

**VIETNAM'S EXPORTS TO TPP COUNTRIES**  
**GRAVITY MODEL, TRADE DETERMINANTS AND TRADE POTENTIALS**

**Tien-Viet Nguyen<sup>1</sup>**

Lecturer, Faculty of Economics and Business Administration, Hai Phong University, Vietnam

PhD Candidate, Department of Economics, University of Birmingham, UK

and

**Michael Henry**

Senior Lecturer, Department of Economics, University of Birmingham, UK

**Abstract**

The recently-signed Trans Pacific Partnership (TPP) is expected to become a new growth engine of Vietnam – an emerging economy with export-oriented growth and high trade openness. Using a modified gravity model following Egger (2002) with 4 econometric estimators (OLS, country FE, time FE and PPML), this study examines trade determinants of Vietnam's exports to 11 TPP countries and detects if there is any trade potential in these trade relations. Evidence is found to significantly support the positive impact of (i) combined economic size, (ii) economic size similarity, (iii) relative factor endowment difference and (iv) ASEAN co-membership and friction effect of distance. Meanwhile bilateral exchange rate shows insignificant impact. Unusually, WTO membership is found to hamper Vietnam's trade with these partners while TPP negotiation status leaves a controversial impact. In addition, a standardized index is calculated to compare actual and estimated trade. The comparison suggests Vietnam's trade potentials with Brunei, Japan, New Zealand, Peru, Mexico and the US but denies those with Australia, Canada, Chile, Myanmar and Singapore.

**Key words** – *TPP, gravity model, trade determinant, trade potential, Vietnam, OLS, FE, PPML*

**Acknowledgements**

This paper was prepared for The ninth Vietnam Economists Annual Meeting VEAM 2016. We are grateful to Professor Robert J. R. Elliott, Department of Economics, University of Birmingham, UK for his helpful comments and suggestions.

---

<sup>1</sup> Corresponding author, email address: [ytn412@student.bham.ac.uk](mailto:ytn412@student.bham.ac.uk) or [vietnt.hpu@gmail.com](mailto:vietnt.hpu@gmail.com)

## 1. INTRODUCTION

Vietnam has been increasingly recognized as a good example of development success based on export-oriented growth as well as active regional economic integration. After the introduction of 'Doi moi' in 1986, a sophisticated policy reform campaign associated with trade liberalization, it has maintained a growth rate of around 6-7 percent for more than two decades, accompanied by a high trade-openness index (total trade accounting for more than 170% of GDP) and has exceeded many Millennium Development Goals (MDG) suggested by the World Bank (WTO Secretariat, 2013).

The economic integration process of Vietnam is marked by its participation in ASEAN in 1995, trade relations normalization with the US in 2002 and its accession to WTO as the 150th member in 2007. However, numerous challenges facing multilateral talks within WTO framework, especially the stagnancy of Doha Round for more than a decade, require countries to find other approaches to facilitate trade liberalization. Hence, bilateral and regional trade agreements have recently become much more preferable, particularly in the dynamic Asia Pacific region. Among a 'spaghetti bowl' of FTAs having existed within this region, the Trans Pacific Partnership (TPP) grabs attention as a 'mega deal', the terms suggested by Li, Wang and Whalley (2014) referring to those whose members' combined GDP is at least a trillion dollars. The agreement among 12 economies (Vietnam, the US, Japan, Canada, Australia, New Zealand, Mexico, Chile, Peru, Singapore, Myanmar and Brunei) altogether covering 60% of the world's GDP, 40% of the world's population and 33% of world trade is also attractive thanks to 'high standards worthy of a 21st-century trade agreement' (Obama, 2009).

The TPP not only consolidates Vietnam's trade relation with tied trading partners such as ASEAN countries (Singapore, Myanmar and Brunei) or ASEAN FTA partners (Japan, New Zealand and Australia) but also creates a good opportunity to boost bilateral trade relation with the US - Vietnam's largest export market without any previous FTA. Hence the TPP is expected to be a new engine for Vietnam's growth in the future. Many studies such as Petri *et al.* (2013), Deardorff (2013), Lukas *et al.* (2013), mostly based on CGE models, argue that as the least developed member, the comparative gain of Vietnam is the largest in terms of both welfare and trade value. Nevertheless some doubts were cast by Benga (2014) on the reliability of these models.

It should be noted that there are remarkable asymmetric circumstances across the 12 members currently discussing the evolving TPP agreement (demographic and geographic diversity, the differences in economic and development level and multilevel trade integration).

Being aware of these, this study utilizes a gravity model to focus on investigating bilateral trade between Vietnam and the other 11 TPP members. Gravity model dating back to Tinbergen (1962) has been widely modified, improved and used to explain bilateral trade determinants and calculated trade potentials between trading partners in various contexts. Within this study, augmented gravity models following Egger (2002) integrated with 4 econometrics techniques (OLS, country FE, time FE and PPML) will be estimated to find out the roles of a number of trade attractors, trade frictions as well as trade policies in Vietnam's trade with TPP countries and to identify if there are any unexhausted trade potentials in these relations.

The result suggests that trade attractors are combined economic size, economic size similarity, relative factor endowment difference and ASEAN co-membership and distance serves as trade friction. Bilateral exchange rate shows no significant impact. Negative impact of WTO membership on Vietnam trade was found while the effect of TPP negotiation is not robust over models. Among 11 TPP partners, a standardized index shows Vietnam's trade potentials with Brunei, Japan, New Zealand, Peru, Mexico and USA and its overtrading with Australia, Canada, Chile, Myanmar and Singapore.

This study will be organized as follows: Section 2 describes Vietnam's trade with TPP countries and summarizes some previous studies about this. Section 3 reviews literature of gravity model. Section 4 describes the methodology, dataset and trade potential index establishment and discusses the result. Finally Section 5 concludes.

## **2. OVERVIEW OF VIETNAM'S TRADE WITH TPP COUNTRIES**

### **2.1. Economic integration process of Vietnam**

After reunification (1975), the US's embargo was extended on the whole of Vietnam. Vietnam's trade was isolated from the rest of the world, except for limited trade and subsidy within Soviet-sponsored Council for Mutual Economic Assistance (COMECON). State monopoly was exercised in foreign trade while the whole economy was centrally planned. Domestic economic crisis (slow growth and soaring inflation) and the collapse of Soviet system created heavy pressure for renovation. In response, 'Doi moi', a political and economic reform, was introduced in 1986, marking a new era in Vietnam's trade and economy. Since then, Vietnam has transformed deeply from a centrally planned economy into a more market-oriented one.

As a result, the economy has flourished, gotten out of poverty and become a lower middle-income country. Vigorous exports together with rising investment have been the driving factors for a hovering growth rate of around 7 percent since 1990s except for the years of the global financial crisis. A trade in goods and services comprising more than 170% of GDP is a strong

evidence of an outward oriented economy (WTO Secretariat, 2013). Vietnam's intra-regional trade within Asia Pacific has accounted for an increasingly considerable proportion of its trade. The government's outstanding performance in reaching its development goals has lifted more than 20 million Vietnamese above the poverty line. The country was one of the most successful borrowers of the World Bank in attaining Millennium Development Goal (MDG) targets (WTO Secretariat, 2013).

Yet trade liberalization has played a critical role in the above mentioned successes. During this process, gradual integration into the regional and global economy has significantly contributed to enhanced competitiveness and export-driven growth. Briefly, Vietnam's economic integration has four remarkable stages: ASEAN/AFTA participation, trade normalization with the US, WTO accession and active bilateral and regional trade negotiation.

***(i) ASEAN/ AFTA/CEPT***

In July 1995, Vietnam entered the Association of Southeast Asian Nations (ASEAN) as the seventh member. The Association<sup>2</sup> dates back to 1962 and aims to accelerate economic growth, social progress, and socio-cultural evolution among its members, protect regional peace as well as stability, and provide opportunities for peaceful resolution of differences. The establishment of ASEAN Free Trade Area (AFTA) was announced in 1992 and associated with the agreement on the Common Effective Preferential Tariff (CEPT). This scheme has progressively reduced the tariff levied on a wide range of products within the region to no more than 5 percent. Participating in ASEAN meant that Vietnam was simultaneously committed to obligations under AFTA/CEPT in exchange for mutual benefits. The timeline for this tariff cut was 2003 for ASEAN-6 (Indonesia, Malaysia, the Philippines, Singapore, Thailand and Brunei), 2006 for Vietnam, 2008 for Laos and Myanmar and 2010 for Cambodia. Further liberalization eliminating all import duties was completed in 2010 for the former six countries and 2015 for the latter four. Integration with this rapidly growing region dramatically boosted Vietnam's trade with both ASEAN and non-ASEAN members. Vietnam's exports within and outside the bloc accelerated by 360% and 634% respectively in 10 years 1993- 2003 (Tumbarello, 2006).

***(ii) Trade relation normalization with the US***

Vietnam's relation with US has experienced an interesting transformation from being enemies to key trading partners. The first few years right after the removal of the embargo did not record any significant improvement in bilateral trade between the two nations, mainly due to Vietnam's lack of 'Normal Trade Relations' (NTR). The Bilateral Trade Agreement (BTA) between the two

---

<sup>2</sup> ASEAN now has 10 members: Malaysia, Philippines, Singapore, Thailand, Brunei, Cambodia, Laos, Myanmar and Vietnam

countries signed in 2000 and coming into force in 2001 extended conditional most favored nation (MFN) trade status, well-known as ‘normal trade relations’ (NTR). This event sharply cut the average tariff the US levied on Vietnam’s goods from 40% to around 4% and boosted the trade flows between the two countries. Merchandise trade nearly doubled between 2001 and 2002 (Martin, 2014). This status was then upgraded to permanent normal trade relations (PNTR) in 2006, as a component of Vietnam’s accession to the World Trade Organization (WTO). In exchange for this, Vietnam granted American companies and service provider better access to the domestic market and committed itself to a series of legal and technical procedure anticipating core WTO obligations. As a result of this upgraded status, bilateral trade jumped again in 2007 (Martin, 2014). The bilateral trade growth has been sustainable and reached 29.7 billion USD in 2013. The US has become Vietnam’s largest export market for many years and Vietnam was the 27<sup>th</sup> largest goods trading partner of the US (USTR, 2013). The two economies are highly complementary to each other. Vietnam mainly exports to the US labour-intensive products like textiles, garments and agricultural products and raw materials like fish, coffee, and tea. Meanwhile the major products that the US exports to Vietnam are high-technology ones.

### ***(iii) WTO accession***

Vietnam applied to join the WTO in 1995 but it was not until after trade relation normalization with the US that Vietnam officially entered WTO in 2007 as the 150th member. Vietnam agreed to comply with key WTO Agreements including the Agreements on Trade-Related Aspects of Intellectual Property Rights, Technical Barriers to Trade, the Application of Sanitary and Phytosanitary Measures, and customs valuation from the date of entry without recourse to any transitional period. Vietnam accepted specific commitments under the GATS in 11 service sectors and 110 subsectors. Obviously, Vietnam’s participation in the WTO was its great effort to integrate with the global economy. The accession to the WTO also meant that Vietnam accepted to implement a number of policy reforms including opening market, eliminating protectionism and upgrading the legal and administrative system to comply with the binding rules of this organization in exchange for better access to the market of the rest of the world. Since its entry to the WTO, Vietnam has been keen on transition to a complete market economy and persuaded its trading partners to appreciate it as a market economy. By early 2013, nearly 40 countries had recognized this status such as the members of ASEAN, China, Japan, Korea, Australia, EFTA member states, Argentina, and South Africa (WTO Secretariat, 2013).

### ***(iv) Active bilateral and regional trade negotiation***

Despite the significance of the WTO accession, this event was not the final stage in Vietnam's economic integration process. As a member of ASEAN, Vietnam benefits from FTA signed between this bloc and other trading partners: ASEAN – China FTA (ACFTA) in 2006; ASEAN – Australia – New Zealand Free Trade Area (AANZFTA) in 2009; ASEAN–India Free Trade Area (AIFTA) in 2009; ASEAN–Japan Comprehensive Economic Partnership (AJCEP) in 2008; ASEAN–Korea Free Trade Area (AKFTA) in 2006. In addition, Vietnam also signed a number of FTA with Chile (Vietnam-Chile Free Trade Agreement -VCFTA) in 2011; Japan (Vietnam-Japan Economic Partnership Agreement – VJEPA) in 2009 and most recently and very important; EU (Vietnam – EU Free Trade Agreement) in 2015. Vietnam has been a negotiating party in the Trans-Pacific Partnership (TPP) with 11 Asia-Pacific countries since 2009; FTA with the member states of EFTA (Iceland, Liechtenstein, Norway, and Switzerland) and Customs union of Belarus, Kazakhstan, and the Russian Federation. The features these FTAs have in common are further liberalization than WTO associated with strict rules regulating trade and selected partners. Hence they are expected to significantly boost trade flows between Vietnam and its key trading partners.

## **2.2. Brief overview of the Trans-Pacific Partnership**

### ***(i) An evolving agreement***

Originally, the TPP was developed from the Trans-Pacific Strategic Economic Partnership conceived by 3 parties (P-3) Singapore, New Zealand and Chile, which aimed at liberalizing trade in the Asia-Pacific region. With the additional participation of Brunei, the P-4 was concluded in 2006. In 2008, the US under the Bush administration announced its intention to join the trade negotiation with P-4, which was the turning point of the agreement's evolution. Inspired by the participation of the US, Australia, Peru and Vietnam also took part in the deal in late 2008 and 2009. After a period of reviewing the US trade policy, the Obama Administration committed the United States to engage with the TPP countries “with the goal of shaping a regional agreement that will have broad-based membership and the high standards worthy of a 21st-century trade agreement.” (Obama, 2009). A consensus to the inclusion of Malaysia in negotiating the TPP was reached in 2010 and the 9 partners agreed a key framework for the agreement at the sidelines of the Asia-Pacific Economic Cooperation (APEC) Ministerial in Honolulu in 2011. After several months of intense bilateral consultations with each of the existing TPP countries, Canada and Mexico officially became negotiating partners. After the official participation of Japan under Abe Administration in 2013, TPP has had 12 Asia-Pacific members, which together account for almost 40% of world GDP and 25% of global exports

(Schott, 2014). Recently, it was signed in February 2016 even though it has not come into force. However, the number of TPP members is still subject to increase as it is open for other parties and a long list of countries express their interest to this agreement such as Korea, Taiwan, Philippines, Laos, Colombia and Indonesia, Cambodia, Bangladesh, Thailand and India.

**(ii) *An ambitious deal***

The agreement negotiated among 12 economies once coming into force is expected to be a ‘21st-century trade agreement’ with ‘comprehensive and high standard’. Regarding trade liberalization, the TPP schedules to eliminate tariff on more than 95% goods represented by around 11,000 tariff lines. Trade of services among members is also expected to be enhanced with the introduction of the ‘negative list’ approach, which presumes comprehensive coverage but allows countries to negotiate specific exceptions to commitments in specific service sectors. Out of 29 Sections in the text of the negotiation, there are only 8 traditional issues including the market access, technical barriers to trade, sanitary and phytosanitary measures, rules of origin, customs cooperation, investment, services and legal and institutional aspects. TPP will also address cross-cutting trade issues like intellectual property rights, government procurement, investment, competition, labour, and environment and so on. As a ‘high standard agreement’, many rules being negotiated are intended to be more rigorous than comparable rules found in the WTO (Fergusson *et al.*, 2015). TPP is expected to be a “new age agreement” with the introduction of many topics able to break new grounds in FTA negotiations such as state-owned enterprises, regulatory coherence, and supply chain competitiveness.

**(iii) *Diversified partners***

One of the special features of TPP is the asymmetric circumstances across negotiating partners, which are shown in Table 1.

The majority of regional trade agreements (RTA) are built on the geographical similarity among members, especially the same continents (EU – Europe, AFTA- Asia, NAFTA-America,...). Meanwhile, 12 participants of TPP come from 3 different continents: Asia (Japan, Vietnam, Brunei, Singapore and Malaysia), America (US, Canada, Mexico, Chile and Peru) and Oceania (Australia and New Zealand). This difference implies a great variation in language, history, culture and so on.

The spatial sizes of the countries vary from Singapore with just under 1000 km<sup>2</sup> area and a single city to the US and Canada with more than 9,000,000 km<sup>2</sup> area and many states. The only geographical characteristic in common between TPP members is that all of them are coastal

countries beside the Pacific Ocean. However, the coastline length also varies hugely from under 200 km (Brunei and Singapore) to more than 200,000 km (Canada).

