Policy Economics Master Thesis

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The Impact of International Students on Bilateral Trade: A State-Level Empirical Study of Australia, Indonesia, India, South Korea, Vietnam, Malaysia, and China

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Abstract

This thesis examines the effects of international students residing abroad in particular Australian states to bilateral trade between Australia and Australian states with the sample origin countries namely Indonesia, India, South Korea, Vietnam, Malaysia, and China. To exploit the causal effects, the thesis is using two statistical methods: first, Ordinary Least Squared (OLS) with state, country of origin, year fixed effect and robust standard errors to tackle homoscedasticity and allowing heteroscedasticity in the data thus providing more reliable standard errors. Second, the thesis is using the Difference-in-Difference (DiD) with the mentioned fixed effects to control time trends and reducing selection bias from the study. The thesis also lags the variable of interest by three years as the average period of undergraduate study in Australia. By using these methods, the main results of the thesis found a negative relationship between International students residing in Australian states and bilateral trade. However, based on the results of the thesis, migration have a statistically significant and positive relationship with bilateral trade.

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1. Introduction and Research Question

1.1. Introduction

Over the years, Australia has maintained strategic partnerships with its neighbouring countries as Australia is one of the western countries that is geographically located near with Asian countries. Australia has a tremendous opportunity to become a powerful geopolitical and trade player amongst the South-East and East Asian nations the summits in the late 2004 (Richardson, 2006). This geopolitical strategy will be significant to create Australian influence on the indo-pacific region. Australia also expanding its cooperation with south Asian countries by having more progressive trade liberalization towards the area (Bandara & Smith, 2002). With respect to the thesis, the sample countries that are used focused on South-East Asian countries namely: Indonesia, Malaysia, Vietnam, East Asian countries namely: China and South Korea, and South Asian country namely: India. By maintaining good geopolitical and trade relationship with these regions, Australia aims to be a key player amongst the regions.

Higher education is one of the most important factors in Australian economy, making international students the third largest export sector of Australian economy (Marginson, 2020). In this case, it is probable that Australian economy is quite dependent on international students studying in Australia. The thesis will be focusing on the international students from the sample countries that were mentioned and the effect towards bilateral trade between Australia and these countries. Based on the study by (Murat,2017), it is found that there is a significant positive relationship between Latin American students studying in OECD countries and bilateral trade.

The thesis aims to construct similar study with different geographical location to test if the findings from (Murat, 2017) align with this thesis. The thesis will be using two main statistical methodologies. First, the thesis will be using the Ordinary Least Squared (OLS) with state, country of origin, and year fixed effects to control for time invariant variables and robust standard errors to tackle homoscedasticity and allowing heteroscedasticity in the data to provide more reliable standard errors. Second, the thesis will be using the Difference-in-

Difference (DiD) method with fixed effects to reduce selection bias that may arise due to students selecting themselves which higher education institution they admit and acknowledging the common trend assumptions between the international students amongst the sample countries.

While the thesis focuses on the impact of the sample countries international students residing in Australian states and bilateral trade for the time period 2009 – 2021, the thesis also controls other variables that are potentially affecting bilateral trade. The thesis follows the gravity equation model thus making bilateral trade value which sums the export and import value of the sample countries with Australia as the dependent variable while controlling for ln GDP of Australia and GST of Australian states and ln GDP of origin countries. Additional controls also applied in this thesis such as net migration, English proficiency index, cost of living, trade agreement dummy, total number of international students from all countries, and Group of Eight universities from each state. Group of Eight is an organization that compromises of the top eight ranked universities in Australia in which it can be an incentive for international students to have a higher education in those universities. The thesis will also be lagging the variable of interest by three years to consider the average year of graduation for at least the undergraduate program of higher education. The thesis will also be excluding the macroeconomic shocks that occurred during 2020 (Covid-19). However, in the robustness checks section, the thesis will also be testing the data by including these into the model.

The results that are gathered from the estimation strategy shows that international students from the sample countries have a negative relationship with bilateral trade while migration shows that it has a positive significant impact towards bilateral trade value.

1.2. Research Question

This thesis is investigating the following questions: *"Do International students migrating and residing to Australia increases bilateral trade between origin countries and Australia?"* This thesis will be answering the main question by using regional-level data for Australian states by exploiting the gravity model theory and by using OLS with country, year, state, and origin fixed effect, and Difference-in-Difference with fixed effect method in the following sections.

2. Literature Review

2.1. Migration and Bilateral Trade

Most of the research that have been done in the past emphasise the importance of migration and bilateral trade. Migration inflow proven to be beneficial as it boosts bilateral trade between the migrants' countries of origin and the countries of destination with a 10% increase of immigrants will have a 1.5% increase in bilateral trade (Genc, 2014). Migration also plays an important part of boosting not only bilateral trade but also international trade, as migration networks function not only at the bilateral level but are also able to forge connections between nations which are the recipients of migrant flows from third parties (Fagiolo & Mastrorillo, 2014). Increasing bilateral trade with developing countries in the form of increasing exports do not have significant effect on the developing countries' emigration to the exporting countries (Menard & Gary, 2018). It is also found that immigrants can influence the trade flows as knowledge and information spill-over from the migrants to those who do not migrate can reduce information costs for home country's bilateral trade flow (Gould, 1994).

H1: The thesis would expect that higher migration inflow from origin country to Australia would boost bilateral trade between Australia and the origin country.

2.2. International Students and Bilateral Trade

Numerous research had been done in the past to study the effect of international students migration can increase bilateral trade between the countries of origin and destination. Specht (2022) found that from OECD (2011) international students are classified as temporary migrants as only between 15% to 35% of international students continue to work at their destination country. High skilled migrants are proven to have a great impact on bilateral trade. However, one can consider international exchange students are also high skilled as it is also proven that international students induce international trade especially students from non-OECD countries with better information barriers (Specht, 2022). Other studies have also found that Latin American international students have a positive and significant impact on bilateral trade between the home economy and the country of graduation, increasing it by more than 3% for every 10% increase in the number of Latin Americans studying in a western

nation (Murat, 2017). Based on the paper published by (Min & Falvey, 2017). If present enrolments of foreign students lead to future increases in bilateral trade flows, then a portion of such gains should be recognized as a benefit resulting from the current supply of international education. From a policy standpoint, these findings show that increasing funding and support for international student exchange is one method to promote trade growth with developing nations (Specht, 2022).

H2: As International students in Australian states increase, there will be a causal effect towards increasing bilateral trade between the sample countries with Australia and its states.

2.3. International Students and Destination Choices

Three of the sample countries (Indonesia, Malaysia, Vietnam) are located in South-East Asia. One of the ways to boost human capital is to improve education of the population. To create more promising educated person, one might consider studying abroad (Pitoyo and Prastika, 2019). Geographically, Asia and Australia are close in distance and the closest western country from Asia in the thesis' sample countries. Based on 2023 Times Higher Education ranking, there are seven Australian universities included in the top 100 universities in the world and every one of them are the Group of Eight (Go8) members which consists of the most prestigious Australian Universities[1]. Having these high rank universities boost interest for international students. Group of Eight (Go8) is an important control for this thesis regression estimation as it will show the number of the highest ranked universities in Australian states which will create more incentives for international students to admit to the universities and migrate to the corresponding state.

