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# Trade Potential and UN Peacekeeping Participation

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**ABSTRACT**
The determinants of a country's UN peacekeeping troop contribution have been persistently studied. Trade, as a crucial self-interest motivation, is one of the important explanatory variables in the extant literature. However, the existing literature presents mixed results on the influence of trade on peacekeeping troop contributions. To capture the effect of trade on contributions precisely, we need to model expectations about future trade volume in a better way. Countries are pressured by the economic and political risks caused by the trade disruption and lobby groups to send peacekeeping troops to enable future trade or secure future investments. Therefore, trade potential, rather than realized trade, drives peacekeeping troop contributions. A gravity model is used to measure the trade potential between the UN peacekeeping mission countries and contributors, and test its relationship with the UN peacekeeping participation. Based on this measurement and a dyadic troop contribution dataset covering the period from 1990 to 2012, this article demonstrates that the counter-factual predictive trade volume is a relevant predictor of UN peacekeeping troop contributions.

## 1. Introduction

Peacekeeping is an important conflict resolution tool. In the light of its importance, there is a question to be raised: what determines peacekeeping troop contributions? Scholars give different answers to this question. Trade is one of the important explanatory variables of this question for it is a crucial self-interest motivation. However, the existing literature finds mixed results about the trade's influence on peacekeeping troop contribution.[1] Different papers examine the relationship in different ways. Rost and Greig[2] examine the non-UN peacekeeping operations and find that

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[1]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces"; Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations"; Rost and Greig, "Taking Matters into Their Own Hands"; Gaibulloev et al., "Personnel Contributions to UN and Non-UN Peacekeeping Missions."
[2]Rost and Greig, "Taking Matters into Their Own Hands."

trade interest can explain the peacekeeping contributions while Perkins and Neumayer find that there is no association between trade ties and peacekeeping contributions if examining both UN peacekeeping and non-UN peacekeeping operations. Following examining peacekeeping contributions, Stojek and Tir utilize UN Security Council's five permanent members' (P5 countries) trade volumes with UN peacekeeping host countries to test trade's influence on peacekeeping participation. They argue that country's contribution is secondary to the mission authorization and therefore, the UN peacekeeping participation is influenced by the key states' trade interests, i.e. P5 countries' interest rather than all countries' trade interest. However, it is possible that individual country's trade interest still matters. It could be the reason that the actual trade volume itself may not be a good indicator of a country's trade interest, given that Stojek and Tir regard the realized trade volume as the forward-looking trade opportunity.

I argue that trade potential is a better indicator to show a country's trade interest in peacekeeping host countries when trade ties are disrupted by wars. Trade potential estimates the extra trade volume, which is the trade volume additional to the realized or actual trade volume. Not only P5 countries but many countries are potentially concerned about the disrupted trade influences the domestic economy and prefer to protect their established trade linkages and investments in mission countries. The objective of peacekeeping is to restore peace which may allow for future trade; in other words, trade potential of peace rather than realized trade under conflict should motivate peacekeeping contributions. Furthermore, this paper links the concept of trade potentials from the field of the economic integration with peacekeeping studies. It bridges the economic literature via using the concept of trade potential in conflict studies and helps conflict literature adding a new variable to explain the motivation of peacekeeping contribution.

In the next section, I review the literature on what determines peacekeeping contributions, in the process of which I pinpoint the position of economic motivations in peacekeeping contributions literature. Then, I narrow it down to the relationship between trade ties and peacekeeping contributions. I show how scholars use different ways to examine the trade's influence on peacekeeping participation. I argue that trade potential is a better indicator of peacekeeping contributors' private interest and present my theoretical mechanism linking trade potential and peacekeeping contributions. Next, I present my research design and discuss my empirical result. I introduce how to use the gravity model to measure trade potentials and use logistic regression to run the main model. Finally, I conclude that trade potentials influence UN peacekeeping participation.

## 2. Peacekeeping Motivations and Peacekeeping Contribution

Earlier scholars claim that the peacekeeping contribution can be regarded as an impure public goods[3] or a 'joint product model'.[4] Peacekeeping operations include both public benefits, i.e. world peace, which is accessible to any country, and private benefits, such as financial reimbursements. In other words, in the process of providing public goods, the providers gain various benefits. Otherwise, if the provider does not receive any private benefit, peacekeeping contribution will be under-provided or even not be provided.[5] Therefore, several studies have focused on the private benefits and distinguish different kinds of private benefits, which can be generally classified into three categories: political benefits, economic benefits and normative benefits.

From the perspective of political benefits, countries send peacekeeping for regional security concerns,[6] coup-proofing,[7] maintaining political or foreign policy affinity,[8] stabilizing former colonial ties[9] and stemming refugee flows.[10] Normatively speaking, some countries send peacekeeping troops for winning a 'good citizen' reputation.[11] Then, there are economic motivations including financial reimbursements,[12] getting foreign aid from 'pivotal states', i.e. developed countries[13] and trade interests.[14]

Even though trade interest, as one type of economic benefits, is intuitive in explaining the motivation of peacekeeping troop contributions, the literature present mixed results. In previous research, Rost and Greig[15] found a statistically significant relationship in state-conducted peacekeeping operations while Perkins and Neumayer[16] who examine both UN peacekeepings and non-UN peacekeeping operations find no association. Following upon Perkins and Neumayer, Stojek and Tir[17] examine the scope of UN peacekeeping operations, and respond to Perkins' no association result. Given that Perkins and Neumayer's paper finds no association, Stojek and Tir

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[3]Bobrow and Boyer, "Maintaining System Stability."
[4]Khanna, Sandler, and Shimizu, "The Demand for UN Peacekeeping."
[5]Boutton and D'Orazio, "Buying Blue Helmets."
[6]Bove and Elia, "Supplying Peace"; Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces."
[7]Kathman and Melin, "Who Keeps the Peace?"; Lundgren, "Backdoor Peacekeeping."
[8]Ward and Dorussen, "Standing Alongside Your Friends."
[9]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces."
[10]Uzonyi, "Refugee Flows and State Contributions."
[11]Neack, "UN Peace-Keeping."
[12]Bobrow and Boyer, "Maintaining System Stability"; Gaibulloev et al., "Personnel Contributions to UN and Non-UN Peacekeeping Missions."
[13]Boutton and D'Orazio, "Buying Blue Helmets."
[14]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces"; Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations"; Rost and Greig, "Taking Matters into Their Own Hands"; Gaibulloev et al., "Personnel Contributions to UN and Non-UN Peacekeeping Missions."
[15]Rost and Greig, "Taking Matters into Their Own Hands."
[16]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces."
[17]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."

only test P5 countries' trade volumes and peacekeeping contributions, and regards peacekeeping contribution from the perspective of the UN institution rather than individual countries. Gaibulloev et al.[18] mentions trade as an explanatory factor in peacekeeping personnel contributions.[19] Their paper uses per capita GDP to measure contributing countries' well-being for the richer a country is, the more loss (including trade loss) will be incurred. Also, the paper uses a monadic measurement, trade openness (trade/GDP), to examine its influence on peacekeeping contributions. As their paper argues, trade openness does not positively affect the supply of peacekeepers for industrial countries may not do business in the conflict areas such as Africa.