**Table 1: Overview of TPP members (2013)**

	GDP (billion US)	Population (million)	GDP Per Capita (USD)	HDI	Continent	Area (Km <sup>2</sup> )	Coastline Length (Km)
<b>Vietnam</b>	171	89.71	1,908	0.638	Asia	310,070	3,444
<b>Canada</b>	1,839	35.16	52,305	0.902	America	9,093,510	202,080
<b>Japan</b>	4,920	127.34	38,633	0.890	Asia	364,560	29,751
<b>USA</b>	16,768	316.50	52,980	0.914	America	9,147,420	19,924
<b>Brunei</b>	16	0.42	38,563	0.852	Asia	5,270	161
<b>Chile</b>	277	17.62	15,702	0.822	America	743,532	6,435
<b>Singapore</b>	302	5.40	55,980	0.901	Asia	700	193
<b>Australia</b>	1,560	23.13	67,473	0.933	Oceania	7,682,300	25,760
<b>New Zealand</b>	188	4.44	42,409	0.910	Oceania	263,310	15,134
<b>Malaysia</b>	313	29.72	10,538	0.773	Asia	328,550	4,675
<b>Mexico</b>	1,262	122.33	10,318	0.756	America	1,943,950	9,330
<b>Peru</b>	202	30.38	6,662	0.737	America	1,280,000	2,414

Source: GDP, Population and GDP per capita from World Bank Data <http://data.worldbank.org/indicator>; HDI from UNDP Data <http://hdr.undp.org/en/content/human-development-index-hdi-table> and Coastline length from CIA Factbook <https://www.cia.gov/library/publications/the-world-factbook/geos/vm.html>

The TPP is diverse in demographic and economic size. While Brunei has a tiny population of under a half of a million people and a 16-billion-dollar economy, the US has a large population of more than 300 million people with an economy of more than 16,700 billion dollars. The members of TPP are also at the different stages of development. There are 5 countries with GDP per capita over 40,000 USD including Australia, the US, Canada, New Zealand and Singapore. Meanwhile, Vietnam, the least-developed countries in the group just has lower-middle income of roughly 2,000 USD per capita. The living standard of the group with reference to HDI index can be categorized into medium HDI country (Vietnam), high HDI (Malaysia, Mexico and Peru) and very high HDI (US, Canada, Mexico, Chile, Singapore, Japan, Australia, New Zealand and Peru).

***(iv) A competitive track in ‘a spaghetti bowl’***

As a dynamic region, Asia Pacific is full of trade agreements and many of them overlap with each other, which can be referred to the concept ‘spaghetti bowl’ suggested by Bhagwati (1995).

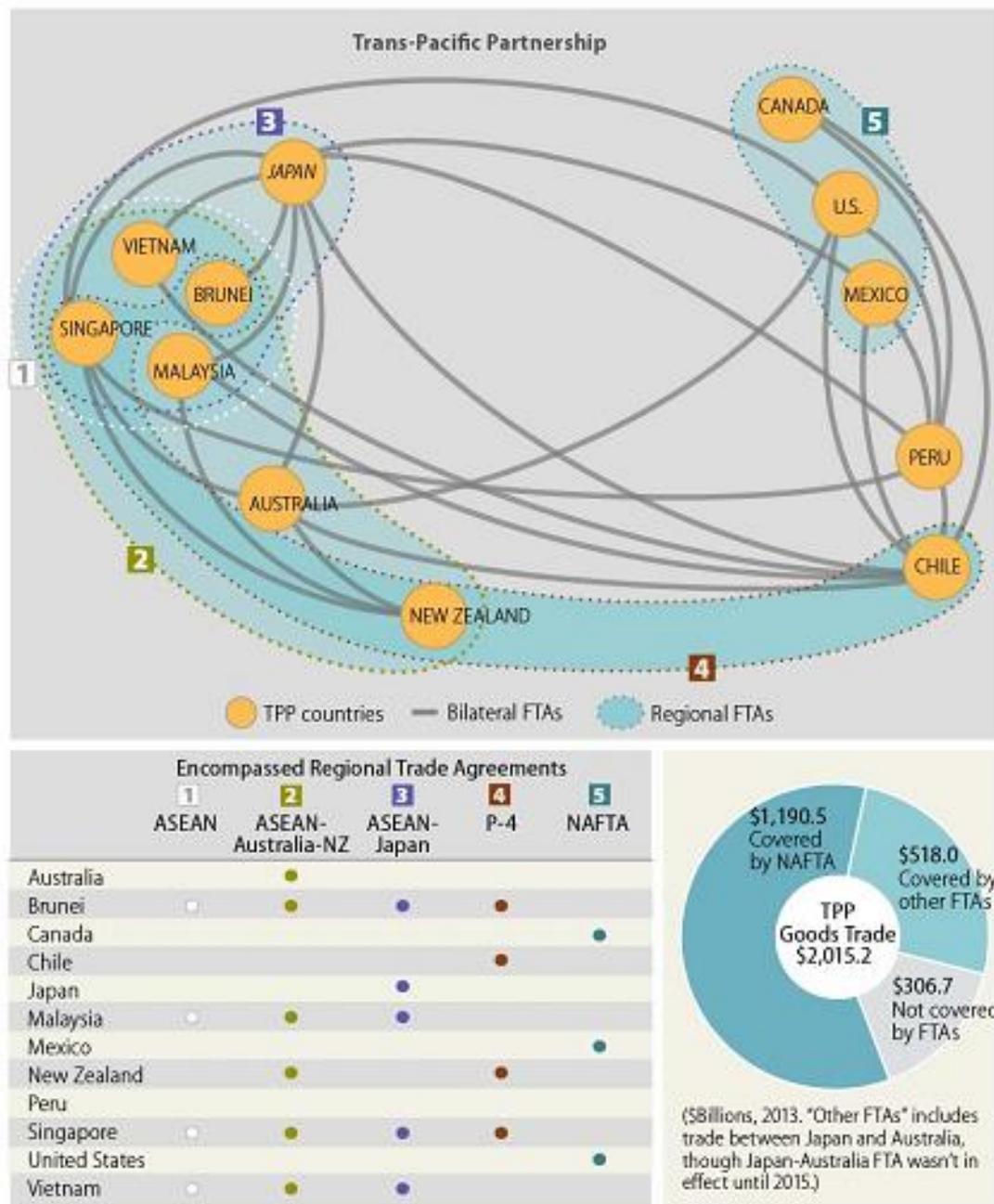
As a part of regionalism, the impact of TPP on the WTO negotiation and the Doha Development Agenda is still controversial. Apart from the multilateral talk, 12 members of TPP have already participated in a number of FTAs, including NAFTA, AFTA, ASEAN – Australia –

New Zealand Free Trade Area (AANZFTA), ASEAN–Japan Comprehensive Economic Partnership (AJCEP). In addition, all of TPP partners are also members of the Asia-Pacific Economic Cooperation (APEC) forum. Despite the absence of FTA negotiation, this organization enhances free trade and investment within the region as a forum for dialogue and establishes nonbinding commitments. There is also a comprehensive network of bilateral trade agreements between members of TPP as presented in Figure 1.

Many authors (for example Petri *et al.*, 2011) argue that TPP is a competitor with other FTAs involving ASEAN countries. Most notably among them, the FTA called Regional Comprehensive Economic Partnership (RCEP) projects to integrate ASEAN with six trading partners namely Australia, China, India, Japan, New Zealand, and South Korea.

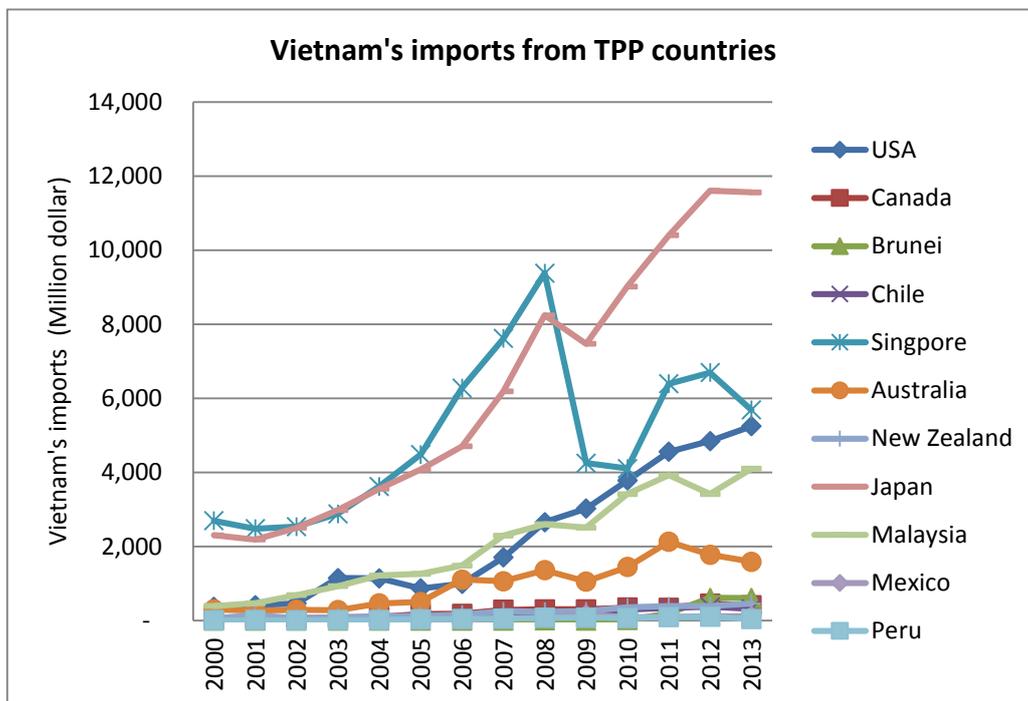
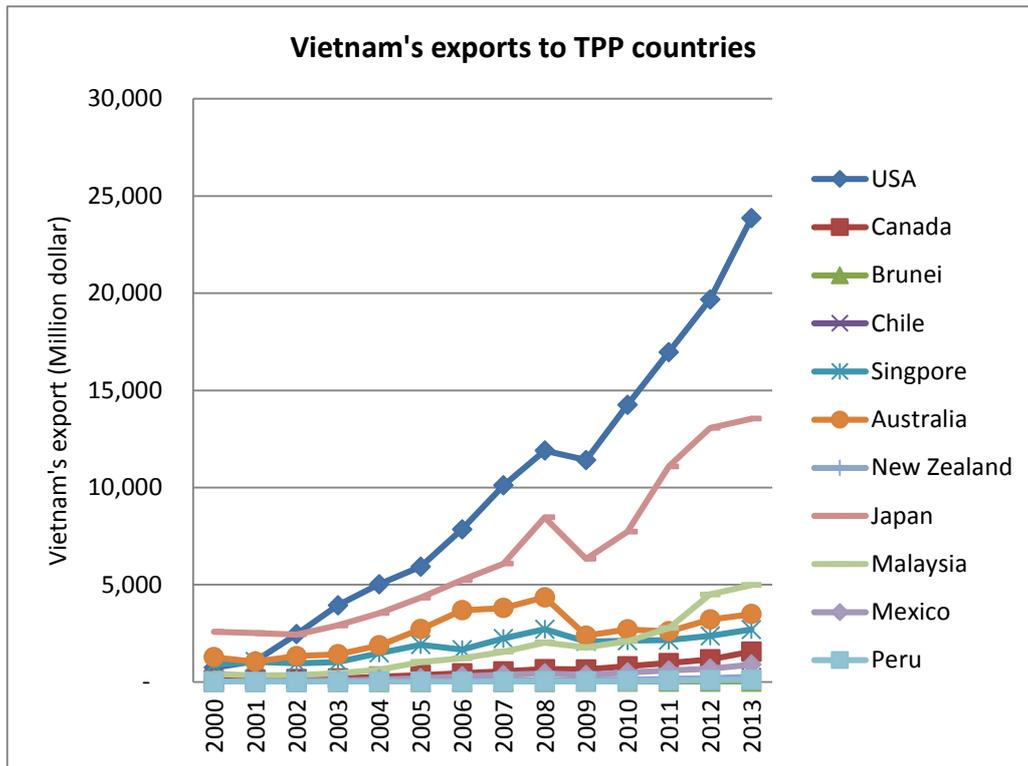
The supplement and competition between these trade blocs are still controversial and unclear. Although many believe that the RCEP will not set the goals as ambitious as the TPP, it is still attractive and 7 countries including Australia, Brunei, Japan, Malaysia, New Zealand, Singapore, and Vietnam have been negotiating both TPP and RCEP simultaneously. Some predict that the two tracks could converge in one FTA since both are still open and welcome new negotiating partners. Meanwhile, others focus on the opposition in leadership of the two largest economies in the world: US- the leader of the TPP and China – the leader of RCEP and predict a low chance that these two leaders could join the track led by the other.

Figure 1: 'Spaghetti bowl' and the TPP



Source: Ferguson et al. (2015, p9)

Figure 2: Vietnam Trade with TPP countries 2000-2013



Source: Author. Data from UNCOMTRADE

### 2.3. Vietnam's trade with the TPP countries

Figure 2 illustrates Vietnam's trade with TPP countries during 2000-2013. Overall, the bilateral trade flows of Vietnam with these partners mostly experienced upward trends in both exports and imports. In addition, among 11 negotiating partners, the most important ones are the US, Japan, Australia, Malaysia and Singapore.

Vietnam's exports to the US took over the first position from Japan's market in 2002 mainly due to the signing of the bilateral trade normalization. Since then, it has risen dramatically to just under 25 billion dollars in 2013. Following the US's imports from Vietnam, Japan's has also grown quickly, except for the year of crisis (2009) and reached roughly 14 billion dollars in 2013. Gradual increases were recorded in the figures for the two ASEAN partners (Malaysia and Singapore) while there was a fall in Vietnam's exports to Australia in the post-crisis compared with the previous period. Vietnam's exports to these market were far below that to the US and Japan and still lower than 5 billion dollar.

While the US has been the largest importer of Vietnam, it has only been the third exporter to Vietnam and experienced a huge trade deficit. After the crisis in 2009, there was a shift in the position between Japan's and Singapore's exports to Vietnam. After becoming the largest exporter to Vietnam, Japan's exports to Vietnam continued rising quickly and reached nearly 12 billion USD in 2013. Meanwhile, Singapore's figure fell from just under 10 billion in 2008 to nearly 6 billion dollar in 2013, which was a little bit higher than the follower (the US). There was a sustainable increase in Malaysia's and Australia's exports to Vietnam during the studied period while Vietnam's imports from other TPP countries were still modest.

A number of studies investigate the potential impacts of the TPP on all members in general and Vietnam in particular. The most frequently cited is the study published by Peter Petri, Michael Plummer, and Fan Zhai from the Peterson Institute for International Economics (PIIE). To deal with the evolvement of the TPP, the authors continue to update the adjusted result on the website. The most updated result in 2013 shows that with TPP-12 (with the inclusion of Japan), Vietnam's exports and imports in 2015 could gain about \$67.9 billion and 65.4 billion respectively (equivalent to 28.4% and 27.3%) above a baseline projection. The authors argue that as the least developed country, Vietnam's welfare gains the best with \$35.3 billion (equivalent to 10.4%) compared with the without-TPP scenario) and the most beneficial industries of Vietnam are textiles, garments and electrical components. Deardorff (2013) argues that Vietnam would benefit from TPPA because it can serve as a FTA between Vietnam and US, which has not existed yet while US is the greatest importer from Vietnam with less significant exports to

Vietnam. More specifically Lukas *et al.* (2013) calculate that Vietnam would gain \$26.2 billion (7.7 % growth) in income and US\$47.2 billion (19.8 % growth) in exports under TPP. However, all of the above mentioned studies use CGE models, which are accused of over-estimated gain due to unrealistic and inconsistent assumptions by Benga (2014). Alternatively, using a Trade in Value added (TiVA)-gravity model, the author predicts a decline in Vietnam’s potential domestic value added exports to TPPA countries by 18% (7.8 billion dollar annually).

### 3. LITERATURE REVIEW

#### 3.1. Gravity model and trade theory

According to Deardorff (1984), there are three questions related to trade between countries that trade theory should provide answers to: which goods, with whom and how much. During the course of history, various models have been introduced mainly to discuss the two first questions. Classical trade theory of which the famous Ricardian model is representative explains goods flows across nations with the introduction of the genius concept ‘comparative advantage’. Accordingly, countries trade with each other based on differences in technology (productivity). Neoclassical theory contributed to the clarification that those differences are due to variation in cross-sector factor intensity and cross-country factor abundance in Heckscher-Ohlin model as well as later derivations. The rising demand for explaining intra-industry trade was then satisfied by a number of New Trade Theory models: Paul Krugman (1980), Elhanan Helpman (1981), and William Ethier (1982). These models emphasized economies of scale and consumer preferences for variety. Old and new trade theories met each other in an integrated model of Helpman and Krugman (1985), which embedded horizontal product differentiation and increasing returns to scales while featuring endowment-based comparative advantage.

While the pattern of trade was considered quite thoroughly in multiple dimensions, theories mentioned above failed to provide a satisfactory explanation on trade volume across countries. Gravity model has emerged as an important branch of empirical analysis to address this issue. Its name reveals that it is based on the analog to physically gravitational forces in bilateral trade flow. This trade model, in the simplest form, states that the value of trade flow between two trading partners  $i$  and  $j$  ( $T_{ij}$ ) is related directly to both countries’ size measured by income level ( $Y_i$  and  $Y_j$ ) but inversely to the distance  $D_{ij}$  between two countries. Similar to Newton’s famous equation in physics, a constant  $A$  also enters the bilateral trade equation of gravity:

$$T_{ij} = A \frac{Y_i Y_j}{D_{ij}}$$

The first conceptualization of gravity model in trade was credited to Tinbergen (1962) and since then the estimation, mainly in log-linearized form, has proliferated and has been defined as the ‘workhorse of international trade’. Leamer and Levinsohn (1995) claimed that gravity equation is one of the most stable and robust empirical relationships thanks to its ability to correctly approximate bilateral trade flow.