H3: Australian University Distance with origin countries and Group of Eight universities location is a powerful determinant for international students to reside in specific state. The

[1] Group of Eight (Go8) consists of: University of Melbourne and Monash University in Victoria, The University of Queensland in Queensland, University of Sydney and UNSW in New South Wales, Australian National University in Australian Capital Territory, and University of Adelaide in South Australia.

further the distance, the less likely students reside in the state hence lowering the bilateral trade.

2.4. Trade Agreements and Bilateral Trade

Indonesia-Australia Comprehensive Economic Partnership Agreement (IA-CEPA) have come into effect since fifth of July 2020. Ninety-nine percent of Australian goods will enter Indonesia duty-free or under vastly improved preferential conditions under IA-CEPA including education (Australian Trade and Investment Commission). The trade agreement is based on the ASEAN and Australia trade agreement, ASEAN-Australia-New Zealand Free Trade Agreement (AANZFTA). IA-CEPA is aimed to enhance bilateral relation between Indonesia and Australia. Since 2012, ASEAN members including Indonesia have been negotiating the expansion of their sub-regional integration with Australia, China, Japan, New Zealand, and the Republic of Korea toward the signing of the RCEP, which follows eight years of numerous meetings and negotiations (Lima et al., 2021). The agreement expected to be beneficial for countries in all parties which can be due to the geographical location of the ASEAN countries with the countries around the South-East Asia. It is also evident that Free Trade Agreements (FTA) increases bilateral trade between countries from EU-15 and CEEC-4 countries in which have a positive impact towards trade flow between the countries (Caporale et al., 2009).

H4: Free trade agreement between countries in which aimed to reduce tariff and ease trade between countries is beneficial for trade flows and expected to have a positive effect.

Overall, existing literature have been rich in regard of the causal effect between migration and bilateral trade as it is proven to have a positive significant relationship. However, the literature on the effect of students studying higher education internationally to bilateral trade is quite scarce. Hence, the thesis is evaluating the topic more specifically on the effects of Indonesian International Students migrating to Australian states towards bilateral trade between Australian states and Indonesia as well as Australia as a whole and Indonesia.

3. Contribution

The previous research that were mentioned in the literature review in the thesis had emphasised the importance of immigration and international trade of countries more specifically, bilateral trade. With some papers, one of the most prominent from (Murat, 2017) have been investigating the effect of international students and bilateral trade between other countries (Latin America & OECD and Non-OECD members). The thesis is trying to exploit the relationship between sample Asian countries international students migration and the bilateral trade between the origin country of the students and the destination country (Australia). The thesis will also investigate the effects of international students migration and trade between top six countries, namely Indonesia, China, Vietnam, South Korea, India, and Malaysia as the most international students residing in Australia and each states.

4. Data

The thesis will explain the most crucial datasets that will be used for the thesis namely regarding the trade value and the number of Indonesian and International students migrating in Australia and its state. The time period that was used for the datasets in the thesis is from the year 2009 until 2021. The Australian Bureau of Statistics (ABS) stores rich datasets containing many variables that are relevant. The thesis has gathered data from this source for total migration number based on source country and place (country) of birth, export and import of merchandise based on country of destination and source. The thesis also obtained Gross State Product (GSP) for each Australian state from the source. Since the thesis will be using the gravity model, it requires data for Indonesia GDP which was obtained from the International Monetary Fund (IMF). The five comparison countries' GDP also were obtained from IMF data. Since the Australian GDP and its states GST are in Australian Dollars, to maintain the same currency for every country, the thesis converts Australian GDP and GST from Australian Dollars to United States Dollars by using the yearly rate from year 2009 until 2021 obtained from OFX[2].

[2] OFX is a foreign exchange and payments company that was founded in 1998 with its headquarter located in Sydney, Australia

Other sources of data were gathered from Australian Government Departments: Department of Trade and Investment Commission to obtain trade data and Department of Education to obtain the international student numbers from country of origin, the number of universities associated in the Group of Eight and the department also provides cost of living based on the capital cities of the states. Australian Department of Home Affairs provided the thesis data for inward migration based on origin countries, visa types as well as the destination state.

Group of Eight is an important variable to consider since this will be the incentive for the international students to study in the specific university from a specific state. The group of eight members are top ranked universities in Australia in which most of its member are the top 100 best ranked universities in the world based on QS world ranking.

Living cost is an important variable to consider especially for international students who will be living abroad to obtain education. The variable is expected to have a significant effect on international students' choice to migrate to Australian states as the living costs between each state are different. The thesis uses data from the cost-of-living calculator that were provided by the Australian Department of Education. However, the calculator can only be used for 2023 and the thesis is calculating the most minimum cost of living (basic costs, no costs for entertainment and others). To obtain the appropriate living cost for each year, this thesis is using the CPI method. CPI for each state were provided by ABS.

$$LivingCost_t = \frac{LivingCost_{2023}}{CPI_{2023}} \; x \; CPI_t \quad (1)$$

To obtain the overall living cost of each year in Australia as a country, the thesis averages the living cost from every state per year.

4.1. Trade Value

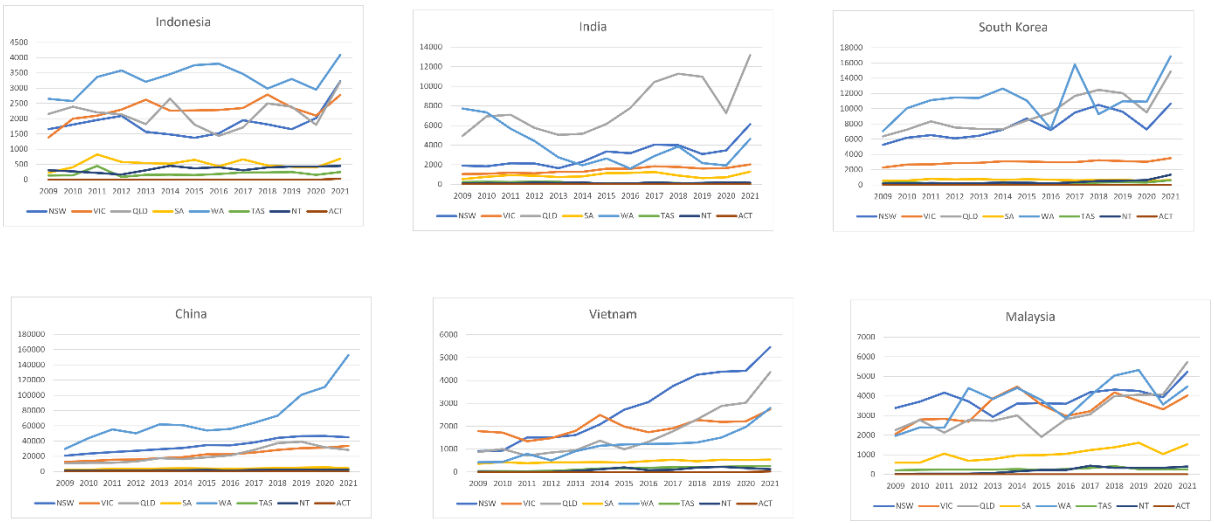

Figure 1: Trade Value sample countries & Australian States (in $ Million). Data Source: Australian Bureau of Statistics & Department of Trade and Investment Commission

Figure 1 explains the trade value between the six sample countries and Australian states in $ Million. Trade value is explained by the sum of import and export. The figure explains bilateral trade between the six sample countries and each Australian states. Western Australia (WA) has the highest trend of bilateral trade relative with other states except India which has the most trade with Queensland. Australian Capital Territory (ACT) has the lowest value of bilateral trade. The differences between each state in trade value can be explained by the differences between natural resources that are provided by each state. Geographical location results distribution of natural resources which are important element that influence export and import between countries in which it can be influential for countries that have no resource hence needing to import (Ruta & Venables, 2012). There is a huge possibility that states as Western Australia needs or have the natural resources in relative to Indonesia hence the state's bilateral trade value is the highest. ACT geographical location explains the low number of trade value in relative to other state as ACT is the smallest state in Australia with only 2358 km^2 area hence the scarcity of natural resources and goods for international trade.

