results point to the conclusion that the respondents have a home bias in consumption due to preferences. When presented otherwise identical products, consumers have a greater valuation of the domestic product relative to the imported product.

Since respondents are consuming rice from the same market, at least in principle, there may be a correlation among the errors within each market. For the variable of interest, $French_{iv} \cdot Disclosed_{iv}$, clustering increases the confidence level of the estimates for each of the five specifications. This implies there may exist a negative intracluster correlation among respondents. However, a test of the intracluster correlation is statistically insignificant. Furthermore, the results are similar whether clustering is done or not done at the market level, so it seems to not affect the results supporting the existence of a home bias.

This estimate of consumers paying approximately 8% more for Malagasy rice should be a lower bound for the true magnitude of the willingness to pay gap. Aside from the concern about respondents having a home bias even when the origin is undisclosed through inferring origin from quality, the ability to infer origin could also be important because origin may reveal information about quality that is not visible to the naked eye. However, French rice is produced to EU standards which implies that if the origin reveals information about unseen quality, it would be the case that consumers should pay more for French rice since French rice would be safer. So, the estimated difference in willingness to pay due to a home bias may actually be larger than 8% if consumers are paying to avoid toxins and other unobservable quality differences.

Table 1.3: OLS Regression Results

Dep. Var.: $log(WTP_{iv})$	(1)	(2)	(3)	(4)	(5)
$Home_{iv} \cdot Disclosed_{iv}$	0.079**	0.081*	0.080**	0.081**	0.079*
	[0.045]	[0.072]	[0.048]	[0.047]	[0.051]
	(0.014)	(0.056)	(0.024)	(0.018)	(0.006)
$Home_{iv}$	-0.087***	-0.090***	-0.086***	-0.088***	-0.088***
	[0.003]	[0.009]	[0.004]	[0.003]	[0.003]
	(0.002)	(0.016)	(0.004)	(0.002)	(0.002)
$Disclosed_{iv}$	-0.045	-0.044	-0.047	-0.047	-0.044
	[0.141]	[0.202]	[0.137]	[0.130]	[0.158]
	(0.072)	(0.104)	(0.052)	(0.058)	(0.060)
$RiceProduction_{iv}$			-0.034	-0.029	-0.029
			[0.155]	[0.242]	[0.241]
			(0.334)	(0.418)	(0.380)
$Female_{iv}$			0.020	0.017	0.019
			[0.337]	[0.404]	[0.366]
			(0.272)	(0.300)	(0.288)
Age_{iv}			0.001	0.001	0.001
			[0.239]	[0.223]	[0.216]
			(0.388)	(0.354)	(0.314)
$Educ_{iv}$			0.003	0.003	0.004
			[0.308]	[0.252]	[0.169]
			(0.500)	(0.515)	(0.328)
$\log(LastPrice_{iv})$				0.032*	0.034*
				[0.055]	[0.064]
				(0.110)	(0.166)
$SelfSuff_{iv}$				0.173*	0.185*
				[0.086]	[0.092]
				(0.118)	(0.248)
$HouseholdSize_{iv}$				0.001	0.002
				[0.860]	[0.700]
				(0.791)	(0.635)
$Anti-France_{iv}$					-0.016
					[0.406]
					(0.486)
$Pro-France_{iv}$					0.052*
					[0.081]
					(0.118)
R^2	0.127	0.139	0.135	0.140	0.158
N	373	335	365	365	365
Market F.E.	○	○	○	○	○
Income F.E.		○			

* p<0.10, ** p<0.05, *** p<0.01 based on unclustered p-values
Robust unclustered p-values in brackets
Wild bootstrap clustered (market) p-values in parentheses
Constant and fixed effects omitted

Table 1.4: Robustness Checks

Dep. Var.: $log(WTP_{iv})$	(6)	(7)	(8)	(9)	(10)
$Home_{iv} \cdot Disclosed_{iv}$	0.079**	0.107**	0.100**	0.057	0.070*
	[0.045]	[0.031]	[0.026]	[0.244]	[0.089]
$Home_{iv}$	-0.087***	-0.096**	-0.095***	-0.061*	-0.052*
	[0.003]	[0.012]	[0.005]	[0.069]	[0.065]
$Disclosed_{iv}$	-0.045	-0.051	-0.051	-0.033	-0.034
	[0.141]	[0.189]	[0.161]	[0.315]	[0.295]
$Home_{iv} \cdot Disclosed_{iv}$		-0.002			
$\cdot Anti\text{-}France_{iv}$		[0.976]			
$Home_{iv} \cdot Disclosed_{iv}$		-0.133			
$\cdot Pro\text{-}France_{iv}$		[0.253]			
$Home_{iv} \cdot Disclosed_{iv}$			-0.108		
$\cdot Taste_{iv}$			[0.213]		
$Home_{iv} \cdot Disclosed_{iv}$				0.049	0.010
$\cdot Quality_{iv}$				[0.526]	[0.886]
R^2	0.127	0.160	0.131	0.133	0.125
N	373	373	373	373	367
Market F.E.	○	○	○	○	○

* p<0.10, ** p<0.05, *** p<0.01 based on unclustered p-values
Robust p-values in brackets
Constant, fixed effects, and 2nd order interaction estimates omitted

The estimation of Equation 1.3 is done with several specifications. For each specification, p-values are calculated both using clustering and not using clustering. Because villages vary geographically, one would expect the rice markets in each to affect willingness to pay in different ways. Therefore, the preferred specification will include market fixed effects. Income, which was collected as categorical predefined bins rather than continuous measure, is included as a set of dummies in Regression (2). However, none of the income coefficients are statistically significant, so they are omitted in subsequent regressions.

A collection of covariates are included in the regressions. The coefficients on $\log(LastPrice_{iv})$ and the self sufficiency variable are both statistically significantly positive. Other things equal, respondents who viewed France in a positive light also had a higher willingness to pay, though this does not drive the home bias effect, as shown in Table 1.4. All other variables are statistically insignificant.

One concern regarding the estimates of the home bias is that it could be driven by people who feel very strong sentiments against France, Madagascar's former colonizer. This does

not, however, appear to be the case. There is no statistically significantly distinct effect on the home bias of self-reported affinity or distaste for France as shown in Regression (7) of Table 1.4. $Anti\text{-}France_{iv}$ and $Pro\text{-}France_{iv}$ are indicator variables for respondents who said they had an unfavorable impression or favorable impression of France, respectively. The omitted category is respondents who were indifferent regarding France. The magnitude of the effect for the baseline respondent who is indifferent to France is statistically insignificantly different across perceptions of France. Regardless, it is not a distaste for France that is driving the home bias result.

The differences in the production process may manifest themselves in a way that affects the taste of the rice. If consumers view rice from Madagascar as having a superior taste, they may pay more only when they believe that their rice will possess that flavor. To address this concern, I control for whether or not respondents say they purchase rice based on the taste. In Regression (8) of Table 1.4, the variable $Taste_{iv}$ is a dummy that takes the value of 1 when consumers said that taste was a factor they considered when buying rice and zero otherwise. Thus, the interpretation of the home bias term is that of a person who does not buy rice based on its taste. For those individuals, the results remains statistically significant and at a reasonable magnitude. For those who consider taste, the sign is actually negative, though insignificant.

Another possible confounding factor for identifying the willingness to pay is that consumers may infer origin from the visible quality and use that inference to form beliefs about unobservable quality. The robustness checks for this possibility still uphold the results of a home bias, but is more nuanced and is presented in Regressions (9)-(10).

The home bias term in Regressions (9) and (10) can be interpreted identically as only the sample used for estimation varies. Both regressions include interactions involving a dummy, $Quality_{iv}$, that takes the value of 1 if the respondent identified quality of rice as a determining factor for purchasing rice and 0 otherwise. This leaves the coefficient on the home bias term in the first row to represent the home bias effect for those who do not consider quality. The

home bias estimate is actually statistically insignificant at traditional thresholds although the sign is still positive. However, this estimate appears sensitive to several outliers on the bottom end of the distribution of willingness to pay. There are six bids that seem sufficiently low that they are unlikely to capture true willingness to pay. These bids were all 200 Ariary or lower, whereas the average price paid by respondents was 350 Ariary. After dropping those six high-leverage observations, the home bias term is again statistically significant. In this case, even if there were an actual difference in unobservable quality, it would not be relevant since that is not a factor considered by that group of respondents. Those respondents who do consider quality are not significantly different from the baseline group.

1.6 Implications for Missing Trade

Relative to the 50% of missing trade proposed by Trefler, the home bias seems to explain a small fraction of that phenomenon. But, as has been mentioned earlier, the home bias is only one of many potential causes. Taking the home bias value of 8%, one can generate a rough estimate of the total amount of trade that does not occur. This can address the importance of home bias in the context of missing trade. This is achieved by using estimates of good-specific price elasticity from others' work and the price effects estimated in this paper to calculate the percentage change in quantity consumed. Estimates for the own price elasticity for rice in Madagascar come from Ravelosoa et al. (1999). They find the own price elasticity to be 0.62 for rural poor in the region including the markets of this survey. The primary result of this paper is that consumers will pay a roughly 8% higher price for domestically produced rice.

Rearranging the standard price elasticity yields a formula for the percentage change in quantity as a function of the elasticity and the percentage change in price.

$$\%\Delta Q = -\%\Delta P \times \varepsilon_D = -8\% \times 0.62 = -4.96\%$$

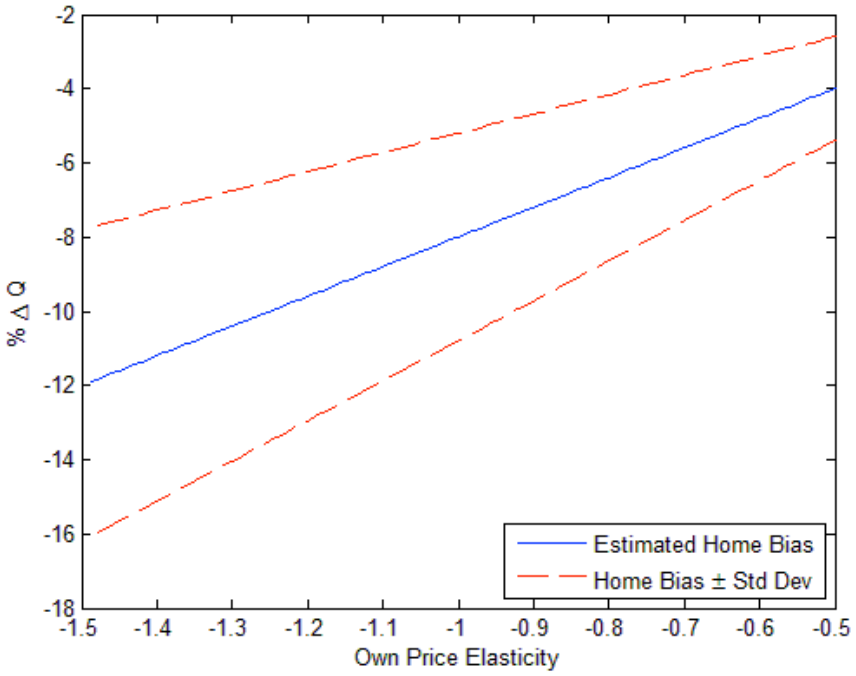
This simple rearrangement of the formula for a good's own price elasticity of demand allows estimation of the change in quantity consumed of imported rice as a function of the percentage change in price due to the differential valuation of rice based on origin. The distaste for foreign production can be treated as an implicit, non-monetary 8% increase in cost. Using the values for price change and for price elasticity, the counterfactual change in quantity consumed is approximately 5%. This indicates that Madagascar, which is already a net consumer of rice, is not importing as much as they otherwise would. Since imported rice does not provide the domestic production utility bonus, this indicates that the quantity consumed of imported rice would be 5% less than it would be absent a home bias.

This result will provide an approximation of the total value of missing trade due to home bias. For two reasons, this calculation will provide a conservative estimate of the effect of home bias. First, as discussed above, the home bias results are actually a lower bound for the true value. So, consumers would actually be willing to pay a larger than 8% premium for domestic production. Second, rice is a staple commodity for consumers in Madagascar and should therefore be demanded inelastically relative to other consumer goods. Therefore, for more elastically demanded goods, there would be a larger quantity effect. Together, these factors indicate that the the missing trade for products other than rice is likely higher than the estimates presented here.

To evaluate the robustness of the estimates of missing trade, Figure 1.2 presents a range of own price elasticities for rice, of which the assumed value of -0.62 falls toward the lower end due to the expected inelastic nature of demand for a staple food. The solid line represents the missing trade value for each price elasticity of a good using the estimated 8% price differential. The dashed lines represent one standard deviation (2.8%) above and below the estimated price effect. As can been seen, there is a wide range of estimates for the value of missing trade due to home bias, indicating the importance of the specific good.

One may be concerned that Trefler's estimate of 50% missing trade may not be generalizable to the case of Madagascar. Trefler's empirical application used primarily large,

Figure 1.2: Range of Trade Effects



developed countries. Madagascar is a small, developing country so there may be different phenomena driving its trade. This degree to which this estimate of missing trade for the present case is appropriate cannot be known. It is not unreasonable to think that trade can be missing to larger or smaller degrees in different sectors and different countries. However, absent a more targeted value, Trefler's estimate of 50% remains the benchmark to which the preference-based home bias must be compared.

There are many potential applications of this result for the modeling of international trade. One such example is the process of estimating the Armington elasticity of substitution between domestic and imported goods. Many papers have done so with a wide variety of resulting values (Alaouze et al. (1977), Shiells et al. (1986), Reinert and Roland-Holst (1992), Gallaway et al. (2003)). These studies have typically employed the same methods and each assume that relative preference weights on the CES aggregation of domestic and imported goods are fixed for a given sector. Based on the assumption that the preference weights are a

fixed ratio, they are only estimated as the result of a fixed effect.[13] As a result, the estimated values for the effect of preferences vary widely and for certain sectors even demonstrate a bias *against* home production, although this is not the focus of these papers (for example, see Shiells, Stern, & Deardorff (1986)). This study, in contrast, provides a reasonable value for the effect of preferences. Any estimated value of the Armington elasticity should be able to support a 5% reduction in imported values.