Nevertheless, gravity model was not widely accepted by economists at first due to the accusation of being atheoretical. Anderson (1979) provided the first justification for theoretical basis for gravity model. He derived the model from a CES demand function *à la* Armington (1969) with differentiated products. Later explanations integrated consumer preferences of Armington type with monopolistic competition frameworks, (Krugman 1980; Bergstrand 1985, 1989; Helpman and Krugman 1985), Heckscher-Ohlin derivation (Deardorff 1998), or Ricardian continuum of goods (Eaton and Kortum 2002). The convergence of gravity model with recent literature on models of international trade with firm heterogeneity was introduced by Bernard *et al.* (2003) and Melitz (2003). Hence problem with gravity model is no longer weak theoretical foundation but how to choose appropriate model specification. Frankel, Stein and Wei (1997:53) claimed that the gravity model has ‘gone from an embarrassing poverty of theoretical foundations to an embarrassment of riches!’.

### 3.2. Trade determinants explained by gravity model

Reviewing the pioneering work of Tinbergen, De Benedictis and Taglioni (2011) divided bilateral trade determinants in gravity model into 3 groups: economic attractors, distance and trade policy. The first group had two components: economic sizes of a pair of countries measured by logarithm of GNP in USD ( $M_i$  and  $M_j$ ). Distance was represented by two variables: geographical distance  $\phi_{ij}$  between two countries in nautical miles, which was roughly proxied for transportation costs or indexed for export market information, and adjacency in form of dummy variable  $N_{ij}$ , which was valued 1 if two countries were having a common land border. Trade policy variable augmented in Tinbergen’s version is a dummy ( $V_{ij}$ ) indicating whether both countries belonged to British Commonwealth system of preferences, which was treated as a kind of preferential trade agreement.

$$\ln X_{ij} = \underbrace{\ln G}_{\alpha_0 \equiv \text{constant}} + \underbrace{a_1 \ln M_i + a_2 \ln M_j}_{\text{economic attractors}} + \underbrace{a_3 \phi_{ij} + a_4 N_{ij}}_{\text{distance}} + \underbrace{a_5 V_{ij}}_{\text{policy}} + \underbrace{\varepsilon_{ij}}_{\text{iid}}$$

A constant ( $\ln G$ ) and a stochastic term ( $\varepsilon_{ij}$ ) were included and coefficients were estimated by OLS. The estimation was very successful with a high multiple correlation coefficient ( $R^2=0.82$ ). Then positive sign of GNP coefficients and negative sign of distance ones became “the expected sign” of later studies.

**(i) Trade flow attractors**

After Tinbergen, economic attractors have been introduced in various nominal terms like GNP, population or GDP per capita. This extension of gravity model could be supported by economic theory as they indicate the demand force in the importing country as well as the supply force in the exporting country. Linnemann (1966) provided different explanations on the inclusion of population variables in these countries. The effect of population in the country of origin was indirectly justified through per capita domestic demand for produced commodities. Meanwhile, the negative effect of the importer’s population on the volume of exports was explained as a result of economies of scale. Interchangeable with population, GDP per capita (Bergstrand, 1989; Frankel, 1997) or infrastructural development index (Limao and Venables 2001) have been used.

Another important contribution of Linnemann (1966) was the introduction of *complementarity index*, which was the first effort to integrate gravity model with the trade theory of factor proportions. This index indicates how the commodity compositions of a trading- partner pair would complement each other or not. It can be thought of as a proxy for relative resource endowments, which explains the volume of trade in the future. This index was developed by Drysdale (1967; 1969) and since then there has been no significant improvement. His idea was that trading value would be enhanced if imported commodities were supplements to domestic goods. Complementarity index is claimed to be more effective in explaining trade flows between small countries, where production of fewer commodities is specialized (Commission, 2003). Afterwards, there were some attempts (e.g. Armstrong and Drysdale, 2009) to validate Drysdale’s complementarity index as a trade determinant in gravity model.

A large number of studies have attempted to augment gravity model with some common characteristics between 2 trading partners, which are deemed to ease trade relations. Hence extended gravity model could include not only economic attractors but also historical attractors, cultural attractors, institutional attractors, social attractors and so on. De Benedictis and Taglioni (2011) showed a long list of these trade determinants: shared border, shared language, shared historical events (colonial links, joint military alliances or co-membership in a political entity), the same institutions or legal systems, shared religion, shared ethnicity or nationality, similar tastes

and technology, and input–output linkages. However, it is worth noting that these attractors are generally lowly volatile across time hence incompatible with fixed effect estimation.

**(ii) Trade flow frictions**

Although geographical distance entered the basic gravity equation as a trade flow friction at the very beginning stage and has become an indispensable part of any extended version, the inclusion of this variable is still a subject for debate. Constant elasticity of trade to distance is econometrically estimated ranging from -0.7 and -1.2 (Disdier and Head, 2008) and the persistency of distance over time was recorded by Brun *et al.* (2005).

Tinbergen’s explanation that physical distance could be roughly proxied for transportation costs or indexed for export market information appears to be not persuasive enough. Researchers would be afraid that such a rough and robust variable could not capture so much information. Balassa (1968) argued that distance does not fully account for variation of cost and transportation fees are not proportionate to increased distance. Hence the inclusion of this variable could be a reason for certain misspecification.

However a number of justifications were presented in response to this argument. Introducing the term “economic distance”, Anderson (1979) validated the gravity approach through characteristics of a pure expenditure system. The non-negative disturbance term in Kalirajan (2008) stochastic frontier gravity model had a similar notion. Derived from Heckscher-Ohlin theorem, gravity model of Deardorff (1995) suggested a novel term called “relative distance”. Nevertheless, it was not until 2009, when Armstrong and Drysdale formulized and applied the relative distance variable in their study that this idea has been highly recognized. Another influential term is “remoteness index” suggested by McCallum (1995) in his famous “Border Puzzle” paper. This concept had been widely applied before being strongly criticized due to lack of theoretical justifications (Anderson and van Wincoop, 2003; Anderson, 2010).

Numerous studies made great efforts to provide better alternatives for simple measurement of distance. Traditionally, this variable was identified by Euclidean distance between the two poles of economic attraction of both countries, for example capitals, major cities, major ports or airports. Some improvements were introduced by estimating the gap between CIF and FOB data. Other made better with a great circle of orthodromic formulae. Nowadays, thanks to the availability of freely online data of virtual distance between any pair of cities, this issue is no longer addressed frequently.

Another issue related to distance variables is whether it should enter the equation explaining bilateral trade flows in a linear manner. This doubt is analogous to the question whether distance

is proportionate to trade cost between two countries. Skeptics may argue that trade costs are also dependent on many other factors, which are not reliant on distance. They could be country specific (such as remoteness, sectoral specialization and so on) or good specific (weight, size, fragility, durability and so on). Using nonparametric techniques, Henderson and Millimet (2008) pointed out that the linearity assumption was supported by the data. However, this conclusion should account for linear correlation between distance and variable trade cost only and there should be some more explanations for fixed trade cost.

Starting from Tinbergen's idea that distance could imply more than transport costs, many researchers move from spatial distance to economic distance. In other words, they seek for explanatory variables that could reduce trade and augment them with gravity equation. These variables, generally linked with a shared history of conflict, provide high significance. (Martin *et al.*, 2008).

It would be a serious shortcoming if we discussed gravity model without mentioning the famous 'border puzzle'. Applying a gravity model for US and Canada, McCallum (1995) estimated a surprisingly huge loss in trade values between states or provinces across countries compared with those within a country. More specifically; he showed that holding other factors constant, the estimated intra-national trade was more than 22 times larger than cross-border trade between Canadian provinces and US states. Apparently, this finding indicates home bias due to strong deterrent effect of border on trade despite a large shared border of two countries highly integrated through a regional trade agreement like NAFTA. This constraint could be explained by a gap in relative prices due to the existence of insurance fee, freight cost, tariffs, non-tariff barriers, and different regulatory structures in cross-border trade, which lead to uncertainty (Rossi–Hansberg 2005).

Using McCallum's data, Anderson and van Wincoop (2003) claimed to solve the border puzzle. Controlling for "multilateral resistance", they lower the border effect by almost a half. The importance of this novel term is that it takes into account the effect of a change in trade relation with a third country on the bilateral trade between the pair of countries analyzed. However, the assumption of symmetric trade costs in Anderson and van Wincoop (2003) seems to be unrealistic. Hence its results were criticized in an important paper by Balisteri and Hillberry (2006), which considered that the border puzzle was not resolved and still there. Head and Mayer (2000) showed that in 1985, Europeans for the average industry purchased 14 times less from foreign producers than from domestic ones at the same distance. The border effect is

deemed to be associated with consumer taste rather than trade barriers and its magnitude varies across sectors.

### ***(iii) Trade policies***

The inclusion of a dummy variable representing co-membership in British Commonwealth system of Preference in the pioneering work of Tinbergen (1962) is inspirational. Since then, analysis of both discriminatory and non-discriminatory trade agreement in extended gravity models has become popular and important in applied international economics. Both the cross section and panel data approaches have been deployed in these investigations, which are generally static and refers to a long run relation.

Regarding multilateralism, Subramanian and Wei (2007) modified the extended gravity model version proposed by Anderson and van Wincoop (2003) including country fixed effects in the regression to furnish robust evidence for a strong impact of WTO on trade, which accounts for about 120% of additional world trade. However, the authors showed that such a positive effect has been uneven based on three main findings. First, industrial countries with more active participation in reciprocal trade negotiations than developing countries experienced a large increase in trade. Second, bilateral trade was greater when both partners implemented liberalization than when only one partner did. Third, there was no significant increase in trade in sectors out of liberalization.

In terms of regionalism, Frankel, Stein and Wei (1997) is one of the most comprehensive and convincing studies. Utilizing a gravity model augmented with trade agreement dummy variables, they quantified the additional trade due to different preferential trade agreements and regional agreements such as APEC.

Tumbarello (2007) ran a gravity model with a dataset covering 182 countries during 1984-2005 controlling for WTO membership to investigate the effect of proliferation of regional trade agreements in Asia. The study showed statistical significance of all standard gravity variables (economic size, per capita income, distance, shared language and shared border), among which distance is the most important. Overall, participating in major RTA in Asia (ASEAN, APEC, and ASAPTA) did not lead to serious trade diversion. However, according to this study, membership of ASEAN did not substantially support intra-region trade flow, which contradicted Frankel and Wei (1997). An explanation was the difference in membership of ASEAN late-comers Cambodia, Lao P.D.R., Myanmar, and Vietnam, whose tariffs were above those of other ASEAN countries.

Hellvin and Nilsson (2000) is an interesting paper, which applied an augmented gravity model to investigate the trading bloc triangle EU, Asia and NAFTA. They found that the weakest trade link in this triangle was between EU and NAFTA, which was below the average level of trade integration among the OECD countries. Meanwhile both the EU's and NAFTA's level of trade integration with Asia were above the average level of trade integration among the OECD countries. However, EU was lagging behind North America on the Asian market, which could be a reason for the establishment of the ASEM.

Using a modified gravity equation, Elliott and Ikemoto (2004) investigated ASEAN intra- bloc and extra-bloc bias progress over time, especially the periods before and after two events: AFTA signing and Asian crisis. They suggested that there was no significant effect on trade flows in the year right after the signing of AFTA and ASEAN countries remained economically outwards oriented and this trend was stimulated by both/either studied event.

Overall, the mainstream approach to evaluate preferential trade policy still follows Tinbergen's original strategy with certain improvement in various contexts. The impact is defined as the marginal effect of a dummy variable representing the existence of the preferential trade on the bilateral trade flows estimated by a gravity model. De Benedictis and Taglioni (2011) pointed out some pitfalls of this strategy. They are the same dose of treatment for all treated countries even in case of discriminatory trade agreement; misleading due to events specific to the country pair at the same time with treatment and no room for a gradual liberalization analysis.

Therefore, there have been some alternatives to this strategy. Firstly, a high volume of studies witness a shift from a dummies strategy to a continuous variables strategy to quantify the effect of trade agreement. Many of them have been fruitful and have opened an interesting research agenda, namely Francois *et al.* (2006), Cardamone (2007) and Cipollina and Salvatici (2010). Secondly, some looked at disaggregated data on trade rather than aggregate ones as traditional, expanding the panel data along the sectoral dimension. Analyzing trade of six selected agricultural-food products in 1985-2000 by an extended gravity model, Jayasinghe and Sarker (2004) found a growth in the share of intra-regional trade within NAFTA. Furthermore, NAFTA enhanced trade among its members rather than with the rest of the world.

### **3.3. 'Trade potential' as an application of gravity model**

Measuring trade potentials between trading partners is an important application of gravity model. The examination of potential trade integrations between EU (some OECD members) and the former COMECON countries was a very early application like that. Egger (2002) reviewed 2 methods applied.

The first approach called in-sample projection was conducted by Wang and Winters (1991), Hamilton and Winter (1992); and Brulhart and Kelly (1999). They estimated a gravity model for EU or OECD countries then made projections of 'natural' trade relations between these countries and the CEEC. The authors argued that there were significant differences in trade behavior between already developed EU countries and ex-members of Central and Eastern European countries (CEEC), which gradually transformed in both system and economy. Then the exhausted trade potential was measured as the difference between the observed and the 'predicted' trade flows. The second approach is more updated and named in-sample projection (Baldwin, 1994; and Nilsson, 2000). The transformed countries were pooled with EU-OECD countries in regression analysis. Then the residual of fitted equation accounted for the variation between potential and actual bilateral trade.

The contributions of Egger (2002) are a correction for serial correlation, identification for best panel data specification and most importantly, an exercise in finding the ratio of actual to potential trade. This gives a measure of bilateral trade performance compared with the mean as predicted by the model.

Working on the panel of exporting flows from 11 Eurozone countries to 32 importers (the 11 euro countries plus 21 other countries), De Benedictis and Vicarelli (2004) estimated 3 different gravity equations. Their findings suggested that the dynamic estimator performed better than the static one regarding goodness of fit and a potential trade index derived from a dynamic specification gives more accurate indications on the spread between actual and potential trade. In addition, the author casted a doubt on the soundness of strong policy implications based on the (in)existence of unrealized trade potentials as trade potential sign is not robust and their signs may vary subject to estimators.

In the context of Africa, Rojid (2006) estimated an extended gravity model with Tobit techniques to point out that 26-African-member COMESA seemed to be a building bloc. However, trade potentials within the region were modest and most of intra-bloc bilateral relations were overtrading, except for some trade flows with Angola and Uganda.

Karagoz (2009) analyzed the trade potential of Turkey, a country adopting export-oriented strategy quite similar to Vietnam, with Asia – Pacific trading partners. While positive impact of economic size and negative of impact of distance played important roles in explaining trade flows of Turkey and analyzed partners, there was no significance in the impact of population. The research found promising potential for trade with Guinea, Peru, Myanmar, Mexico, Laos

and Brunei whilst overtrading was recorded in the bilateral trade of Turkey with the remaining partners in the sample.

Moharreri and Khosravi (2014) estimated an augmented gravity equation on agriculture and manufacturing sectors to evaluate the trade potential within TPP from 2000 to 2010, particularly focusing on the effect of complementary level. They found that in the manufacturing sector, unexhausted potentials were higher in intra- bloc trade than inter-bloc trade. In addition the impact of complementary level was greatest on trade flows within each continental region. The study suggested that Singapore and New Zealand markets were not regarded as attractive destinations to direct trade flows within the bloc while Vietnam and the US held no trade potentials in export flows to other members. Sharing the same context, Banga (2015) argued that in order to estimate the impact of participating trade agreements on member countries, domestic value added (DVA) exports is a better indicator than 'gross exports'. Hence he used Trade in Value-Added Gravity model (TiVA Gravity) to estimate the trade potentials between Malaysia and TPP countries.

One among a few gravity models specifically designed for analyzing Vietnam's trade, Thai Tri Do (2006) estimated bilateral trade between Vietnam and 23 European countries from 1993 to 2004 and calculated trade potentials. He found that Vietnam trade flows could be improved with 15/23 studied partners. While economic size, market size and exchange rate were the main factors driving Vietnam export with European countries, distance and history failed to show any significant impact in his estimated gravity equation.

## **4. EMPIRICAL ANALYSIS**

### **4.1. Methodology**

In order to investigate trade determinants between Vietnam and TPP countries, this study modifies a model suggested by Egger (2002). The advantage of this application is four folds. Firstly, as it is backed by theory, Egger's model (partially) corrects the problem of omitted variable bias associated with purely intuitive gravity model and is able to explain quite well the trade flows. Secondly, it captures many variables appropriate with asymmetric circumstances across TPP countries (for example different size, different factor endowment and so on) and allows the introduction of other relevant variables. Thirdly, it is compatible with various econometric techniques, hence allowing a comparison across estimators for robust findings. Last but not least, Egger's model is suitable for trade potential analysis, one of the main objectives of this study.