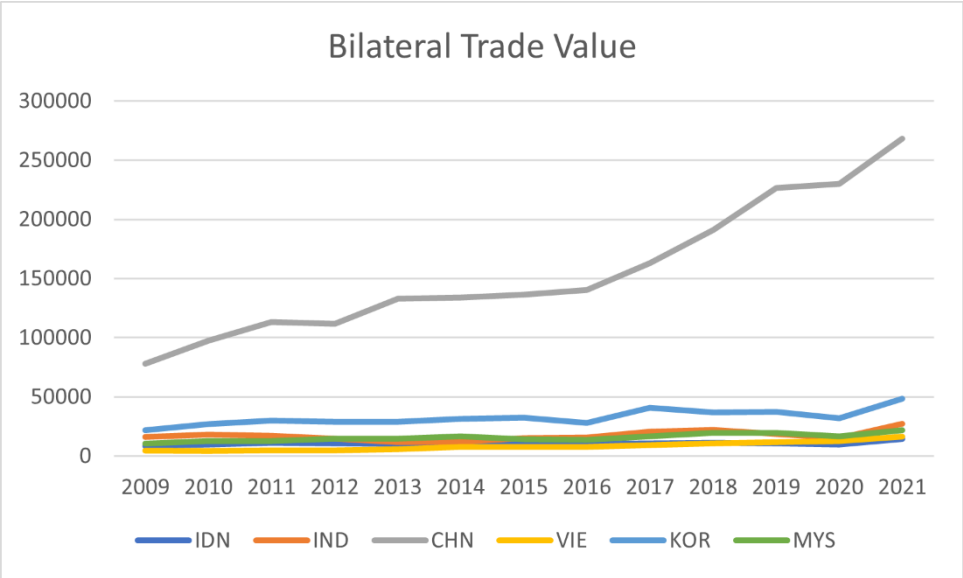

Figure 2: Trade Value sample countries & Australia (in $ Million). Data Source: Australian Bureau of Statistics & Department of Trade and Investment Commission

As figure 1, Figure 2 also explains the bilateral trade value. However, in this section, the figure explains the bilateral trade value between the sample countries and Australia as a whole country. Based on the graph, Bilateral trade value between the countries is relatively stable between 800 to 1000 million dollars while China and Australia has the highest bilateral trade value amongst the sample countries. Surprisingly, although there was a major economic shock around the world, the COVID-19 pandemic that started around 2019, the bilateral trade value of the sample countries and Australia climbs significantly starting from 2020.

4.2. International Students

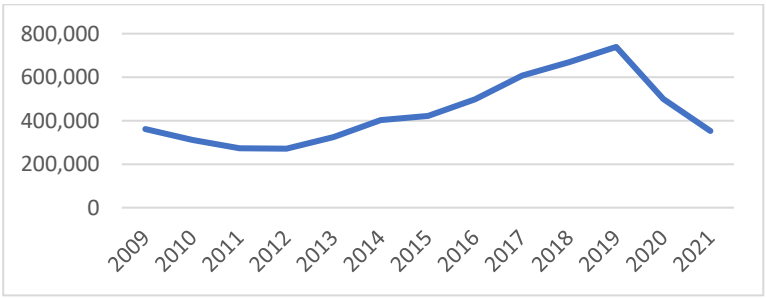

Figure 3: International Students Residing in Australia. Data Source: Australian Bureau of Statistics & Department of Education

Figure 5 shows the trend of international students from all over the world residing in Australia. The number of students is relatively stable and having an upward trend over the

years which peaked in 2019 with total of 739,075 higher education students from other countries. However, after 2019, international students' number experienced massive downfall due to COVID-19 pandemic that came into effect in 2020. The pandemic does not allow international students to enter Australian border hence they have to be introduced with online learning from their home country.

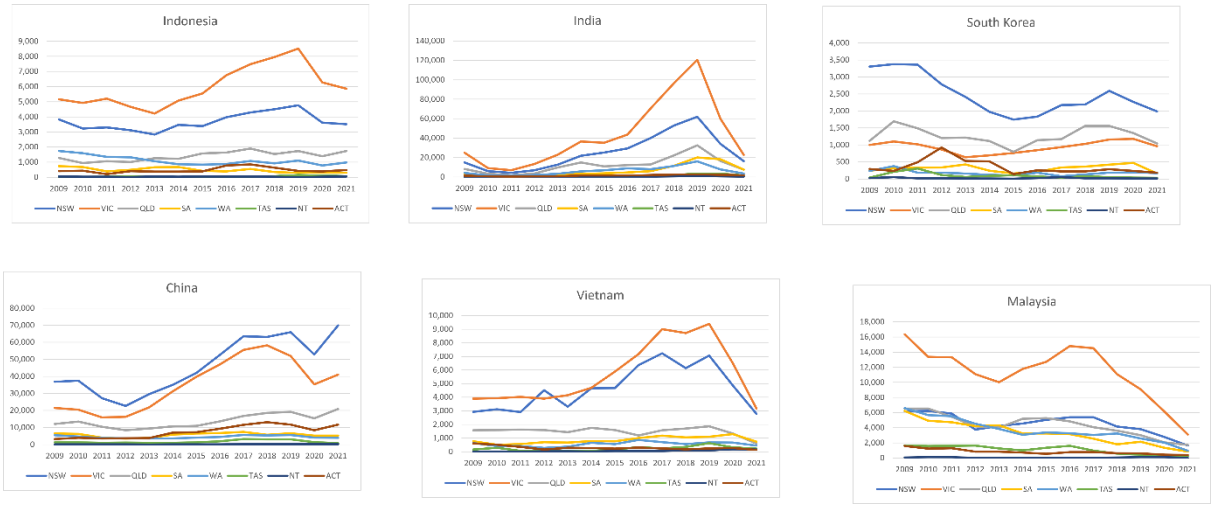

Figure 4: Total students from the six sample countries residing in each Australian states from 2019 - 2021

Figure 4 shows the number of international students residing in Australian states in 2009-2021 from the six sample countries that are used in this thesis. Based on the graph of each country, the trends are similar with the graph in figure 5 in which there are upward slopping trend until 2019 (pre-covid) and downfall in the next year due to the pandemic. However, Based on figure 6, there are some countries (India, Vietnam. Malaysia) that have a significant decrease in students residing in Australia while other countries (Indonesia, China, South Korea) have a slight decrease due to the pandemic. This can be due to the differences in choices from each nationality while facing the pandemic. International students could stay in Australia during the pandemic, or they can travel back to their home country to study online from their home country.