Another particular application of these estimated parameter values is computable general equilibrium (CGE) models. Hillberry and Hummels (2013) summarize the utility functions employed by CGE trade models as typically involving a CES aggregator of the form

$$Q = \left(b_H Q_H^{\theta} + b_F Q_F^{\theta}\right)^{1/\theta}, \qquad \theta = (\sigma - 1)/\sigma$$

where σ is the Armington elasticity of substitution. In this generic CGE utility function, there are two sets of parameters that would be affected by my estimate of home bias. The elasticity σ is derived from a method that did not account for any observed preference-related values as described above. Additionally, there are preference weights b_H and b_F which will, independent of the substitutability, augment utility of domestic goods (Q_H) relative to imported goods (Q_F). If these values are not calibrated to properly reflect the true nature of home bias, this could significantly alter the results of the CGE. Indeed, Valenzuela et al. (2008) demonstrate that leading CGE trade models are not terribly robust to varying parameters. To extract meaningful policy predictions from CGE models, parameters must be grounded in accurate estimates, as can be taken from the present results.

1.7 Conclusion

There is a long history of economists recognizing there to be less trade than would be expected on a theoretical basis. Many reasons have been attributed to this phenomenon. However,

[13] See Hillberry & Hummels for a summary of Armington elasticity estimation.

the vast majority of papers that attempt to identify the causes of home bias focus exclusively on the role of trade costs in reducing international trade flows. Trade costs certainly are important for determining trade patterns, but this does not preclude other factors from generating a home bias. In particular, I demonstrate that there are inherent preferences that lead individuals to favor consumption of domestically produced goods. This paper provides an empirical test of whether preference-based home bias should be incorporated into trade models. This is quite important for a variety of reasons, including but not limited to estimation of Armington elasticities and policy predictions from CGEs.

In order to settle the issue of whether there are preference-based reasons for the home bias, I develop a theoretical model that allows consumers to derive greater utility from goods produced in their home country. From this model, I am able to demonstrate that an estimate of the effect of home bias on willingness to pay for a good can be derived using a linear combination. This estimate is a conservative lower bound because there are several complicating factors: availability of Malagasy rice in the market, unobservable quality, and inference of origin. Each one will counter the home bias effect.

Data was collected from a survey and an experiment in Madagascar. In order elicit the proper collection of willingnesses to pay, respondents were prompted for a bid for either domestically produced rice or imported French rice. By randomly revealing the origin of the rice, a difference in difference of sorts can be estimated using OLS. Results show that respondents do have a home bias in consumption of rice. This effect occurs separately from any inherent quality differences between the two origins. Consumers pay at least 8% more (quantity 5% less) for domestically produced rice, as this estimate is a lower bound for the true value. Using this value, approximately 10% or more of Trefler's missing trade can be accounted for by preference-based home bias. This goes a significant way to explaining the 50% of missing trade identified by Trefler.

The vast majority of rice in Madagascar is imported from India, Pakistan, and Vietnam. France is a relatively small source of processed rice. However, given that France once colo-

nized Madagascar, it will be more familiar to respondents. France is the ideal source of rice for this study because a product from a developed country should be of higher unobservable quality, which will only bolster the results presented here. However, this is a particular case and there could potentially be other dynamics involved when the foreign country is of a similar development level. An extension of the current study would be to test for heterogeneity of home bias relative to different potential trading partners.

To the extent that these results are generalizable to the full collection of internationally tradeable goods, this has important implications for our normative assumptions regarding the counterfactual effects of eliminating trade barriers. If consumers' preferences display a home bias, even the total elimination of trade costs would lead to smaller increases in welfare than if there were no such bias. Despite having access to imported goods at the same costs, consumers would still choose to consume domestic goods, negating the benefit of actually reducing those trade impediments. If this home bias is a permanent characteristic of a individuals' preferences, then this home bias is functionally equivalent to a tariff on imports that cannot be lifted.

This paper employs a particular method of estimating consumers' preferences for domestically produced goods. Essentially, what this paper does is hold constant the quality of a good and test how consumers will value a product as its origin varies. This is not the only method of estimating quality. For instance, Khandelwal (2010) conditions on the price of the good and then assesses quality to products with higher market shares. My approach allows for an additional nuance in that it allows for preferences to vary across countries which would imply that market shares would also vary in a systematic way. While quality is not easily quantified, the study demonstrates that consumers may interpret "quality" in different ways based on their background.

Most papers that attempt to explain the existence of home bias use the sector or even the country as the unit of analysis. At this level, it would be quite challenging to identify individual preferences. This paper, however, looks at the ways individuals respond to the

same good being produced in different origins. This establishes the importance of considering the role of preferences in determining trade flows. Inherent preferences, in part, drive the missing trade that we see in international trade.

1.8 Appendix

1.8.1 Alternate Utility Forms

In Section 1.2, a quasilinear utility function is used to demonstrate that, when consumers are inelastically offered one unit of rice, the price can be expressed as a linear function of the origin effect and the quality effect. While quasilinear utility is a very particular form, this desired condition is generalizable to other utility forms and not reliant on the quasilinear structure. The following subsections demonstrate other utility functions that would also generate linear price functions.

Cobb-Douglas

Let the consumer have utility

$$U(X,Y,Z) = {X_Q^{C^D}}^{\alpha} Y^{\beta} Z^{\gamma} \qquad \text{s.t.} \qquad p_{X_Q^{C^D}} X_Q^{C^D} + p_Y Y + p_Z Z = w$$

where $\alpha = \alpha_0 + \alpha_1 Pr(C = M|Q, D, C) + \alpha_2 Q$ so that the weight on X_Q^C is the same as presented in Section 1.2. Y and Z are goods that can either be other $C - Q$ varieties or completely distinct goods. β and γ are unrestricted. The only assumption on preferences is that the sum of α, β, and γ is one.

Then, the demand for X_Q^C is given by:

$$X_Q^{C^D} = \frac{\alpha w}{p_{X_Q^{C^D}}}$$

Again, allowing the quantity supplied to inelastically be one, price is therefore equal to

$$p_{X_Q^{C^D}} = \alpha w = w\Big(\alpha_0 + \alpha_1 Pr(C = M|Q, D, C) + \alpha_2 Q\Big)$$

Constant Elasticity of Substitution

Let the consumer have utility

$$U\Big(X_Q^{C^D}, Y\Big) = \left(\alpha_Q^{C^D}{}^{\frac{1}{\sigma}} X_Q^{C^D}{}^{\frac{\sigma-1}{\sigma}} + \alpha_Y{}^{\frac{1}{\sigma}} Y^{\frac{\sigma-1}{\sigma}}\right)^{\frac{\sigma}{1-\sigma}} \qquad \text{s.t.} \qquad p_{X_Q^{C^D}} X_Q^{C^D} + p_Y Y = w$$

where $\alpha_Q^{C^D} = \alpha_0 \cdot \alpha_1 Pr(C = M|Q, O) \cdot \alpha_2 Q$ so that the weight on $X_Q^{C^D}$ is analogous to Section 1.2. Then, demand is given by

$$X_Q^{C^D} = \alpha_Q^{C^D} w p_I{}^{\frac{\sigma}{1-\sigma}} p_{X_Q^{C^D}}{}^{-\frac{1}{1-\sigma}}$$

where p_I represented the CES price index. Then, by normalizing individual good prices so that the index equals one and setting quantity demanded to one inelastically, it is possible to rearrange the price and take its log so that

$$\begin{aligned}
\log(p_{X_Q^{C^D}}) &= (1-\sigma)\Big(\log w + \log \alpha_Q^{C^D}\Big) \\
&= (1-\sigma)\Big(\log w + \log \alpha_0 + \log \alpha_1 Pr(C = M|Q, D, O) + \log \alpha_2 Q\Big)
\end{aligned}$$

1.8.2 Survey Locations

18 surveyed locations in Antananarivo province, Madagascar.

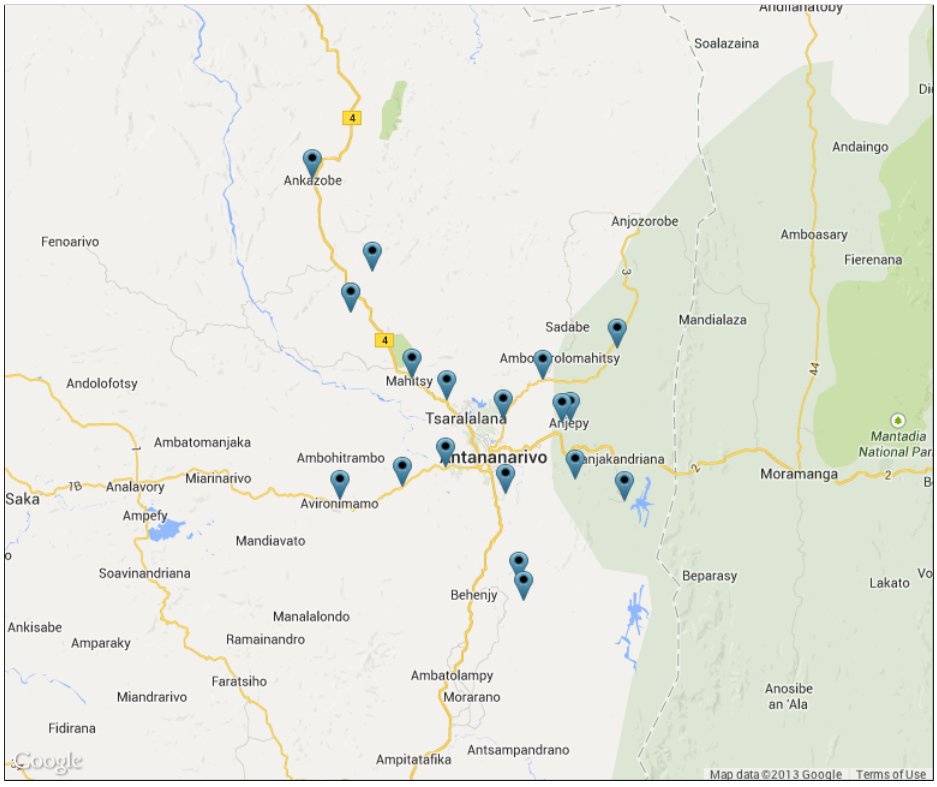


Table 1.5: Villages and Distance to Capital

Location	Distance to Capital (km)	Location	Distance to Capital (km)	Location	Distance to Capital (km)
Ambohidratrimo	20	Mahavelona	65.1	Anjepy	28
Talata Volon'ondry	27.8	Andramasina	39.9	Betoho	26
Sabotsy Namehana	10.8	Arivonimamo	49.2	Mahitsy	31.5
Alakamisy Fenoarivo	16.8	Ambohijanaka	12.6	Morokay	57.2
Sabotsy Ambohitromby	46	Ankazondandy	52.4	Ankazobe	92.2
Alarobia Ambatomanga	39.7	Imeritsiatosika	30.5	Fihaonana	55.4
Mean Distance	38.95				
Std. Deviation	20.77				

1.8.3 Omitted Observations

Some survey respondents could not or would not complete all questions in the experimental portion of the survey, preventing their use in the regression analysis.

Table 1.6: Included vs. Omitted Observations

	Included	Omitted	t-stat
% Female	0.284	0.448	2.571***
	(0.451)	(0.502)	
Age	41.827	42.968	0.597
	(14.038)	(15.349)	
Years of School	7.937	8.917	2.038*
	(3.442)	(3.868)	
Household Size	5.044	5.758	2.137***
	(2.244)	(3.687)	
% Rice Self Production	0.834	0.742	−1.750*
	(0.378)	(0.441)	
Last Price	350.347	362.653	−0.795
	(96.718)	(130.819)	
Median Income Tranche	$7-$9	$4-$7	
N	446	63	

* p<0.10, ** p<0.05, *** p<0.01
Standard deviations in parentheses
Note: Includes group not used in analysis

1.8.4 Auction Compliance

Table 1.7: Predicting Auction Compliance for those Obligated to Purchase

	Linear Probability	Probit
Dep. Var.: $Comply_{iv}$	(11)	(12)
$RiceProduction_{iv}$	0.157	1.048**
	[0.200]	[0.046]
	{0.190}	
$Female_{iv}$	0.290*	1.467*
	[0.100]	[0.065]
	{0.086}	
Age_{iv}	-0.002	-0.009
	[0.538]	[0.461]
	{0.555}	
$Education_{iv}$	-0.001	-0.004
	[0.929]	[0.919]
	{0.973}	
$\log(LastPrice_{iv})$	-0.045	0.307
	[0.933]	[0.861]
	{0.939}	
$SelfSuff_{iv}$	-0.575	0.512
	[0.851]	[0.959]
	{0.859}	
$HouseholdSize_{iv}$	-0.015	-0.059
	[0.543]	[0.452]
	{0.492}	
N	109	109
Market F.E.	○	○

* p<0.10, ** p<0.05, *** p<0.01
Dependent variable a dummy signifying active compliance (purchase) in auction
Market clustered p values in brackets
Wild cluster bootstrapped p-values in braces when possible with linear estimation
Constant and market fixed

1.8.5 Results by Relevant Sub-Group

Results below are for:

(13) Full Sample

(14) Females only

(15) BDM Auction non-violaters

(16) BDM Auction purchasers

(17) Frequent rice purchasers

Table 1.8: Subsample Analysis

Dep. Var.: $log(WTP_{iv})$	(13)	(14)	(15)	(16)	(17)
$Home_{iv} \cdot Disclosed_{iv}$	0.079**	0.109	0.086**	0.157	0.101
	[0.045]	[0.197]	[0.022]	[0.142]	[0.122]
	{0.020}	{0.196}	{0.014}	{0.104}	{0.132}
$Home_{iv}$	-0.087***	-0.116*	-0.076***	-0.206**	-0.074
	[0.003]	[0.093]	[0.005]	[0.021]	[0.120]
	{0.002}	{0.114}	{0.006}	{0.036}	{0.186}
$Disclosed_{iv}$	-0.045	-0.089*	-0.055**	-0.025	-0.085*
	[0.141]	[0.079]	[0.043]	[0.685]	[0.064]
	{0.078}	{0.064}	{0.034}	{0.683}	{0.048}
R^2	0.127	0.197	0.123	0.337	0.240
N	373	112	316	58	103
Market F.E.	○	○	○	○	

* p<0.10, ** p<0.05, *** p<0.01
Market clustered p-values in brackets
Wild cluster bootstrapped p-values in braces when possible with linear estimation
Constant and market fixed effects omitted

1.8.6 Sentiments Toward France

Table 1.9: Probability of Like/Dislike France

	Dep. Var.: $Pro-France_{iv}$		Dep. Var.: $Anti-France_{iv}$	
	Linear Prob.	Probit	Linear Prob.	Probit
	(18)	(19)	(20)	(21)
$RiceProduction_{iv}$	0.009	0.039	0.045	0.116
	[0.071]	[0.221]	[0.073]	[0.213]
	{0.909}		{0.446}	
$Female_{iv}$	-0.060	-0.208	-0.073	-0.230
	[0.054]	[0.175]	[0.057]	[0.172]
	{0.364}		{0.172}	
Age_{iv}	0.001	0.003	0.003	0.008
	[0.002]	[0.005]	[0.002]	[0.005]
	{0.541}		{0.086}	
$Educ_{iv}$	-0.006	-0.016	0.023***	0.068***
	[0.008]	[0.024]	[0.007]	[0.021]
	{0.494}		{0.008}	
$\log(LastPrice_{iv})$	-0.037	-0.094	-0.020	-0.064
	[0.070]	[0.193]	[0.055]	[0.172]
	{0.803}		{0.787}	
$SelfSuff_{iv}$	-0.227	-0.582	-0.080	-0.268
	[0.408]	[1.125]	[0.321]	[1.007]
	{0.861}		{0.841}	
$HouseholdSize_{iv}$	-0.010	-0.032	0.020*	0.058*
	[0.010]	[0.033]	[0.012]	[0.033]
	{0.278}		{0.094}	
R^2	0.105		0.125	
N	365	362	365	362
Market F.E.	○	○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Market clustered p-values in brackets
Wild cluster bootstrapped p-values in braces when possible with linear estimation
Constant and market fixed effects omitted

Chapter 2

Can Trade be a Counterterrorist Policy?

2.1 Introduction

Free markets have long been cited as a way to defeat terrorism and violence. In 2003, official U.S. policy was to extend trade access as a means to promote peace. President George W. Bush argued, "Across the globe, free markets and trade have helped defeat poverty, and taught men and women the habits of liberty. So I propose the establishment of a U.S.-Middle East free trade area within a decade, to bring the Middle East into an expanding circle of opportunity, to provide hope for the people who live in that region."[1] Despite these prominent public policies, conflicting empirical results yield no consensus on the nature of the relationship between trade and terrorism. This paper contributes to the understanding of trade and terrorism in several ways.

Terrorism, in this context, is defined as a violent extrajudicial act by a non-state actor intended to achieve some political or social goal. This paper's finding is threefold: first, when a country exports more to a trading partner, that trading partner will be attacked more frequently in the exporting country.[2] For example, if Nigeria were to export more to the United States, more Americans would be attacked within Nigeria. Second, when one

[1] Office of the Press Secretary. The White House. US-Middle East Free Trade Area. 9 June 2004.

[2] The incidence of terrorism is measured as the number of attacks during a year in which a person of the indicated nationality was victimized.

country exports more to another given country, there will be fewer attacks in the exporting country against all other foreign countries. For example, increased exports from Nigeria to the United States would lead to fewer attacks on Canadians in Nigeria . Finally, there is consistent but statistically insignificant evidence that increased total exports will reduce the number of attacks on domestic targets. For example, if Nigeria increases its exports to the world, there may be fewer attacks on Nigerians in Nigeria.

A country's trade and its exposure to terrorism are closely related. Stable, peaceful countries are better able to engage other nations and maintain a trade relationship. Countries with booming economies supported by robust exports will provide employment alternatives to terrorism for their citizens. These proposed links between terrorism and trade demonstrate the endogenous nature of the two phenomena. To address this problem, I instrument for the endogenous trade to see the effect on the number of attacks.

In the present study, I recognize that a single country-pair's trade is endogenous. This implies trade with other countries is similarly endogenous. So, the total amount of trade is an aggregate-level endogenous variable that must be addressed. One must also address the endogenous aggregate level of trade in which a country engages. So, there are actually two endogenous factors that will affect a country's terrorism and at least two instruments are required for unbiased estimation of the effect of bilateral trade on terrorism.

To address the endogeneity of a country's aggregate exports and terrorism, terms of trade will be used as an instrument. Terms of trade shocks are generally considered exogenous to individual small countries. This has been used as an instrument primarily in the international macroeconomics literature (Broda (2004), Mendoza (1995)). Shocks to the multilateral terms of trade a country faces will be employed as an instrument to control for a country's aggregate exports.

In order to deal with the endogeneity of bilateral trade, an instrument that varies at the country-pair level must be sought. Such a variable exists through the observation that countries with low bilateral exchange rate variability experience greater trade. Following

Tenreyro (2007), by constructing a measure of the *likelihood* that two countries will be pegged to a common currency, an instrument for bilateral trade can be used. Tenreyro's approach and results have been confirmed by a number of other studies. Both of these instruments will be further explained in Section 2.3.

There are three potential avenues through which trade could affect terrorism. First, as exports increase, the presence of FDI from the destination country will tend to increase. There is a correlation between bilateral FDI and bilateral exports. So, as a country's exports increase, one would expect the number of expatriates from the export destination residing in that country and the amount of property owned by nationals of the export destination to both increase. This will make the logistics of attacking a foreigner easier. Second, even if the population of expatriates and amount of property of trading partners located in the exporting country did not increase, the export destination still comes to acquire a more central role in the economy. As the ultimate source of demand, being a main export destination makes a foreign country an appealing target.

The last potential avenue would work in the opposite direction of the previous two. To the extent that trade involves the production of legitimate products (e.g. textiles, agriculture, mining, etc.) the opportunity cost of choosing to engage in terrorism should rise. Through this avenue, terrorism against a target of any nationality should fall. Through these three competing phenomena, trade can directly affect the frequency and composition of terrorist attacks.

To formalize this tradeoff between attacks on trade partners and alternative targets, a choice theoretic model is developed that first provides individuals the choice between engaging in terrorism or working in a legitimate sector. Furthermore, terrorists can choose between attacking foreign targets or a domestic target with random success or failure. Using this framework, comparative statics are performed to make predictions about the effect of increased trade on the commission of terrorist acts against each target. Theoretical results indicate that terrorism against a trading partner could increase as foreign targets become

more prominent, or could decrease as trade promotes alternatives to terrorism. The model predicts that as trade increases, the number of attacks against all other targets, foreign and domestic, should fall.

The prevailing framework for terrorist behavior is the rational terrorist model. This approach treats terrorists not as radical zealots but as calculating utility maximizers seeking influence. The rational terrorist model is an extension of the Becker (1971) household production model as applied to individuals seeking political goals. It is most appropriate as a model for describing the political economy of an autocratic government or marginalized minority where influence is not achieved through democratic means. As a result, individuals decide to engage in terrorism, which gains them prominence and influence (Crenshaw (1981), Crenshaw (2001), Kydd and Walter (2006)).

The imposition of standard economic assumptions leads to testable predictions for terrorist activity. Enders and Sandler (1993) finds that as terrorists structure their plans, they will respond rationally to factors that alter the cost-benefit ratio of terrorism. If one form of terrorism becomes more costly, then terrorists will employ that method less frequently in favor of less costly methods. Similarly, terrorists pursue "promising" targets that play an important role in their country's economy. Neumayer and Plümper (2011) argue that since America is a major geopolitical power, attacks on Americans will bring greater levels of influence. They find that a large American military presence makes attacks on Americans logistically more feasible and that host countries come to depend on the foreign military power in myriad ways.

There exists a robust literature regarding the role, or lack thereof, for economic development in reducing terrorism. One line of the literature argues that income and education do not affect the incidence of terrorism (Krueger and Malečková (2003), Berrebi (2007), Krueger (2008)). On the other hand, a competing narrative argues that evidence against income is not generalizable, and in a cross-country setting income is negatively related to terrorism (Li and Schaub (2004), Blomberg and Hess (2005)). There have been no conclusive findings

on the role of income, but there remains a viable possibility that increased income through trade might reduce terrorism.

While there has been relatively little work done on the effect of trade on terrorism, there has been extensive work on the effect of terrorism on trade. Empirical studies by Nitsch and Schumacher (2004) and by Blomberg and Hess (2006) both find a negative relationship between the two. Blomberg and Hess do acknowledge the possibility of endogeneity and instrument for conflict with unspecified UN voting records. This instrument likely does not satisfy the exclusion restriction given that explicit or implicit state sponsors of terror will vote in a systematically different manner than peaceful states. These state sponsors of terror will likely have a different relationship with the international economy. Mirza and Verdier (2008) write a theoretical paper focusing on the endogeneity issue, critiquing Blomberg and Hess (2006) in the process; however, they do not make any attempt at econometric estimation.

While there has been very little examination of the role that trade has on terrorism, others have studied rather extensively the role of trade on interstate conflict. Again, the results are mixed. Early work on the topic concurred with the "liberal" view that trade promotes interstate peace (Polachek (1980), Polachek (1997), Polachek and Seiglie (2007)). The next generation of studies argued the opposite, that trade increases the likelihood that two countries go to war (Barbieri (1996), Barbieri (2002)). The most recent papers have nuanced views that trade does not have a significant effect on interstate conflict (Keshk et al. (2004)) or that trade does matter but the direction depends on the context (Martin et al. (2008)). In a paper most similar to the present study, Parlow (2013) argues that endogeneity also plagues the trade-interstate conflict question. His instrument, rainfall, is less convincing as a factor driving trade.

Section 2.2 will present a model that proposes a choice-theoretic framework for a rational potential terrorist. Section 2.3 discusses the empirical methods used in estimation. Section 2.4 describes the data used in the estimation. Section 2.5 presents the results and Section 2.6 concludes.

2.2 Model

While terrorism is a broadly interpreted phenomenon, it will have a more clearly specified definition for the purposes of theoretical modeling. For compatibility with the empirical section, the criteria employed by the Global Terrorism Database will also be the theoretical framework for what constitutes a terrorist attack. A terrorist attack is an intentionally conducted act involving violence or the threat of violence by subnational (i.e. non-state) individual(s) meeting at least two of the following three criteria: (1) aim is to a political, economic, religious, or social goal, (2) the intent is to influence a group larger than the direct victims, or (3) the act violates internationally recognized legal standards. To summarize, terrorism involves malevolent acts seeking to somehow influence a country's socio-political policies.

The fundamental motivation behind the rational terrorist model is that individuals and collective groups care not only about their individual material consumption but also the political influence they wield. This is similar to Becker's household production model (Becker (1971)). Political influence can be acquired in a variety of ways. Primarily, political influence is derived from traditional channels of democratic expression. However, when traditional methods are ineffective for achieving political reform, political influence may be derived from illegitimate sources through the disruptive effect of terrorist activities. If the payoffs from terrorism change, so too should terrorist behavior.

Existing models of trade and security primarily focus on the relationship among trade, insecurity, and defense. For example, Anderson and Marcouiller (1997) study the choice of production or predation with the possibility of defense also playing a significant role. The model proposed below is not fundamentally different from Anderson and Marcouiller's except that they additionally allow for agents to allocate labor to defense, and they embed a Ricardian production model to make predictions with respect to specialization. Those focuses are not applicable in the present study, but both are choice theoretic models of competing production-violence alternatives. Another related model is that of Anderson

(2014), in which the author embeds terrorism and counterterrorism in the same labor market within an open economy. The paper examines the strategic interaction between terrorists and the government. These papers demonstrate the existence of various strategies to model the choices related to trade and terrorism, although they differ slightly in focus.

For the present study, the ideal model will make the concept concrete while maintaining generality and simplicity. To do so, consider the following context. It is derived from the Becker (1968) model of crime and follows the general choice-theoretic model of Landes (1978) in which there are three potential states of the world: no terrorism, terrorism is successful, and terrorism is attempted but fails (also, see Enders and Sandler (2004)). This is an ideal model to study the effect of trade on terrorism itself because the primary mechanism is the tradeoff between the payoffs of production and terrorism. Individuals in a given country can derive utility from legitimate economic activity (i.e. production), U^N. The value of U^N is known and entirely predetermined by known prevailing conditions.

As an alternative, individuals can undertake terrorist activity in their home county (no migration is allowed). Attacks entail stochastic outcomes, reflecting the uncertain and risky nature of terrorism. Risk-neutral individuals will engage in terrorism whenever the expected utility from terrorism (EU^T) exceeds the certain utility of refraining from terrorism, $EU^{Terr} > U^N$. Furthermore, suppose that a terrorist has a choice over whom he will attack, either domestic targets or one of two foreign targets: foreign trading partners or foreign non-trading targets. Foreign non-trading partners reside in the host country but are from a nation with no trade relationship with the host country. For any potential victim, a terrorist has a random chance of success with probability π^{Dom} of success for an attack on a domestic target and probability π^{TP} or π^{NTP} of success when attacking a foreign trade partner or foreign non-trade partner respectively. This results in a trio of expected utilities for the possible targets.

$$EU^{Terr} = \begin{cases} EU_{Dom} = \pi^{Dom} U^S_{Dom} + (1 - \pi^{Dom}) U^F_{Dom} \\ EU_{TP} = \pi^{TP} U^S_{TP} + (1 - \pi^{TP}) U^F_{TP} \\ EU_{NTP} = \pi^{NTP} U^S_{NTP} + (1 - \pi^{NTP}) U^F_{NTP} \end{cases}$$

where U^S_{Dom} is the utility derived from a successful (S) attack on domestic targets and U^F_{Dom} is the utility from a failed (F) attack on a domestic target. U^S_{TP}, U^F_{TP}, U^S_{NTP}, and U^F_{NTP} are defined analogously. The utility derived from a successful attack against a given target is assumed to be greater than for a failed attack.