Careful reading reveals that there is a subtle but significant distinction between Perkins and Neumayer's and Stojek and Tir's theoretical arguments. Perkins and Neumayer use bilateral trade volumes in a dyadic method to examine whether trade is related to an individual country's peacekeeping contribution. In contrast, Stojek and Tir[20] think that no association between trade volumes and peacekeeping contributions because Perkins and Neumayer[21] examine all countries' willingness. Stojek and Tir switch to examine major UN decision makers' contribution willingness for they argue that country's contribution is secondary to the mission authorization and therefore, the UN peacekeeping participation is influenced by the key states' trade interest (P5 countries) rather than all countries' trade interest. Peacekeeping participation in their paper means the UN authorization, which is from the perspective of the UN institution. In short, voluntary sending troops by a country is different from the UN's authorization and then participation.

However, the changed strategy shows that scholars still believe that trade ties should hold an explanatory power in peacekeeping contributions. After all, the trade is an important part in private economic benefits and countries will protect it. Setting aside the literature of peacekeeping operations, trade has been regarded as a valid motivation in third party military intervention and etc. Kathman[22] argues that the potential conflict spillover risk increase the likelihood of the intervention of neighbouring countries with strong trade interests in order to contain the violence. Bove et al.[23] investigate what the relationship of bilateral trade flows between the United States and the rest of the world and US military presence. Bove et al.[24] find that

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[18]Gaibulloev et al., "Personnel Contributions to UN and Non-UN Peacekeeping Missions."
[19]They regard trade interest as a part of a country's private benefits and as a proxy for trade interests.
[20]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[21]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces."
[22]Kathman, "Civil War diffusion."
[23]Bove, Elia, and Sekeris, "US Security Strategy."
[24]Bove, Gleditsch, and Sekeris, " 'Oil Above Water' Economic."

countries at war with higher bilateral trade in oil and gas are more likely to attract the external intervention.

However, here in peacekeeping studies, given that the influence of the trade is mixed, I question whether actual trade itself is able to capture a country's private trade interests properly. I thus propose an alternative method, i.e. trade potential to model trade benefits.

## 3. Reconsider the Mechanism: Trade Potentials and Peacekeeping Contribution

Stojek and Tir[25] explicitly and carefully lay out a causal path from trade to participation in peacekeeping missions. Their causal path can be summarized in this way: both interstate wars and intrastate wars influence international trade.[26] The interrupted international trade can have a powerful effect on domestic politics as it diminishes economic growth and job creation.[27] Then, the affected growth and employment can influence the incumbent office holding.[28] In order to lower the affected risk, countries will contribute troops in peacekeeping operations for post-civil war stability of mission host countries, considered as the vehicle of future trade and economic growth, can be regarded as in a contributors' interest.[29]

Specifically, Stojek and Tir[30] argue that 'P5 countries and their trade-oriented domestic constituencies are more motivated by future profit-making opportunities than by undoing past losses' in order to seek faster profits from their investment. Their empirical result shows that the past trade loss, which is measured by the difference between trade volumes prior to the civil war onset and trade volumes prior to the ceasefire, actually dissuades the UN peacekeeping participation. Following on Srojek and Tir's path, I argue that trade potential influences the UN peacekeeping participation. Trade potential means that there exists the extra volume that a country could have achieved, if there were no wars. It is a perceived or predicted concept.

Before arguing trade potential's influence, two limitations on Stojek and Tir's trade argument should be noted. Stojek and Tir[31] argue that P5 countries, as they economically powerful, can already establish high trade volume ties with peacekeeping host countries, which shows both the trade

[25]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[26]Bayer and Rupert, "Effects of Civil Wars"; Anderton and Carter, "The Impact of War on Trade."
[27]Rogowski, "Political Cleavages"; Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[28]Lewis-Beck and Stegmaier, "Economic Determinants of Electoral Outcomes"; MacKuen, "Political Drama."
[29]Kassebaum and Hamilton, "Peacekeeping and the US National Interest."
[30]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[31]Ibid.

promise (for the past trade can be regarded as a promise for the future trade) and material evidence (for the high volume trade is already showed with the actual trade). First, it is questionable to use the realized/current trade prior to the civil war to represent the trade opportunity. The war may have lasted already a long time and that trade volume could be outdated as trade opportunity. Second, many non-P5 countries may currently not have as high as P5 countries' trade volumes but they also have trade interest in peacekeeping host countries. They may expect that they could have more extensive trade links in the future after the war has ended. Non-P5 countries can also have trade opportunity or promise in the future and are inclined to contribute troops, but this trade future expectation is not necessarily captured by the current/realized trade volume. I argue that counterfactual trade volume can be represented by trade potentials.

Trade potential means that the extra trade volume a country could have achieved if there were no wars (perceived/predicted trade). Compared with the Stojek and Tir's method that using the trade volume before the wars shows the trade opportunity/promise, trade potential can be dynamically estimated each year after the war breaks out. In other words, trade potential is regarding a counter-factual concept.

Furthermore, the elasticity of demand and supply[32] and asset specificity[33] or factor mobility[34] is relevant to estimate the existence of trade potential. Countries and lobby groups or traders have their trade expectation even though there is a war. Firms are profit-maximizing and they estimate the conflict-associated risks and internalized the related transaction costs, which reduce trades even before conflicts' occurrence.[35] However, the reduced trade links does not mean that there is no demand or supply from the peacekeeping senders. Therefore, trade is elastic and countries are endeavouring to protect the shrunk trade interest, to remedy it and if possible to expand it. In other words, traders will have *ex ante* expectations, which are trade potentials. Countries then send peacekeeping troops. Also, regarding factor mobility and asset specificity, traders, i.e. peacekeeping senders do not want to spend money to find an alternative market for they have already invested in peacekeeping host countries with specific assets. Especially, Foreign Direct Investment (FDI), as an important private benefits in the peacekeeping contribution,[36] can be incorporated in the trade interest. The FDI are considered by investors in a long time term for factories and infrastructures do not easily translate into liquid asset.[37] As

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[32]Reuveny, " The Trade and Conflict Debate"; Li and Sacko, "The (Ir) Relevance of Militarized."
[33]Williamson, *The Mechanism of Governance*; Li, "Foreign Direct Investment."
[34]Hirschman, *National Power*.
[35]Li and Sacko, "The (Ir) Relevance of Militarized."
[36]Gaibulloev et al., "Personnel Contributions to UN and Non-UN Peacekeeping Missions."
[37]Li, "Foreign Direct Investment."

long as the infrastructure is still workable, it represents trade potential for it is much easier to re-invest in an extant country. Therefore, I argue that this future trade expectation means the perceived future trade opportunities, which can be represented by the predicted trade volume and further represented by the trade potentials, i.e.:

Trade potential = Predicted trade volume − Actual/Existing trade volume

Arguably, trade potential presents a powerful motivation to send peace-keepers. Sending peacekeeping troops may not necessarily guarantee that the trade ties can be quickly remedied with the pre-war increasing trade speed but the deterrence effect of peacekeeping troops[38] may reduce the possible damage caused by the civil war. Therefore, countries will contribute troops to attain peace and to maintain it post-conflict.