4.3. English Proficiency Index

To obtain the level of English proficiency from origin country, the thesis gathered English proficiency index data from Education First (EF)[3]. However, the data only starts from the year 2011 until 2021 hence 2009 until 2010 can be deemed as missing data.

Very High	High	Moderate	Low	Very Low
60-80	55-59.99	50-54.99	45-49.99	0 - 44.99

Figure 5: EF English Proficiency Index Scoring. Source: EF EPI

Education First provided the scoring method and classification of each country's score by using the numbers above to determine in which category the corresponding country belongs, from very low proficiency until very high English proficiency. English proficiency is one of the most important factors to control in the thesis since it will have an effect towards number of students studying in Australian states due to Australia is one of the English-speaking countries hence the lectures, test, and interactions in the university and each state will be done in English.

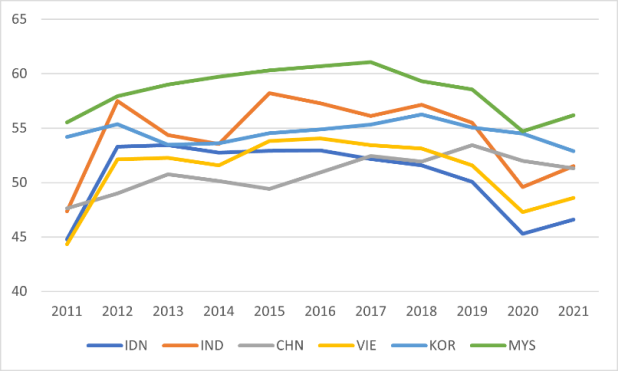

Figure 6: Sample countries EF EPI. Source: EF EPI

[3] Education First is an education organization that have been operating since 1965 which focuses on English language education. EF EPI is based on test data that were gathered from more than 2,100,000 test takers from samples around the world to examine English proficiency from countries around the world.

Based on the graph in Figure 6, English proficiency between the six sample countries between 2011 and 2021 based on the EF English Proficiency (EF EPI) index that was gathered. It is found that Indonesia has a relatively moderate English proficiency with a slight decline in 2020 compared to other comparing countries namely China, Vietnam, South Korea, and India while falling behind Malaysia with a relatively high English proficiency in which making Malaysia having the most proficient English compared to the other sample countries.

4.4. Net Migration

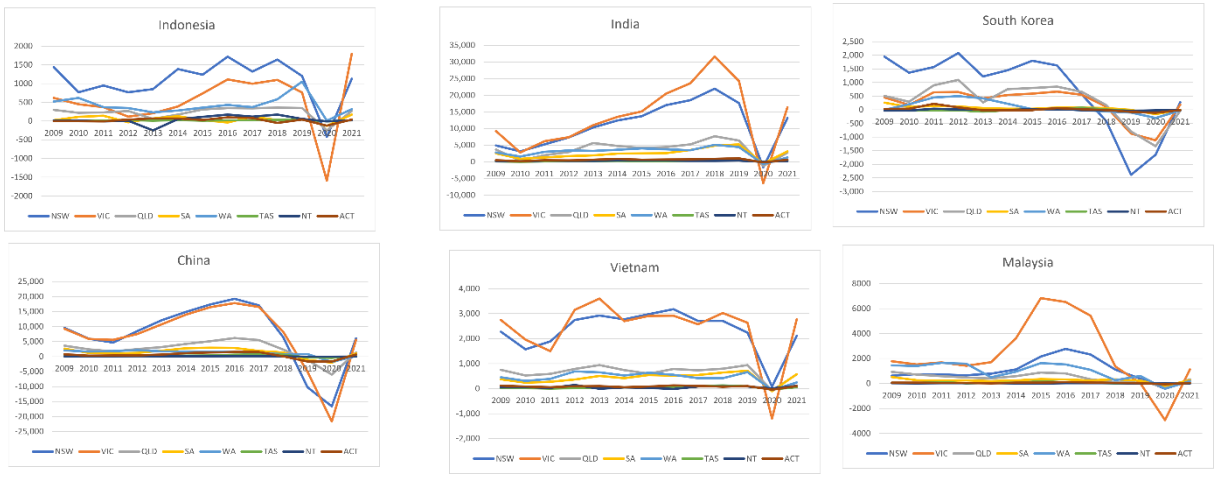

Figure 7: Net migration 2009-2021 from each sample countries and states of destination

Based on the graphs from figure 7, net migration from each sample countries are relatively upward and stable before 2020. For every country, there is a significant fall in net migration numbers for every state in Australia hence the negative net migration numbers. This is due to global shock (Covid-19). As mentioned in the previously in the thesis, Australia was one of the strictest countries in the world during the covid period (country and state lockdown), this can be a main driver of the decline in the net migration number in the country.

To conclude the data, there is a jump in trade value between Australia and Indonesia starting from year 2020. This could be caused by the IA-CEPA agreement which would increase trade between the two countries while Indonesian students studying in Australia also increase after 2017. This could be an indication of reverse causality or that Indonesian students are more incline to study in Australia due to scholarship availability. Number of

students in Australia is those who are attending higher education in every state in Australia. International students in Australia have been increasing from each year with a slight fall in 2011. This can be due to several economic shocks that happened in Australia during the period. Australian dollar reached its peaked due to mining boom from 2000 until 2013 in which Australia enjoyed massive foreign investment inflows which led to currency appreciation with 1 USD equals to 1.10 AUD (Reserve Bank of Australia). As the Australian Dollar appreciated, it also affects cost of living in the country to became higher. In the case of Singapore dollar's gain, it has resulted in a spike in the country's cost of living rankings for both foreigners and regular citizens whereas in Hong Kong, because the Hong Kong dollar is pegged to the US dollar, the impact of exchange rate movements on both foreigners and regular residents is limited (Tan & Lu, 2017). International students' country of destination can be impacted due to higher cost of living hence international students migrating to Australia fell during the period. Other economic shock that happened during the period also includes Queensland flood which started in December 2010 until 2011 in which it affected domestic production which in turn will also affect exported goods in Australia. This could also influence students that were migrating to Queensland for study. During the year 2019, it is also seen that international students migrating to Australia also dropped significantly. This mainly caused by the COVID-19 pandemic hence international students during the year does not come to Australia to attend normal classes while being introduced to online learning from their home countries. Additionally, Australia also applied one of the strictest border closure policies in the world which denied entry of foreign arrivals with all reasons including to study during the pandemic era.

5. Empirical Strategy

To answer the main question of the effects of International students migrating to study in Australian states towards bilateral trade between the sample countries and Australia, the thesis will be using the theory-based estimation framework from the gravity model equation. To have the appropriate sets of controls, the thesis follows the choice of controls from (Murat, 2017) with some modifications by adding some controls that are relevant to the thesis' study.

The thesis will be focusing on the causal effect between Australia and Australian states with the six sample countries.