A potential terrorist will become an actual terrorist if the expected utility of terrorism against one of the targets will exceed the known utility of non-terrorist behavior.

$$EU_{Dom} > U^N$$

$$EU_{TP} > U^N$$

$$EU_{NTP} > U^N$$

The parameters involved in these inequalities determine the decision of a potential terrorist. If each of the three inequalities were to hold, a terrorist would then compare the expected utility derived from each of the potential targets. A terrorist will chose to attack a trade partner target if the following also hold

$$EU_{TP} > EU_{Dom}$$

$$EU_{TP} > EU_{NTP}$$

A policy that alters the parameters involved in these inequalities will have predictable results for individuals' decisions to engage in or refrain from terrorism.

The total amount of terrorism will increase if the probability of success increases, $\pi^{Dom} \uparrow$, $\pi^{TP} \uparrow$, or $\pi^{TP} \uparrow$. If the likelihood of success increases for only one of the three potential targets, then the distribution of terrorist attacks will shift across targets. For example, if trading partner targets were more easily attacked so that π^{TP} were to increase, one would

see more attacks against trading partners and fewer against domestic or non-trading partner foreign targets.

Similarly, if the utility from either a successful or unsuccessful terrorist attack were to increase so that $U^S_{Dom} \uparrow$, $U^F_{Dom} \uparrow$, $U^S_{TP} \uparrow$, $U^F_{TP} \uparrow$, $U^S_{NTP} \uparrow$, or $U^F_{NTP} \uparrow$, then the overall incidence of terrorism will also increase. Likewise, if the utility derived from either of the trading partner target attack outcomes were to increase unilaterally, then there would be a redistribution of attacks from domestic and non-trading partner targets to trading partner targets.

Finally, if there are more opportunities for legitimate non-terrorist activities, meaning $U^N \uparrow$, then the expected value of terrorism would be less likely to exceed the alternative. This would result in a weakly lower number of terrorist incidents against each target.

To summarize, the overall level of terrorism will increase if $\pi^{Dom} \uparrow$, $\pi^{TP} \uparrow$, $\pi^{NTP} \uparrow$, $U^S_{Dom} \uparrow$, $U^F_{Dom} \uparrow$, $U^S_{TP} \uparrow$, $U^F_{TP} \uparrow U^S_{NTP} \uparrow$, $U^F_{NTP} \uparrow$ or $U^N \downarrow$. If a policy were to have the opposite effect on these parameters, then the level of terrorism would instead decrease.

The particular event of interest in the context of this study is trade with a foreign country. This will affect several of the parameters directly. First, as trade with a foreign country increases, the presence of that foreign country in the host country will increase. This could occur through the arrival of expats or the establishment of intermediary businesses. As more people or institutions are physically located in a host country, it becomes logistically easier for a terrorist to successfully find a target of the trading partner's nationality. For this model, this would imply trade would increase the probability of successfully attacking a foreign trading partner, an increase in π^{TP}.

Another effect of increased trade with a foreign country is that foreign nationals come to acquire a relatively more significant role in the economy. As production is increasingly focused on exports to the foreign country, the importance of these foreigners increases at the expense of other nationalities. If terrorists are behaving rationally, they should gain greater utility from attacks on those who will provide them the greatest prominence. As trade with

the foreign country increases, the utility from attacks on the foreign trading entity, U^S_{TP}, will increase with the utility from domestically targeted attacks, U^S_{Dom}, and non-trading partner attacks, U^S_{NTP}, relatively lower, though not necessarily in absolute terms. The result of this change would be the reallocation of attacks from domestic targets and non-trade partners to trade partners. It is also possible that the utility from an unsuccessful attack would increase, having similar implications.

Lastly, as exports to a foreign country increase, so too should the employment opportunities for individuals producing in the export sector. This would imply a greater return for individuals who work in this legitimate sector, raising the value of U^N. If there are attractive alternatives to terrorism, then one would expect the frequency of all types of terrorist incidents to fall.

These are the primary effects of increased trade. Some of them yield conclusive predictions and some of them yield theoretically ambiguous predictions. First, the value of attacks on domestic entities and non-trading entities fall along with there being more legitimate economic activities. These factors combine to indicate that there would be less terrorism committed against domestic targets and non-trading partner targets. Second, there is greater value to attacks on trading partner targets and the attacks are more likely to be successful. However, there are greater legitimate opportunities that would keep potential terrorists from becoming actual terrorists. So, the dominant channel for trading partner attacks can only be answered based on the data.

2.3 Empirical Approach

The primary focus of this paper is the effect of bilateral trade on the likelihood that trading partners' interests will be attacked in a given country. However, the most basic econometric methods available will not account for endogeneity issues that arise for these variables.

The choice for a country to trade extensively with another is primarily the result of its

citizens assessing the costs and benefits of establishing operations there, either as a seller or a buyer. It should be reasonable to assume that the security situation in another country will factor into the decision to trade with that country. At the same time, the opportunities to engage in legitimate export-oriented business could raise the opportunity cost of engaging in terrorism. So, assuming these propositions are true to any degree, it will be the case that terrorism and trade will be jointly determined in equilibrium.

As described above, there is a clearly endogenous relationship between bilateral trade and terrorism. This also implies that there is another potential source of endogeneity that must be accounted for. If bilateral trade constitutes an endogenous variable, then the sum of all individual trade values is also endogenous. The economic intuition is that terrorism may be more responsive to the overall level of trade such that trade values will affect terrorism systematically for all of a country's partners. The implication is that a separate source of endogeneity must also be addressed.

So, one cannot simply regress the incidence of terrorism on exports because terrorism and trade are jointly endogenous, biasing any OLS estimate. Estimation will therefore focus on a standard method of addressing endogeneity, the use of instrumental variables. In order to maintain the strict exogeneity of regressors, two instruments must be employed to identify the unbiased effect for both bilateral trade and total exports on the incidence of terrorism. Of these variables, one is a country-pair specific variable and the other varies at the exporter level.

To appropriately estimate the effect of a country's exports on terrorist activity, an instrument must be found that affects total exports but does not affect terrorism except through trade channels. One approach to selecting this instrument is to choose a trade variable that is exogenous. Fortunately, such a variable exists for a subset of countries. Shocks to the terms of trade, a ratio of the export price index to the import price index, can reasonably be considered exogenous for small countries. The rationale is as follows. A country's terms of trade are calculated using world prices of goods imported and exported by that country.

If world prices are set on a global market populated by many countries, any small country is a price taker. Thus, for these countries, prices are set in a manner that is independent of its behavior.

Furthermore, shocks to the terms of trade of a country are likely to be determined exogenously because any stochastic component to the terms of trade are less foreseeable than the permanent component of terms of trade. Let shocks (τ_t) be measured as

$$ToT_t = \overline{\tau} + \tau_t$$

Then, the shock to the terms of trade of a small country in year t, τ_t, would be a good candidate for an instrument for the endogenous country-level total exports.

A country's terms of trade are closely related to the income received from exports, which can alter the tradeoffs for potential terrorists. As the terms of trade increase, the return on sales to the world increases. To the extent that terms of trade affect income, it would appear to be something that should be used to explain terrorism on its own. However, when controlling for exports, the terms of trade would be redundant as any relationship between the terms of trade and income would flow through exports, a reflection of the IV exclusion restriction. So, aggregate exports would actually incorporate whatever role terms of trade has on terrorism.

One concern with the proposition that terms of trade shocks are exogenous is the potential influence of large countries on world prices (Mendoza (1995), Broda (2004)). Furthermore, if a country is small but still plays a large role in the supply of a single good, they may still have an effect on world prices. This is the case for oil exporters so the assumption of exogenous terms of trade is appropriate only for small, non-oil exporting countries. The sample employed for estimation will be restricted to exclude larger countries that may influence world prices and small countries that are significant exporters of crude oil. I will adopt the definition of a small, non-oil exporting country used by Broda (2004). The only modification

of this definition is that China, a small country during the time of Broda's study, will be reclassified as a large country for the 2000-2009 timeframe.

The above provides the justification for an instrument for total exports. Another instrument that varies at the country-pair level is still needed to control for exports from one country to another. An instrument for bilateral trade is adopted from Tenreyro (2007). There is a long and established record of exchange rate variability negatively affecting trade (for example Abrams (1980), Frankel and Wei (1993), Rose and Engel (2002)). So, to the extent that countries can reduce the variability of their bilateral exchange rates, countries should increase their trade. The ultimate form of exchange rate variance minimization and currency integration is for two countries to use the same currency.

In order to create an exogenous measure of currency integration, I follow and update Tenreyro (2007) in constructing a probability that any two countries are pegged to the same currency, whether the peg is one of their currencies or the currency of a third party. In particular, countries who peg their currency to another typically choose either the U.S. Dollar or the Euro. There are other currencies that serve as a peg for smaller countries. But, the Dollar and the Euro are the two currencies that are most frequently used as pegs by a significant margin. The Tenreyro (2007) study covered the years prior to the advent of the Euro so she used the Franc and Deutschmark, which are no longer in circulation. She additionally used the British Pound and the Rand. Neither of these is prominent relative to the current use of the Dollar and Euro as pegs. Thus, it is not concerning that these currencies must be omitted from consideration due to econometric estimation.[3] Also, some countries peg to a basket of currencies. These are excluded from any measure of common currency because they will not fully integrate unless two countries happen to choose an identical mix.

For a given country, there are a variety of factors that predict whether it pegs to a major

[3]The Rand is pegged with the currencies of Lesotho, Swaziland, and Namibia. This varied in Tenreyro's time period but not in the current one. The British Pound is pegged with 8 commonwealth currencies. None of these exist separately in the trade or terrorism data.

currency. These variables are specific to the relationship between the anchor country (i.e. U.S. or Eurozone countries) and the client country (any potential pegging country). The key to these variables is that they are not transitive. For example, knowing the distance between countries X & Y and the distance between countries X & Z does not pin down the distance between Y & Z. None of the employed bilateral variables are transitive in nature so nothing about the relationship between client countries is used to form the probability.

Using logit analysis, I generate the predicted likelihood that nation n with currency c is pegged to the dollar or the euro, $\widehat{\pi_n^{\$}}$ and $\widehat{\pi_n^{€}}$ respectively. First, I run the logit regressions:

$$\pi_{nt}^{c} = \Phi\big(\boldsymbol{\beta}^{c'} Z_{nt} + \varepsilon_{nt}\big)$$

This allows the creation of a predicted value for each currency. Explanatory variables used in this regression are GDP, population, distance to anchor currency country, ratio of country's GDP to anchor's GDP, ratio of country's population to anchor population, common languages between country and anchor, and colonial relationship between country and anchor. Results for the logit regressions are presented in Appendix 2.7.1.

The outcome variable for each of these regressions is a dummy variable taking the value of 1 if the country pegged their currency to the anchor currency, either the Dollar or Euro. These two currencies are used as an anchor far more commonly than any other currencies by a significant margin. Out of the 178 countries in the sample, over the years 2000-2009, 105 peg to either the Dollar or the Euro at some point in time. Of these, 51 countries are pegged to one of the currencies for the entire time and 54 are pegged to a currency in some but not all of the years. There were 45 countries that pegged to the Dollar at some point but were not pegged to the Dollar at another point.

Using the estimated parameters, the predicted value is generated according to the equation

$$\widehat{\pi_{nt}^{c}} = \Phi\big(\widehat{\boldsymbol{\beta}^{c}}' Z_{nt}\big)$$

This provides the probability that each country will be pegged to that particular currency. Since the predicted probabilities of pegging to that currency only involve the observed characteristics employed in the probit, the probabilities should be independent across countries. Thus, two separate logits are estimated: one for whether a country pegs to the Euro and another for whether a country pegs to the Dollar. This assumes that there is a set of factors affecting the likelihood a county pegs to each currency but those factors are not relevant or appropriate for determining why a country pegs to the other country. Given the dyadic nature of pegging, this is the ideal estimation, as opposed to a single equation, because only the client-anchor relationship is used and not information on outside countries. Thus, the probability that any two countries are both pegged to the same currency is simply the product of the two individual probabilities.

Then, the likelihood that country i is pegged to the same currency as country j is given by

$$\pi_{ij} = \hat{\pi_i^{\$}}\hat{\pi_j^{\$}} + \hat{\pi_i^{€}}\hat{\pi_j^{€}}$$

The parameter π_{ij} is correlated with the amount of trade because it predicts the probability two countries peg to the same currency but is defined by variables that are not specific to that country-pair. Furthermore, the proposed instrument is a predicted probability so any other phenomena not explicitly included in the logit model will not be included in the instrument.

The two measures of trade are relatively standard. The variable X_{eit} captures the value of bilateral trade produced in country e and exported to country i. The variable TX_{et} is defined as $TX_{et} = \sum_i X_{eit}$. It records the total value of all exports to all trading partners for each exporting country.

The last of the key variables are the two instruments, π_{eit} and τ_{et}, for the endogenous trade variables. The instrument $\pi_{eit} \in [0, 1]$ is constructed as described above to generate the probability that country i and country e are both pegged to the same currency. The instrument τ_{et} is the shock to the terms of trade, defined as the deviation from the mean

level of terms of trade, $\tau_{et} = TOT_{et} - \overline{ToT_e}$, over the 2000-2009 time frame.