Then why do countries choose UN peacekeeping rather than other forms of third party intervention? Stojek and Tir already argue that UN peacekeeping is a more cost-economical, legitimate and effective tool than a unilateral action. Firstly, the cost of UN peacekeeping operations is shared by UN members. Even though Rost and Greig argue that countries can contribute to a state-conducted peacekeeping, they also admit that peacekeeping is costly. Given that the financial burden shared by other UN members, the expenditure of peacekeeping operations is much cheaper than the cost of state-conducted peacekeeping operations.[39] Not only costly in manpower and resources, the UN peacekeeping operation is a better choice for countries in terms of reputation and audience costs.[40] Participating in UN peacekeeping operations reduces the risk of unpopular results while statesmen at least echo the interest group's demand. Also, participation in UN peacekeeping can be a legitimate and noble symbol,[41] reducing the voices of opposition.

In short, based on Stojek and Tir's causal mechanism, I suggest distinguishing realized/current trade, and trade potential. Whereas trade have been examined as predictors of peacekeeping operations and found to affect P5 behaviour but not that of smaller contributor countries. I focus on trade potential. Besides, trade potentials can be measured in a time-dynamic-variation way, which can help to examine the continuation of a mission's troop contribution.

An argument summarized in hypothesis 1:

*Hypothesis 1*: The higher trade potential between peacekeeping contributing countries and mission host countries, the higher probability that UN peacekeeping troops will be sent by contributing countries.

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[38]Doyle and Sambanis, "International Peacebuilding"; Fortna, "Does Peacekeeping Keep Peace?"
[39]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[40]Ibid.
[41]Hurd, "Legitimacy, Power."

## 4. Research Design

This paper focuses on trade potentials' influence on countries' UN peace-keeping contributions, which is the main model. I first introduce the gravity model to calculate predicted trade volume. Then, trade potentials are calculated via deducting actual trade volumes from predicted trade volumes. Finally, I insert trade potential into a model of UN peacekeeping contributions, and run the main model is by using the calculated trade potentials in step one. Before the two steps, the current literature regarding trade potentials and the gravity model are presented initially.

### 4.1. Trade Potentials and the Gravity Model

The gravity model is a widely used method to forecast international trade volumes in economics. Derived from and similar to Newton's physical principle of mutual attraction of two masses, the gravity model in economics gains an empirical success in predicting countries' trade flows. Many articles associate the gravity model with the liberal peace theory.

As Kabir et al.[42] comprehensively summarize, the gravity model can be broadly classified into three topics: generalized gravity model,[43] gravity model used in intra-industry trade,[44] and gravity mode used in homogeneous and heterogeneous product.[45] The focus here is on the generalized gravity model rather than the other two topics. Gravity model articles associated with conflict studies[46] usually discuss liberal peace theory, i.e. the relationship between trade and the probability of the war. The main reason scholars[47] bring up gravity model components in conflict studies is that they question whether trade flow can model well in the liberal peace theory. The gravity model suggests different social interactions may influence both trade and conflict. Gravity model is not usually used to calculate trade potentials and barely used in the peacekeeping research community.

Therefore, I use the gravity model to calculate trade potentials and focus on the basic components of gravity model including population, GDP and distance. In modelling international trades via the gravity model, the demand factor of international trades is proportioned with the GDP, and the supply

[42]Kabir, Salim, and Al-Mawali, "The Gravity Model and Trade Flows."
[43]Anderson, "A Theoretical Foundation"; Anderson and Van Wincoop, "Gravity with Gravitas"; Deardorff, "Determinants of Bilateral Trade."
[44]Bergstrand, "The Heckscher-Ohlin-Samuelson Model."
[45]Feenstra, "Integration of Trade."
[46]Martin, Mayer, and Thoenig, "Make Trade Not War?"; Long, "Bilateral Trade in the Shadow"; Keshk, Pollins, and Reuveny, "Trade Still Follows the Flag"; Hegre, "Trade Dependence or Size Dependence?"; Hegre, Oneal, and Russett, "Trade Does Promote Peace."
[47]Keshk, Pollins, and Reuveny, "Trade Still Follows the Flag"; Hegre, "Trade Dependence or Size Dependence?"; Hegre, Oneal, and Russett, "Trade Does Promote Peace."

factor is proportioned with the population. 'Higher income suggests higher demand, while higher population suggests greater self-sufficiency .'[48] The distance factor represents the trade costs. In other words, 'the model believes that bilateral trade is positively related to incomes of the two trading countries and negatively related to their geographical distance and the size of their respective domestic markets'.[49] Further clarification of the gravity model in this article will be mentioned in the following context and it is time to introduce the concept of trade potential.

The concept of trade potential is often utilized in economics or political economy. Trade potential is an operationalization to research the integration of economy. When a country is going to join the international trade system, the existing in-the-system countries will have the economic expectations of new countries and then will forecast future trade volumes. For instance, it is widely studied on Eastern Europe's economic integration into the European Union (EU) economy.[50] However, to the best of my knowledge, the concept of trade potential has so far not been used in conflict studies. The trade potential concept here is used to measure the economic expectation of peacekeeping senders on host countries. To some extent, peacekeeping host countries are expected to re-integrate into the non-conflict international trade system. In other words, conflicts influence host countries' trades with other countries. Peacekeeping senders may have an expectation to normalize host countries' economic relationships, which motivates peacekeeping contribution.

### 4.2. Step One: Estimate Predicted Trade Volume

To estimate the predicted trade volume, the gravity model will only include some basic components. $\widehat{T}$ is the predicted trade volume, $P$ the population, $G$ the GDP, and $D$ means the distance between country $i$ and country $j$ in kilometres.

$$\ln \widehat{T}_{ij} = \beta_i \ln P_i + \beta_j \ln P_j + \beta_i \ln G_i + \beta_j \ln G_j - \beta_{ij} \ln D_{ij} + \epsilon_{ij}$$

Imports and exports[51] are added up to a number representing total trade volume. I use the dyadic version of the Correlates of War Project (COW) Trade dataset. To try to expand the time frame, the relative longer time frame datasets of GDP[52] and population[53] are used. I identify the distance

[48]Wang and Winters, "The Trading Potential."
[49]Li and Sacko, "The (Ir) Relevance of Militarized."
[50]Wang and Winters, "The Trading Potential"; Hamilton et al., "Opening Up International Trade"; Martínez-Zarzoso and Nowak-Lehmann, "Augmented Gravity Model"; Nilsson, "Trade Integration."
[51]Barbieri, Keshk, and Pollins, "Trading Data"; Barbieri, Keshk, and Pollins, "Correlates of War Project."
[52]Gleditsch, "Expanded Trade."
[53]Banks and Wilson, "Cross-National Time-Series."

between two countries via capital distance as in Gleditsch and Ward's dataset.[54]

Several strategies are used on the gravity model in step one. Firstly, I use the sub-sample, which includes all non-conflict dyads and excludes the in-conflict dyads to estimate the gravity model coefficients. Secondly, in the gravity model estimation, the time frame is restricted to the post-World War II era. Furthermore, step one is a data-driven process and therefore, Theil's $U$ is used to decide which gravity model specification will be used.