5.1. Descriptive Statistics

Table 1: Descriptive statistics of variables used between 2009-2021

VARIABLES	DESCRIPTION	Number of observations	Mean	Standard Deviation	Min.	Max.
stateid	State Unique ID	702	5	2.58383	1	9
originid	Origin countries unique ID	702	3.5	1.709043	1	6
year	Year of Observation	702	2015	3.757751	2009	2021
netmigration	Total net migration to each state from each observed countries	702	2608.348	7927.41	-50270	73190
students	Total students residing in Australian states from each observed countries	702	10093.88	24832.83	5	258692
totstudents	Total international students migrating to Australian States	702	97954.25	144333	728	739075
Go8	Number of Group of eight universities on each Australian states	702	1.777778	2.300324	0	8

livingcost	Cost of living in each Australian states	702	1195.818	208.685	888.7239	1763.614
gdpaus	GDP per capita of Australia and GST of each Australian states every year observed (in $ Million)	702	65474.81	14213.16	41280.48	115193.6
gdporigin	GDP per capita of observed origin countries every year observed (in $ Million)	702	9112.961	9434.271	1115.829	35142.26
export	Export value Australia – origin countries (in $ Million)	702	5387.507	17068.3	0	177242
import	Import value Australia – origin countries (in $ million)	702	3521.151	9502.394	0	91224
tradevalue	Sum of export and import	702	8908.658	24993.98	0	268466
epi	English Proficiency Index from each sample countries	594	53.30636	3.786826	44.32	61.07
distance	Distance to Australian States from	702	6744.704	1918.09	2904	12018

	origin countries (in KM)					
Tradeagreement	Dummy Variable of bilateral trade agreement between Australia and origin countries	702	0.5	0.5003565	0	1

Table 1: Descriptive Statistics. Self Made, Data Source: Australian Bureau of Statistics (ABS), IMF, EF

The variables that are listed in table 1 are the variables that will be used as the estimation for the thesis' empirical strategy. Migration numbers have a minimum with negative value. This is due to the out-migration from each Australian State to other countries hence the negative values.

5.2. Variables

5.2.1. Outcome Variable

The outcome variable explains the sum of export and import in which acts as the bilateral trade relationship between Australian states and the sample origin countries in the thesis for every sample year period.

5.2.2. Independent Variable

The thesis aims to exploit the regional causal effect between International students residing and studying in Australian states and bilateral trade relationship with the origin countries. To exploit the causal effect, the thesis is using number of students originating from Indonesia as its independent variable. Additionally, the thesis is also using the number of students from comparison countries, India, China, Vietnam, South Korea, and Malaysia as its independent variable.

5.2.3. Controls

The thesis is using several controls to investigate other sources that can affect bilateral trade between Indonesia and Australia. The controls are: Total net migration from every sample country, regardless the purpose, total international students from every country, the

number of group of eight university members from each state, average living cost in each state, distance, import and export values, GDP of each state in Australia and Indonesia as well as the comparison countries GDP, and dummy variable of IA-CEPA agreement while also controlling dummy variable of each bilateral trade agreement between Australia and the comparison countries: ChAFTA[4], AANZFTA[5], ECTA[6], KAFTA[7], and MAFTA[8]

5.3. Main Estimation

The thesis will be applying the Gravity Model Equation while also applying the empirical specification from (Murat, 2017) for the choices of controls while also having additional controls that are more relevant to the thesis study. To avoid any shocks from covid-19, the thesis will be excluding year 2020 and 2021. The baseline specification is as follows:

$$LnY_{ijt} = \beta_0 + \beta_1 lnGDP_{it} + \beta_2 lnGDP_{jt} + \beta_3 lnStudents_{jt} + \beta_4 lnTotStudents_t + \beta_5 EPI_{jt} + \beta_5 lnDistance_j + X' + \theta_t + \theta_{(s,o)} + \varepsilon_i \quad (2)$$

In which LnY_{ijt} is the sum of export and import between Australia along with its states and the six sample countries in the specific sample period. $lnGDP_{it}$ is GDP of Australian states in a specific period and $lnGDP_{jt}$ is the GDP of origin country in the specific period, $lnStudents_{jt}$ is the number of students originated from the sample countries in a specific period, EPI_{jt} is English proficiency from each country of origin in a certain period sample while $lnDistance_{jt}$ is the distance between the sample countries and the Australian states. X' is the set of controls from the descriptive statistics that are time variate, namely living cost,

[4] China Australia Free Trade Agreement: Bilateral trade agreement between Australia and China which came into effect since 20 December 2015

[5] Asean Australia New Zealand Free Trade Agreement: Trade agreement between Australia and South-East Asian Nations

[6] Australia-India Economic Cooperation and Trade Agreement: Bilateral trade agreement between Australia and India which came into effect since 2022 (not applicable for the time period of the thesis).

[7] Australia-Korea Free Trade Agreement: Bilateral trade agreement between Australia and South Korea which came into effect since 8 April 2014

[8] Malaysia-Australia Free Trade Agreement: Bilateral trade agreement between Australia and Malaysia which came into effect since 30 March 2012

net migration, and trade agreement dummy, and the number of group of eight universities in each Australian states. θ_t is the year fixed effect while $\theta_{(s,o)}$ is the state and origin fixed effect. As mentioned in (Murat, 2017), students independent variables $lnStudents_{jt}$ & $lnInterStudents_t$ have to be lagged by three periods as it is the average period of students to be graduating from undergraduate (bachelor) program in Australia.

However, by only using the OLS method, it can create potential biases in the results due to potential identification threats. It can be that international students are overvalued with respect to the effect to bilateral trade. There could also be omitted variable bias. To have more credibility on the results, the thesis is enhancing the OLS with state, country of origin, and year fixed effects and robustness to tackle homoscedasticity and allowing heteroscedasticity in the data thus providing more reliable standard errors.

Then, the thesis will also be using the Difference-in-Difference (DiD) method to exploit the variation between the number of students from the six sample countries and the effect to bilateral trade with Australia and its states. The variation will be separated into two groups: number of sample students in the four states with the most number of international students (Victoria, Queensland, New South Wales, and Australian Capital Territory) and the other four states with the least number of international students (Northern Territory, Western Australia, Southern Australia, Tasmania). The four states with most international students will be the treated group while the other four will be the control group.

5.3.1. Identification

In order to have a Difference-in-Difference design, it is necessary to have a common trend assumption which can be seen that the treated and controlled states have a common upward trend. The international students residing in Australian states from the sample countries trend started to ascend in 2014 hence the thesis will treat 2014 – 2019 as the post-treatment period.

The Average Treatment Effect on the Treated (ATET) can be estimated by the following model:

$$LnY_{ijt} = \beta_0 + \beta_1 * T_i + T * Post_t + \delta * (T_i * Post_t) + X' + \theta_t + \theta_{(s,o)} + \varepsilon_i \quad (3)$$

LnY_{ijt} is the natural log of the bilateral trade value in the specific period year t, T_i is the dummy of the treatment that were mentioned in the earlier section, $Post_t$ is the time dummy that indicates post or pre-treatment period. As it is shown in the data section of the thesis, significant upward trend in international students residing in Australian states starts in 2014 making 2014 – 2019 to be the post-treatment period and 2009 – 2013 to be the pre-treatment period. δ is the coefficient of the interaction term between treatment dummy and post. This indicates the DiD itself.

6. Results

6.1. Main Result

In this section, the thesis is showing the results based on the estimation strategy and identification from the previous section.

