

Terrorist Activities against Association of Southeast Asian Nations (ASEAN) and Exports from the United States to ASEAN Countries

Tam Bang Vu, Heng (Helen) Tien, and Jeffrey Pieper

Abstract—This research examines the impact of terrorist activities against Association of Southeast Asian Nations (ASEAN) countries and the US exports to these countries over the period from 1988 to 2017. A traditional gravity model is extended to allow non-gravity variables such as terrorist activities and two policy-related variables: relative exchange rate and relative corruption level between the US and each of the ASEAN countries. We find that terrorist activities have negative and significant impacts on exports from the US to ASEAN countries both directly and indirectly.

Index Terms—Gravity model, terrorism, corruption level, exchange rate regimes.

I. INTRODUCTION

The Association of Southeast Asian Nations (ASEAN) was founded in 1967, with original member states: Indonesia, Malaysia, Philippines, Singapore and Thailand. ASEAN currently is comprised of ten nations. Brunei, Cambodia, Laos, Myanmar, and Viet Nam have joined ASEAN since 1967. With high export growth rates since the 1980s, ASEAN has harvested the fruits of its hard work. However, terrorist activities can hamper trade. Hence, ASEAN should be concerned with the terrorist attacks against its partners and must be able to assess the damages caused by global terrorism so that it can adjust its policies accordingly.

In this paper, we use data on terrorist activities on the soil of ASEAN countries. Those countries where terrorist activities occur are referred to as host countries. We analyze US exports to these ASEAN countries using an extended gravity model for a set of panel data by utilizing these three variables in addition to the traditional gravity variables: per capita incomes of export and import countries and bilateral distances.

Section II of this paper discusses existing research. Section III presents the methodology and data. Section IV analyzes the estimation results. Section V provides policy suggestions and concludes.

II. EXISTING RESEARCH

Anderson [1] was the first author to introduce a theoretical justification for the gravity model although Tinbergen [2], Poyhonen [3] and Linneman [4] were the first authors to apply the gravity model to bilateral trade estimations without

a theoretical foundation. Bergstrand [5] improves Anderson's model by adding the costs of distribution, marketing, and dependence of each country's products on their own market conditions into the equation. Bergstrand [6] enhances his 1985 model by incorporating monopolistic competitive markets and a production function with increasing returns to scale in the Heckscher-Ohlin framework. Rauch [7] extends the model to allow several variables that might affect bilateral trade such as the common border between the two countries, linguistic and colonial links, and trade bloc membership.

Baier and Bergstrand [8] revise the Bergstrand model further by adding trade openness to the model, including transport-cost reduction and tariff liberalization. Feenstra [9] modifies the original equation to allow for multilateral resistance. van Bergeijk [10] applies the Feenstra model to estimate the volume of trade rather than exports or imports. Fracasso [11] uses per capita income of each country separately. All these papers find that incomes or per capita incomes in both countries affect bilateral trade positively.

The topic of terrorism and bilateral trade is fairly new in economic literature. Nitsch and Schumacher [12] were the first to provide a paper on bilateral trade and terrorism. They find that terrorist activities reduce the volume of trade. Specifically, a 100 percent increase in the number of terrorist incidents is associated with a decrease in the volume of trade by roughly four percent. The idea of terrorism as a bilateral activity, which involves a source country and a host country, is new. Blomberg and Rosendorff [13] find that incomes of both, source and host countries, have a significantly positive impact on bilateral terrorism. Mirza and Verdier in 2008 [14] also recommend that bilateral flows of transnational terrorism be used as a bilateral variable in the gravity model. Their idea is an extension of a paper by Mirza and Verdier in 2006 [15]. They find a two-way causality between bilateral terrorism and trade flows.