In the first step, all countries can be divided into countries that are in conflicts and countries that are not in conflicts. We do not want in-conflict countries included in the gravity model estimation because we want to estimate counter-factual trade volumes for these in-conflict countries. In other words, the conflict dyads are not kept in the country pool in the process of calculating the gravity model coefficients. The country pool which is used in the first step is a sub-sample of all countries. Otherwise, it influences the coefficient result. For example, all countries' trade with South Sudan from 2013 to present will be excluded in gravity model estimation in the first step because South Sudan experienced a civil war in 2013. I use the UCDP dyadic version dataset[55] to identify which countries are suffering inter-state or intra-state wars. Then I label belligerents with time ID and delete these countries in the dyadic trade dataset.[56]

The scope of countries is restricted previously and now the restriction of the time scope is explained here. From the perspective of the history, many countries disappeared and became independent, which creates problems of the country inconsistency. To specify and compare the result more easily, I use the time frame of the post-World-War II period in the first step estimation.[57]

Step one is a data-driven process in which different models, including dyad-fixed effect, country1-fixed effect, country2-fixed effect [58] and year-fixed effect are used to calculate the trade potential. Subsequently, I use Theil's $U$ value[59] to assess the model quality. The understanding of Theil's $U$ is that if a country's trade can be estimated directly by the trade of its last year (the naïve estimation), there is no point in using the gravity model to predict the trade volume. The equation of Theil's $U$ is presented.

[54]Gleditsch and Ward, "Measuring Space."
[55]Harbom, Melander, and Wallensteen, "Dyadic Dimensions"; Peterson, "Dyadic Trade."
[56]This method is consistent with Luca De Benedictis and Claudio's trade potential literature. They call this method as 'out-of-sample'. I change the wording here to refrain from the confusion with the 'out-of-sample' method in forecasting
[57]The second step is from 1990 to 2012 due to the data limitation for some control variables.
[58]country1 and country2 means country fixed effect. The original dataset keep the data in a one-dyad-once way.
[59]Bechtel and Leuffen, "Forecasting European Union Politics"; Theil, *Applied Economic Forecasting*.

If the predicted trade by the gravity model is better than the naïve estimation, the value should be smaller than one. If different data-driven processes of the gravity model are better than naïve estimation (i.e. one year before trade), the smaller value of Theil's $U$ is, the better model quality is. i.e.

$$U = \sqrt{\frac{\Sigma_{t=1}^{T}(\text{ActualTradeVolume} - \widehat{\text{PredictedTradeVolume}})^2}{\Sigma_{t=1}^{T}(\text{ActualTradeVolume} - \widehat{\text{NaiveTradeVolume}})^2}}$$

Given that Theil's $U$ makes a comparison with the naïve estimation, the gravity model equation should always add another term, that is, the lagged dependent variable. Theil's $U$ uses naive estimation as a benchmark. If examined from another perspective, only if the gravity model equation includes the lagged trade volume variable (i.e. naïve estimated result), can the Theil's $U$ assure that the gravity model terms (population, GDP and distance) play their role. In order to use Theil's $U$ to assess the prediction quality, the predicted trade volume calculated by the gravity model which includes the lagged actual trade variable is compared with the naïve estimated trade volume.

## 4.3. Step Two: Main Model

### 4.3.1. Independent Variable: Trade Potential

Following up step one, to calculate the trade potential, I deduct the predicted trade volume from the actual trade volume[60] Several points should be noted here.

First, every country receives a trade potential value for every year. It is in contrast with Stojek and Tir's method.[61] Their method of calculating trade loss is using trade volumes prior to the civil war onset minus trade volumes prior to the ceasefire. They use the trade before the civil war directly represents the trade opportunity. Both trade volumes prior to the civil war onset and trade volumes prior to the ceasefire are static. Therefore, their trade and trade loss variables are static. However, trade potential variable is calculated annually because each year has a predicted trade volume value and an actual trade volume value. Therefore, trade potential is dynamic.

Secondly, trade potential may have a negative value.[62] Since potential trade is measured by deducting actual trade from predicted trade volumes it is possible to have negative trade potential. A positive value of the trade potentials means that there is a real trade potential in the future, while a

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[60]For a similar approach, see De Benedict and Vicarelli, "Trade Potentials."
[61]Stojek and Tir, "The Supply Side of United Nations Peacekeeping Operations."
[62]De Benedictis and Vicarelli, "Trade Potentials."

negative value means that there is no trade potential for the actual trade already 'has reached its potential level'.[63] From the methodological perspective of ordinary least square estimation (OLS), this is reasonable. A negative value means that there are data points under the predicted linear line. Even though negative values can occur, they are not informative and, therefore, I have decided to code all negative values as zero because it is suggested by the theory that 'trade has reached its potential level'.

Thirdly, trade potentials include some extreme values. Usually for trade and GDP variables, log-transformation is used. In line with previous studies, I log transform trade potential as the variable includes some extreme values and its distribution is skewed.

### 4.3.2. Dependent Variable

The dependent variable is the UN peacekeeping participation, i.e. participating in or not. It is a dummy variable rather than a continuous variable for the theory does not necessarily indicate that the higher the trade potential, the larger the number of troops that a country will contribute. However, the result of the dependent variable as a continuous variable (i.e. troop numbers) is also provided as a comparison purpose in the robustness check section. Data for the dependent variable is compiled from two datasets: Kathman's dataset[64] and IPI dataset.[65] The original datasets are the number of peacekeeping troops, including military troops, the UN peacekeeping police, and observers. The UN peacekeeping participation is coded as one when at least one person including military troops, the UN peacekeeping police, and observers, is sent to a UN peacekeeping mission. Otherwise, it is coded as zero.

Also, token troop contribution can be regarded as an issue in peacekeeping contribution.[66] Therefore, another way to code dependent variable is that I set a cut off point at 20. In other words, if a sender contributes less than 20 personnels in a host country mission, it will not be counted as a participation and will be coded as 0. This result is also showed in the robustness check section.

### 4.3.3. Control Variables

Many other variables can influence the UN peacekeeping participation. To illustrate it clearly, control variables are elucidated via different perspectives including the characteristics of conflicts, missions, host countries,

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[63]Ibid.

[64]Kathman, "United Nations Peacekeeping."

[65]Perry and Smith, "Trends in Uniformed Contributions to UN Peacekeeping"; IPI, "The International Peace Institute."

[66]Coleman, "Token Troop Contributions."

peacekeeping senders and the dyadic relationship between host countries and peacekeeping senders.

Regarding the characteristics of conflicts themselves, conflict intensity can be counted. A country is likely to contribute the UN peacekeeping troop in intense conflicts. Conflict intensity is measured with the UCDP dataset of the battle related death[67]. In conflict studies, conflict intensity can be a categorical variable and classified into 2 categories (less than 1000 people and more than 1000 people), while here conflict intensity is a continuous variable measured with the number of death people.