Table A1: Main results table: OLS with fixed effects and DiD with fixed effects

lnTradeValue	(1)	(2)	(3)
VARIABLES	Model 1	Model 2	Model 3
lnGDPAUS	1.065	0.873	1.081
	(1.105)	(1.107)	(1.119)
lnGDPORIGIN	0.805***	0.859***	0.805***
	(0.0738)	(0.0988)	(0.0750)
lnStudents	-0.0861**	-0.0809**	-0.0857**
	(0.0264)	(0.0273)	(0.0258)
lnTotstudents	0.293	0.287	0.308
	(0.422)	(0.427)	(0.432)
epi	-0.102***	-0.103***	-0.102***
	(0.0176)	(0.0188)	(0.0175)
lnCost	-2.609	-0.258	-1.582
	(2.790)	(3.180)	(2.191)
lnNetmigration	0.361***	0.451***	0.362***
	(0.0549)	(0.0554)	(0.0553)
tradeagreement	-0.298**	-0.294**	-0.297**
	(0.119)	(0.112)	(0.119)
Go8	-	-	-
lnDistance	0.539		0.538
	(0.376)		(0.376)
treatment		-	-

post		0.464*	0.677***
		(0.231)	(0.164)
DiD		-0.109	-0.101
		(0.267)	(0.262)
Fixed effects	State and year fixed effects		
Additional fixed effects		origin	origin
Observations	401	401	401
R-squared	0.589	0.578	0.590
Number of stateid	9	9	9

Note: Standard errors in parentheses. Full table available on A1 The dependent variable is ln of bilateral trade value which sums total exports and imports from Australian states. Model 1 is OLS with robustness and fixed effect method, Models 2 and 3 are using the DiD method with different set of controls. LnGDPAUS is the real GDP per capita from Australian states, lnGDPORIGIN is the real GDP per capita from the six sample origin countries, lnstudents is the total students from sample countries, lntotstudents is the total number of students from every countries in the world. Stateid are clustered. On all three models, there are 401 observations while r-squared are 0.589, 0.578, 0.590 respectively. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1

Table A1 is the results that were gathered by performing the regressions that were mentioned in the main estimation and identification strategy section of the thesis. The thesis performed two regressions with different methods to test the hypotheses that were gathered in the previous sections. Model (1) uses the simple OLS regression with robustness and fixed effects method, model (2) and (3) uses the DiD method with fixed effects and only differ in the choice of controls to test (lnDistance). Treatment variable is the dummy variable that indicates the four top states that were mentioned in the previous section. Post variable is the dummy that indicates pre and post treatment. In this case, the pre-treatment is between 2009 – 2013 while the post treatment is between 2014 – 2019 as previously reported. DiD is the interaction term between post and treatment. Post have a statistically significant impact at ten and 5 percent respectively in model 2 and model 3 while DiD does not have a statistical significance.

In the first, second, and third model, it is gathered that Australian GDP and GST had no statistically significant impact although the result yields a positive relationship with bilateral trade value. However, in all three models, GDP of origin country does have a significant statical value at one percent. In the first model, a one percent increase in origin GDP would increase bilateral trade value by 0.805. In the second model, one percent increase in origin GDP yields an increase of 0.859 percent of bilateral trade value. While in the third model, one percent increase in origin GDP would increase 0.805 percent of bilateral trade value. This is in-line with the gravity model equation.

Based on the first hypothesis (H1) of the thesis, an increase in net migration would increase trade and from the results in table A1, it appears that the hypothesis is indeed correct. By using the method in model 1, it is found that a one percent increase in net migration to Australia and Australian states would increase trade by 0.3 percent and it is significant at one percent. In model 2, one percent increase in net migration will increase trade by 0.4 percent and it is significant at one percent level. In model 3, one percent increase in net migration would increase bilateral trade by 0.3 percent. All of these results are statistically significant at one percent level.

From the second hypothesis (H2), the thesis expect international students and bilateral trade would have a positive relationship. However, in the results on table A1, international students from the six focus countries have a negative relationship with bilateral trade. By using the first model, a one percent increase in international students from the focus countries would decrease bilateral trade by 0.086 percent, in the second model, one percent increase in international students from the sample countries would decrease trade by 0.08 percent while in the third model, one percent increase of students from these countries will decrease bilateral trade by 0.085 percent. All of these models yield a statistical significance at five percent level. While also controlling for the number of total international students from all countries, the thesis gathered statistically insignificant results in all models.

The third hypothesis (H3) of the thesis expect that the more kilometre of distance between origin countries and Australian state, it will decrease international students and will decrease bilateral trade. However, the hypothesis is rejected because of statistical insignificance.

The fourth hypothesis (H4) from the thesis would expect that if there are more trade agreements that have taken place, there would be more bilateral trade hence a positive relationship. However, in the main results from table A1, trade agreement have negative relationship with bilateral trade in all models with statistical significance at five percent level.

7. Robustness Checks

The variable of interest: number of international students residing in Australian states from sample countries and trade agreement is expected to have a positive relationship with bilateral trade. However, based on the result, the expectation does not hold. This could be driven by two things: The nature of the data and the economic shock or conditions in these countries. Macroeconomic shocks can be a driving factor for the result as global financial crisis still influence ASEAN mainly on GDP and exports (Purnama et al., 2019). It is important to note the half of sample countries that were tested in the thesis are ASEAN countries (Indonesia, Malaysia, Vietnam). Thus, it is possible that although there are trade agreements that have taken place, there can be a negative relationship with bilateral trade due to decline in the export and import from these countries. The nature of the data could also influence the results. The estimation strategy that were conducted in the thesis uses three year lags to compromise the effects of sample students residing in Australia and graduating on three-year average. The thesis will now be testing the following: main results without using lagged variable and by also including covid-19 shock years. In this section, the thesis will be using the same estimation strategy and using the models from the previous section and will only be testing the first (OLS with robustness) and third (DiD) models from the previous section.

7.1. Robustness check by including covid-19 years

Table A2: Main results of regression by including covid-19 shocks

LnTradeValue	(1)	(3)
VARIABLES	OLS-FE	DiD-FE
LnGDPAUS	1.330	2.549*
	(0.831)	(1.147)
LnGDPORIGIN	0.802***	0.830**
	(0.0779)	(0.302)
Lnstudents	-0.0747**	-0.0138
	(0.0320)	(0.0247)
Lntotstudents	0.0768	0.398
	(0.198)	(0.274)
epi	-0.0992***	-0.00277
	(0.0173)	(0.0179)
LnDistance	0.630	0.406
	(0.373)	(1.452)
Lnlivingcost	-1.825	-5.921**

	(2.058)	(2.140)
Lnnetmigration	0.325***	0.0342
	(0.0560)	(0.0386)
Trade Agreement	-0.268*	-0.0619
	(0.121)	(0.0584)
Go8	-	-
Fixed effects	State-year fixed effects	
Observations	449	449
R-squared	0.549	0.739
Number of stateid	9	9

Note: Standard errors in parentheses. Full table available on A2. The dependent variable is natural logarithm of bilateral trade value which sums total exports and imports from Australian states. LnGDPAUS is the real GDP per capita from Australian states, lnGDPORIGIN is the real GDP per capita from the six sample origin countries, lnstudents is the total students from sample countries, lntotstudents is the total number of students from every country in the world. On all models, Stateid are clustered. There are 449 observations while r-squared are 0.549 and 0.739 respectively. *** p-value < 0.01, ** p-value < 0.05, * p-value < 0.1

In the first model, by only using the simple OLS method, it is gathered that Australian GDP and GST had a statistically insignificant impact. However, by using the third model, it has a statistically significant power at ten percent level in which a one percent increase of Australian GDP and GST would increase trade by 2.55 percent. Country of origin GDP also have a statistically significant power at one percent level in model 1 while also maintaining statistical significance at five percent level on model 3.