Blomberg and Rosendorff [13] identify the source countries for much transnational terrorism by reading the descriptions of terrorist incidents for the period 1968-2003 reported in Miklous *et al.* [16], but the identification was based on their own judgment, as such it is full of subjectivity. For this reason, the other studies have used only data on terrorist activities in host countries. Blomberg and Mody [17] discover that violence in the forms of terrorism, revolutions, and wars in a host nation reduces investment, mainly in developing countries. Piazza and Walsh [18] find that terrorism increases human rights' restrictions by the governments in the host countries. Llorca-Vivero [19] shows that terrorism reduces tourist flows to a host country, and

Manuscript received November 18, 2018; revised April 11, 2019.
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Berrebi and Ostwald [20] reveal that terrorism decreases the rate of fertility in the host countries.

Based on this analysis, we also use data on terrorist activities in the host countries only for our estimations. Different from the above authors, we investigate terrorist activities that have occurred in the aforementioned ten ASEAN countries and examine the effects of these attacks on exports from the U.S. Dutt and Traca [21] show empirically that corruption hurts trade in a majority of cases, inspiring us to investigate how corruption in ASEAN countries might affect the importation of US goods, which is the equivalency of US exports to these countries.

III. METHODOLOGY AND DATA

A. Methodology

We explore the traditional gravity model and account for terrorist activities in the following model, in which all gravity variables are in logarithmic form:

$$EXP_{ij,t} = \alpha_1 + \alpha_2 TER_{j,t-k} + \alpha_3 PCY_{i,t-k} + \alpha_4 PCY_{j,t-k} + \alpha_5 DIS_{ij} + \alpha_6 EXC_{ij,t-k} + \alpha_7 COR_{ij,t-k} + \varepsilon_{it} \quad (1)$$

where:

$TER_{j,t-k}$ = terrorist activities; $EXP_{ij,t-k}$ = per capita exports from country i to country j ;

$PCY_{i,t-k}$ = per capita income of country i ; $PCY_{j,t-k}$ = per capita income of country j ;

DIS_{ij} = the distance between countries i and country j ;

$EXC_{ij,t-k}$ = exchange rate (country i 's currency in term of country j 's); $COR_{ij,t-k}$ = relative corruption level between country i and country j ; in which i = the United States; $j = 1, 2.. 10$ each of the 10 ASEAN countries; and t is time.

To examine the indirect effects of the terrorist activities in these trade partners of ASEAN, we also form the variable $TERY$ as the interaction of TER and PCY .

$$TERY_{j,t-k} = TER_{j,t-k} * PCY_{j,t-k} \quad (2)$$

Since $TERY$ is written as a function of TER and PCY , there are high correlations among these three variables, and so $TERY$ is estimated alternatively in a separate model:

$$EXP_{ij,t} = \beta_1 + \beta_2 TERY_{j,t-k} + \beta_3 PCY_{i,t-k} + \beta_4 PCY_{j,t-k} + \beta_5 DIS_{ij} + \beta_6 EXC_{ij,t-k} + \beta_7 COR_{ij,t-k} + \varepsilon_{it} \quad (3)$$

Holding other variables unchanged, the coefficient of $TERY$ can be written as:

$$\beta_2 = \frac{EXP_{ij,t}}{TER_{j,t-k} * PCY_{j,t-k}} = \frac{EXP_{ij,t} / PCY_{j,t-k}}{TER_{j,t-k}}, \quad (4)$$

where the expression $EXP_{ij,t} / PCY_{j,t-k}$ measures the composition of per capita exports to per capita income.

B. Data

Data on exports from the US to ASEAN countries are from

the Direction of Trade Statistics CD [22] provided by the International Monetary Fund (IMF) and updated with the data on the IMF website. These data are for exports of goods from the US to ASEAN countries during the period from 1988 to 2017, making a total of 300 observations. The data are in current US dollars. Trade in services takes a back seat in ASEAN's economies. Thus, using data on exports of goods is acceptable.

Data on the number of terrorist incidents that occurred in the above ten countries are from the Global Terrorism Database (GTD) CD, updated by its Advisory Board website. Data are available for the period from 1980 to 2017, allowing for several lagged variables without reducing the numbers of observations. Incidents are reported monthly for each country, so we add them up to obtain the yearly data.