As for the characteristics of missions, the mission type can influence peacekeeping participation. Peacekeeping senders may decide to send troops based on the mission types including observer mission and traditional mission.[68] Many developed countries contribute token troops in peacekeeping missions.[69] Token troop strategy means a limited number of troop contribution and is widely used in the UN peacekeeping missions to gain prestige. The easier way to contribute token troops is via the observer missions. Even though the dependent variable is not the number of troops, the code of peacekeeping participation is based on the number of troops and may be influenced by mission types. The latest measurement of peacekeeping mission types is updated by Hegre et al. Therefore, the model controls this variable by classifying missions into two types as Hegre et al.[70]

From the perspective of peacekeeping contributors, the model includes the variables of financial reimbursement, democratic status and other ongoing missions. Firstly, even though financial reimbursement is criticized by Coleman and Nyblade, financial reimbursement argument is still widely used in the current peacekeeping contribution literature that countries' UN peacekeeping participation is for financial profit-making. However, there is no direct measurement in the current literature but in the way of military expenditures per soldier.[71] Therefore, military expenditures per solider here is a proxy measurement of financial reimbursement from the UN and is calculated via the ratio of military expenditures to the number of military personnel by using the COW dataset of National Material Capabilities.[72] Secondly, democratic countries are more likely to contribute

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[67]Pettersson, Högbladh, and Öberg, "Organized Violence." This variable is re-managed and recoded by the author. I delete some intra-state dyads for some conflicts are not in the control or mandate of UN peacekeeping missions. For example, FLEC-R and FLEC-FAC are rebels who fight in the enclaves of Angola, Cabinda, which is not related with UN missions. Therefore, the death toll is not counted within the conflict intensity.
[68]Hegre, Hultman, and Nygård, "Evaluating the Conflict-Reducing."
[69]Coleman, "Token Troop Contributions."
[70]Hegre, Hultman, and Nygård, "Evaluating the Conflict-Reducing."
[71]Ward and Dorussen, "Standing Alongside Your Friends."
[72]Singer, Bremer, and Stuckey, "Capability Distribution, Uncertainty."

peacekeeping troops.[73] Therefore, polity democratic score, polity 2 is used to control. Furthermore, on-going other missions are included in the model. The variable may constrain peacekeeping contributors' military ability to contribute in other peacekeeping missions and the data is used from Ward and Dorussen's replication material.[74]

From the perspective of dyadic relationship, the model incorporates distance between host countries and peacekeeping contributors, security alliance, colonial ties,[75] refugee flows and direct contiguity relationship. Firstly, the longer the distance between two countries, the less likely a country send troops. Distance data is used from the minimum capital distance dataset.[76] Secondly, security alliance influences the contribution of peacekeeping missions.[77] Security alliance is proxy measured by defense pact with a dummy variable.[78] The data is from the COW dataset of security alliance.[79] Thirdly, former colonial ties can influence peacekeeping participation.[80] They are coded as dummy variables from the dataset.[81] Furthermore, the dyadic refugee flows can influence the peacekeeping contribution because contributors concern about their regional stability[82] and contribute to the host countries to avoid the conflict spill-over effect.[83] Refugee data is from the UNHCR[84] database.[85] Also, in order to test whether a country worries a spill-over conflict, the border dummy variable is included for the neighbour country bordered with host countries are likely to contribute in the UN peacekeeping missions. The COW dataset of the direct contiguity[86] is used to code common borders and changed from different types of contiguity into a dummy variable.

# 5. Empirical Analysis

## 5.1. Gravity Model Coefficient Calculation

As previously mentioned, the sub-sample method and the Theil's $U$ value are used to improve and assess the quality of the model prediction. Therefore,

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[73]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces"; Lebovic, "Uniting for Peace?"
[74]Ward and Dorussen, "Standing Alongside Your Friends."
[75]Martin, Mayer, and Thoenig, "Make Trade Not War?"
[76]Gleditsch and Ward, "Measuring Space."
[77]Lebovic, "Uniting for Peace."
[78]Given that the original dataset is used for survival analysis, therefore, many dyads without any security alliance do not appear in the dataset. These dyads are filled with 0 in this paper's dataset.
[79]Gibler and Sarkees, "Measuring Alliances."
[80]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces."
[81]Mayer and Zignago, "Notes on CEPII's Distances Measures."
[82]Perkins and Neumayer, "Extra-Territorial Interventions in Conflict Spaces"; Bove and Elia, "Supplying Peace."
[83]Uzonyi, "Refugee Flows."
[84]UNHCR, "United Nations High Commissioner."
[85]Some dyads are not included in the dataset will be imputed with 0 as no refugees.
[86]Stinnett et al., "The Correlates of War."

only the best performing model's regression table is presented here.[87] The model is the gravity model with dyad fixed effect and has the lowest value of the Theil's $U$ **(0.871)**. The Theil's $U$ values of other models are presented in Appendix.

In Table 1, all gravity model factors are statistically significant at 1% confidence level. The model has a high $R$ square value for it includes the lagged dependent variable, which is consistent with Hegre et al.'s result.[88]

## 5.2. Step Two: Main Model and Discussion

My dependent variable, the UN peacekeeping participation, is a binary item for again my theory does not necessarily indicate that the higher the trade potential, the larger the number of troops that a country will contribute. I use logit models for step two of the analysis. The standard error is clustered in a dyadic fashion. Table 2 shows the result of the main model, which is the main model.

As previously mentioned, the main independent variable is censored if there are negative values. Trade potential is also taken the natural log form for there are some positive outliers. The skewness of the distribution can then be justified. These methods are employed in the following table. Model 1 is statistically significant at 1% level and in a positive direction, which shows that there exists a positive relationship between trade potential and the UN peacekeeping participation. Therefore, the hypothesis one holds. However, given that these results are from logit models, their coefficients cannot be interpreted directly. To obtain a substantive understanding of the effect of trade potential on the UN peacekeeping (PKO) participation, I thus present the predicted probability of a country contributing over its trade potential in Figure 1.

The figure above shows the influence of trade potential's influence on UN peacekeeping operation participation. When there is no trade potential and other control variables are held at their mean values, the probability is around 20%. The probability can achieve upto around 40% when the trade potential value is at its max value. In other words, when all the other control variables are held to the mean value, the larger trade potential is, the more likely a country participates in the UN peacekeeping operations.

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[87]There are different estimate techniques. As I mentioned in the article, step 1 is only for a data-driven process and therefore, I use the basic version of gravity model with OLS estimator. However, to ensure the robustness of the result, I include the gravity model with 'colonial ties, common language and common border' variables with OLS estimator Anderson and Van Wincoop, "Gravity with Gravitas." I also use Poisson Pseudo-Maximum Likelihood Estimator (PPML) method Santos Silva and Tenreyro, "The Log of Gravity." Both step 1 and step 2 results are showed in Appendix
[88]Hegre, Oneal, and Russett, "Trade Does Promote Peace."

**Table 1.** Gravity model with dyad fixed effect.

|  | Model 1 |
|---|---|
| $trade_{t-1}$(LDV) | 0.69*** |
|  | (0.00) |
| $GDP_{country1}$ | 0.27*** |
|  | (0.00) |
| $GDP_{country2}$ | 0.26*** |
|  | (0.00) |
| $population_{country1}$ | −0.09*** |
|  | (0.00) |
| $population_{country2}$ | −0.03*** |
|  | (0.00) |
| distance | −0.34*** |
|  | (0.01) |
| $R^2$ | 0.96 |
| Adj. $R^2$ | 0.96 |
| Num. obs. | 376,268 |

Note: ***$p < .001$, **$p < .01$, *$p < .05$.