Given the two endogenous variables, the empirical strategy will actually involve two first stage regressions. For exporter e, importer i, and in year t, the empirical equations to estimate are:

$$Terrorism_{eit} = (\alpha_e + \alpha_i + \phi_t) + \beta_X \widehat{\log(X_{eit})} + \beta_T \widehat{\log(TX_{et})} + \boldsymbol{\theta}' Z_{eit} + \varepsilon_{eit} \tag{2.1}$$

$$\log(X_{eit}) = (\alpha_e^\star + \alpha_i^\star + \phi_t^\star) + \beta_\tau^\star \tau_{et} + \beta_\pi^\star \pi_{eit} + \boldsymbol{\theta}'^\star Z_{eit} + \varepsilon_{eit}^\star \tag{2.2}$$

$$\log(TX_{et}) = (\alpha_e^{\star\star} + \phi_t^{\star\star}) + \beta_\tau^{\star\star} \tau_{et} + \boldsymbol{\theta}'^{\star\star} Z_{et} + \varepsilon_{eit}^{\star\star} \tag{2.3}$$

where the α_e parameters are an exporter fixed effect, the α_i parameters are an importer fixed effect, the ϕ_t parameters are a year fixed effect, and $\boldsymbol{\theta}$ is a vector of covariate parameters. The dependent variable $Terrorism_{eit}$ is the number of attacks occurring in country e against country i's interests in year t.

Errors are allowed to be correlated across exporter and importer so the appropriate two way clustering will be employed. This will allow for directed terrorism to be correlated across location and across targets. So for example, consider a terrorist attack in Afghanistan against Americans. This method of clustering will allow for errors to be correlated across all other Afghanistan observations because it is inherently a high-terrorism location. At the same time, observations for attacks on Americans would also be correlated as a highly attacked country given its hegemonic status. A potential improvement on this method could be to employ dyadic clustering. This would allow for errors to be correlated in the same two ways as described above but also would allow attacks within a country to be correlated with attacks on that country somewhere else. This is more general and a potential improvement for estimation.

The instrumental variables estimation of Equations 2.1, 2.2, and 2.3 together will provide an unbiased estimate of the effect of non-zero exports on terrorist activity against country i occurring in country e. By using two stage least squares estimation, the value β_X can be used to test whether bilateral exports from country e to country i will increase or decrease

the number of attacks on citizens or property of country i located in country e.

The key variables in this estimation are the dependent terrorism variable, the trade variables, and the instruments. The dependent variable is a count of the number of terrorist attacks occurring in a directed manner. This does not imply that the perpetrator is necessarily a national of country e but could instead be from a third party country. However, among countries experiencing terrorism, only 10.8% of known-perpetrator attacks were by foreign entities. The remainder was committed by domestic entities or groups of unknown origin, such as "Gunmen" or "Students."

One potential concern regarding this instrument is the generated regressor problem. The value π_{ij} is a constructed value that will be used to estimate the exogenous component of bilateral exports in the first stage. This introduces a sampling error to the standard instrumental variables framework. The sampling error can yield inconsistent standard errors. The standard method for addressing this is to bootstrap the standard errors. Future work can test the importance of correcting standard errors.

There are two related questions that will be investigated. The first is the effect of bilateral exports on the number of attacks against foreigners from countries other than the actual trading partner. Empirically, this would be implemented in a nearly identical manner to the above-described estimation method. This would only differ in the dependent variable.

The second related question that will be investigated empirically is the effect of a country's exports on the incidence of terrorism on domestic interests. For example, if Somalia were to boost its exports to the world, would there be more or fewer terrorist incidents targeting Somali people and property within Somalia? In this case, there is no particular role for bilateral exports as all trading partners could be aggregated into a single foreign entity. There is still the issue of endogeneity but it is limited to the single relevant variable, TX_{et}. Thus, a more standard IV model can be used with a single first stage regression.

$$HomeAttack_{et} = (\alpha_e + \phi_t) + \delta_T \widehat{\log(TX_{et})} + \boldsymbol{\psi}' Z_{et} + \varepsilon_{et} \tag{2.4}$$

$$\log(TX_{et}) = (\alpha_e^\star + \phi_t^\star) + \delta_\tau^\star \tau_{et} + \boldsymbol{\psi}'^\star Z_{et} + \varepsilon_{et}^\star \tag{2.5}$$

Here, the variables are defined similarly to the previous regressions. Again, equations 2.4 and 2.5 provide an unbiased estimate of the effect of a country's total exports on the number of attacks on residents of the country in which the attack occurs. This is a country level phenomenon so there is no variation at the country-pair level.

2.4 Data

The data used for this study were derived from several sources. First, trade data were collected from a balanced panel of 198 countries from the Correlates of War dataset. These data were compiled from IMF cost, insurance and freight (c.i.f.) import reports. These data were slightly richer in that missing observations are filled using other IMF import and export reports. The original IMF data set possessed missing values. These were filled with data from secondary sources. The result is that zero values truly imply zero trade and missing values are truly unavailable. For the analysis, observations with missing data were dropped from consideration as were trade flows observed to be zero. This is so as to answer the question on the intensive rather than extensive margin. The variable is expressed as log of exports from a country to its trading partners in the estimation.

The variables population, real GDP (constant 2012 $), and terms of trade data are taken from the World Bank's World Development Indicators. Terms of trade data were sufficiently rich for inclusion beginning in 2000 so all other data is restricted to the years 2000-2009. Terms of trade are defined as the percentage ratio of the export unit value indexes to the import unit value indexes, with each country's terms of trade normalized to 100 in the year 2000. Shocks to the terms of trade are defined as the deviation from the mean of each country's terms of trade from 2000-2009. Data on a country's monetary policy and to which anchor currency their own currency is pegged is derived from the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions. Currencies that had no separate legal tender, a currency board, a conventional peg, or a stabilized arrangement were all classified

as pegged whereas more flexible arrangements were not.

Terrorism data is collected from the Global Terrorism Database (GTD). This is a database maintained by the National Consortium for the Study of Terrorism And Responses to Terrorism. The database, which covers the years 1970 to 2012, contains over 113,000 terrorist attacks. Each terrorist incident is recorded along 120 dimensions, noting various characteristics of the attack. To be included in the database as a terrorist event, the incident in question must employ "the threatened or actual use of illegal force and violence by a non-state actor to attain a political, economic, religious, or social goal through fear, coercion, or intimidation."

From the 120 variables present in the dataset, the information used to construct my measure of a terrorist attack was derived from the location and year of the attack along with the nationality of the victims. For each country, the number of attacks on a target of each nationality was tallied. This creates a directed bilateral measure of the targeting of a particular country's interests. Each one of these terrorist incidents could have targeted a citizen of a country, property owned by citizens of the country, or both. Whether an attack injures or kills an individual or damages that individual's property, a similar sense of fear will likely be generated.

It should be noted that each observation comprises a single incident of terrorism focused on a country's or countries' people or property. The severity of the attack did not matter in that if there was a single person directly affected or thousands, it would be recorded identically. It is not possible to identify the number of victims by nationality or the property destroyed by nationality of owner. It should also be noted that a single incident can count toward an attack on multiple trading partners. For example, a terrorist attack on Coalition troops could result in one measured attack on the USA and another on Canada if American and Canadian personnel were both affected.

2.5 Results

Tables 2.1 to 2.4 give the results of the effect of trade on the quantity of terrorist attacks. The results present the two stage least squares estimates that do not suffer from the endogeneity issue of standard ordinary least squares estimates.

The key variable presented for these results is the level of bilateral exports, $\log(Exports_{eit})$. These parameters for $\log(Exports_{eit})$ are presented in the first rows of the bilateral trade estimation. The results of the other endogenous regressor, $\log(TotalExports_{eit})$, is presented in the second row.

Gross domestic product data (GDP_{it} and GDP_{et}) are included for both importer and exporter as are variables for importer and exporter population ($Population_{it}$ and $Population_{et}$). Distance ($Distance_{ie}$) is included as measured between two nations' capitals. All GDP, population, and distance variables are expressed in log form. A dummy ($Border_{ie}$) for two countries sharing a border is included. A dummy ($CommonLanguage_{ie}$) for both countries having at least 10% of their population speaking the same language is included. Last, a dummy ($Colony_{ie}$) for both countries having been in a colonial relationship is also included.

Throughout the presentation of the results, various subsamples will be used to demonstrate the effect of trade on terrorism for different types of countries or relationships between countries. The purpose of showing results for different subsamples is to demonstrate the heterogeneity of the role trade plays in terrorism. There will be four primary subsamples to be examined. First, each test will be performed on the entire sample of every observed country pair. Examples of these could involve trade between Norway and Sweden or between Egypt and Israel. Second, the sample will be restricted to the population of country-pairs that experience a terrorist attack in the exporting country against the export destination at any point in time. This is intended to focus on cases where the trading partner has a history of being attacked. An example of this would be that Egypt-Israel would be included but Norway-Sweden would be excluded. Third, the sample will be restricted to countries where the exporting country was the setting for a terrorist attack at any point. This purpose of

this subsamples is to determine the effect of trade on terrorism in countries prone to this type of violence. For example, Egypt's exports to all trading partners would be included. Last, the sample will be restricted to country pairs with positive numbers of attacks in the given year. This is intended to give the effect of exports on terrorism for countries actively experiencing attacks. For example, Egypt-Israel observations would included only for the years during which there were attacks. Each of these subsamples asks the same questions but in a different context. While certainly related, the results vary based on the exact nature of the setting. The fact that certain specifications yield significant results while other specifications yield insignificant results is a reflection of the heterogeneous nature of the link between exports and terrorism.

Table 2.1 shows the results of estimation for all observations. So, any country-pair over the included time frame for which there was a positive amount of trade was included. This is the most general dataset possible, meaning that there are country-pairs with frequent attacks alongside a multitude of country-pairs that never experience attacks. Even if trade were to increase for one of the minor trading partners, the other country would still play a minor role in the domestic economy. In these cases, one would expect there to be the smallest marginal effect of trade on terrorism. In fact, there is no statistically significant effect of trade on terrorism when trade between all countries are included. The lefthand columns report the coefficient estimates for all trading partners and the righthand side reports the estimates for all trading partners with at least $1 million of bilateral exports. At this level, there appears to be no statistically significant relationship between trade and terrorism.

Table 2.2 presents the estimates of the relationship between trade and terrorism for country-pairs for which there is a history of terrorist attacks. This subsample constitutes all the observations drawn from country-pairs with a positive number of terrorist attacks at any point over the time frame. The general interpretation of this table is as the effect of trade on terrorist activity against potential export destinations whom have already been attacked. The first row of the table presents the coefficient estimates for $\log(Exports_{eit})$.

For this sample, all specifications are statistically insignificant but consistently positive.

The results in Table 2.3 present estimates for a subsample of countries that have any history of terrorism in the exporting country. Observations are included for these regressions if there was, at any point, a terrorist attack occurring in the exporting country. This table can be interpreted as providing the effect of trade on terrorism against trading partners in terrorism-prone countries. The magnitudes imply that doubling exports from Country A to Country B would imply approximately 0.01 additional terrorist attacks in Country A targeting the interests of Country B. For this subsample of the population, this change would yield a percentage change of approximately 70%, given that the mean number of attacks is 0.012 per year.

The results are strongest in an economic sense when restricting data to those observations for which the trade partner is attacked although the parameter estimates are not directly comparable. Table 2.4 shows the estimates for observations with positive levels of terrorism against the trading partner. Because these are positive values, it is possible to use the log transformation to allow for a more straightforward elasticity interpretation. These results indicate that a 1% increase in bilateral exports will cause a roughly .77% increase in the number of terrorist attacks. This implies that increasing trade with a country in which there are already attacks will yield a quite large increase in the number of attacks. This counters the proposition that bilateral trade will foster goodwill and reduce overall terrorism. The economic magnitude of this is not qualitatively different from other estimates. For this case, estimation is not limited to only those with greater than $1 million in exports as the combined restriction of positive attacks and larger exports reduces the degrees of freedom too substantially.

The overall takeaway the regressions in Tables 2.1 to 2.4 is that the effect of trade on terrorism against trading partners is heterogeneous. Trade with a country possessing a relatively peaceful relationship with a potential trade partner will likely have no effect or only a small increase in terrorist attacks. However, trade with a foreign country that is

already the host of terrorist attacks will likely have an important, deleterious increase.

For each subsample, first stage regressions are reported in Tables 2.13 to 2.19 of Appendix 2.7.2. Instruments are generally sufficiently strong that an F stat of 10 is attained. The F stat appears weak when importer and exporter fixed effects are excluded. This is not concerning as the 2nd stage model without fixed effects is primarily shown for comparison and not the preferred specification. A measure of the joint strength of multiple instruments, the Cragg-Donald F statistic, is also significant for all preferred specifications.

Another theoretical prediction from Section 2.2 is that foreigners from countries other than a trading partner would be attacked less often in the exporting country. The intuition behind this prediction is that the trading partner will become more prominent as they receive a larger share of exports. This leaves other foreigners relatively less prominent within the economy and thus a less appealing target in terrorist attacks. For example, if Kenya were to increase exports to the United States, the model predicts there would be fewer terrorist attacks on Ugandans located in Kenya. The results, presented in Tables 2.5 to 2.8, demonstrate the negative relationship between exports and terrorist attacks on a third party country.

Table 2.5 presents the results for all country pairs regardless of their history with respect to terrorism. The coefficients can be interpreted so that a doubling of exports to the given foreign country will decrease the number of terrorist attacks against other foreign countries by approximately 0.2 per year. This marginal effect constitutes a roughly 20% decrease as the average number of attacks on nationalities other than the trading partner is 1.04 per year. Results are statistically significant for both the case of all trade partners and for large trading partners as defined by exporting at least $1 million. The magnitudes are similar so the size of the trade flow does not appear to differentially affect the reduction in terrorist attacks. Interestingly, whereas the results were insignificant for all trading partners, the overall results are quite strong for non-trading partners.