#### ***(i) Ordinary least squares (OLS)***

$$\begin{aligned} \ln Exp_{ijt} = & \beta_0 + \beta_1 Sum_{ijt} + \beta_2 Sim_{ijt} + \beta_3 Dif_{ijt} + \beta_4 \log Dist_{ij} + \beta_5 E_{ijt} + \beta_6 ASEAN_{ij} \\ & + \beta_7 WTO_{ijt} + \beta_8 TPP_{ijt} + \varepsilon_{ijt} \quad (1) \end{aligned}$$

The first model is estimated by an ordinary least squares (OLS) estimator with a White heteroscedasticity correction. The explanatory variable ( $\ln Exp_{ijt}$ ) is log of exports from country  $i$  to country  $j$  in the year  $t$ . In this study there is only 1 host country  $i$  (Vietnam) and 11 partners  $j$  (Australia, Brunei, Canada, Chile, Japan, Mexico, Myanmar, New Zealand, Peru, Singapore, the US) in a period of 13 years from 2001 to 2013.

The inclusion of 3 trade attractors in this Egger-type model is deemed to be in line with the endowment-based new trade model with Dixit and Stiglitz (1977), Helpman and Krugman (1985) and Helpman (1987). They are bilateral sum of GDP ( $Sum_{ijt}$ ), similarity in country size ( $Sim_{ijt}$ ) and relative factor endowment difference ( $Dif_{ijt}$ ), which are expected to positively affect export flows and calculated as follows:

$$\begin{aligned} Sum_{ijt} &= \log(GDP_{it} + GDP_{jt}) \\ Sim_{ijt} &= \log\left(1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}}\right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}}\right)^2\right) \\ Dif_{ijt} &= \left| \log\left(\frac{GDP_{it}}{POP_{it}}\right) - \log\left(\frac{GDP_{jt}}{POP_{jt}}\right) \right| \end{aligned}$$

It is noted that indexed GDP and POP are respectively gross domestic product and population of a country in a specific year and GDP per capita is a commonly used as a proxy for capital-labour ratio (Egger, 2002). In addition, we add the dummy variable ASEAN, which values unity if both trading partners are ASEAN members, otherwise zero. Co-membership of ASEAN can account for a number of common characteristics between 2 countries, which could ease trade relations for example the similarity and proximity in location (Asia continent and Southeast Asia region) and culture as well as the positive effect on trade of FTA within ASEAN (AFTA/CEPT). Hence the expected sign of ASEAN variable is positive. Notably, in the study period (2001-2013), ASEAN membership is time-invariant and just dependent on two dimensions  $i$  and  $j$ .

Regarding trade friction, the variable  $Dist_{ij}$  (geodesic distances) is calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population).

In terms of policy, there are three variables added to the model. Bilateral real exchange rate  $E_{ijt}$  in this study follows Elliot and Ikemoto (2004) and is calculated as the local currency value of one unit of  $j$ 's local currency, multiplied by country  $j$ 's GDP deflator and divided by country  $i$ 's GDP deflator. A depreciation of local currency is associated with an increase in bilateral real exchange rate and stimulates exports value from the host country. Hence  $E_{ijt}$  is expected to have positive sign and confirmed by Subramanian and Wei (2007). The second policy variable is WTO co-membership  $WTO_{ijt}$ , a dummy variable takes the value 1 if both trading partners are official members of this organization, otherwise zero. Trade liberalization within WTO is expected to have a positive effect on bilateral trade. Additionally, we suggest the dummy variable TPP negotiation status ( $TPP_{ijt}$ ) valued at unity if both the host and thee partner participate in TPP negotiation in the year  $t$ . Our hypothesis is that the prospect of better market access thanks to trade barrier elimination within future TPP stimulates trade between negotiators and this dummy variable will have a positive sign. Finally the error term  $\varepsilon_{ijt}$  is added to explain the effects of other unobservable variables.

To check the robustness of OLS model overtime, this study breaks the data into two sub-periods: before the financial crisis (2001-2008) and from the financial crisis (2009-2013) to estimate the model 1b and 1c then compare these estimates with the entire-data estimate.

**(ii) Fixed effect (FE)**

Although the simple OLS estimator (1) is able to explain trade flows quite well and convenient for interpretation, it could face struggle with certain degree of misspecification. Mátyás (1997) noted that a three-way specification is the most natural representation of bilateral trade flows. However, OLS method fails to capture the effect of all dimensions (exporter, importer and time). Egger (2002) claimed that convenient OLS estimates are very likely to result in inconsistent ones.

In literature, to deal with the inconsistency problem associated with OLS, researchers have used panel data techniques (Egger 2000, Rose and van Wincoop 2001, Mátyás 1998, Wall 2000, Melitz, 2007 and so on) to exploit all dimensions included in datasets covering cross-section trade flows among countries for several consecutive years. The advantages of panel data techniques are at least two folds. Firstly, they allow addressing the evolvement of variables of interest over time and/or identifying the specific effects of time or country. Secondly, they almost completely reduce the potential problem of multicollinearity sometimes associated with cross-section data.

Two major panel data techniques are fixed effect (FE) and random effect (RE). However, FE estimation largely dominates in the literature of gravity model due to the restrictive assumption associated with RE (Shepherd, 2012). RE estimator is consistent only if the unobserved heterogeneity is distributed as a random variable with given mean and variance, which requires no correlation between the individual effects and the regressors (Herrera and Baleix, 2009). However there is no theory supporting this assumption and it is frequently violated in practice. Meanwhile, FE estimators are still consistent without this assumption.

This study will benefit from FE technique in two approaches. Firstly, model 2 is estimated with the introduction of country FE, which includes dummy variables for each trading partner except one country to avoid perfect collinearity. Noted that because there is only one host country (Vietnam), these dummies are actually also served as a proxy for a pair of trading partners (both the exporter and importer). This will help to control all sources of unobserved heterogeneity which are constant for a given dyad across time. The cost for increased explanatory ability of the model is the exclusion of the variable  $ASEAN_{ij}$ , which is perfectly correlated with FE introduced.

$$\begin{aligned} \ln Exp_{ijt} = & \beta_0 + \beta_1 Sum_{ijt} + \beta_2 Sim_{ijt} + \beta_3 Dif_{ijt} + \beta_4 \log Dist_{ij} + \beta_5 E_{ijt} + \beta_6 WTO_{ijt} \\ & + \beta_7 TPP_{ijt} + \sum_{k=1}^{10} \gamma_k Dumcountry_k + \varepsilon_{ijt} \quad (2) \end{aligned}$$

Secondly, model 3 introduces time FE with the inclusion of dummy variables for each year, except one year to avoid collinearity. Mátyás (1997) argued that there may be a business cycle effect, which is common for all countries, but vary across years. Time FE added to model 3 accounts for business cycle effect during the studied periods.

$$\begin{aligned} \ln Exp_{ijt} = & \beta_0 + \beta_1 Sum_{ijt} + \beta_2 Sim_{ijt} + \beta_3 Dif_{ijt} + \beta_4 \log Dist_{ij} + \beta_5 E_{ijt} + \beta_6 ASEAN_j \\ & + \beta_7 WTO_{ijt} + \beta_8 TPP_{ijt} + \sum_{k=1}^{12} \gamma_k Dumyear_k + \varepsilon_{ijt} \quad (3) \end{aligned}$$

**(iii) Poisson Pseudo-Maximum Likelihood (PPML)**

Another problem arising in OLS estimation (equation 1) is “log or not to log”. The log-linearized estimates may generate substantial biases due to heteroscedasticity and the ‘zero trade’. Firstly, the condition for consistency of OLS requires variance of the error term  $\varepsilon_{ijt}$  to be independent of the regressor such as countries’ size or distance. However, trade data often violate this

condition, hence causing a serious source of bias in practical applications of the gravity model (Santos Silva and Tenreyro, 2006). In addition, the existence of zero-value bilateral exports, which are dropped from the sample in OLS estimation due to logarithmic transformation, can lead to additional biases in the estimation.

A resolution for these two problems is replacing log-linearized estimator with a multiplicative form. This study will apply Poisson Pseudo-Maximum Likelihood (PPML) proposed by Santos Silva and Tenreyro (2006), which is quite similar to running a type of non-linear least squares on the original model. This could help to correct the biases in the OLS estimator as it provides consistent estimate under just weak assumptions that the model contains the correct set of explanatory variables. In addition, the Poisson estimator naturally includes observation associated with ‘zero trade’ data. Finally, this method enables straightforward interpretation of the coefficients similar to OLS. The equation of PPML estimator is provided in (4):

$$\begin{aligned} Exp_{ijt} = e^{\beta_0} \cdot (GDP_{it} + GDP_{jt})^{\beta_1} \cdot exp(\beta_2 Sim_{ijt} \\ + \beta_3 Dif_{ijt}) \cdot Dist_{ijt}^{\beta_4} \cdot exp(\beta_5 E_{ijt} + \beta_6 ASEAN_j + \beta_7 WTO_{ijt} + \beta_8 TPP_{ijt} \\ + \varepsilon_{ijt}) \quad (4) \end{aligned}$$

#### 4.2. Data

We estimate a panel of exports from Vietnam to 11 TPP countries over the period 2001-2013. Exports in USD are from International Trade Center (ITC), which redirected the dataset from UN COMTRADE. Nominal GDP in USD and Population are from UNDP Database. Distance is from CEPII (the GeoDist Database). Local currency value and GDP deflator are collected from IMF. WTO membership is provided by WTO database. The membership of TPP countries is synthesized from US Trade Representative (USTR).

#### 4.3. Trade potentials index

In order to evaluate the trade potential between Vietnam and TPP countries, we follow De Benedictis (2004). Firstly, trade potential ( $TP_{ijt}$ ) between country  $i$  to country  $j$  in the year  $t$  is defined as an actual-to-estimated trade ratio. It is calculated as follow, where  $\widehat{Exp}_{ijt}$  is the fitted export value. The index lower than 1 implies the under-trade situation and there is room for improvement in bilateral trade. Otherwise, there is over-trading between these countries.

$$TP_{ijt} = \frac{Exp_{ijt}}{\widehat{Exp}_{ijt}}$$

Then trade potential will be standardized by the following equation:

$$STP_{ijt} = \frac{TP_{ijt} - 1}{TP_{ijt} + 1}$$

Standardized Trade Potential (STP) varies from -1 to +1. Finally, we use the Average Standardized Trade Potential (ASTP) to assess the trade potential over the whole period of 13 year between host country  $i$  and the trading partner  $j$

$$ASTP_{ij} = \frac{\sum_{t=2001}^{2013} STP_{ijt}}{13}$$

As the average value of STP, ASTP also varies from -1 to +1. There exists unexhausted trade potential between a pair of countries in the studied period if ASTP is negative. Otherwise, the two countries overtrade during this period and there is no room for improvement.

#### 4.4. Result and discussion

##### (i) OLS estimation result and robustness over time

Table 2 illustrates the OLS estimates for equation (1) over the entire studied period (2001 – 2013) as well as 2 sub-periods before and from the financial crisis (2001-2008 and 2009-2013 respectively). Overall, the OLS estimator performs quite well with high goodness- of- fit ( $R^2$  adjusted). The models are able to explain more than 90% of the real trade.

The coefficients of bilateral GDP sum and country size similarity come with expected signs, high significance and large magnitude. 1% increase in the combined economic size of Vietnam and trading partner raised exports from Vietnam by 3.82% in the former sub-period, 2.84% in the latter sub-period and 3.15% in the whole period. These figures for 1% increase in similarity in size between two countries were 3.08%, 1.97% and 2.36% respectively. The difference in relative factor endowment also showed the robustly positive impact on Vietnam's exports over time. Vietnam tended to export more to the country less similarly endowed.

The distance as expected showed the significant friction effect with high robustness. 1% in distance tended to reduce Vietnam's exports by nearly 1% before the financial crisis and 0.44% after this event. Meanwhile, there was no significance in the influence of bilateral exchange rate. The dummy variable ASEAN membership entered the model with robustly positive sign.

The two last variables' coefficients have unexpected signs and need further investigation. The co-membership in WTO reduced Vietnam's export to the trading partner by 62% ( $\exp(-0.97)-1=-0.62$ ) during the investigated period. Similarly, negotiating TPP with a trading partner cut Vietnam's export to it by roughly 29% ( $\exp(-0.34)-1=-0.29$ ). However, the effect of this negotiation was statistically insignificant in each separate sub-period.

**Table 2: OLS estimates over the entire period and 2 sub-periods**

Variable	Model 1 (OLS 2001-2013)	Model 1b (OLS 2001-2008)	Model 1c (OLS 2009-2013)
Bilateral sum of GDP <i>Sum<sub>ijt</sub></i>	3.15 *** (0.16)	3.82 *** (0.25)	2.84 *** (0.10)
Similarity in country size <i>Sim<sub>ijt</sub></i>	2.36 *** (0.17)	3.08 *** (0.26)	1.97 *** (0.12)
Relative factor endowment difference <i>Dif<sub>ijt</sub></i>	0.42 *** (0.09)	0.32 * (0.14)	0.37 *** (0.06)
Logarithm of distance <i>logDist<sub>ij</sub></i>	-0.66 *** (0.15)	-0.98 *** (0.24)	-0.44 *** (0.10)
Bilateral real exchange rate <i>E<sub>ijt</sub></i>	-2.15 (4.63)	-0.41 (6.3)	12.13 (14.03)
ASEAN membership <i>ASEAN<sub>j</sub></i>	1.13 ** (0.35)	1.27 ** (0.47)	1.18 *** (0.23)
TPP negotiation status <i>TPP<sub>ijt</sub></i>	-0.34 * (0.14)	-0.38 (0.3)	-0.14 (0.12)
WTO co-membership <i>WTO<sub>ijt</sub></i>	-0.97 *** (0.21)	-0.98 *** (0.26)	-
Constant	-63.25 *** (4.07)	-76.62 *** (5.97)	-58.55 *** (2.63)
Number of Observations	142	87	55
<i>R</i> <sup>2</sup>	0.9153	0.908	0.9809
<i>R</i> <sup>2</sup> adjusted	0.9102	0.8985	0.9780

Robust standard errors in parentheses: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

**(ii) Various econometric estimators, trade determinants and trade potentials**

The OLS estimator needs to be compared with other econometric estimators for robust findings due to potential sources of bias associated with OLS method. These results are shown in Table 3. Model 2 with country fixed effect has the highest  $R^2$  adjusted (97.24%) but the fewest number of significant variables. Accordingly, only combined GDP of two countries and distance has impact at the significance level of 10%. Hence the unobserved time-invariant factors which are constant for country pair captured by importer dummies play an important role in explaining Vietnam's export flows to the 11 partners.

Overall, model 3 (time FE) and model 4 (PPML) support the signs of almost all variables shown in the OLS estimates with high significance except for the dummy TPP negotiation status. Both models confirm positive impacts of 3 trade attractors: bilateral sum of GDP, similarity in country size and relative factor endowment difference at the significance level of 1%. This finding is in line with Egger (2002).

**Table 3: Estimates applied various techniques**

Variable	Model 1 (OLS)	Model 2 (Country FE)	Model 3 (Time FE)	Model 4 (PPML)
Bilateral sum of GDP <i>Sum<sub>ijt</sub></i>	3.15 *** (0.16)	1.43 *** (0.2)	3.88 *** (0.18)	0.26 *** (0.02)
Similarity in country size <i>Sim<sub>ijt</sub></i>	2.36 *** (0.17)	0.03 (0.37)	3.12 *** (0.19)	0.21 *** (0.02)
Relative factor endowment difference <i>Dif<sub>ijt</sub></i>	0.42 *** (0.09)	-0.7 (0.39)	0.3 *** (0.08)	0.04 *** (0.01)
Logarithm of distance <i>logDist<sub>ij</sub></i>	-0.66 *** (0.15)	-4.8 ** (1.49)	-0.83 *** (0.14)	-0.04 *** (0.01)
Bilateral real exchange rate <i>E<sub>ijt</sub></i>	-2.15 (4.63)	-7.99 (5.17)	-1.89 (3.9)	-0.56 (0.43)
ASEAN membership <i>ASEAN<sub>j</sub></i>	1.13 ** (0.35)	-	1.64 *** (0.25)	0.10 *** (0.03)
TPP negotiation status <i>TPP<sub>ijt</sub></i>	-0.34 * (0.14)	0.19 (0.14)	0.53 ** (0.16)	-0.03 * (0.01)
WTO co-membership <i>WTO<sub>ijt</sub></i>	-0.97 *** (0.21)	-0.04 (0.13)	-3.57 *** (0.54)	-0.09 *** (0.02)
Constant	-63.25 *** (4.07)	20.93 (14.58)	-79.02 *** (4.23)	-3.94 *** (0.39)
Number of Observations	142	142	142	142
<i>R</i> <sup>2</sup>	0.9153	0.9755	0.9384	0.8975
<i>R</i> <sup>2</sup> adjusted	0.9102	0.9724	0.9288	-

Robust standard errors in parentheses: \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$

Distance shows the negative sign in all estimated models but with various elasticity ranging from -0.04 in PPML to -4.8 in country FE. This is consistent with previous studies. Conducting a meta-analysis across 1,467 estimates from 103 papers, Disdier and Keith Head (2006) found that the mean elasticity of distance on trade flows is about 0.9, with 90% of estimates between 0.28 and 1.55 and the PPML estimates tend to report much smaller distance effects.