**Table 2.** Trade potential's influence on peacekeeping participation.

|  | Model 1 |
|---|---|
| Trade potential | 0.16*** |
|  | (0.02) |
| Capital distance | −0.00*** |
|  | (0.00) |
| Security alliance | −0.29* |
|  | (0.12) |
| Colonial ties | 0.69** |
|  | (0.23) |
| Democratic country (Polity2) | 0.06*** |
|  | (0.00) |
| Refugee flows | −0.00* |
|  | (0.00) |
| Conflict Intensity | −0.00 |
|  | (0.00) |
| PKO mandate | 0.93*** |
|  | (0.05) |
| Border (dummy) | −0.85*** |
|  | (0.17) |
| Number of co-current missions | 0.56*** |
|  | (0.02) |
| Financial reimbursement | −0.00 |
|  | (0.00) |
| Constant | −2.02*** |
|  | (0.05) |
| AIC | 13, 036.38 |
| BIC | 13, 127.68 |
| Log Likelihood | −6506.19 |
| Deviance | 13, 012.38 |
| Num. obs. | 14, 892 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$, standard errors are clustered in a dyadic fashion.
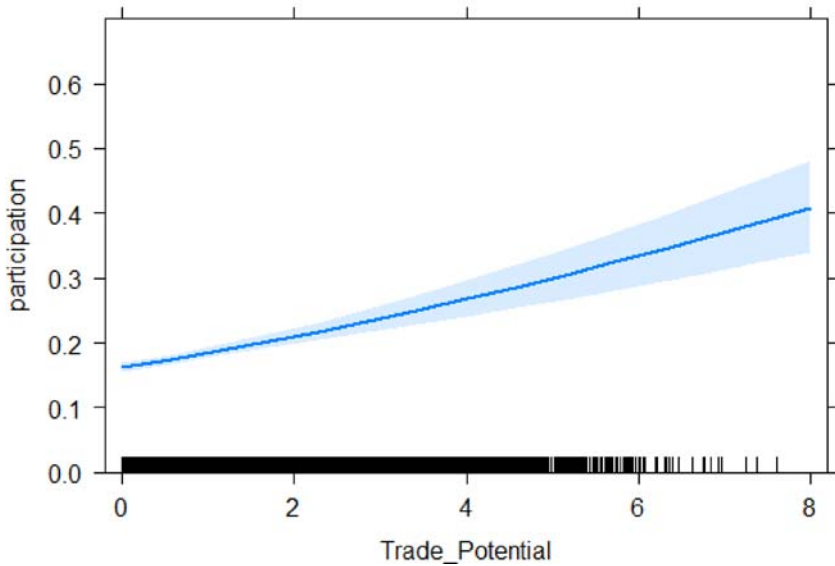
**Figure 1.** Effect of trade potential on UN peacekeeping participation.

Regarding control variables, some are consistent with the existing literature while others are not. The capital distance, colonial ties and democratic country status are in the expected direction.[89] The capital distance shows a negative relationship with a country's peacekeeping participation, while colonial ties between senders and host countries show a positive relationship and democratic countries are also more likely to participate in the peacekeeping operations. Even though the financial reimbursement is a popular and important argument in explaining the UN peacekeeping contribution, Model 1 is in line with Coleman and Nyblade's[90] findings that the financial reimbursement is not a valid explanation. The number of concurrent missions variable is in a different expected direction but consistent with the literature's finding,[91] which shows that countries have a general willingness in contributing the UN peacekeeping troops. Furthermore, PKO mandate tells the same story with the number of concurrent missions. It shows that countries are likely to contribute in traditional missions compared with observer missions. However, after using trade potential variable, some other variables are inconsistent with the literature or lose their significance. Conflict intensity loses the significance, which is inconsistent with the literature[92] and does not show that conflict intensity

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[89]Ward and Dorussen, "Standing Alongside Your Friends".
[90]Coleman and Nyblade, "Peacekeeping for Profit?"
[91]Ward and Dorussen, "Standing Alongside Your Friends."
[92]Bove and Elia, "Supplying Peace."

**Table 3.** Trade potential's influence on peacekeeping participation and contribution.

| | Model 2 binary DV (recoded) | Model 3 continuous DV |
|---|---|---|
| Trade potential | 0.10*** | 0.06*** |
| | (0.03) | (0.01) |
| Capital distance | −0.00*** | −0.00*** |
| | (0.00) | (0.00) |
| Security alliance | 0.28 | 0.04 |
| | (0.17) | (0.05) |
| Colonial ties | 1.67*** | 1.01*** |
| | (0.26) | (0.21) |
| Democratic country (Polity2) | 0.04*** | 0.01*** |
| | (0.01) | (0.00) |
| Refugee flows | −0.00 | −0.00*** |
| | (0.00) | (0.00) |
| Conflict Intensity | 0.00*** | 0.00** |
| | (0.00) | (0.00) |
| PKO mandate | 0.98*** | 0.41*** |
| | (0.07) | (0.03) |
| Border (dummy) | −1.21*** | −0.39*** |
| | (0.27) | (0.05) |
| Number of co-current missions | 0.50*** | 0.39*** |
| | (0.02) | (0.01) |
| Financial reimbursement | −0.00** | −0.00** |
| | (0.00) | (0.00) |
| Constant | −3.30*** | 0.29*** |
| | (0.08) | (0.02) |
| AIC | 6719.04 | |
| BIC | 6810.34 | |
| Log Likelihood | −3347.52 | |
| Deviance | 6695.04 | |
| Num. obs. | 14,892 | 14,892 |
| $R^2$ | | 0.16 |
| Adj. $R^2$ | | 0.16 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$, standard errors are clustered in a dyadic fashion.

makes a country more likely to participate in a UN peacekeeping operation. The variable of border country shows a negative relationship, which does not show that a neighbour country worries about the spill-over conflict. Refugee flows variable shows an opposite direction compared with the literature.[93]

## 6. Robustness Checks

### 6.1. Cut-off Binary and Continuous Dependent Variable

Some argues that token troop contribution can be regarded as an issue in peacekeeping contribution. Therefore, in Model 2, the dependent variable is recoded for I set up a cut off point at 20, which means if a country contributes less than 20 personnels, it doesn't count as a participation. Model 3 uses the continuous variable (i.e. troop number) as the dependent variable. In both models, the influence of the trade potential are statistically significant at 1% level (Table 3).

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[93]Uzonyi, "Refugee Flows."

## 6.2. Comparison Between Predicted Trade and Actual Trade

Some may argue that trade potential could have a reversed causality for peacekeeping contribution. The presence of the peacekeeping may secure the stability and then increase the trade volume. Therefore, in this part, I take a step back and dissect trade potential into two parts: predicted trade volume and actual trade volume. The actual trade volume may have a reserve casual relationship with the UN peacekeeping participation, but the predicted trade volume does not. The data of the predicted trade volume is generated by the gravity model. Also, to be consistent with the empirical result, the negative values of predicted trade volumes are coded as zero. Also, this is an opportunity to compare the influence of the actual trade and the predicted trade. According to the regression table, Model 4 presents the result that predicted trade volume still holds (Table 4).