Table 2.6 examines the same relationship, between exports to one foreign country and

attacks on other foreign countries, for country-pairs that have at least one terrorist incident at some point in their relationship over the time period covered. This subsample also supports the prediction that other countries will be attacked less frequently as another becomes a more central export destination. In this case, the statistical significance is present only when minor trading partners are included but not when when the sample is restricted to large trading partners. One possible interpretation of this is that the effect is largest as a small trading partner increases exports and transitions into large trading partner status. Then, they truly assume a role of prominence as a potential terrorist target. These results suggest that if exports to a country that has or will be attacked doubled, there would be between a 0.3 and 0.7 reduction in the number of attacks against third-party countries in the exporting country. Given an average of roughly 2 attacks on nationalities other than the trading partner, this is roughly a 15-35% reduction in attacks. The magnitudes are larger for this subsample but the statistically significant results remain negative.

Another subsample of potential interest is exporting countries that have a record of terrorism because it could be these countries are unique from others. These results are presented in Table 2.7. This provides yet another example of a subsample for which the theoretical predictions appear to hold. The results are statistically significantly negative. The magnitude of the point estimates is in between the previous two samples. These results suggest that a doubling of trade yields a roughly 0.2 to 0.4 reduction in the number of attacks against other countries. With an average number of attacks on this subsample of approximately 1.7, this would correspond to a 15-28% decrease. Thus, increasing exports from a country inclined to terrorism will reduce the incidence of terrorism against countries other than the destination country.

Lastly, the results in Table 2.8 give the effect of trade on terrorism for countries already experiencing attacks on the trading partner. Whereas this was the strongest subset of results for attacks on trading partners, this is the one subset for non-trading partners for which the results are not statistically significant. For ease of interpretation, the dependent variable

is the log transformation of the number of attacks on non-trading partners. Thus, the estimates can be interpreted as the percentage change in the number of attacks on foreigners other than the trade partner due to a 1% increase in exports to the foreign trade partner. The point estimates are generally negative but in no case is the estimate particularly close to statistical significance. The negative coefficients are certainly not conclusive but fit the overall narrative. Again, due to small sample sizes, it is not possible to further restrict the sample to exports greater than $1 million.

One variable that is excluded from the current analysis is a measure of the number of attacks perpetrated by foreign or transnational groups. This measure is present in the data. For all attacks for which the perpetrator was known, the attack was grouped into a domestic category if the organization was primarily based in the nation where the attack occurred. Otherwise, the attack was grouped into an international category. When this measure was included, for each of the regressions the results were very similar. This variable is excluded from the analysis because the distribution of attacks is likely endogenous to the local economy. Furthermore, a group's origin is often unknown. However, when this dimension is included, results are qualitatively unchanged.[4]

A country's relationship with other nations is a complicated one in the dyadic world of international trade. It is therefore not prudent to assume that trade is uncorrelated across countries. However, with the commonality of trade across importers as well as commonality of trade across exporters, it is appropriate to use two-way clustering. For each of the regressions in Tables 2.1 to 2.4, the standard errors are clustered at the exporter level and at the importer level. This is an appropriate method of treating standard errors but there are alternatives that may be even more robust. Cameron and Miller (2015) examine the dyadic role of trade. They conclude that dyadic correlation can be important in this context. This allows for correlation between any two observations that include a common country on either end of the trade flow. This form of clustering is prominent in the social network literature

[4]Available by request.

following the methodology of Fafchamps and Gubert (2007). The importance of dyadic correlation has not yet been established for terrorism but this is a potential extension of this current paper.

As trade is incorporated into the economy of a country with potential terrorists two potential dynamics occur. First, the incentives for attacking host country nationals are altered. As foreign nations gain primacy of influence in a country, domestic targets may become less appealing to terrorists. This is of significant interest as the majority of terrorist attacks are in fact domestic. Second, the economic presence of foreign countries will increase, making foreigners more easy to attack. Tables 2.9 to 2.11 present some suggestive evidence that one or both of these are indeed the case. The first row of parameter estimates give the marginal effect of a change in the total value of exports in a country on the number of terrorist attacks aimed at that country's own interests. Tables 2.9 and 2.10 give the change in the number of terrorist attacks if total exports were to be doubled. Table 2.11 gives the percentage change of the number of attacks on domestic interests resulting from a 1% increase in the country's total exports. The results do not provide any statistically significant evidence for a relationship between the total value of exports and the number of attacks on domestic interests. Despite this fact, there is a consistently negative sign on the $\log(TotalExports_{et})$ coefficient and it is only marginally insignificant for certain specifications. This is in accordance with the model. As shown in Section 2.2, as exports increase either (1) potential terrorists will become actual terrorists against foreigners or (2) existing terrorists substitute away from attacks on domestic targets to attacks on foreigners. The present results indicate that the second avenue may be occurring.

Taken together, these results paint a somewhat mixed picture regarding the debate over whether trade yields welfare-enhancing reductions in terrorist attacks across countries. There appears to be a type of targeting phenomenon in which foreign trading partners become a more primary focus of attacks as they gain a more prominent role in the economy. This is especially true for country-pairs that have already experienced attacks. Because trade

does reduce terrorism against other foreigners, there do exist some positive externalities to trade in that sense. While evidence is inconclusive, as a country trades more with these foreign partners, there may be a beneficial decrease in the number of attacks on the domestic parties. Further study would be needed to establish this. Thus, trade as an antiterrorist policy presents uncertain policy conclusions. Given the complicated nature of terrorism, this is not an altogether surprising result.

2.6 Conclusion

The relationship between trade and terrorism is a murky one. Popular discourse regarding the opening of markets and exchange of ideas indicates that we should expect trade to reduce the incidence of terrorism as ideas and goodwill are exchanged. Simultaneously, it can be argued that increased trade allows for increased interaction between potential terrorists and foreign targets that may, for a variety of reasons, be particularly appealing. This would instead increase the incidence of terrorism in a country.

Within the rational terrorist framework, individuals may choose to engage in terrorism as an entirely rational means for gaining socio-political prominence. Using a simple choice-theoretic framework, a few simple predictions can be derived. First, domestic individuals and non-trading partners should be targeted less frequently as foreign individuals come to represent a larger fraction of the economy. Second, trade has a theoretically ambiguous effect on terrorism against foreign trading partners because it increases the legitimate economic opportunities that would provide an alternative to terrorism. However their presence also makes them logistically easier to attack.

Because trade and terrorism decisions are simultaneously made, a simple regression of one variable on the other would suffer from endogeneity bias. To address this issue, which has not yet been done in the literature, instruments are employed for both bilateral trade values and countries' total exports. At the country-year level, terms of trade are a plausible

instrument when restricted to small countries. At the country-pair-year level, the probability the two countries share a common currency is used as an instrument. Through this double IV approach, unbiased estimates of the effect of trade on terrorism can be derived.

Econometric estimation yields strong support for trade's effect on terrorist attacks against foreigners and suggestive evidence for the effect on the home targets. A doubling of bilateral trade would yield a small but positive change in terrorism for general relationships between trade partners. Among trading partners that are already attacked, a one percent increase in trade would yield approximately 0.7% more attacks. That same increase in exports would have the opposite effect on the incidence of terrorism against foreigners from countries other than the trading partner. Doubling trade would reduce these attacks by roughly 0.5 attacks per year. Analysis of attacks on domestic targets do not yield statistically significant results but do have consistently negative estimates, as theoretically predicted.

This paper significantly improves on estimates of the relationship between trade and terrorism. Never before has the importance of endogeneity been fully accounted for from a econometric perspective. This paper presents evidence that bilateral trade is not a panacea for global peace. In fact, increased trade may have a perverse effect of increasing terrorism against certain targets. Bilateral trade policy is complicated and multifaceted. Trade's possible implications for terrorism must be considered.

Table 2.1: I.V.–Trading Partners–All Observations

	All Observations				All Observations, Exports> $1m			
	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)
Dep. Var.:	$\#TradePartnerAttacks$				$\#TradePartnerAttacks$			
$\log(Exports_{eit})$	0.060	0.000	0.001	0.054	-0.067	0.002	0.003	-0.329
	(0.182)	(0.003)	(0.004)	(0.054)	(0.140)	(0.005)	(0.005)	(1.213)
$\log(TotalExports_{et})$	-0.011	-0.012	-0.017	-0.019	-0.023	-0.025	-0.031	0.022
	(0.018)	(0.017)	(0.018)	(0.021)	(0.037)	(0.031)	(0.031)	(0.223)
$\log(GDP_{et})$			0.067	0.015			0.103	0.392
			(0.052)	(0.068)			(0.075)	(1.015)
$\log(Population_{et})$			0.035	0.180			0.070	-0.603
			(0.032)	(0.161)			(0.056)	(2.438)
$\log(GDP_{it})$			0.011	-0.019			0.025	0.201
			(0.012)	(0.031)			(0.022)	(0.627)
$\log(Population_{it})$			0.003	-0.008			0.012	0.064
			(0.006)	(0.015)			(0.011)	(0.189)
$\log(Distance_{ie})$				0.079				-0.400
				(0.085)				(1.447)
$Border_{ie}$				0.001				0.212
				(0.037)				(0.618)
$CommonLanguage_{ie}$				-0.038				0.116
				(0.033)				(0.465)
$Colony_{ie}$				-0.026				0.219
				(0.038)				(0.759)
N	76638	76638	71750	62058	47563	47563	45146	38571
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.2: I.V.–Trading Partners–Ever Terrorism for Country-Pair

	Country Pairs with Terrorism				Country Pairs with Terrorism, Exports> $1m			
	(30)	(31)	(32)	(33)	(34)	(35)	(36)	(37)
Dep. Var.:	$\#TradePartnerAttacks$				$\#TradePartnerAttacks$			
$\log(Exports_{eit})$	0.034	0.006	0.007	0.034	-0.170	0.010	0.012	0.030
	(0.048)	(0.005)	(0.005)	(0.033)	(0.624)	(0.008)	(0.008)	(0.041)
$\log(TotalExports_{et})$	-0.015	-0.024	-0.030	-0.026	0.008	-0.051	-0.053	-0.058
	(0.026)	(0.032)	(0.034)	(0.032)	(0.214)	(0.055)	(0.054)	(0.059)
$\log(GDP_{et})$			0.145	0.140			0.231	0.241
			(0.096)	(0.093)			(0.148)	(0.158)
$\log(Population_{et})$			0.128	0.271			0.265	0.339
			(0.125)	(0.212)			(0.232)	(0.261)
$\log(GDP_{it})$			0.020	0.005			0.050	0.043
			(0.026)	(0.021)			(0.045)	(0.034)
$\log(Population_{it})$			0.008	0.004			0.025	0.021
			(0.012)	(0.012)			(0.021)	(0.016)
$\log(Distance_{ie})$				0.031				0.020
				(0.044)				(0.045)
$Border_{ie}$				0.054				0.077
				(0.039)				(0.050)
$CommonLanguage_{ie}$				-0.033				-0.027
				(0.031)				(0.032)
$Colony_{ie}$				-0.009				0.011
				(0.026)				(0.028)
N	36183	36183	33324	29611	24106	24106	22544	20117
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.3: I.V.–Trading Partners–Ever Terrorism in Exporter

	Exporters with Terrorism				Exporters with Terrorism, Exports> $1m			
	(38)	(39)	(40)	(41)	(42)	(43)	(44)	(45)
Dep. Var.:	$\#TradePartnerAttacks$				$\#TradePartnerAttacks$			
$\log(Exports_{eit})$	0.074	0.005	0.005	0.041	-0.091	0.009*	0.010**	0.139
	(0.222)	(0.003)	(0.003)	(0.043)	(0.283)	(0.004)	(0.005)	(0.646)
$\log(TotalExports_{et})$	-0.015	-0.023	-0.028	-0.029	-0.036	-0.045	-0.050	-0.060
	(0.030)	(0.027)	(0.027)	(0.029)	(0.058)	(0.046)	(0.045)	(0.067)
$\log(GDP_{et})$			0.125	0.124			0.199	0.122
			(0.084)	(0.088)			(0.131)	(0.515)
$\log(Population_{et})$			0.103	0.266			0.206	0.587
			(0.089)	(0.199)			(0.162)	(1.795)
$\log(GDP_{it})$			0.016	-0.005			0.039	-0.022
			(0.020)	(0.022)			(0.035)	(0.314)
$\log(Population_{it})$			0.006	-0.001			0.021	0.002
			(0.010)	(0.011)			(0.017)	(0.089)
$\log(Distance_{ie})$				0.047				0.148
				(0.059)				(0.741)
$Border_{ie}$				0.028				-0.007
				(0.030)				(0.342)
$CommonLanguage_{ie}$				-0.037				-0.078
				(0.036)				(0.323)
$Colony_{ie}$				-0.010				-0.040
				(0.030)				(0.286)
N	46238	46238	42800	38162	29678	29678	27910	24982
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.4: I.V.–Trading Partners–Positive # Attacks

	Small Countries			
	(46)	(47)	(48)	(49)
Dep. Var.:	$\log(\#Attacks on Trade Partner)$			
$\log(Exports_{eit})$	-0.008	0.771*	0.770*	-1.473
	(0.107)	(0.432)	(0.395)	(1.834)
$\log(TotalExports_{et})$	0.117	-1.016	-0.829	1.029
	(0.292)	(0.668)	(0.760)	(1.586)
$\log(GDP_{et})$			-0.698	1.493
			(1.539)	(4.671)
$\log(Population_{et})$			2.978	0.861
			(5.423)	(10.119)
$\log(GDP_{it})$			0.139	4.811
			(1.671)	(4.227)
$\log(Population_{it})$			0.519	8.538
			(3.715)	(13.685)
$\log(Distance_{ie})$				-2.612
				(3.104)
$Border_{ie}$				0.270
				(0.822)
$CommonLanguage_{ie}$				-1.210
				(1.411)
$Colony_{ie}$				2.344
				(2.960)
N	353	353	347	326
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.5: I.V. - Non-Trading Foreigners - All Observations