The insignificant effect of bilateral real exchange rate on Vietnam's exports found in this study is similar to those in previous studies (Soloago and Winters, 2001; Elliott and Ikemoto, 2004). The positive sign of ASEAN robust over different estimators in this study is in line with Elliott and Ikemoto (2004) but contradicts to the finding of Sharma and Chua (2000) and Soloaga and Winters (2001).

An unexpected finding of this paper is the negative impact of the WTO on Vietnam's exports, which is reported in all 4 models. In literature, the effect of the WTO on trade is still controversial. Rose (2002, 2004a) denied evidence that the WTO had increased world trade while Subramanian and Wei (2006) claimed 120% of additional world trade was accounted for by the

WTO. However, the latter also suggests that the effect of WTO is uneven: the developing countries (the case of Vietnam) less actively participating in reciprocal trade negotiations witness an increase in trade not as large as the industrial countries and liberalization is required for greater bilateral trade. We suggest that the potential explanation for this negative impact is the weakened supply force from Vietnam exporters. Our hypothesis is that Vietnam's firms fail to compete against foreign firms in global market due to less support from the government, which is the result of the market-oriented reform required by the WTO accession.

The effect of TPP negotiation on Vietnam's exports is inconsistent over models. Its coefficient is negative in OLS estimates but positive in time FE model and negative with very near-zero-magnitude in the PPML model. Our explanation is that TPP negotiation affects the expectation of both importers and exporters in two opposite ways. On one hand, the outlook of better market access due to almost completely eliminated tariff within TPP region boosts intra-bloc trade (trade creation) and Vietnam's exports also reap this benefit. This argument is similar to previous studies like Petri *et al.* (2013), Deardorff (2013), and Lukas (2013). However future TPP could also hamper Vietnam's exports. As it may include too many rules and regulations whose standard is higher than Vietnam's level of development including but not limited to intellectual property rights (TRIPS++), TBT, SPS, labor, environment and so on, these 'high standard' rules would actually serve as sophisticated new trade barriers against Vietnam's goods. In addition, a very strict 'rule of origin' attached to TPP may prevent cheap input flow from China to Vietnam (trade diversion) and may erode competitive advantages of Vietnam's manufacturers. It is noted that these arguments do not imply negative impact of TPP on Vietnam's export in long term but are applicable only in short-term, when there is not enough time for domestic institutional and legal reform to adapt the 'new play rule'.

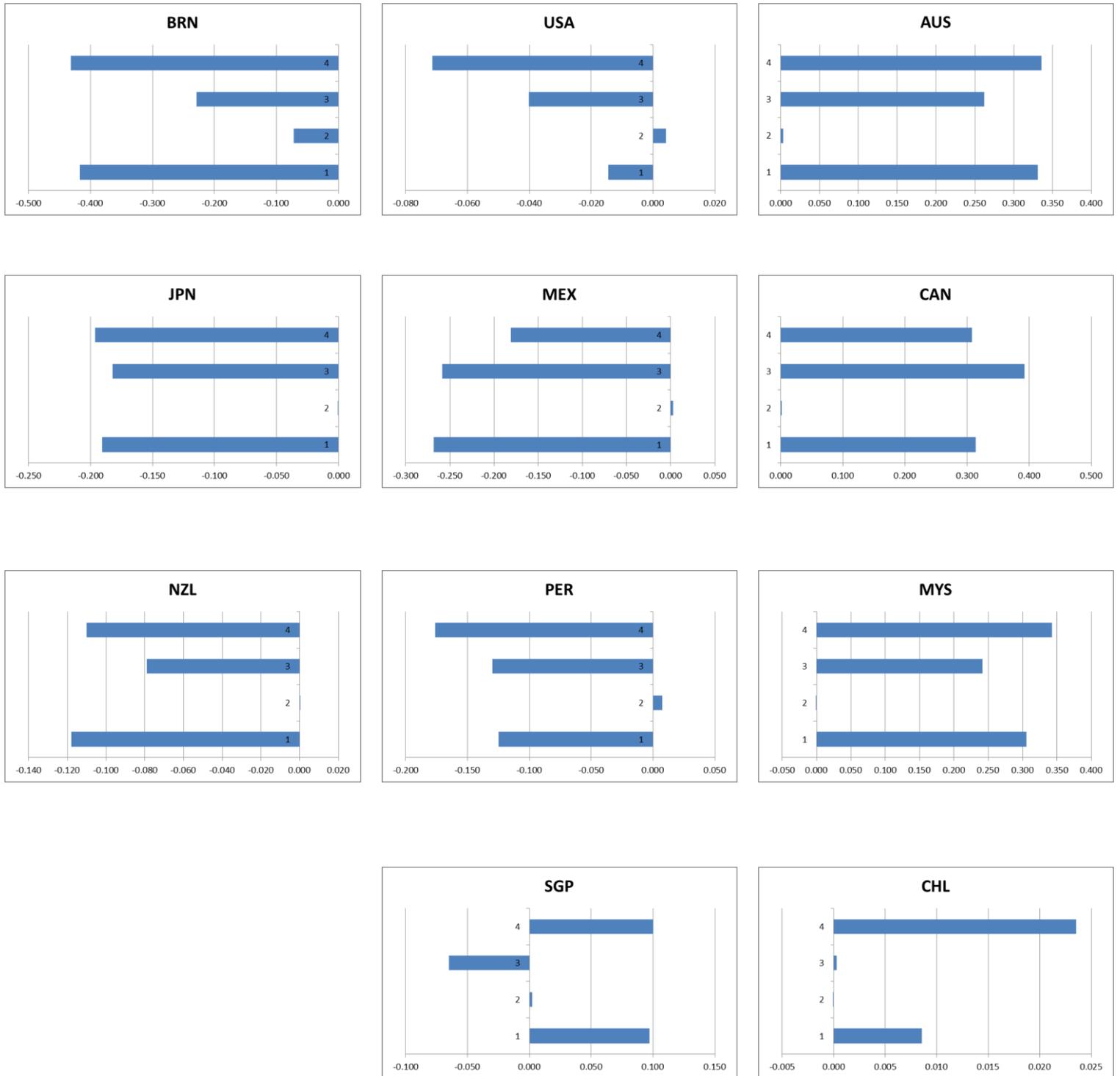
The last finding is about trade potentials between Vietnam and the 11 partners shown in Table 4 and Figure 3. Overall the models estimated fit the actual trade quite well with  $R^2$  adjusted around and even above 90%. The negative signs in ASTP illustrated in Table 4 indicate the signal for unexhausted trade potentials. Brunei, Japan and New Zealand are the markets whose trade potentials for Vietnam's exports are reported by all models. Meanwhile, all of them suggest Vietnam's overtrading with Australia, Canada, Chile and Myanmar. Except for model 2, three others reveal Vietnam's unexploited trade potentials with 3 American countries: Peru, Mexico and USA. Singapore shows a little trade potentials only in the time FE model.

**Table 4: Average standardized trade potential (ASTP)**

Country	Model 1	Model 2	Model 3	Model 4
AUS	0.331	0.003	0.262	0.336
BRN	-0.418	-0.072	-0.229	-0.432
CAN	0.314	0.002	0.393	0.308
CHL	0.009	0.000	0.000	0.024
JPN	-0.191	0.000	-0.182	-0.197
MEX	-0.269	0.002	-0.259	-0.181
MYS	0.305	0.000	0.242	0.342
NZL	-0.118	0.000	-0.079	-0.110
PER	-0.125	0.007	-0.130	-0.176
SGP	0.097	0.002	-0.065	0.100
USA	-0.014	0.004	-0.040	-0.071

*A negative sign is a signal for unexhausted trade potential. A positive sign indicates overtrading*

Figure 3: Average Standardized Trade Potential



Horizontal axis: ASTP index, Vertical axis: model 1 (OLS), model 2 (country FE), model 3 (Time FE), model 4 (PPML)  
 Bar to the left (negative) is signal for unexhausted trade potential. Bar to the right (positive) indicates overtrading

## 5. CONCLUSIONS AND POLICY IMPLICATIONS

This study investigates Vietnam's exports to 11 TPP countries in the periods from 2001 to 2013 to find out trade determinants and identify trade potentials. 4 estimators are conducted to estimate gravity model suggested by Egger (2002) namely OLS, country FE, time FE and PPML with some modifications. Overall, the models excellently capture the reality and are able to explain more than 90% of Vietnam's exports. The followings are some important results with policy implications mainly interpreted from OLS estimator (the baseline model).

There are strong and robust evidences on the trade-creating effect of a number of variables. Vietnam tends to export more to the country with similar size but different relative factor endowment. Larger combined GDP of Vietnam and trading partner substantially encourages its exports. Only 1% increase in the former would raise the latter by 3.15%. This is an important signal for Vietnam to choose the focused exporting market. There should be more policies supporting exports to large markets in TPP like US, Japan, Australia and Canada,... to fully take advantage of their attraction. In addition, Vietnam has a special preference in exporting to ASEAN countries. Deeper regional integration with these countries will benefit Vietnam's exports.

It is noted that distance leaves a varying friction effect across models while no significant impact is found in bilateral real exchange rate. In the baseline model, the magnitude of friction is large: 1% increase in distance reduces Vietnam's exports to the targeted market by 0.66%. Trade literature reveals that distance proxies for transport cost and information barriers. Hence, to facilitate exports to TPP countries, there should be appropriate measures to lower this coefficient by reducing transport cost and eliminating information barriers. Transportation is sensitive to economies of scales and administration. Hence, there should be uniform and consistent plan to integrate and harmonize manufacturing, warehouse, domestic and international transportation in supply chain. Meanwhile there should be a reduction in administrative cost and unnecessary procedures to enhance the transparency, efficiency and effectiveness of state agencies regulating foreign trade. Last but not least, exporting firms need information support from the government and state bodies including but not limited to market research, trade promotion and so on.

It is remarkable that WTO co-membership unexpectedly hinders Vietnam's exports while TPP negotiation status has mixed effects. The evidence on negative impact (-62%) of accession into WTO in this study once again warns that there has been insufficient and ineffective preparation

for the domestic firms to fairly perform in global market and compete against foreign competitors. Domestic firms are not ready to reap benefits from opportunities but too passive to be fully affected by the challenges (more severe competitive pressure, global crisis,...) associated with international integration. Taking into account the fact that TPP was already signed and will become effective soon, the lessons learnt from WTO should be quickly converted into appropriate actions. Yet easier access to attractive markets with nearly zero tariff is traded for higher standard for export goods (TRIPS++, SPS, TBT, regulation on labour and environment and tough rules of origin). For some certain extent, we could justify that entering TPP, Vietnam accepts short term shock to trade for long term benefits. However this argument should be challenged by the question how long will be enough for the 'short term'. If appropriate measures and actions, from both the government and firms, are failed to be timely taken, the consequence would be much heavier than WTO.

Finally, the majority of models estimated suggest that Vietnam has unexploited trade potentials with Brunei, Japan, New Zealand, Peru, Mexico and USA while overtrading with Australia, Canada, Chile, Myanmar and Singapore. Evidence on trade potential means that Vietnam's exporters has been underperformed in 6 named markets. This implies great opportunities. Trade potential index gives a direction for identifying existing issues. There should be some abnormal unexplored problems with these markets, which have hindered Vietnam's exports. However, once the issues are addressed, Vietnam's exports will be boosted substantially.

Besides these findings and contributions, this study is not free of limitation in need of improvement. Firstly, the aggregate trade dataset used in this study could be enlarged and provide better validity and more insightful findings if exploited at a more disaggregate level (for example 2-digit HS). Secondly, this study limits the sample within TPP-negotiators and ignores the effect on other countries outside this bloc (such as China). Thirdly, the controversial effect of TPP negotiation needs further investigation provided that it is still an evolving agreement.

## REFERENCES

- Anderson, J.E. 2010, *The Gravity Model*, National Bureau of Economic Research, Inc, Massachusetts M.A.
- Anderson, J.E. 1979, "A Theoretical Foundation for the Gravity Equation", *The American Economic Review*, vol. 69, no. 1, pp. 106-116.
- Anderson, J.E. & van Wincoop, E. 2003, "Gravity with Gravitas: A Solution to the Border Puzzle", *American Economic Review*, vol. 93, no. 1, pp. 170-192.
- Armington, P.S. 1969, "The Geographic Pattern of Trade and the Effects of Price Changes Structure", *Staff Papers - International Monetary Fund*, vol. 16, no. 2, pp. 179.
- Balassa, B. 1968, *An Econometric Study of International Trade Flows (Book Review)*, Econometrica.
- Baldwin, R.E. 1994, *Towards an integrated Europe / Richard E. Baldwin*, Centre for Economic Policy Research, London.
- Balistreri, E.J. & Hillberry, R.H. 2006, "Trade frictions and welfare in the gravity model: how much of the iceberg melts?", *Canadian Journal of Economics/Revue canadienne d'économique*, vol. 39, no. 1, pp. 247-265.
- Banga, R. 2014, "Trans Pacific Partnership Agreement (TPPA): Implications for Domestic Value-Added Trade of Malaysia", *UNCTAD background paper*, vol. no. RVC-12 UNCTAD.
- Bergstrand, J.H. 1989, "The Generalized Gravity Equation, Monopolistic Competition, and the Factor-Proportions Theory in International Trade", *The review of economics and statistics*, vol. 71, no. 1, pp. 143-153.
- Bergstrand, J.H. 1985, "The Gravity Equation in International Trade: Some Microeconomic Foundations and Empirical Evidence", *The review of economics and statistics*, vol. 67, no. 3, pp. 474-481.
- Bernard, A.B., Eaton, J., Jensen, J.B. & Kortum, S. 2003, "Plants and Productivity in International Trade", *American Economic Review*, vol. 93, no. 4, pp. 1268-1290.
- Bernard, A.B., Jensen, J.B., Redding, S.J. & Schott, P.K. 2007, "Firms in International Trade", *Journal of Economic Perspectives*, vol. 21, no. 3, pp. 105-130.
- Bhagwati, J. 1995, "U.S. Trade Policy: The Infatuation with Free Trade Agreements", [Online], , pp. Columbia University Academic Commons. Available from: <http://hdl.handle.net/10022/AC:P:15619>. [01/90/2015].

- Brun, J., Carrre, C., Guillaumont, P. & de Melo, J. 2005, "Has Distance Died? Evidence from a Panel Gravity Model", *The World Bank Economic Review*, vol. 19, no. 1, pp. 99-120.
- Cardamone, P. 2007, *A survey of the assessments of the effectiveness of Preferential Trade Agreements using gravity models*, TRADEAG - Agricultural Trade Agreements.
- Commission, I.T. 2003, "A gravity model for the calculation of trade potentials for developing countries and economies in transition", *United Nations Conference on Trade and Development*, , Geneva, Switzerland, [Online], . Available from: [http://lionel.fontagne.free.fr/papers/TSM\\_MII.pdf](http://lionel.fontagne.free.fr/papers/TSM_MII.pdf).
- De Benedictis, Luca and Taglioni, Daria 2011, "The Gravity Model in International Trade" in *The Trade Impact of European Union Preferential Policies*, eds. L. De Benedictis & L. Salvatici, Springer Berlin Heidelberg, , pp. 55-89.
- De Benedictis, L. & Vicarelli, C. 2004, "Trade Potentials in Gravity Panel Data Models", *The B.E. Journal of Economic Analysis & Policy*, vol. 5, no. 1.
- Deardorff, A.V. 1984, "Testing Trade Theories and Predicting Trade Flows" in *Handbook of International Economics*, Vol. 1 edn, Elsevier Science Publishers, .
- Deardorff, A. 2013, "Trade Implications of the Trans-Pacific Partnership for ASEAN and Other Asian Countries", *Working Papers, Research Seminar in International Economics, University of Michigan*, vol. No 638.
- Deardorff, A.V. 1995, *Determinants of Bilateral Trade: Does Gravity Work in a Neoclassical World?*, National Bureau of Economic Research, Inc.
- Disdier, A. & Head, K. 2008, "The Puzzling Persistence of the Distance Effect on Bilateral Trade", *The review of economics and statistics*, vol. 90, no. 1, pp. 37-48.
- Dixit, A.K. & Stiglitz, J.E. 1977, "Monopolistic Competition and Optimum Product Diversity", *The American Economic Review*, vol. 67, no. 3, pp. 297-308.
- Do Thai Tri 2006, *A gravity model for trade between Vietnam and twenty-three European countries*, Department of Economics and Society, Dalarna University, Sweden.
- Drysdale, P. 1967, *Australian-Japanese trade*, Australian National University, Canberra, Australia.
- Drysdale, P. 1969, "Japan, Australia, New Zealand: The Prospect for Western Pacific Economic Integration\*", *Economic Record*, vol. 45, no. 3, pp. 321-342.