**Table 4.** Robustness check.

|  | Model 4 binary DV | Model 5 binary DV (recoded) | Model 6 continuous DV |
|---|---|---|---|
| Actual trade (log) | 0.01 | 0.08 | 0.02 |
|  | (0.04) | (0.05) | (0.02) |
| Predicted trade (log) | 0.25*** | 0.21*** | 0.09*** |
|  | (0.04) | (0.05) | (0.02) |
| Capital distance | −0.00*** | −0.00*** | −0.00*** |
|  | (0.00) | (0.00) | (0.00) |
| Security alliance | −0.57*** | 0.00 | −0.11 |
|  | (0.13) | (0.17) | (0.06) |
| Colonial ties | 0.11 | 1.02*** | 0.73*** |
|  | (0.22) | (0.26) | (0.21) |
| Democratic country (Polity2) | 0.05*** | 0.04*** | 0.01*** |
|  | (0.00) | (0.01) | (0.00) |
| Refugee flows | −0.00* | −0.00 | −0.00*** |
|  | (0.00) | (0.00) | (0.00) |
| Conflict Intensity | −0.00 | 0.00*** | 0.00** |
|  | (0.00) | (0.00) | (0.00) |
| PKO mandate | 1.17*** | 1.29*** | 0.50*** |
|  | (0.05) | (0.07) | (0.03) |
| Border (dummy) | −1.27*** | −1.77*** | −0.54*** |
|  | (0.18) | (0.27) | (0.06) |
| Number of co-current missions | 0.51*** | 0.46*** | 0.36*** |
|  | (0.02) | (0.02) | (0.01) |
| Financial reimbursement | −0.00*** | −0.00*** | −0.00*** |
|  | (0.00) | (0.00) | (0.00) |
| Constant | −2.48*** | −3.95*** | 0.12*** |
|  | (0.06) | (0.09) | (0.02) |
| AIC | 12, 757.17 | 6517.88 |  |
| BIC | 12,856.08 | 6616.79 |  |
| Log Likelihood | −6365.59 | −3245.94 |  |
| Deviance | 12, 731.17 | 6491.88 |  |
| Num. obs. | 14, 892 | 14, 892 | 14, 892 |
| $R^2$ |  |  | 0.17 |
| Adj. $R^2$ |  |  | 0.17 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$ standard errors are clustered in a dyadic fashion.

# 7. Conclusion

In this paper, I identify the puzzle of mixed result in trade's influence on peacekeeping contribution. Then, I argue that trade potential rather than trade should be a better indicator to show peacekeeping contributors' interest in host countries. I argue that the lobby groups can regard elasticity of demand and supply, asset specificity or factor mobility to pressure the government to send peacekeepers. By using gravity model to calculate the predicted trade volume and to get the value of trade potential, I run a logit regression on peacekeeping participation. The result shows that trade potential is a good indicator. For a robustness check, I use both predicted trade volume and actual trade volume to show that the result still holds.

In using a quantitative method to examine trade potentials' influence on peacekeeping contribution, I contribute the peacekeeping studies in several ways. Firstly, I probe the puzzle of mixed result of trade's influence on peacekeeping contribution. I provide the empirical evidence that trade potentials influence on peacekeeping contribution. Secondly, I use a new concept of trade potential in conflict studies and try to combine trade potential concept from economic integration literature with peacekeeping studies. Trade potential can be an important indicator in many other conflict studies. Thirdly, I use a two-step research design. In the first step, I use gravity model in a sub-sample method to calculate the predicted trade and then get the trade potential. In the second step, I run the main model to get the result.

Some scholars[94] question the empirical workhouse of gravity model and use latent space model to modify it. The future research can carry on this issue. However, The results presented here are supportive of the hypothesized linkage between trade potential and UN peacekeeping contributions.

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## Disclosure Statement

## About the Author

*Shenghao Zhang* is a PhD candidate in Department of Government, University of Essex. His main research interest is in UN peacekeeping operations.

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[94]Ward, Ahlquist, and Rozenas, "Gravity's Rainbow."

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# Appendices

## *Appendix 1. Step One Result*

Appendix 1 part shows alternative models' specification result in step one.

### *A.1. Alternative Model Specification with OLS Estimator*
### *A.2. Theil's U Table*

This section presents all Theil's *U* value results calculated in step one.

**Table A1.** Alternative model specification with OLS estimator.

|  | Model 1 Pool | Model 2 Random | Model 3 FE with ccode1 | Model 4 FE with ccode2 | Model 5 FE with year |
|---|---|---|---|---|---|
| (Intercept) | −0.59*** (0.01) | −0.64*** (0.01) |  |  |  |
| $trade_{t-1}$(LDV) | 0.87*** | 0.86*** | 0.86*** | 0.85*** | 0.88*** |

*(Continued)*

**Table A1.** Continued.

|  | Model 1 Pool | Model 2 Random | Model 3 FE with ccode1 | Model 4 FE with ccode2 | Model 5 FE with year |
|---|---|---|---|---|---|
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $GDP_{country1}$ | 0.11*** | 0.12*** | 0.14*** | 0.13*** | 0.11*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $GDP_{country2}$ | 0.12*** | 0.12*** | 0.13*** | 0.12*** | 0.11*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $population_{country1}$ | −0.04*** | −0.04*** | −0.03*** | −0.04*** | −0.03*** |
|  | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) |
| $population_{country2}$ | −0.03*** | −0.03*** | −0.03*** | 0.02*** | −0.03*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| distance | −0.11*** | −0.12*** | −0.13*** | −0.14*** | −0.11*** |
|  | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| $R^2$ | 0.93 | 0.92 | 0.96 | 0.96 | 0.96 |
| Adj. $R^2$ | 0.93 | 0.92 | 0.96 | 0.96 | 0.96 |
| Num. obs. | 376, 268 | 376, 268 | 376, 268 | 376, 268 | 376, 268 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$.

| Theil's $U$ value table (sub-sample OLS) | | | |
|---|---|---|---|
| Models (All with LDV) | Theil's $U$ | Choose? | observations |
| FE with importer2 (ccode2) dummy | 0.9440105 |  | 376,268 |
| FE with importer1 (ccode1) dummy | 0.9498293 |  | 376,268 |
| FE with year dummy | 0.9486414 |  | 376,268 |
| Pooled | 0.9564451 |  | 376,268 |
| RE | 0.9568447 |  | 376,268 |
| FE with dyad | 0.8712868 | smallest | 376,268 |

## Appendix 2. Alternative Estimation Method in Step1 with its Step2 Result

### A.3. Gravity Model with Three Extra Variables

Here, I only show the result with year fixed effect as it takes a week of High Performance computer to calculate the main result with dyad fixed effect in the text.

### A.4. PPML Estimator

## Appendix 3. Main Model without Control

## Appendix 4. Further Explanation on Robustness Check

**Table A2.** Gravity model with three extra variables and year fixed effect.

|  | Model 1 |
|---|---|
| $trade_{t-1}$ (LDV) | 0.87*** |
|  | (0.00) |
| $GDP_{country1}$ | 0.11*** |
|  | (0.00) |
| $GDP_{country2}$ | 0.12*** |
|  | (0.00) |
| $population_{country1}$ | −0.04*** |
|  | (0.00) |

(*Continued*)

**Table A2.** Continued.

|  | Model 1 |
| --- | --- |
| *population*$_{country2}$ | −0.03*** |
|  | (0.00) |
| distance | −0.10*** |
|  | (0.00) |
| colony | 0.15*** |
|  | (0.01) |
| common language | 0.08*** |
|  | (0.00) |
| border (dummy) | 0.10*** |
|  | (0.01) |
| $R^2$ | 0.96 |
| Adj. $R^2$ | 0.96 |
| Num. obs. | 376, 268 |

Note: ***$p$ < .001; **$p$ < .01; *$p$ < .05.