Based on the first hypothesis (H1) of the thesis, an increase in migration would increase trade and from the results in table A2, it appears that the hypothesis is indeed correct. In model 1, one percent increase in migration will increase trade by 0.3 percent and it is significant at one percent level. However, while using the third model method, migration does not have statistical significance anymore.

From the second hypothesis (H2), the thesis expect international students and bilateral trade would have a positive relationship. Based on the results on table A2 model 1, international students from the six focus countries still have a negative relationship with bilateral trade and is statistically significant at five percent level. In the third model it also decreases bilateral trade by 0.01 percent but is statistically insignificant. For students from all countries, the results is still statistically insignificant

The third hypothesis (H3) remained rejected in table A2 since all of the models does not yield a statistically significant results for the effect of distance on bilateral trade.

The fourth hypothesis remains rejected, and in this specification, trade agreement variable became less powerful in which its statistically significant at 10 percent level in which it decreases bilateral trade by 0.26 percent in the second model and is statistically significant in the third model.

7.2. Robustness check by including covid years and discarding lagged variable

Table A3: Main results regression without using lagged variable.

Trade Value	(1)	(3)
VARIABLES	OLS-FE	DiD-FE
LnGDPAUS	1.372	2.731*
	(0.801)	(1.230)
LnGDPORIGIN	0.785***	1.032**
	(0.0976)	(0.312)
Lnstudents	0.325**	-0.0914
	(0.103)	(0.0498)
Lntotstudents	0.622	0.861
	(0.479)	(0.478)
epi	-0.118***	0.00465
	(0.0185)	(0.0155)
LnDistance	0.612	0.280
	(0.387)	(1.322)
Lnlivingcost	-2.216	-5.929**
	(2.062)	(2.539)
Lnnetmigration	0.0775	0.0643
	(0.0809)	(0.0533)
Trade Agreement	-0.255*	-0.0861
	(0.120)	(0.0603)
Go8	-	-
Fixed effects	State-year fixed effects	
Constant	-7.738	-1.055
	(17.97)	(17.46)
Observations	449	449
R-squared	0.604	0.746
Number of stateid	9	9

Note: Standard errors in parentheses. Full table available on A3. Table A3 follows the same empirical and estimation strategy as table A2. The only difference being that in this table, the thesis does not lag variable of interest to three years. LnGDPAUS is

the real GDP per capita from Australian states, lnGDPORIGIN is the real GDP per capita from the six sample origin countries, lnstudents is the total students from sample countries, lntotstudents is the total number of students from every country in the world. There are 449 observations in all models with 0.604 and 0.746 r-squared respectively. *** p-value < 0.01, ** p-value <0.05, * p-value < 0.1

From the results gathered in table A3, the statistical significance are relatively similar with the statistical power in table A2. However, there are some differences of the coefficients and relationships. The variable of interest, number of international students from the 6 sample countries now yields a positive relationship with bilateral trade by using the first model while also yielding negative relationship while using the third model. In the first model, one percent increase in international students from the 6 sample countries would yield an increase of 0.32 percent in bilateral trade and it is statistically significant at five percent level. This is in-line with the hypothesis that the thesis has expected in the previous section. However, this is not the main result since it is necessary to lag three years in the variable to observe the effect of students to bilateral trade hence the result of causality of this variable is not as expected (negative).

One of the surprising results from the main estimation is that English Proficiency Index (EPI) has a negative relationship with bilateral trade. The thesis would expect that the more proficient the county is in English, the more it will have a bilateral trade relationship with Australia. However, several arguments can explain the result. First, the sample countries might have diverse trading partners outside Australia which in this case, would lower the bilateral trade. Second, one of the implications that a country is developed is the language proficiency. In this case, it is possible that the countries with proficient English might not specialize in industries in Australia. Group of eight have a statistically significant power at one percent level in which an additional group of eight in an Australian state would increase trade by 0.15 percent by running a simple OLS regression method which is not relevant since as previously mentioned, simple OLS would yield an under or overestimation of the value and threat to potential biases. While running the test in the first and third model, by adding the fixed effects, the results yield to omitted variable. This is due to missing values from the STATA software that was used to regress the results in this thesis hence group of eight is omitted on both models.

8. Conclusion & Policy Implications

From the results that were gathered in the main results, it can be concluded that international students residing in Australian states from the sample countries have a negative relationship with bilateral trade value of Australian states and the origin sample countries and it is statistically significant at five percent for all models apart from the first model in the robustness check table A3. However, overall, the result of the thesis differs from (Murat, 2017) which found that international students have positive relationship with bilateral trade in the case of Latin America and OECD countries. The difference in this thesis results also could be influenced by three arguments: First, the difference in dataset and sample countries that were used. (Murat, 2017) is using Latin American countries as its variable of interest while this thesis is focusing on six sample Asian countries. The differences in the sample influenced the difference in characteristics and movement of the sample hence the different results. Second, it is possible that there could exist a reverse causality in which bilateral trade is influencing the number of international students, not the other way around. Third, policy changes along the years of observation may affecting the results such as changes in immigration and student visa policies. Although in overall tests international students from the sample countries yields negative relationship, one could not ignore the importance of international students towards the country's economy as it is one of the variables that can increase GDP and regional GDP hence an improvement on educational sector of a country is still very much needed.

The thesis also found that trade agreement has a negative relationship with statistical significance power on all models, this is due to the effects of macroeconomic shocks that are still affecting Asian economy due to the global financial crisis in which it affects GDP and exports of the country (Purnama et al., 2019). However, as a policymaker, it is important to note that most of the sample countries just started the bilateral trade agreement as recent as 2012 (Malaysia) while Indonesia being the most recent bilateral trade agreement with Australia which came into effect just in 2020. There is still a lot of room for improvement on bilateral trade between the sample countries and Australia since the bilateral trade agreement has only started recently. By having more trade agreements, countries can reduce tariffs on export and imports thus creating more trade.

It is important to note as a policymaker that migration have a statistically significant impact at one percent level on all models that were tested in the thesis and having a positive relationship towards bilateral trade. This finding suggests that more migration would create more bilateral trade between countries. Since net migration includes all purposes (not only for study) of migrating to Australian states, but it is also possible that the other purpose of migration drives bilateral trade the most. By having more working opportunities in the regions, in this case, Australian states, it will incentivize working professionals around the world to work in the region thus creating more skilled migrants entering the country which will be beneficial to the country of destination economy.

Overall, the thesis has found a numerous impact on various variables on the bilateral trade of Australian states and origin countries by using the two statistical methods and gravity model equation. The thesis can pave ways for further research should the topic gains researchers' interest as there could be more improvement should future research on the topic have more time, knowledge, and data availability to exploit the topic with other statistical methods.