- Drysdale, P.D. 2009, *The Influence of Economics and Politics on the Structure of World Trade and Investment Flows*, East Asian Bureau of Economic Research.
- Eaton, J. & Kortum, S. 2002, "Technology, Geography, and Trade", *Econometrica*, vol. 70, no. 5, pp. 1741-1779.
- Egger, P. 2002, "An Econometric View on the Estimation of Gravity Models and the Calculation of Trade Potentials", *World Economy*, vol. 25, no. 2, pp. 297-312.
- Egger, P. 2000, "A note on the proper econometric specification of the gravity equation", *Economics Letters*, vol. 66, no. 1, pp. 25-31.
- Elliott, R.J.R. & Ikemoto, K. 2004, "AFTA and the Asian Crisis: Help or Hindrance to ASEAN Intra-Regional Trade?", *Asian Economic Journal*, vol. 18, no. 1, pp. 1-23.
- Ethier, W.J. 1982, "National and International Returns to Scale in the Modern Theory of International Trade", *The American Economic Review*, vol. 72, no. 3, pp. 389-405.
- Fergusson, I.,F, McMinimy, M.,A & Williams, B.,R. 2015, *The Trans-Pacific Partnership (TPP) Negotiations and Issues for Congress*, Congressional Research Service, US.
- Frankel, J.A. & S. J. Wei 1998, "Regionalization of World Trade and Currencies: Economics and Politics" in *The Regionalization of the World Economy*, ed. Jeffrey A. Frankel, The University of Chicago Press, Chicago and London, pp. 189-219.
- Frankel, J.A. 1997, *Regional trading blocs in the world economic system / Jeffrey A. Frankel, with Ernesto Stein and Shang-Jin Wei*, Institute for International Economics, Washington, DC.
- Frankel, J., Stein, E. & Wei, S. 1995, "Trading blocs and the Americas: The natural, the unnatural, and the super-natural", *Journal of Development Economics*, vol. 47, no. 1, pp. 61-95.
- Hamilton, C.B., Winters, L.A., Hughes, G. & Smith, A. 1992, "Opening up International Trade with Eastern Europe", *Economic Policy*, vol. 7, no. 14, pp. 78-116.
- Head, K. & Mayer, T. 2000, "Non-Europe: The magnitude and causes of market fragmentation in the EU", *Weltwirtschaftliches Archiv*, vol. 136, no. 2, pp. 284-314.
- Hellvin, L. and L. Nilsson 2000, "Trade Flows Between Trading Blocs: The Case of the EU's Trade with Asia and NAFTA", *Swedish Network for European Studies in Economics and Business, Discussion Paper*, [Online], . Available from: <http://www.snee.org/filer/papers/36.pdf>.
- Helpman, E. 1987, "Imperfect competition and international trade: Evidence from fourteen industrial countries", *Journal of the Japanese and International Economies*, vol. 1, no. 1, pp. 62-81.

- Helpman, E. 1985, *Market structure and foreign trade : increasing returns, imperfect competition and the international economy / Elhanan Helpman and Paul R. Krugman*, Wheatsheaf, Brighton.
- Helpman, E. 1981, "International trade in the presence of product differentiation, economies of scale and monopolistic competition: A Chamberlin-Heckscher-Ohlin approach", *Journal of International Economics*, vol. 11, no. 3, pp. 305-340.
- Henderson, D. & Millimet, D.L. 2008, "Is gravity linear?", *Journal of Applied Econometrics*, vol. 23, no. 2, pp. 137-172.
- Jayasinghe, S. & Sarker, R. 2008, "Effects of regional trade agreements on trade in agrifood products: Evidence from gravity modeling using disaggregated data", *Review Of Agricultural Economics*, vol. 30, no. 1, pp. 61-81.
- Kalirajan, K. 2008, "Gravity model specification and estimation: revisited", *Applied Economics Letters*, vol. 15, no. 13, pp. 1037-1039.
- Karagoz & Saray 2010, "Trade Potential of Turkey with Asia-Pacific Countries: Evidence from Panel Gravity Model", *International Economic Studies*, vol. 36, no. 1, pp. 19-26.
- Kelly, M. 1998, *Ireland's Trading Potential with Central and Eastern European Countries: A Gravity Study*, Trinity College Dublin, Economics Department.
- Krugman, P. 1980, "Scale Economies, Product Differentiation, and the Pattern of Trade", *The American Economic Review*, vol. 70, no. 5, pp. 950-959.
- Leamer, E.E. & James Levinsohn 1995, "International Trade Theory: The Evidence" in *Handbook of International Economics*, eds. G. M. Grossman & K. Rogoff, Amsterdam; New York and Oxford, pp. 1939-1994.
- Li, C., Wang & J. Whalley, J. 2014, *China and Global Mega Trade Deals*.
- Limao, N. & Venables, A.J. 2001, "Infrastructure, Geographical Disadvantage, Transport Costs, and Trade", *World Bank Economic Review*, vol. 15, no. 3, pp. 451-479.
- Linnemann, H. 1966, *An econometric study of international trade flows / Hans Linnemann*, North-Holland Publishing Company, Amsterdam.
- Lukas Gajdos *et al.* 2013, "The Trans-Pacific Partnership and its impact on EU trade", , " *Directorate-General for External Policies Policy Briefing*, .
- Martin 2014, *U.S.-Vietnam Economic and Trade Relations: Issues for the 113th Congress*, Congressional Research Service, US.

- Mátyás, L. 1998, "The gravity model: Some econometric considerations", *World Economy; World Econ.*, vol. 21, no. 3, pp. 397-401.
- Mátyás, L. 1997, "Proper Econometric Specification of the Gravity Model", *World Economy*, vol. 20, no. 3, pp. 363-368.
- McCallum, J. 1995, "National Borders Matter: Canada-U.S. Regional Trade Patterns", *The American Economic Review*, vol. 85, no. 3, pp. 615-623.
- Melitz, J. 2007, "North, South and distance in the gravity model", *European Economic Review*, vol. 51, no. 4, pp. 971-991.
- Melitz, M. 2003, "The impact of trade on intra-industry reallocations and aggregate industry productivity", *Econometrica; Econometrica*, vol. 71, no. 6, pp. 1695-1725.
- Moharreri and Khosravi 2011, "Trade Potentials of the TPP: A Gravity Estimation", .
- Nilsson, L. 2000, "Trade integration and the EU economic membership criteria", *European Journal of Political Economy*, vol. 16, no. 4, pp. 807-827.
- Obama 2009, *Remarks of President Obama at Suntory Hall*, Tokyo, Japan.
- Petri, P.A., Plummer, M.G. & Zhai, F. 2012, *Trans-Pacific Partnership and Asia-Pacific Integration: A Quantitative Assessment*, Peterson Institute for International Economics.
- Pham, C.S. 2006, *Estimating the gravity model when zero trade flows are frequent and economically determined*, The World Bank.
- Rose, A. 2005, "Does the WTO make trade more stable?", *Open Economies Review*, vol. 16, no. 1, pp. 7-22.
- Rose, A. 2004, "Do WTO members have more liberal trade policy?", *Journal of International Economics*, vol. 63, no. 2, pp. 209-235.
- Rose, A. & van Wincoop, E. 2001, "National money as a barrier to international trade: The real case for currency union", *American Economic Review; Am.Econ.Rev.*, vol. 91, no. 2, pp. 386-390.
- Rose, A. 2003, *Do we really know that the WTO increases trade? / Andrew K. Rose*, European University Institute, Badia Fiesolana, San Domenico (FI).
- Rossi-Hansberg, E. 2005, "A spatial theory of trade", *American Economic Review; Am.Econ.Rev.*, vol. 95, no. 5, pp. 1464-1491.
- Schott 2014, *Current Status and Future Prospects of the TPP Negotiations*, Tokyo, Tokyo, Japan.

- Sharma, S.C. & Chua, S.Y. 2000, "ASEAN: economic integration and intra-regional trade", *Applied Economics Letters*, vol. 7, no. 3, pp. 165-169.
- Sheng, Y., Tang, H.C. & Xu, X. 2014, "The impact of the ACFTA on ASEAN–PRC trade: estimates based on an extended gravity model for component trade", *Applied Economics*, vol. 46, no. 19, pp. 2251-2263.
- Shepherd, B. 2013, "The Gravity Model of International Trade: A User Guide", .
- Silva, J. & Tenreyro, S. 2006, "The log of gravity", *Review Of Economics And Statistics; Rev.Econ.Stat.*, vol. 88, no. 4, pp. 641-658.
- Soloaga, I. & Alan Wintersb, L. 2001, "Regionalism in the nineties: what effect on trade?", *North American Journal of Economics and Finance*, vol. 12, no. 1, pp. 1-29.
- Subramanian, A. & Wei, S. 2007, "The WTO promotes trade, strongly but unevenly", *Journal of International Economics*, vol. 72, no. 1, pp. 151-175.
- Tinbergen, J., 1903- 1962, *Shaping the world economy : suggestions for an international economic policy*, Twentieth Century Fund, New York.
- Tumbarello 2006, "Does Vietnam overtrade with its neighboring countries? A regional investigation using a gravity model", *Selected Issue, IMF Country Report No.06/20*, .
- Tumbarello, P. 2007, *Are Regional Trade Agreements in Asia Stumbling or Building Blocks? Some Implications for the Mekong-3 Countries*, International Monetary Fund.
- Wang, Z.K. & Winters, L.A. 1991, "The Trading Potential of Eastern Europe", *Journal of Economic Integration*, vol. 7, no. 2, pp. 113-136.
- WTO Secretariat 2013, *Trade Policy Review of Vietnam*, Trade Policy Review Body.

## APPENDIX

**Table A1: FTA between Vietnam and TPP countries**

FTA name	Abbreviation	Signing year
ASEAN – China FTA	ACFTA	2006
ASEAN – Australia – New Zealand Free Trade Area	AANZFTA	2009
ASEAN–Japan Comprehensive Economic Partnership	AJCEP	2008
Vietnam-Chile Free Trade Agreement	VCFTA	2011
Vietnam-Japan Economic Partnership Agreement	VJEPA	2009

*Source: The author compiles from literature*

**Table A2: WTO/GATT participation of TPP countries**

ISO code	Country name	Year of WTO participation	Year of GATT participation
AUS	Australia	1995	1948
BRN	Brunei	1995	1993
CAN	Canada	1995	1948
CHL	Chile	1995	1949
JPN	Japan	1995	1955
MEX	Mexico	1995	1986
MYS	Malaysia	1995	1948
NZL	New Zealand	1995	1948
PER	Peru	1995	1951
SGP	Singapore	1995	1995
USA	US	1995	1948
VNM	Vietnam	2007	2007

*Source: The author compiles from WTO database, available at [https://www.wto.org/english/thewto\\_e/whatis\\_e/tif\\_e/org6\\_e.htm](https://www.wto.org/english/thewto_e/whatis_e/tif_e/org6_e.htm)*

**Table A3: The evolvement of TPP negotiation**

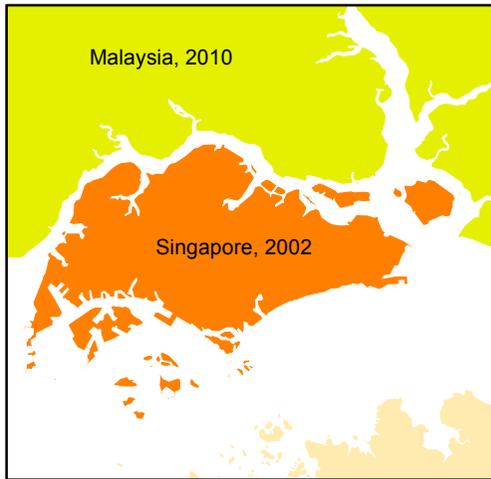
<b>Year</b>	<b>Negotiators</b>	<b>Number of negotiators</b>
2002	Singapore, New Zealand and Chile	3
2005	Singapore, New Zealand, Chile and Brunei	4
2008	Singapore, New Zealand, Chile, Brunei, US, Australia, Peru and Vietnam	8
2010	Singapore, New Zealand, Chile, Brunei, US, Australia, Peru, Vietnam and Malaysia	9
2012	Singapore, New Zealand, Chile, Brunei, US, Australia, Peru, Vietnam, Malaysia, Canada and Mexico	11
2013	Singapore, New Zealand, Chile, Brunei, US, Australia, Peru, Vietnam, Malaysia, Canada, Mexico and Japan	12

*Source: The author compiles from literature*

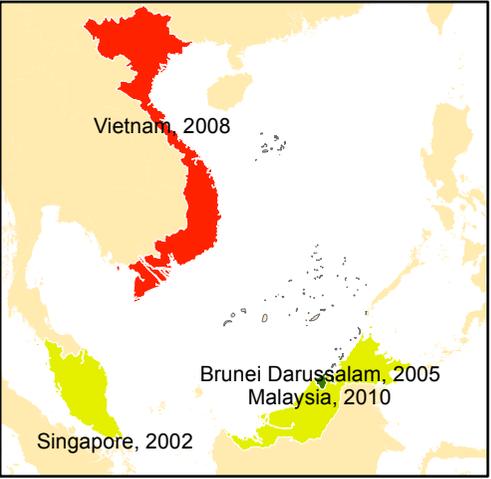
**Table A4: Variable definition and data source**

Variables	Definition	Source
$Exp_{ijt}$	Aggregated exports value from country $i$ to country $j$ in year $t$	UNCOMTRADE
$GDP_{it}, GDP_{jt}$	GDP of exporting and importing countries in year $t$	UNDP
$POP_i, POP_j$	Population of exporting and importing countries in year $t$	UNDP
$Dist_{ij}$	Geodesic distances calculated following the great circle formula, which uses latitudes and longitudes of the most important cities/agglomerations (in terms of population)	CEPII
$E_{ij}$	<i>Bilateral real exchange rate</i> calculated as the local currency value of one unit of $j$ 's the local currency, multiplied by country $j$ 's GDP deflator and divided by country $i$ 's GDP deflator	IMF, Calculation
$WTO_{ijt}$	Dummy variable, =1 if both $i$ and $j$ are WTO members in year $t$	WTO
$ASEAN_{ij}$	Dummy variable, =1 if both $i$ and $j$ are ASEAN members	ASEAN
$TPP_{ijt}$	Dummy variable, =1 if both $i$ and $j$ negotiate TPP	USTR
$Sum_{ijt}$	<i>Bilateral sum of GDP</i> $Sum_{ijt} = \log(GDP_{it} + GDP_{jt})$	Calculation
$Sim_{ijt}$	<i>Similarity in country size</i> $Sim_{ijt} = \log\left(1 - \left(\frac{GDP_{it}}{GDP_{it} + GDP_{jt}}\right)^2 - \left(\frac{GDP_{jt}}{GDP_{it} + GDP_{jt}}\right)^2\right)$	Calculation
$Dif_{ijt}$	<i>Relative factor endowment difference</i> $Dif_{ijt} = \left  \log\left(\frac{GDP_{it}}{POP_{it}}\right) - \log\left(\frac{GDP_{jt}}{POP_{jt}}\right) \right $	Calculation