Data for per capita income, population, and GDP deflator are from the US Department of Agriculture website. We convert the bilateral trade data in current dollars to those in constant dollars using the GDP deflators. Data on exports are then divided by population to obtain per capita measures. Data on corruption are from the Worldwide Governance Indicators Series on the World Bank website. The data is for the corruption level in each country. We convert this dataset to the relative level of corruption between each of the ASEAN countries and the US by forming the ratio of the two indices.

Data on distances are from the Institute for Research on the International Economy website. We also experiment with the internal distance ($INDIS$) for each region added. The internal distance is defined as the average distance between any two points within a region, which is greater the greater the land size of the region. Hence, the average distance between host area and source area in region j with a land size A_j is equal to the radius of a circular area, which is approximately equal to the region's land size A_j :

$$INDIS_{jj} = \sqrt{A_j / \pi} \quad (5)$$

Data on real exchange rates are also from the US Department of Agriculture website. They are expressed as the comparative exchange rate between a country and US real exchange rate, which is normalized to unity. We calculate the average exchange rate for ASEAN and convert this dataset to the bilateral exchange rate between each of the ASEAN countries and the US by forming the ratio of the two exchange rates. All other data are available for the period from 1988 to 2017.

IV. ESTIMATION RESULTS

We first perform the AIC procedures and find that models using one-lag values are the best: the AIC values are smallest for all four models. Next, we carry out the Granger Causality tests to investigate the possible two-way causality. The results for all models show that exports per capita from SEA to its trade partners do not Granger cause the terrorist activities. Hence, single-equation estimations are appropriate. We then perform the modified Hausman test, called the second variant of the Hausman test in Kennedy [23], and find that the models do not have any endogenous problem. Table I

shows the results.

TABLE I: AGGREGATE EFFECTS OF TERRORISM ON US EXPORTS TO SEA COUNTRIES

Dependent Variable: Logarithm of Bilateral Exports per Capita

Variable	Model (1)	Model (3)
TER _j	-0.7111** (0.032)	-
TERY _j	-	-0.0814** (0.034)
PCY _i	0.3680** (0.026)	0.3716** (0.025)
PCY _j	1.1049*** (0.003)	1.1113*** (0.002)
EXC _{ij}	0.7595*** (0.004)	0.7269*** (0.006)
DIS _{ij}	-0.4769 (0.275)	-0.4176 (0.334)
COR _{ij}	-0.0436** (0.025)	-0.0415** (0.027)
IDIS	0.0018** (0.032)	0.0016** (0.046)
Sample Size	280	280
Prob > F	0.000	0.000
R-Squared	0.7862	0.7784
Root MSE	0.4849	0.4853

Notes: p-value in parenthesis; *, **, *** denotes significances at 10%, 5%, and 1%, respectively.

The original Hausman tests performed for model selection indicates that fixed effect (FE) models are more suitable than random effect (RE) ones. Hence all estimations are carried out using a fixed effect approach of least squares dummy variables (LSDV) with both country and time dummies added as discussed in Greene [24]. Next, we experiment with adding trade openness to the model but find that the estimated coefficients are highly insignificant in the presence of terrorist activities. The Ramsey RESET tests show that the models do not have any important omitted variable. The White tests reveal that there are heteroskedasticity problems on all models. Therefore, the subsequent regressions are performed using the Stata robust commands to obtain corrected standard errors. The Arellano-Bond [25] tests on the possible autocorrelations for panel data show that there are no serious autocorrelation problems,

TABLE II: GROUP EFFECTS OF TERRORISM ON US EXPORTS TO EACH GROUP IN SEA

Dependent Variable: Logarithm of Bilateral Exports per Capita

Variable	Model (1)	Model (3)
HITE _i	-0.0775** (0.019)	-
HITY _i	-	-0.0845** (0.030)
METE _i	-0.005 (0.069)	-
METY _i	-	0.004 (0.238)
LOTE _i	0.197*** (0.002)	-
LOTY _i	-	0.336*** (0.001)
PCY _i	0.2799** (0.046)	0.2453** (0.049)
PCY _j	1.262*** (0.001)	1.183*** (0.003)
EXC _{ij}	0.7279*** (0.003)	0.7195*** (0.002)
DIS _{ij}	-0.3247 (0.193)	-0.3756 (0.176)
COR _{ij}	-0.0412** (0.029)	-0.0424** (0.031)

IDIS	0.0016** (0.025)	0.0017** (0.038)
Sample Size	280	280
Prob > F	0.000	0.000
R-Squared	0.7734	0.7841
Root MSE	0.4774	0.4705

Notes: p-value in parenthesis; *, **, *** denotes significances at 10%, 5%, and 1%, respectively.