**Table A3.** Step2 result with the gravity model with three extra variables.

|  | Model 1<br>binary DV | Model 2<br>binary DV (recoded) | Model 3<br>continuous DV |
| --- | --- | --- | --- |
| Trade potential | 0.12*** | 0.03 | 0.03* |
|  | (0.02) | (0.03) | (0.01) |
| Capital distance | −0.00*** | −0.00*** | −0.00*** |
|  | (0.00) | (0.00) | (0.00) |
| Security alliance | −0.29* | 0.28 | 0.04 |
|  | (0.12) | (0.17) | (0.05) |
| Colonial ties | 0.73** | 1.72*** | 1.03*** |
|  | (0.22) | (0.25) | (0.21) |
| Democratic country (Polity2) | 0.06*** | 0.05*** | 0.01*** |
|  | (0.00) | (0.01) | (0.00) |
| Refugee flows | −0.00* | −0.00 | −0.00*** |
|  | (0.00) | (0.00) | (0.00) |
| Conflict Intensity | −0.00 | 0.00*** | 0.00** |
|  | (0.00) | (0.00) | (0.00) |
| PKO mandate | 0.93*** | 0.97*** | 0.41*** |
|  | (0.05) | (0.07) | (0.03) |
| Border (dummy) | −0.84*** | −1.21*** | −0.38*** |
|  | (0.17) | (0.27) | (0.05) |
| Number of co-current missions | 0.56*** | 0.50*** | 0.39*** |
|  | (0.02) | (0.02) | (0.01) |
| Financial reimbursement | −0.00 | −0.00* | −0.00* |
|  | (0.00) | (0.00) | (0.00) |
| Constant | −1.99*** | −3.24*** | 0.32*** |
|  | (0.05) | (0.08) | (0.02) |
| AIC | 13, 067.63 | 6729.67 | 13, 158.936820.97 |
| Log Likelihood | −6521.82 | −3352.83 | 13, 043.636705.67 |
| Num. obs. | 14, 892 | 14, 892 | 14, 892 |
| $R^2$ |  |  | 0.16 |
| Adj. $R^2$ |  |  | 0.16 |

Note: ***$p$ < .001; **$p$ < .01; *$p$ < .05.

**Table A4.** Gravity model with PPML estimator.

| | Model 1 |
|---|---|
| (Intercept) | −0.45*** |
| | (0.04) |
| distance | −0.04*** |
| | (0.00) |
| population$_{country1}$ | 0.00 |
| | (0.00) |
| population$_{country2}$ | 0.01* |
| | (0.00) |
| GDP$_{country1}$ | 0.05*** |
| | (0.00) |
| GDP$_{country1}$ | 0.05*** |
| | (0.00) |
| trade$_{t-1}$(LDV) | 0.94*** |
| | (0.00) |
| AIC | |
| BIC | |
| Log Likelihood | |
| Deviance | 10, 987, 974.03 |
| Num. obs. | 389, 648 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$.

**Table A5.** Step2 result with PPML's step1 result.

| | Model 1 binary DV | Model 2 binary DV (recoded) | Model 3 continuous DV |
|---|---|---|---|
| Trade potential | 0.15*** | 0.12*** | 0.05*** |
| | (0.02) | (0.02) | (0.01) |
| Capital distance | −0.00*** | −0.00*** | −0.00*** |
| | (0.00) | (0.00) | (0.00) |
| Security alliance | −0.34** | 0.29 | 0.03 |
| | (0.12) | (0.15) | (0.05) |
| Colonial ties | 0.70** | 1.78*** | 1.11*** |
| | (0.22) | (0.24) | (0.20) |
| Democratic country (Polity2) | 0.05*** | 0.03*** | 0.01*** |
| | (0.00) | (0.01) | (0.00) |
| Refugee flows | −0.00* | −0.00 | −0.00*** |
| | (0.00) | (0.00) | (0.00) |
| Conflict Intensity | −0.00 | 0.00*** | 0.00** |
| | (0.00) | (0.00) | (0.00) |
| PKO mandate | 1.04*** | 1.13*** | 0.48*** |
| | (0.05) | (0.07) | (0.03) |
| Border (dummy) | −0.83*** | −1.13*** | −0.37*** |
| | (0.16) | (0.24) | (0.05) |
| Number of co-current missions | 0.55*** | 0.49*** | 0.38*** |
| | (0.02) | (0.02) | (0.01) |
| Financial reimbursement | −0.00* | −0.00*** | −0.00*** |
| | (0.00) | (0.00) | (0.00) |
| Constant | −2.02*** | −3.30*** | 0.30*** |
| | (0.05) | (0.08) | (0.02) |
| AIC | 14, 505.05 | 7419.73 | |
| BIC | 14, 597.47 | 7512.15 | |
| Log Likelihood | −7240.53 | −3697.87 | |
| Deviance | 14, 481.05 | 7395.73 | |
| Num. obs. | 16, 338 | 16, 338 | 16, 338 |
| $R^2$ | | | 0.17 |
| Adj. $R^2$ | | | 0.17 |

Note: ***$p < .001$; **$p < .01$; *$p < .05$.

**Table A6.** Models without control variables.

|  | Model 1 | Model 2 | Model 3 |
|---|---|---|---|
| (Intercept) | −1.58*** | −2.77*** | 0.12*** |
|  | (0.02) | (0.03) | (0.00) |
| Trade Potential | 0.25*** | 0.19*** | 0.03*** |
|  | (0.02) | (0.02) | (0.00) |
| AIC | 19, 502.00 | 9710.57 |  |
| BIC | 19, 517.82 | 9726.39 |  |
| Log Likelihood | −9749.00 | −4853.29 |  |
| Deviance | 19, 498.00 | 9706.57 |  |
| Num. obs. | 20, 113 | 20, 113 | 20, 113 |
| $R^2$ |  |  | 0.01 |
| Adj. $R^2$ |  |  | 0.01 |

Note: ***$p$ < .001; **$p$ < .01; *$p$ < .05.

**Table A7.** Regression with only predicted trade or actual trade.

|  | Model 1 | Model 2 |
|---|---|---|
| Predicted trade (log) | 0.26*** |  |
|  | (0.01) |  |
| Actual trade (log) |  | 0.22*** |
|  |  | (0.01) |
| Capital distance | −0.00*** | −0.00*** |
|  | (0.00) | (0.00) |
| Security alliance | −0.57*** | −0.56*** |
|  | (0.13) | (0.13) |
| Colonial ties | 0.11 | 0.16 |
|  | (0.22) | (0.22) |
| Democratic country (Polity2) | 0.05*** | 0.05*** |
|  | (0.00) | (0.00) |
| Refugee flows | −0.00* | −0.00* |
|  | (0.00) | (0.00) |
| Conflict Intensity | −0.00 | −0.00 |
|  | (0.00) | (0.00) |
| Border (dummy) | −1.27*** | −1.23*** |
|  | (0.18) | (0.18) |
| Number of co-current missions | 0.51*** | 0.51*** |
|  | (0.02) | (0.02) |
| Financial reimbursement | −0.00*** | −0.00*** |
|  | (0.00) | (0.00) |
| Constant | −2.48*** | −2.40*** |
|  | (0.06) | (0.06) |
| AIC | 12, 755.22 | 12, 794.67 |
| BIC | 12, 846.52 | 12, 885.97 |
| Log Likelihood | −6365.61 | −6385.33 |
| Deviance | 12, 731.22 | 12, 770.67 |
| Num. obs. | 14, 892 | 14, 892 |

Note: ***$p$ < .001; **$p$ < .01; *$p$ < .05 standard errors are clustered in a dyadic fashion.