	All Observations				All Observations, Exports> $1m			
	(50)	(51)	(52)	(53)	(54)	(55)	(56)	(57)
Dep. Var.:	$\#TradePartnerAttacks$				$\#TradePartnerAttacks$			
$\log(Exports_{eit})$	15.213	-0.240*	-0.133*	1.746	-13.369	-0.231*	-0.140	-9.902
	(47.208)	(0.133)	(0.077)	(1.410)	(25.670)	(0.130)	(0.089)	(34.874)
$\log(TotalExports_{et})$	-2.245	-2.506	-3.106	-3.223	-4.048	-4.416	-4.773	-3.235
	(3.511)	(3.168)	(3.193)	(3.223)	(6.355)	(4.644)	(4.599)	(8.045)
$\log(GDP_{et})$			10.921	9.434			10.731	19.435
			(7.525)	(7.663)			(6.803)	(29.385)
$\log(Population_{et})$			2.805	7.112			1.246	-19.466
			(5.005)	(6.157)			(3.816)	(71.019)
$\log(GDP_{it})$			0.088	-0.635			0.067	5.666
			(0.060)	(0.796)			(0.049)	(17.936)
$\log(Population_{it})$			-0.007	-0.216			-0.015	1.790
			(0.014)	(0.361)			(0.014)	(5.422)
$\log(Distance_{ie})$				2.774				-11.822
				(2.216)				(41.605)
$Border_{ie}$				-1.383				4.983
				(1.130)				(17.705)
$CommonLanguage_{ie}$				-0.928				3.808
				(0.753)				(13.390)
$Colony_{ie}$				-1.197				5.945
				(1.066)				(21.615)
N	76638	76638	71750	62058	47563	47563	45146	38571
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.6: I.V.–Non-Trading Foreigners–Ever Terrorism for Country-Pair

	Country Pairs with Terrorism				Country Pairs with Terrorism, Exports> $1m			
	(58)	(59)	(60)	(61)	(62)	(63)	(64)	(65)
Dep. Var.:	$\#Non-TradePartnerForeignerAttacks$				$\#Non-TradePartnerForeignerAttacks$			
$\log(Exports_{eit})$	9.485	-0.725*	-0.366**	1.776	-41.522	-0.637	-0.263	1.888
	(12.188)	(0.428)	(0.186)	(1.365)	(130.947)	(0.423)	(0.160)	(1.606)
$\log(TotalExports_{et})$	-1.799	-5.049	-5.943	-5.626	5.282	-8.169	-7.409	-8.884
	(6.695)	(5.994)	(6.010)	(5.875)	(46.472)	(8.319)	(6.643)	(8.102)
$\log(GDP_{et})$			25.005*	24.866*			19.778*	24.388*
			(14.599)	(14.690)			(10.625)	(13.790)
$\log(Population_{et})$			4.942	13.104			5.505	5.161
			(17.609)	(17.964)			(10.443)	(16.229)
$\log(GDP_{it})$			0.272*	-0.528			0.147	-0.356
			(0.147)	(0.871)			(0.095)	(0.973)
$\log(Population_{it})$			0.012	-0.036			-0.011	0.016
			(0.029)	(0.261)			(0.023)	(0.286)
$\log(Distance_{ie})$				2.534				2.171
				(1.848)				(1.847)
$Border_{ie}$				-1.668				-1.181
				(1.257)				(0.936)
$CommonLanguage_{ie}$				-1.153				-0.990
				(0.959)				(0.900)
$Colony_{ie}$				-0.985				-0.818
				(0.946)				(0.555)
N	36183	36183	33324	29611	24106	24106	27910	20117
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.7: I.V.–Non-Trading Foreigners–Ever Terrorism in Exporter

	Exporters with Terrorism				Exporters with Terrorism, Exports> $1m			
	(66)	(67)	(68)	(69)	(70)	(71)	(72)	(73)
Dep. Var.:	$\#Non-TradePartnerForeignerAttacks$				$\#Non-TradePartnerForeignerAttacks$			
$\log(Exports_{eit})$	19.741	-0.476*	-0.240*	2.067	-19.831	-0.392*	-0.263	8.995
	(62.519)	(0.261)	(0.128)	(1.728)	(55.375)	(0.227)	(0.160)	(42.508)
$\log(TotalExports_{et})$	-2.535	-4.469	-4.852	-4.842	-5.647	-7.275	-7.409	-7.849
	(7.329)	(4.876)	(4.675)	(4.604)	(10.816)	(6.942)	(6.643)	(6.914)
$\log(GDP_{et})$			19.974	19.948			19.778*	13.616
			(12.394)	(12.454)			(10.625)	(32.811)
$\log(Population_{et})$			7.062	15.924			5.505	30.676
			(12.366)	(13.696)			(10.443)	(121.084)
$\log(GDP_{it})$			0.178*	-0.773			0.147	-3.882
			(0.101)	(1.097)			(0.095)	(21.249)
$\log(Population_{it})$			0.003	-0.176			-0.011	-0.932
			(0.021)	(0.467)			(0.023)	(6.199)
$\log(Distance_{ie})$				3.004				10.333
				(2.404)				(48.908)
$Border_{ie}$				-1.752				-4.943
				(1.510)				(23.316)
$CommonLanguage_{ie}$				-1.379				-4.418
				(1.208)				(21.019)
$Colony_{ie}$				-0.965				-3.997
				(1.052)				(18.290)
N	46238	46238	42800	38162	29678	¿ 29678	27910	24982
Year F.E.	○	○	○	○	○	○	○	○
Importer/Exporter F.E.		○	○	○		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.8: I.V.–Non-Trading Foreigners–Positive # Attacks

	Small Countries			
	(74)	(75)	(76)	(77)
Dep. Var.:	$\log(\#AttacksNon-TradeForeigners)$			
$\log(Exports_{eit})$	-0.800	-0.187	-0.057	0.363
	(1.079)	(0.189)	(0.192)	(0.977)
$\log(TotalExports_{et})$	1.717	-0.897	-2.118	-1.781
	(1.726)	(1.219)	(1.623)	(1.602)
$\log(GDP_{et})$			4.631	1.988
			(4.008)	(4.997)
$\log(Population_{et})$			14.471	19.753**
			(13.056)	(8.358)
$\log(GDP_{it})$			0.639	-1.399
			(0.787)	(0.977)
$\log(Population_{it})$			7.713***	8.420
			(2.944)	(15.180)
$\log(Distance_{ie})$				0.658
				(1.656)
$Border_{ie}$				-0.337
				(0.275)
$CommonLanguage_{ie}$				0.111
				(0.715)
$Colony_{ie}$				-0.477
				(1.381)
N	305	305	303	284
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(Exports_{et})$ is predicted probability of pegging to common currency
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Two-way Importer-Exporter clustered std errors in parentheses
Constant and year/importer/exporter fixed effects not shown

Table 2.9: I.V.–Domestic Targets–All Observations

	Small Countries		
	(78)	(79)	(80)
Dep. Var.:	$\#Attacks on Domestic Targets$		
$\log(TotalExports_{et})$	-41.790	-40.677	-48.336
	(36.138)	(35.253)	(36.884)
$\log(GDP_{et})$			195.550**
			(94.759)
$\log(Population_{et})$			-123.233
			(88.455)
N	707	707	697
Year F.E.	○	○	○
Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Exporter clustered std errors in parentheses
Constant and year/exporter fixed effects not shown

Table 2.10: I.V.–Trading Partners–Ever Any Attack by Exporter

	Small Countries		
	(81)	(82)	(83)
Dep. Var.:	$\#Attacks on Domestic Targets$		
$\log(TotalExports_{et})$	-78.528	-69.664	-75.990
	(60.511)	(53.658)	(51.800)
$\log(GDP_{et})$			328.737**
			(147.455)
$\log(Population_{et})$			-295.120
			(190.680)
N	413	413	403
Year F.E.	○	○	○
Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Exporter clustered std errors in parentheses
Constant and year/exporter fixed effects not shown

Table 2.11: I.V.–Trading Partners–Positive # Attacks

	Small Countries		
	(84)	(85)	(86)
Dep. Var.:	$\log(\#AttacksonDomesticTargets)$		
$\log(TotalExports_{et})$	-7.862	-0.441	-1.047
	(44.863)	(0.782)	(0.981)
$\log(GDP_{et})$			5.147*
			(2.829)
$\log(Population_{et})$			-5.606
			(10.315)
N	129	129	126
Year F.E.	○	○	○
Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Instrument for $\log(TotalExports_{et})$ is terms of trade shock
Exporter clustered std errors in parentheses
Constant and year/exporter fixed effects not shown

2.7 Appendix

2.7.1 Logit Model Estimation

Table 2.12: Logit: Pegging to Anchor Currency

	Pegging to Euro	Pegging to Dollar
	(1)	(2)
Dep. Var.:	$D^{€}_{ct}$	$D^{\$}_{ct}$
$\log(Distance^{A}_{c})$	-0.951***	-0.535***
	(0.078)	(0.081)
$\log(GDP_{ct})$	0.345	7.363***
	(1.097)	(2.854)
$\log(Population_{ct})$	1.882	-9.088
	(19.754)	(6.741)
$\log(GDP_{ct}/GDP_{At})$	0.494	7.481***
	(1.097)	(2.855)
$\log(Population_{ct}/Population_{At})$	1.936	-8.894
	(19.754)	(6.740)
$CommonLanguage^{A}_{ct}$	0.638***	0.498***
	(0.162)	(0.131)
$Border^{A}_{c}$	0.602***	
	(0.226)	
$Colony^{A}_{c}$	1.192***	
	(0.146)	
N	1777	1777
χ^2	457.6	210.0

* p<0.10, ** p<0.05, *** p<0.01
Country clustered std errors in parentheses
Regressions for country c and anchor $A \in \{€, \$\}$

2.7.2 First Stage Regressions

Table 2.13: First Stage Attacks on Trading Partners - All Observations

	Small Countries			
	(87)	(88)	(89)	(90)
Dep. Var.:	$\log(Exports_{eit})$			
$TermsOfTrade_{et}$ -0.000	-0.001	-0.000	0.000	
	(0.001)	(0.001)	(0.001)	(0.000)
$ProbPeg_{eit}$	-0.797***	8.854***	8.844***	-0.993***
	(0.149)	(0.162)	(0.166)	(0.157)
$\log(GDP_{et})$			1.243***	1.105***
			(0.113)	(0.101)
$\log(Population_{et})$			-2.434***	-2.685***
			(0.277)	(0.244)
$\log(GDP_{it})$			0.643***	0.560***
			(0.071)	(0.061)
$\log(Population_{it})$			0.230***	0.196***
			(0.068)	(0.058)
$\log(Distance_{ie})$				-1.614***
				(0.013)
$Border_{ie}$				0.738***
				(0.045)
$CommonLanguage_{ie}$				0.539***
				(0.022)
$Colony_{ie}$				0.699***
				(0.070)
R^2	0.009	0.592	0.604	0.729
N	76638	76638	71750	62058
F	66.5	432.0	442.0	713.9
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and importer/exporter/year fixed effects not shown

	Small Countries		
	(91)	(92)	(93)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	0.007	0.007***	0.007***
	(0.005)	(0.001)	(0.001)
$\log(GDP_{et})$			1.593***
			(0.113)
$\log(Population_{et})$			-1.420***
			(0.300)
R^2	0.029	0.987	0.990
N	710	710	700
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.14: First Stage Attacks on Trading Partners - Ever Any Country-Pair Attack

	Small Countries			
	(94)	(95)	(96)	(97)
Dep. Var.:	$\log(Exports_{eit})$			
$TermsOfTrade_{et}$	-0.003**	-0.002***	-0.002***	-0.001*
	(0.001)	(0.001)	(0.001)	(0.001)
$ProbPeg_{eit}$	-1.527***	5.340***	5.748***	-1.135***
	(0.223)	(0.223)	(0.232)	(0.215)
$\log(GDP_{et})$			0.559***	0.324**
			(0.165)	(0.148)
$\log(Population_{et})$			-4.948***	-4.557***
			(0.478)	(0.425)
$\log(GDP_{it})$			0.683***	0.594***
			(0.092)	(0.079)
$\log(Population_{it})$			0.136	0.109
			(0.089)	(0.076)
$\log(Distance_{ie})$				-1.434***
				(0.018)
$Border_{ie}$				0.849***
				(0.061)
$CommonLanguage_{ie}$				0.652***
				(0.031)
$Colony_{ie}$				0.587***
				(0.089)
R^2	0.012	0.652	0.663	0.764
N	36183	36183	33324	29611
F	41.6	297.7	301.7	466.4
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and importer/exporter/year fixed effects not shown

	Small Countries		
	(98)	(99)	(100)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	0.007	0.010***	0.009***
	(0.008)	(0.001)	(0.001)
$\log(GDP_{et})$			1.756***
			(0.175)
$\log(Population_{et})$			-1.220**
			(0.581)
R^2	0.027	0.987	0.991
N	329	329	319
F	0.9	433.7	572.0
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.15: First Stage Attacks on Trading Partners - Ever Any Attack by Exporter

	Small Countries			
	(101)	(102)	(103)	(104)
Dep. Var.:	$\log(Exports_{eit})$			
$TermsOfTrade_{et}$	-0.001	-0.001**	-0.001	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)
$ProbPeg_{eit}$	-0.757***	6.727***	7.020***	-1.010***
	(0.196)	(0.202)	(0.209)	(0.197)
$\log(GDP_{et})$			0.518***	0.305**
			(0.152)	(0.136)
$\log(Population_{et})$			-4.520***	-4.218***
			(0.403)	(0.356)
$\log(GDP_{it})$			0.650***	0.585***
			(0.085)	(0.073)
$\log(Population_{it})$			0.206**	0.173**
			(0.082)	(0.070)
$\log(Distance_{ie})$				-1.468***
				(0.016)
$Border_{ie}$				0.798***
				(0.055)
$CommonLanguage_{ie}$				0.677***
				(0.028)
$Colony_{ie}$				0.489***
				(0.085)
R^2	0.011	0.636	0.647	0.751
N	46238	46238	42800	38162
F	44.9	353.8	358.9	559.0
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and importer/exporter/year fixed effects not shown