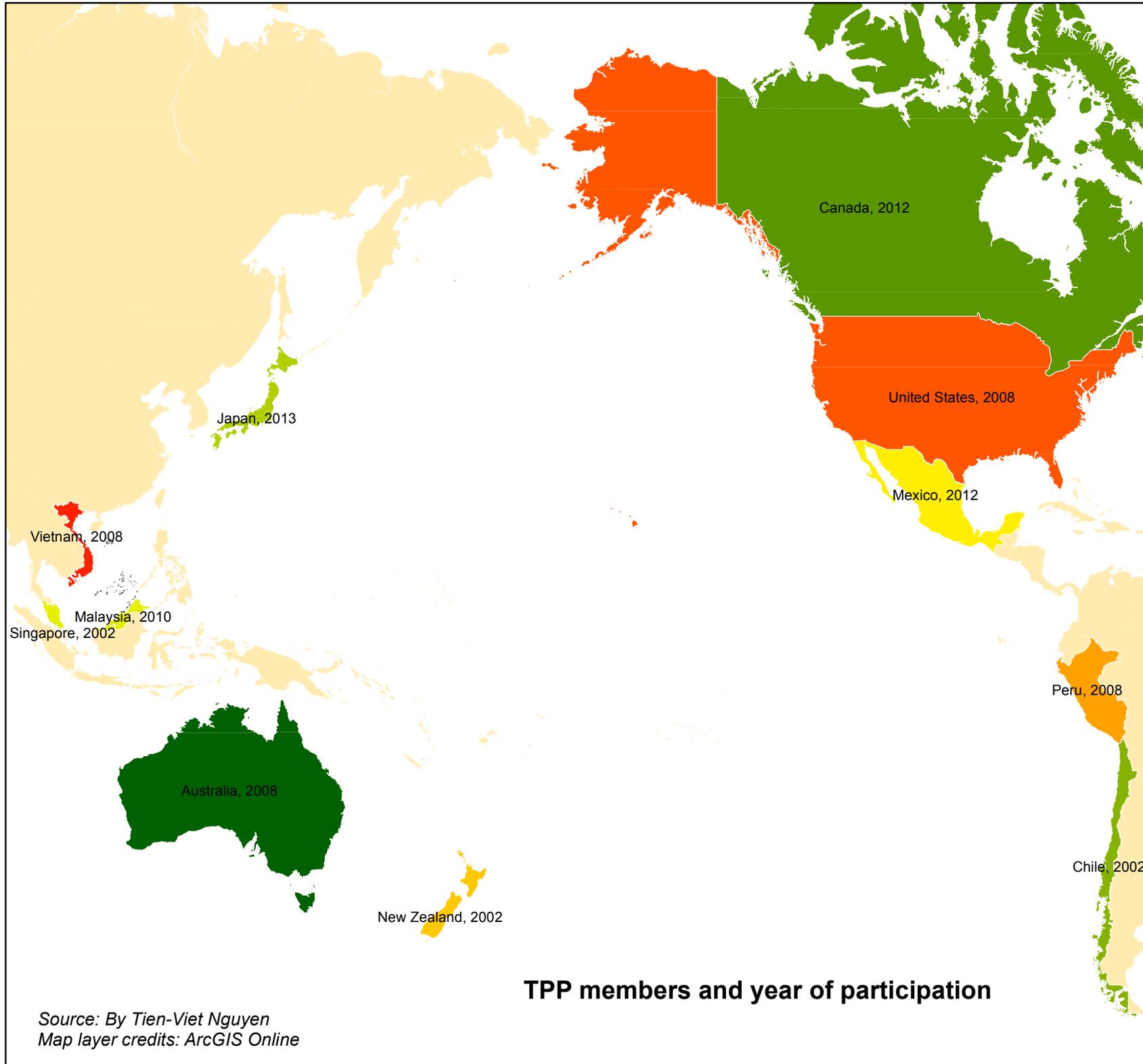
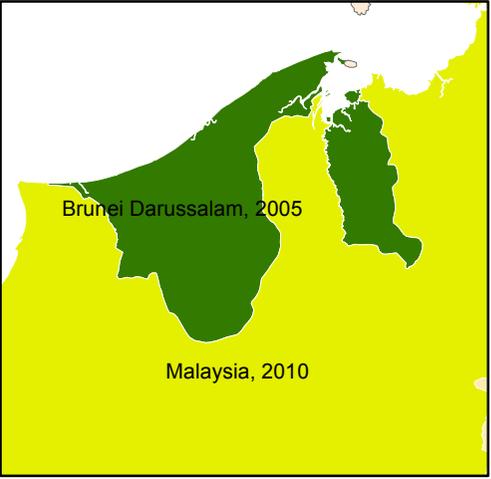
### SINGAPORE



### ASEAN



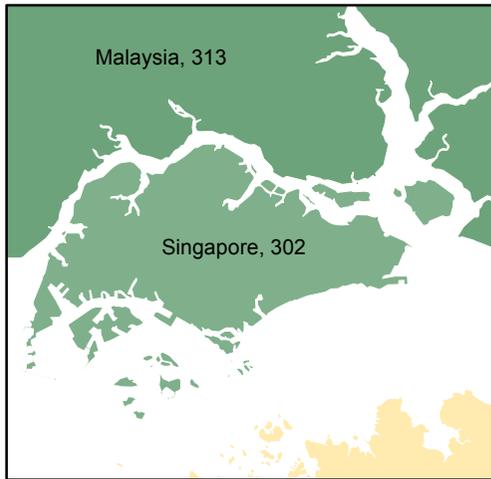
### BRUNEI



**TPP members and year of participation**

Source: By Tien-Viet Nguyen  
Map layer credits: ArcGIS Online

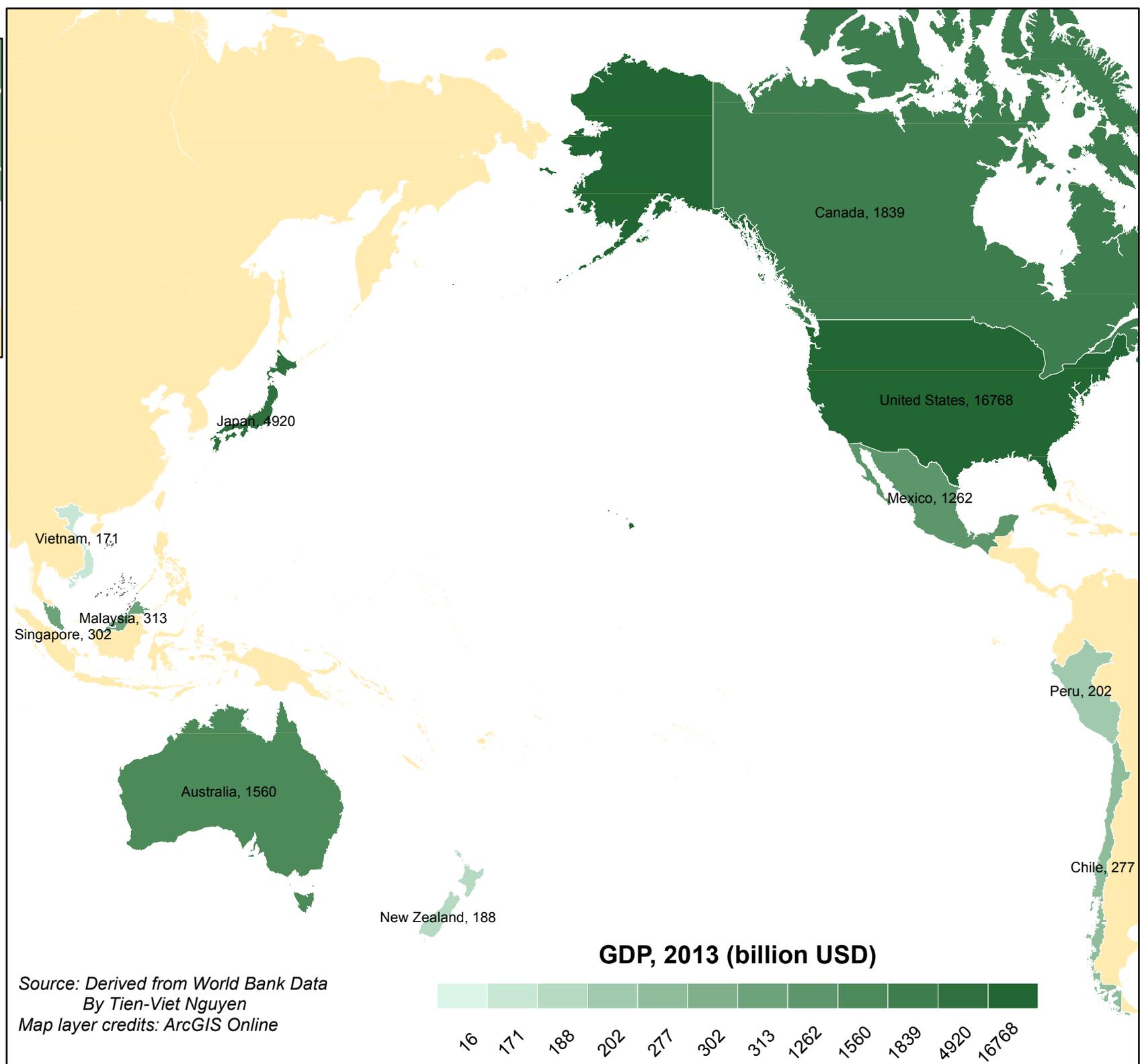
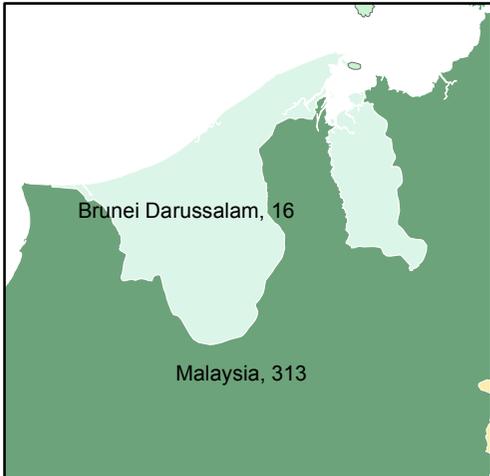
### SINGAPORE



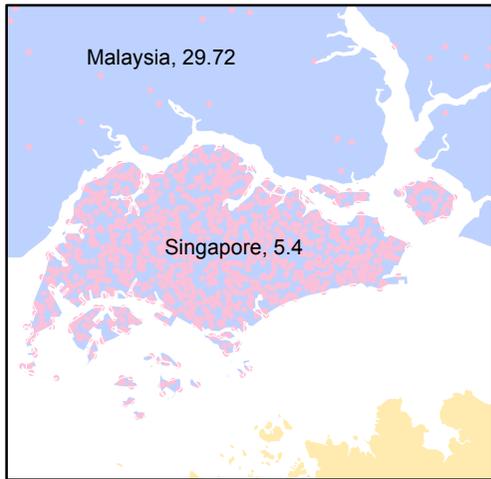
### ASEAN



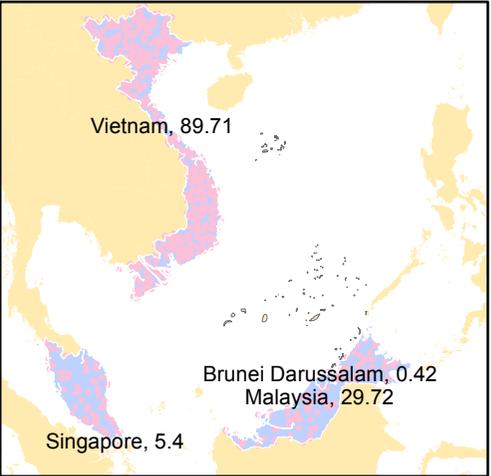
### BRUNEI



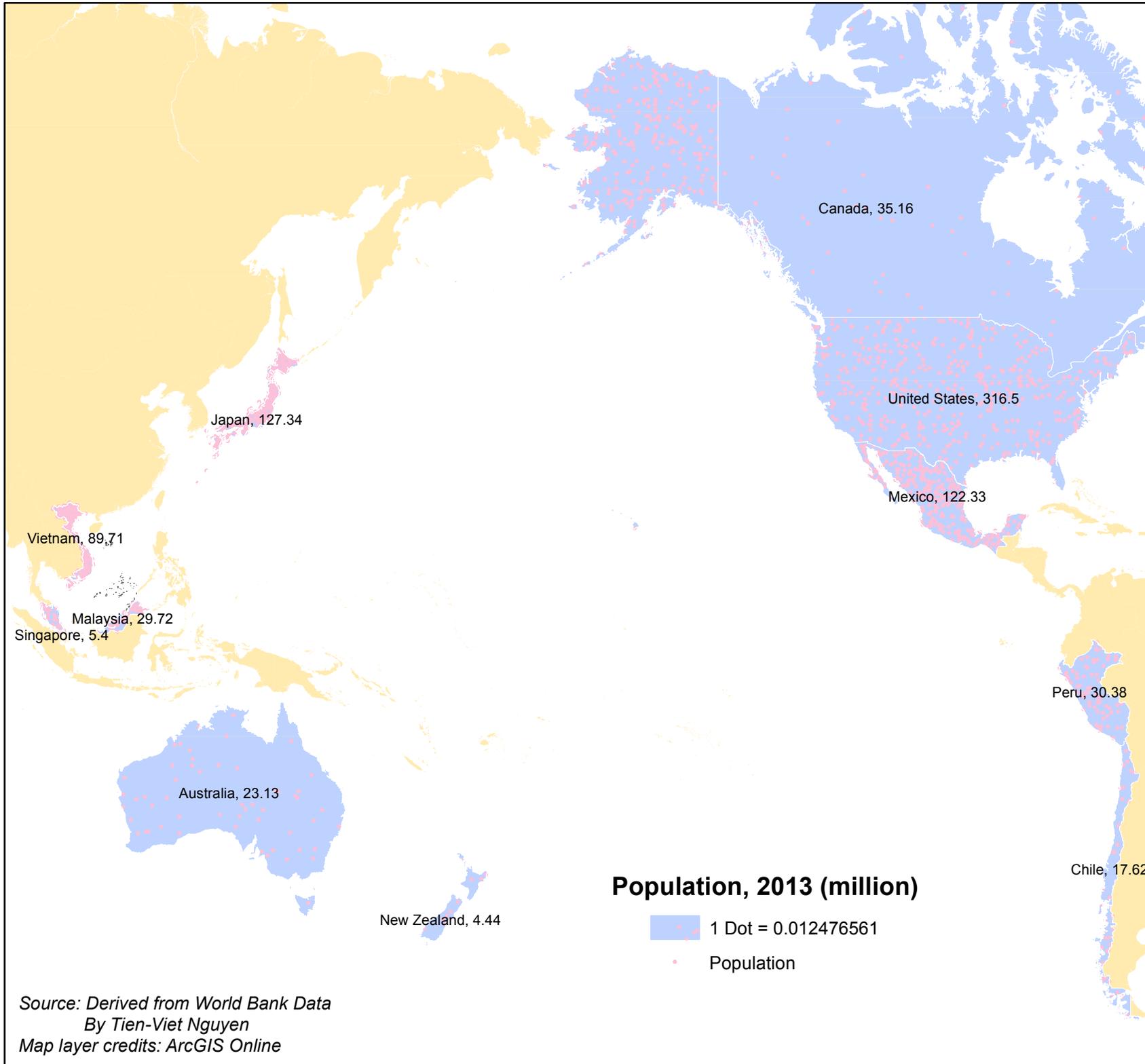
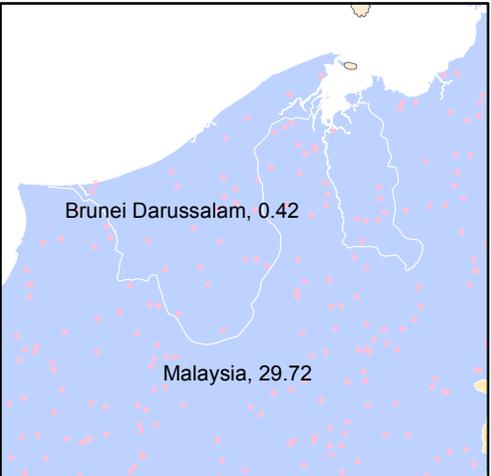
### SINGAPORE