We next investigate the effects of terrorist activities in certain groups of countries in the SEA. The 10 countries in questions are divided into three groups: the high level, intermediate level, and low level of terrorist activities. The first comprises four countries with the highest number of terrorist incidents: Cambodia, Indonesia, and the Philippines. Table II displays the estimation results. The interaction terms of this group with *TER* and *TERY* form the high-terrorism variables (*HITE* and *HITY*, respectively).

The second group comprises countries with the intermediate level of terrorist activities: Thailand and Malaysia. The interaction terms of this group with *TER* and *TERY* create the medium-terrorism variables (*METE* and *METY*, respectively). The last group is the remaining countries with low level of terrorist activities (*LOTE* and *LOTY*, respectively). The *HITE* and *HITY* are used as the base dummies.

V. DISCUSSION

Table I reveals the aggregate effects of the terrorist activities against ASEAN countries on the US exports to these countries. It shows that terrorist activities in the host countries affect per capita exports from the US negatively. The estimated coefficients are statistically significant for all four models. Specifically, when terrorist activities double in the host countries, there is a reduction of 0.71 percent and 0.77 percent in per capita exports from the US to ASEAN countries for Models (1) and (3), respectively.

Table II reveals that per capita exports from SEA to the group with a high level of terrorist activities suffer more reduction than the average level in the aggregate estimations. For example, a coefficient of *HITE* is -0.838 versus -0.774 for *TER*, and that of *HITY* is -0.987 versus -0.926 for *TERY*. In addition, the F tests performed on the differences between the two coefficients confirm that they are significantly so. Note that the estimated coefficients for the other groups are expressed relative to the base dummies.

However, the reductions in per capita exports from SEA to the group with the low level of terrorist activities are substantially less than those for the other two groups and significantly so as evidenced by their respective p-values, which are all less than 0.002.

VI. CONCLUSION

The estimation results discussed in the previous section show that exports from the SEA are severely influenced by the terrorist activities against its major trade partners. There are several strategies that SEA can implement to mitigate these negative impacts.

First, improve SEA's partnership in any arrangement of counterterrorist-oriented relationships, either multilateral or

bilateral, with the global community. Second, preventive measures should be carried out to avoid possible problems in the future. Third, make every effort to fight corruption, which has directly impinged negative effects on SEA's exports. Fourth, improve SEA's trade relations with other countries by engaging in more free trade agreements, mutually tariff reductions, and economic cooperation.

Due to the limitations of the gravity model in general and the ASEAN's trade deficits in particular, the magnitudes of the estimated coefficients in this paper should be interpreted with caution. It is more prudent to pay attention to the direction and a confident interval of change instead of a specific number. Still, some adjustments can be made based on the research results concerning these confident intervals. It is the author's hope that future research can exploit the analyses in this paper and the foundation of trade theory to develop more sophisticated models for bilateral trade with more interdependent relationships between any two regions.

CONFLICT OF INTEREST

The submitted work was carried out without any conflict of interest whatsoever.

AUTHOR CONTRIBUTIONS

Tam Vu initiated the theoretical model and wrote the Introduction, the Literature Review, as well as the Methodology Sections. Heng Tien performed the data analysis and wrote the Data as well as the Estimation Results sections. Jeffrey Pieper wrote the Discussion and the Conclusion sections, as well as went over the whole paper. All authors had approved the final version.

ACKNOWLEDGMENT

The authors wish to thank the ICABE attendants for their valuable comments on this paper.

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