	Small Countries		
	(105)	(106)	(107)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	0.008	0.009***	0.009***
	(0.007)	(0.001)	(0.001)
$\log(GDP_{et})$			1.867***
			(0.155)
$\log(Population_{et})$			-1.573***
			(0.459)
R^2	0.033	0.986	0.990
N	415	415	405
F	1.4	515.6	704.3
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.16: First Stage Attacks on Trading Partners - Positive # Attacks

	Small Countries			
	(108)	(109)	(110)	(111)
Dep. Var.:	$\log(Exports_{eit})$			
$TermsOfTrade_{et}$	-0.035***	0.007	0.003	0.005
	(0.010)	(0.007)	(0.008)	(0.007)
$ProbPeg_{eit}$	8.674***	3.598	3.537	-1.828
	(2.439)	(2.497)	(2.518)	(2.163)
$\log(GDP_{et})$			2.255	1.758
			(2.026)	(1.648)
$\log(Population_{et})$			-1.737	-0.109
			(7.921)	(6.521)
$\log(GDP_{it})$				1.773
				(2.187)
$\log(Population_{it})$				7.020
				(8.279)
$\log(Distance_{ie})$				-1.852***
				(0.213)
$Border_{ie}$				-0.248
				(0.424)
$CommonLanguage_{ie}$				-0.746**
				(0.302)
$Colony_{ie}$				1.581***
				(0.367)
R^2	0.093	0.852	0.853	0.912
N	353	353	349	326
F	3.2	10.9	10.6	17.8
Year F.E.	○	○	○	○
Importer/Exporter F.E.		○	○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and importer/exporter/year fixed effects not shown

	Small Countries		
	(112)	(113)	(114)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	-0.007	0.007***	0.007***
	(0.010)	(0.001)	(0.001)
$\log(GDP_{et})$			0.936***
			(0.252)
$\log(Population_{et})$			1.216
			(0.793)
R^2	0.063	0.996	0.997
N	141	141	137
F	0.9	475.3	655.6
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.17: First Stage Attacks on Domestic Targets - All Observations

	Small Countries		
	(115)	(116)	(117)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	0.007	0.007***	0.007***
	(0.005)	(0.001)	(0.001)
$\log(GDP_{et})$			1.504***
			(0.114)
$\log(Population_{et})$			-1.482***
			(0.296)
R^2	0.031	0.987	0.990
N	707	707	697
F	2.2	600.1	758.2
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.18: First Stage Attacks on Domestic Targets - Ever Any Attack by Exporter

	Small Countries		
	(118)	(119)	(120)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	0.008	0.009***	0.009***
	(0.007)	(0.001)	(0.001)
$\log(GDP_{et})$			1.724***
			(0.157)
$\log(Population_{et})$			-1.773***
			(0.452)
R^2	0.032	0.987	0.991
N	413	413	403
F	1.3	542.2	711.4
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Table 2.19: First Stage Attacks on Domestic Targets - Positive # Attacks

	Small Countries		
	(121)	(122)	(123)
Dep. Var.:	$\log(TotalExports_{et})$		
$TermsOfTrade_{et}$	-0.008	0.007***	0.007***
	(0.011)	(0.001)	(0.001)
$\log(GDP_{et})$			0.850***
			(0.271)
$\log(Population_{et})$			1.430
			(0.862)
R^2	0.071	0.996	0.997
N	129	129	126
F	0.9	534.6	700.7
Year F.E.	○	○	○
Importer/Exporter F.E.		○	○

* p<0.10, ** p<0.05, *** p<0.01
Std errors in parentheses
Constant and exporter/year fixed effects not shown

Bibliography

Abrams, Richard K (1980) "International trade flows under flexible exchange rates," *Economic Review*, Vol. 65, pp. 3–10.

Alaouze, Chris M, John S Marsden, and John Zeitsch (1977) "Estimates of the Elasticity of Substitution between Imported and Domestically Produced Commodities at the Four Digit ASIC Level,"Technical report, Monash University, Centre of Policy Studies/IMPACT Centre.

Anderson, James E (2014) "Terrorism, Trade and Public Policy," *Research in Economics*.

Anderson, James E and Douglas Marcouiller (1997) "Trade and Security, I: Anarchy,"Technical report, National Bureau of Economic Research.

Anderson, James E. and Douglas Marcouiller (2002) "Insecurity and the Pattern of Trade: An Empirical Investigation," *Review of Economics and Statistics*, Vol. 84.2, pp. 342–352.

Armington, Paul S. (1969) "A Theory of Demand for Products Distinguished by Place of Production," *Staff Papers- International Monetary Fund*, pp. 159–178.

Atkin, David (2013) "Trade, Tastes, and Nutrition in India," *The American Economic Review*, Vol. 103.5, pp. 1629–1663.

Barbieri, Katherine (1996) "Economic interdependence: A path to peace or a source of interstate conflict?" *Journal of Peace Research*, Vol. 33, pp. 29–49.

——— (2002) *The Liberal Illusion: Does Trade Promote Peace?*: University of Michigan Press.

Becker, Gary S (1968) "Crime and Punishment: An Economic Approach," *Journal of Political Economy*, Vol. 76.

Becker, Gary Stanley (1971) *Economic Theory*: Alfred Knoff.

Becker, Gordon M., Morris H. DeGroot, and Jacob Marschak (1964) "Measuring Utility by a Single-Response Sequential Method," *Behavioral Science*, Vol. 9.3, pp. 226–232.

Berrebi, Claude (2007) "Evidence about the link between education, poverty and terrorism among Palestinians," *Peace Economics, Peace Science and Public Policy*, Vol. 13.

Blomberg, S Brock and Gregory D Hess (2005) "The Lexus and the olive branch: Globalization, democratization and terrorism," *Democratization and Terrorism (November 2005)*.

——— (2006) "How much does violence tax trade?" *The Review of Economics and Statistics*, Vol. 88, pp. 599–612.

Broda, Christian (2004) "Terms of trade and exchange rate regimes in developing countries," *Journal of International Economics*, Vol. 63, pp. 31–58.

Cameron, A. Colin, Jonah B. Gelbach, and Douglas L. Miller (2008) "Bootstrap-based Improvements for Inference with Clustered Errors," *The Review of Economics and Statistics*, Vol. 90.3, pp. 414–427.

Cameron, A. Colin and Douglas L. Miller (2015) "Robust Inference for Dyadic Data," Presented at the Winter North American Meetings of the Econometric Society, Boston, January 5, 2015.

Crenshaw, Martha (1981) "The causes of terrorism," *Comparative Politics*, pp. 379–399.

——— (2001) "Why America? The globalization of civil war," *Current History-New York Then Philadelphia*, Vol. 100, pp. 425–432.

Dornbusch, Rudiger, Stanley Fischer, and Paul Anthony Samuelson (1977) "Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods," *The American Economic Review*, pp. 823–839.

Enders, Walter and Todd Sandler (1993) "The Effectiveness of Antiterrorism Policies: A Vector-Autoregression-Intervention Analysis.," *American Political Science Review*, Vol. 87, pp. 829–844.

——— (2004) "What do we know about the substitution effect in transnational terrorism," *Researching Terrorism: Trends, achievements, failures*, Vol. 119, p. 137.

Evans, Carolyn L (2001) "Home Bias in Trade: Location or Foreign-ness?"Technical report, Staff Report, Federal Reserve Bank of New York.

Fafchamps, Marcel and Flore Gubert (2007) "The formation of risk sharing networks," *Journal of Development Economics*, Vol. 83, pp. 326–350.

Frankel, Jeffrey A and Shang-Jin Wei (1993) "Trade blocs and currency blocs," *NBER Working Paper No. 4335*.

Gallaway, Michael P, Christine A McDaniel, and Sandra A Rivera (2003) "Short-run and Long-run Industry-level Estimates of US Armington Elasticities," *The North American Journal of Economics and Finance*, Vol. 14, pp. 49–68.

Helpman, Elhanan (1999) "The Structure of Foreign Trade," *The Journal of Economic Perspectives*, Vol. 13.2, pp. 121–144.

Hillberry, Russell and David Hummels (2013) "Trade Elasticity Parameters for a Computable General Equilibrium Model," *Handbook of Computable General Equilibrium Modeling*, Vol. 1, pp. 1213–1269.

Hoffmann, Vivian and Ken Mwithirwa Gatobu (2014) "Growing their Own: Unobservable Quality and the Value of Self-provisioning," *Journal of Development Economics*, Vol. 106, pp. 168–178.

Keshk, Omar MG, Brian M Pollins, and Rafael Reuveny (2004) "Trade still follows the flag: The primacy of politics in a simultaneous model of interdependence and armed conflict," *Journal of Politics*, Vol. 66, pp. 1155–1179.

Khandelwal, Amit (2010) "The long and short (of) quality ladders," *The Review of Economic Studies*, Vol. 77, pp. 1450–1476.

Krueger, Alan B (2008) "What makes a homegrown terrorist? Human capital and participation in domestic Islamic terrorist groups in the USA," *Economics Letters*, Vol. 101, pp. 293–296.

Krueger, Alan B and Jitka Malečková (2003) "Education, poverty and terrorism: Is there a causal connection?" *The Journal of Economic Perspectives*, Vol. 17, pp. 119–144.

Kydd, Andrew H and Barbara F Walter (2006) "The strategies of terrorism," *International Security*, Vol. 31, pp. 49–80.

Landes, William M (1978) "Economic Study of U.S. Aircraft Hijacking, 1961-1976," *Journal of Law & Economics*, pp. 1–31.

Li, Quan and Drew Schaub (2004) "Economic Globalization and Transnational Terrorism A Pooled Time-Series Analysis," *Journal of Conflict Resolution*, Vol. 48, pp. 230–258.

Markusen, James R (2013) "Putting Per-capita Income Back into Trade Theory," *Journal of International Economics*, Vol. 90, pp. 255–265.

Martin, Philippe, Thierry Mayer, and Mathias Thoenig (2008) "Make trade not war?" *The Review of Economic Studies*, Vol. 75, pp. 865–900.

Mendoza, Enrique G (1995) "The terms of trade, the real exchange rate, and economic fluctuations," *International Economic Review*.

Mirza, Daniel and Thierry Verdier (2008) "International trade, security and transnational terrorism: Theory and a survey of empirics," *Journal of Comparative Economics*, Vol. 36, pp. 179–194.

National Consortium for the Study of Terrorism And Responses to Terrorism (2010) "Global Terrorism Database," http://www.start.umd.edu/gtd.

Neumayer, Eric and Thomas Plümper (2011) "Foreign terror on Americans," *Journal of Peace Research*, Vol. 48, pp. 3–17.

Nitsch, Volker and Dieter Schumacher (2004) "Terrorism and international trade: an empirical investigation," *European Journal of Political Economy*, Vol. 20, pp. 423–433.

Obstfeld, Maurice and Kenneth Rogoff (2001) "The Six Major Puzzles in international Macroeconomics: is there a Common Cause?" *NBER Macroeconomics Annual 2000*, Vol. 15, pp. 339–412.

Parlow, Anton (2013) "Does trade promote peace? - Using a gravity equation in a nn dyadic relationships world," Ph.D. dissertation, University of Wisconsin-Milwaukee.

Polachek, Solomon W (1997) "Why democracies cooperate more and fight less: the relationship between international trade and cooperation," *Review of International Economics*, Vol. 5, pp. 295–309.

Polachek, Solomon W and Carlos Seiglie (2007) "Trade, peace and democracy: an analysis of dyadic dispute," *Handbook of Defense Economics*, Vol. 2, pp. 1017–1073.

Polachek, Solomon William (1980) "Conflict and trade," *Journal of Conflict Resolution*, Vol. 24, pp. 55–78.

Ravelosoa, Julia Rachel, Steven Haggblade, and Harivelo Rajemison (1999) *Estimation des Elasticités de la Demande à Madagascar à Partir d'un Modèle AIDS*: Repoblikan'i Madagasikara, Ministère des finances et de l'économie, Secrétariat général, Institut national de la statistique.

Reinert, Kenneth A and David W Roland-Holst (1992) "Armington Elasticities for United States Manufacturing Sectors," *Journal of Policy Modeling*, Vol. 14, pp. 631–639.

Rose, Andrew K and Charles Engel (2002) "Currency Unions and International Integration.," *Journal of Money, Credit & Banking (Ohio State University Press)*, Vol. 34.

Samuelson, Paul A (1954) "The transfer Problem and Transport Costs, II: Analysis of Effects of Trade Impediments," *The Economic Journal*, pp. 264–289.

Shiells, Clinton R, Robert M Stern, and Alan V Deardorff (1986) "Estimates of the Elasticities of Substitution between Imports and Home Goods for the United States," *Weltwirtschaftliches Archiv*, Vol. 122, pp. 497–519.

Tenreyro, Silvana (2007) "On the trade impact of nominal exchange rate volatility," *Journal of Development Economics*, Vol. 82, pp. 485–508.

Trefler, Daniel (1995) "The Case of the Missing Trade and other Mysteries," *The American Economic Review*, Vol. 85:5, pp. 1029–1046.

Valenzuela, Ernesto, Kym Anderson, and Thomas Hertel (2008) "Impacts of Trade Reform: Sensitivity of Model Results to Key Assumptions," *International Economics and Economic Policy*, Vol. 4, pp. 395–420.

Yi, Kei-Mu (2010) "Can Multistage Production Explain the Home Bias in Trade?" *The American Economic Review*, Vol. 100:1, pp. 364–393.