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10. Appendix

10.1. Table A1

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
lnGDPAUS	1.065	0.873	1.081
	(1.105)	(1.107)	(1.119)
lngdporigin	0.805***	0.859***	0.805***
	(0.0738)	(0.0988)	(0.0750)
lnstudents	-0.0861**	-0.0809**	-0.0857**
	(0.0264)	(0.0273)	(0.0258)
lntotstudents	0.293	0.287	0.308
	(0.422)	(0.427)	(0.432)
epi	-0.102***	-0.103***	-0.102***
	(0.0176)	(0.0188)	(0.0175)
lncost	-2.609	-0.258	-1.582
	(2.790)	(3.180)	(2.191)
lnnetmigration	0.361***	0.451***	0.362***
	(0.0549)	(0.0554)	(0.0553)
tradeagreement	-0.298**	-0.294**	-0.297**
	(0.119)	(0.112)	(0.119)
Go8	-	-	-
logdistance	0.539		0.538
	(0.376)		(0.376)
1o.treatment		-	-
1.post		0.464*	0.677***
		(0.231)	(0.164)
1.treatment#1.post		-0.109	-0.101
		(0.267)	(0.262)
2012.year	0.594**	0.534***	0.575***
	(0.178)	(0.130)	(0.140)
2013.year	0.696**	0.579**	0.648***
	(0.249)	(0.187)	(0.177)
2014.year	0.767*	0.153	0.0642
	(0.366)	(0.355)	(0.342)
2015.year	1.050*	0.377	0.333
	(0.476)	(0.404)	(0.405)
2016.year	0.896**	0.202	0.165
	(0.368)	(0.276)	(0.270)
2017.year	0.933**	0.212	0.182
	(0.300)	(0.174)	(0.160)
2018.year	1.030***	0.290**	0.260**

	(0.281)	(0.0995)	(0.0881)
2019o.year		-	-
2019.year	0.790**		
	(0.267)		
2.originid	0.879	0.620	0.861
	(1.167)	(0.482)	(1.159)
3.originid	1.864	1.638***	1.847
	(1.069)	(0.300)	(1.048)
4.originid	-0.0339	-0.158	-0.0448
	(0.685)	(0.317)	(0.682)
5.originid	-0.699	-0.860*	-0.714
	(0.999)	(0.447)	(0.990)
6.originid	-0.456	-0.537*	-0.466
	(0.527)	(0.272)	(0.519)
Observations	401	401	401
R-squared	0.589	0.578	0.590
Number of stateid	9	9	9

10.2. Table A2

VARIABLES	(1) Model 1	(2) Model 2	(3) Model 3
loggdpaus	1.001**	1.330	2.549*
	(0.403)	(0.831)	(1.147)
loggdporigin	0.884***	0.802***	0.830**
	(0.0667)	(0.0779)	(0.302)
logstudents	-0.144***	-0.0747**	-0.0138
	(0.0418)	(0.0320)	(0.0247)
logtotstudents	0.572***	0.0768	0.398
	(0.0830)	(0.198)	(0.274)
epi	-0.0631***	-0.0992***	-0.00277
	(0.0140)	(0.0173)	(0.0179)
logdistance	-0.671**	0.630	0.406
	(0.330)	(0.373)	(1.452)
logcost	-3.015***	-1.825	-5.921**
	(0.702)	(2.058)	(2.140)
lognetmigration	0.531***	0.325***	0.0342
	(0.0670)	(0.0560)	(0.0386)
tradeagreement	0.00486	-0.268*	-0.0619
	(0.114)	(0.121)	(0.0584)
o.go8	0.155***	-	-
	(0.0366)		

2012.year	0.578***	0.0820
	(0.133)	(0.147)
2013.year	0.673***	0.300
	(0.192)	(0.176)
2014.year	0.805**	0.554*
	(0.270)	(0.298)
2015.year	1.130**	0.958*
	(0.341)	(0.441)
2016.year	0.969***	0.680*
	(0.266)	(0.348)
2017.year	1.001***	0.613*
	(0.210)	(0.290)
2018.year	1.063***	0.608*
	(0.206)	(0.266)
2019.year	0.843***	0.605*
	(0.197)	(0.290)
2020.year	1.365***	0.451
	(0.302)	(0.318)
2021.year	1.216***	0.991**
	(0.232)	(0.357)
2011.did		-0.765
		(0.599)
2012.did		-0.525
		(0.520)
2013.did		-0.731
		(0.523)
2014.did		-0.664
		(0.477)
2015.did		-0.696
		(0.503)
2016.did		-0.673
		(0.483)
2017.did		-0.737
		(0.508)
2018.did		-0.836
		(0.668)
2019.did		-0.750
		(0.527)
2020.did		0.133
		(0.439)
2021o.did		-
2.originid		0.362
		(1.040)
3.originid		1.229
		(1.158)

4.originid			-0.279
			(0.603)
5.originid			-1.177
			(1.192)
6.originid			-0.652
			(0.580)
Constant	10.76	-4.328	6.302
	(9.101)	(16.27)	(15.83)
Observations	449	449	449
R-squared	0.687	0.549	0.739
Number of stateid		9	9

10.3. Table A3

VARIABLES	(1) Model1	(2) Model 2	(3) Model 3
loggdpaus	1.051**	1.372	2.731*
	(0.418)	(0.801)	(1.230)
loggdporigin	0.908***	0.785***	1.032**
	(0.0675)	(0.0976)	(0.312)
logstudentss	0.144	0.325**	-0.0914
	(0.107)	(0.103)	(0.0498)
logtotstudentss	0.319***	0.622	0.861
	(0.0786)	(0.479)	(0.478)
epi	-0.0713***	-0.118***	0.00465
	(0.0151)	(0.0185)	(0.0155)
logdistance	-0.791**	0.612	0.280
	(0.308)	(0.387)	(1.322)
logcost	-2.783***	-2.216	-5.929**
	(0.718)	(2.062)	(2.539)
lognetmigration	0.451***	0.0775	0.0643
	(0.113)	(0.0809)	(0.0533)
tradeagreement	-0.00530	-0.255*	-0.0861
	(0.112)	(0.120)	(0.0603)
Go8	0.151***	-	-
	(0.0359)		
2012.year		0.655***	0.0187
		(0.112)	(0.125)
2013.year		0.652**	0.149
		(0.194)	(0.127)
2014.year		0.682**	0.358

	(0.245)	(0.272)
2015.year	0.984***	0.736
	(0.290)	(0.423)
2016.year	0.727**	0.384
	(0.272)	(0.323)
2017.year	0.664*	0.250
	(0.307)	(0.292)
2018.year	0.538	0.226
	(0.372)	(0.292)
2019.year	0.213	0.121
	(0.396)	(0.374)
2020.year	0.102	0.324
	(0.311)	(0.417)
2021.year	1.112***	0.965*
	(0.325)	(0.428)
1o.treatment		-
1o.post		-
0b.treatment#0b.post		0
		(0)
0b.treatment#1o.post		0
		(0)
1o.treatment#0b.post		0
		(0)
1o.treatment#1o.post		0
		(0)
2011.did		-0.600
		(0.527)
2012.did		-0.357
		(0.454)
2013.did		-0.604
		(0.439)
2014.did		-0.591
		(0.414)
2015.did		-0.553
		(0.414)
2016.did		-0.581
		(0.426)
2017.did		-0.694
		(0.456)
2018.did		-0.794
		(0.623)
2019.did		-0.628
		(0.436)
2020.did		0.294

			(0.329)
2021o.did			-
2.originid			0.711
			(0.893)
3.originid			1.329
			(1.034)
4.originid			-0.162
			(0.531)
5.originid			-1.588
			(1.187)
6.originid			-0.781
			(0.547)
Constant	10.88	-7.738	-1.055
	(9.212)	(17.97)	(17.46)
Observations	449	449	449
R-squared	0.682	0.604	0.746
Number of stateid		9	9