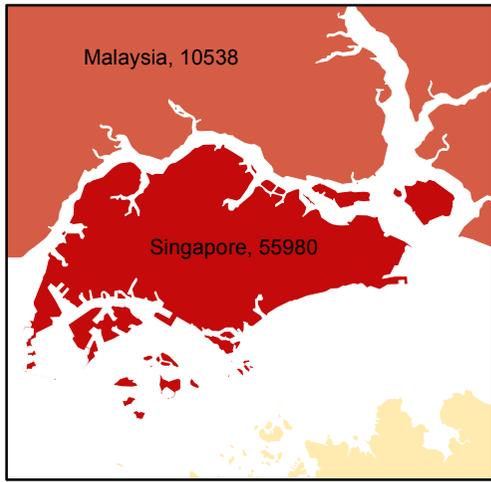
### ASEAN



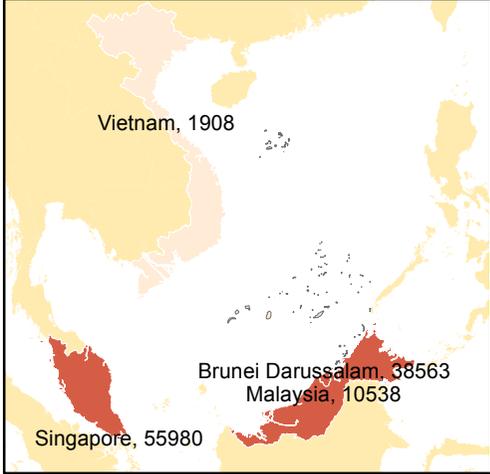
### BRUNEI



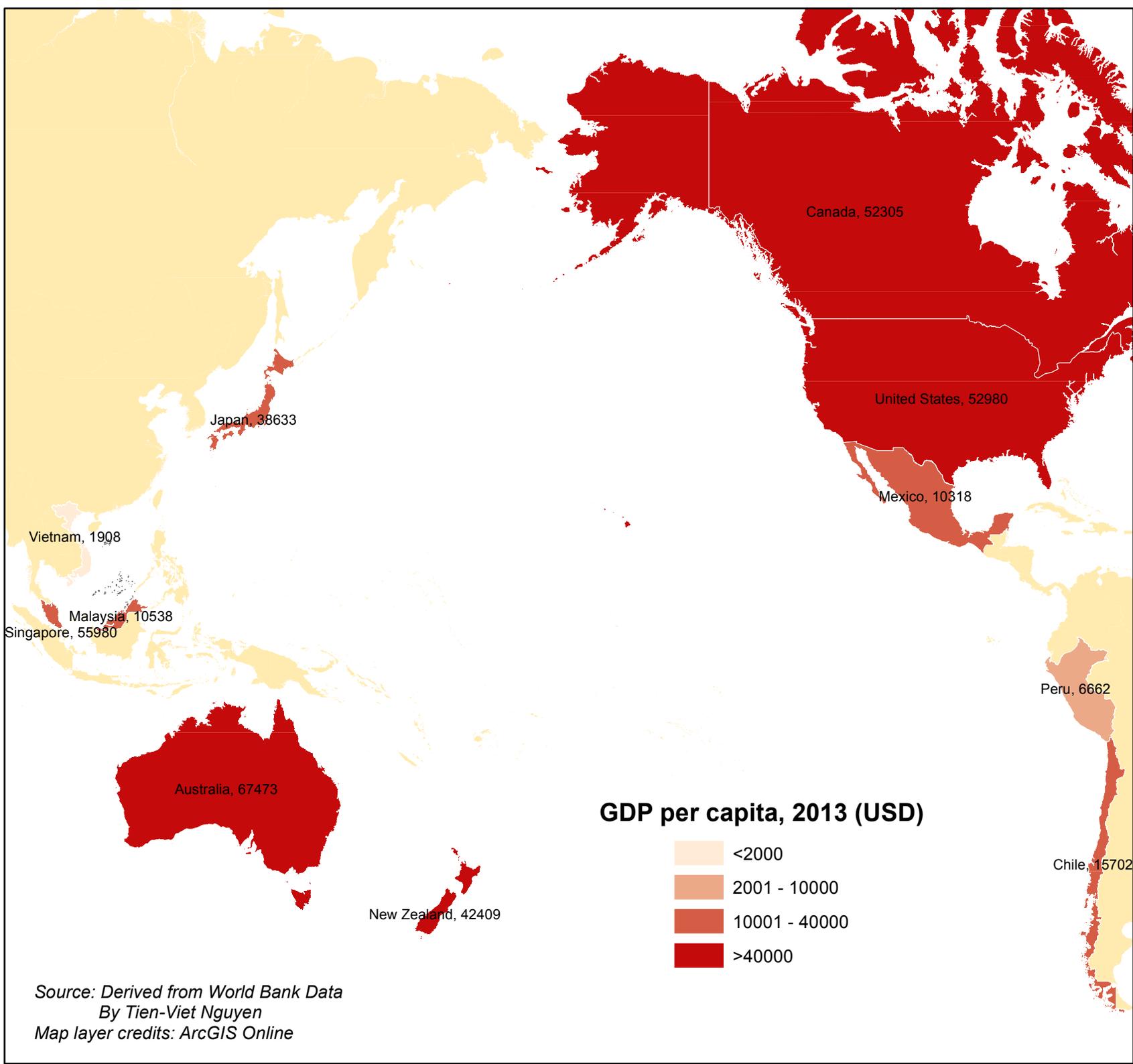
### SINGAPORE



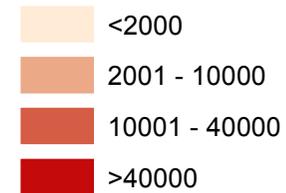
### ASEAN



### BRUNEI

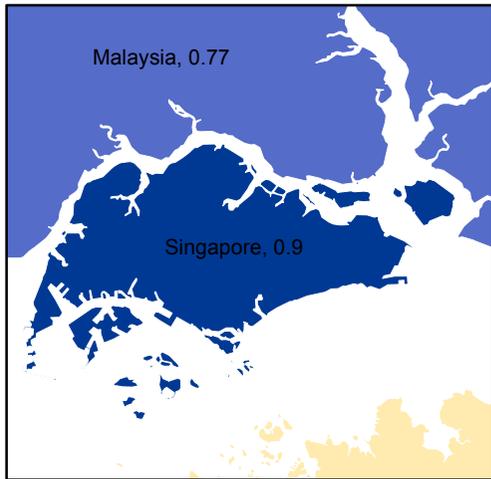


### GDP per capita, 2013 (USD)

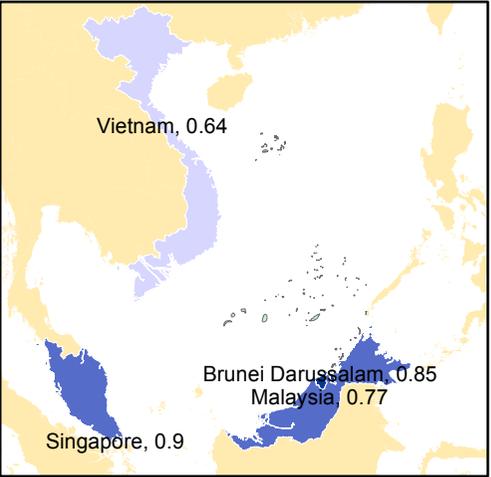


Source: Derived from World Bank Data  
By Tien-Viet Nguyen  
Map layer credits: ArcGIS Online

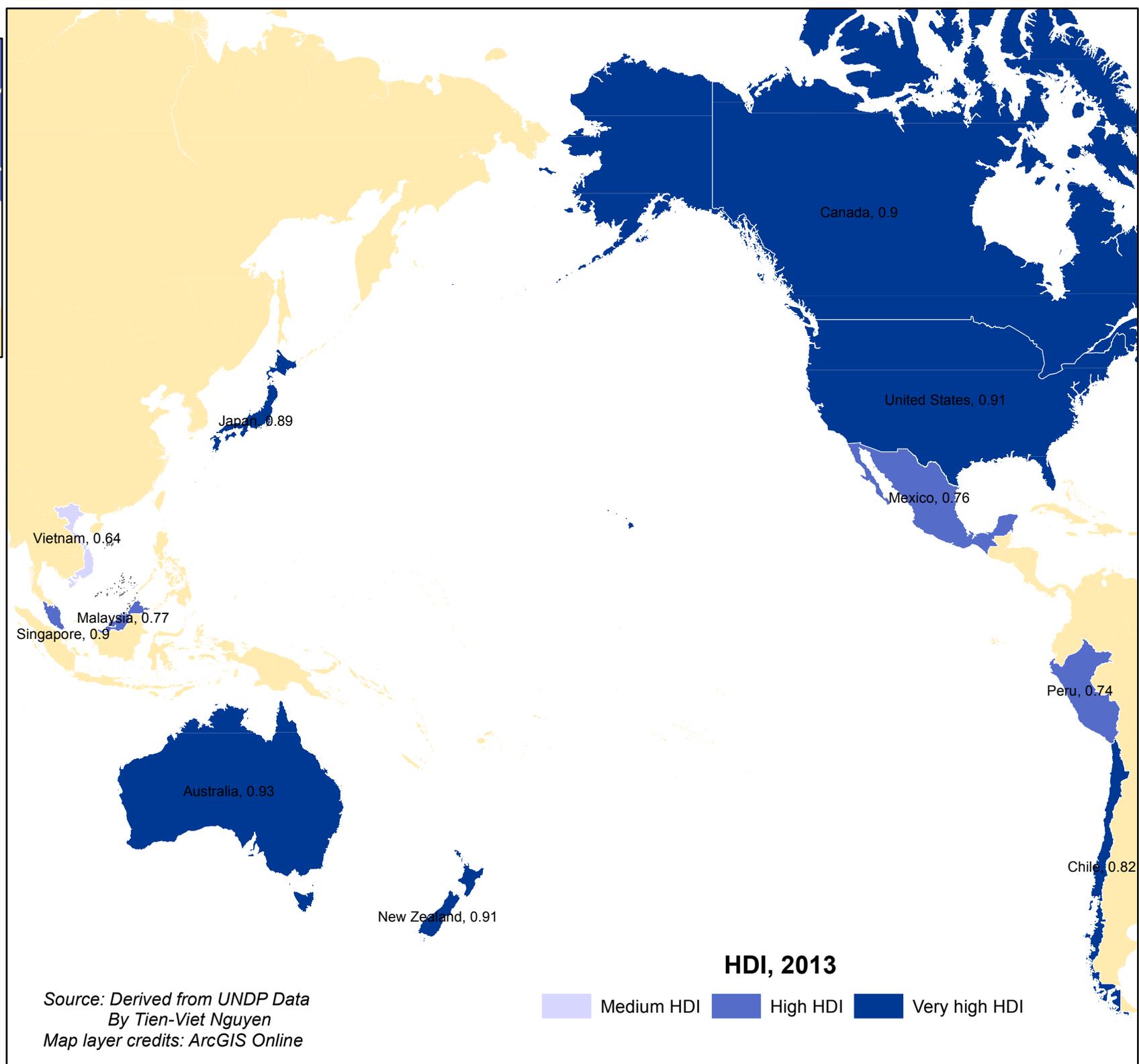
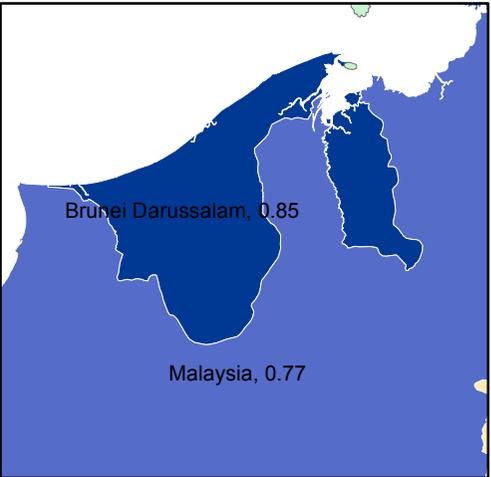
### SINGAPORE



### ASEAN



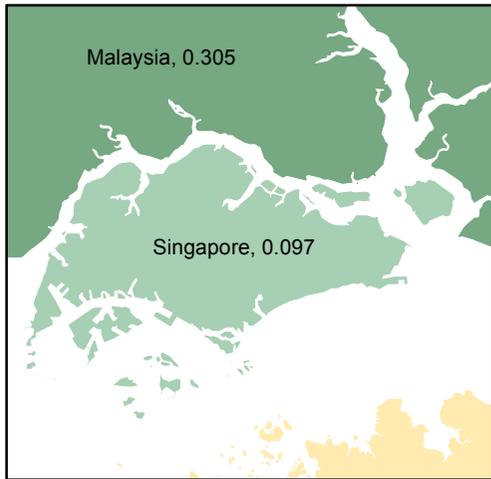
### BRUNEI



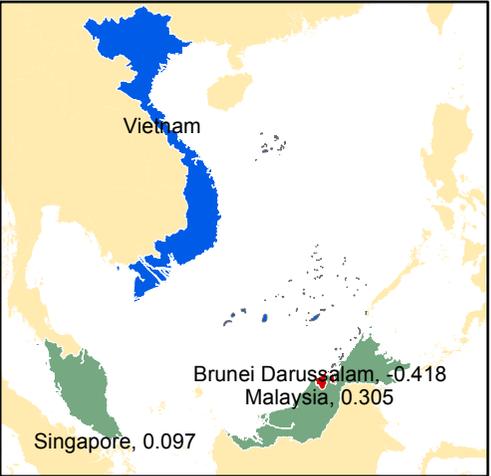
Source: Derived from UNDP Data  
By Tien-Viet Nguyen  
Map layer credits: ArcGIS Online



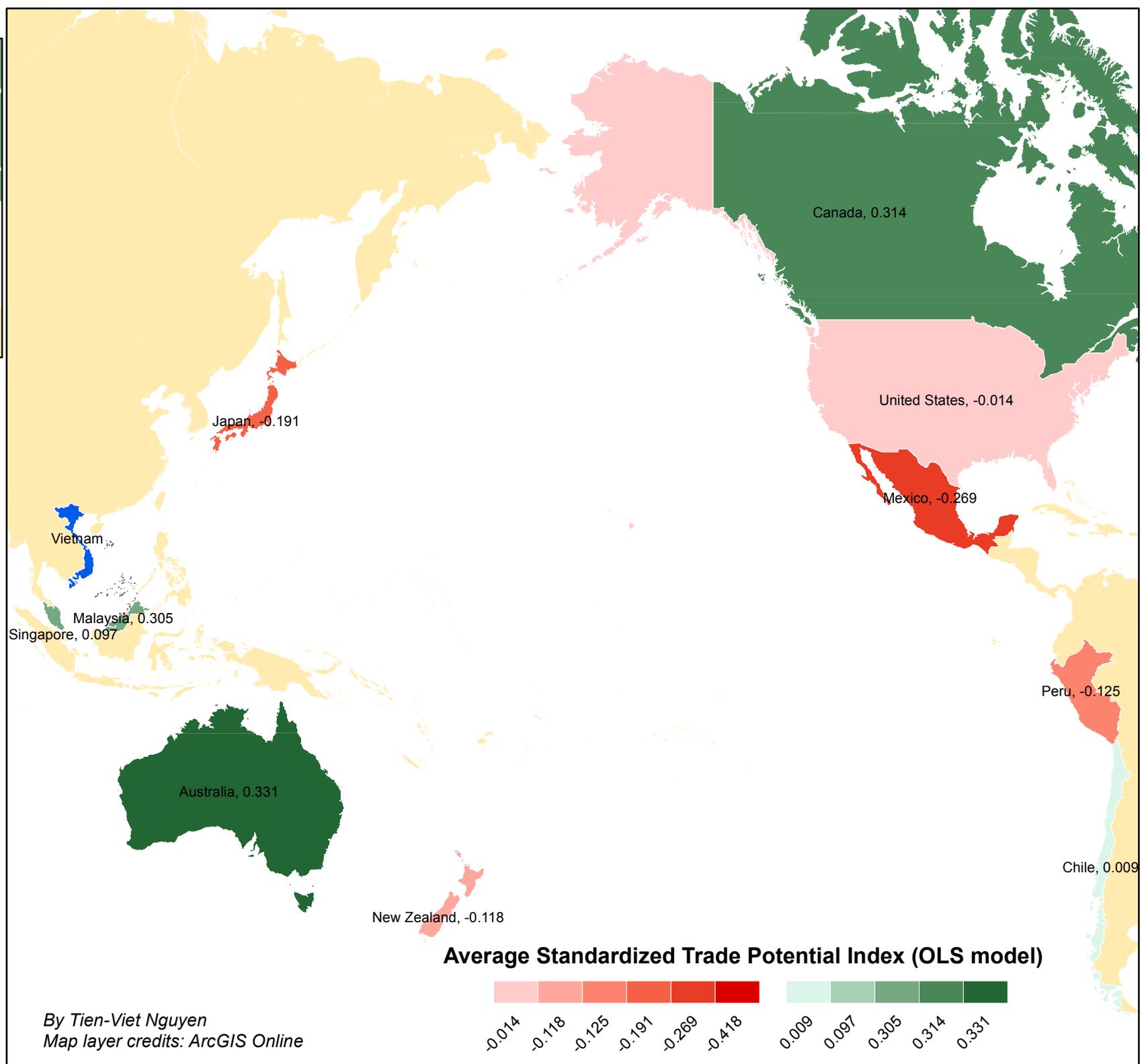
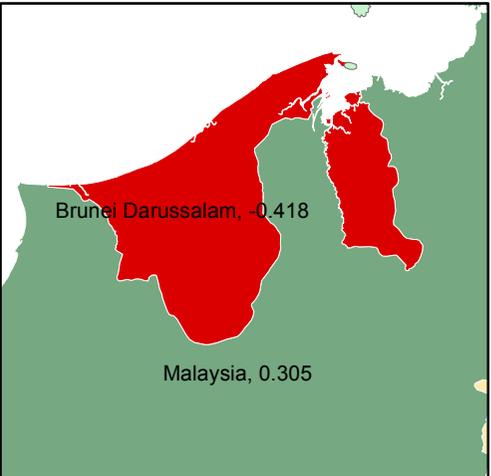
### SINGAPORE



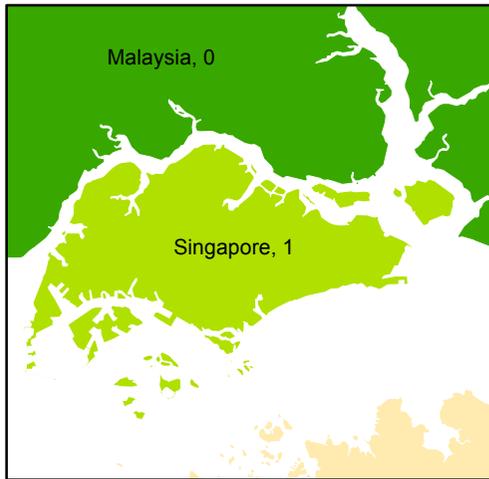
### ASEAN



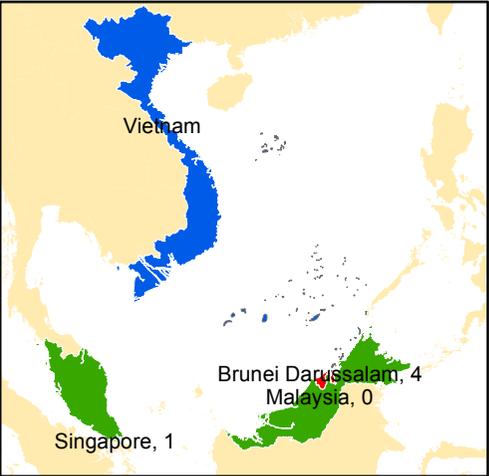
### BRUNEI



### SINGAPORE



### ASEAN



### BRUNEI

