## **CHAPTER 4**

## **Empirical Result**

The discussion of this chapter is divided to 3 main sections. First of all, it aims to present the characteristic of Cambodia's trading partners (section 4.1). Secondly, this chapter will present and analyze the factors affecting bilateral trade between Cambodia and its partners in ASEAN by Pooled OLS and Random Effects Model (section 4.2). Additionally, section 4.2 also explains the preferable of Random Effects Model over Pooled OLS Model. Subsequently, the various diagnostic tests are applied to relax the Random Effects Model (section 4.3). Resulting to from the various diagnostic tests cause contemporaneous problems in the model; thus, Feasible Generalized Least Square (FGLS) is used to estimate the gravity equation. In section 4.4, the factors determine the bilateral trade between Cambodia and its trading partners has been explained. The last part of this chapter gives an explanation on the predicted trade potential using the out-off sample approach. Likewise, the results in section 4.5 show the overall predicted trade potential of Cambodia with its partners and the result of trade potential with each pair individual partners.

# 4.1 Characteristics of Cambodia's trading partners

In this section, it presents the characteristics of the Cambodia's trading partners by two main parts. The first part describes about the overall descriptive statistic of Cambodia's trading partners (table 4.1). Lastly, it presents the mean of each partner's GDP and GDP per capita.

Notably, at the mean real GDP of 8.59 billion USD and the mean GDP per capita of 625.04 USD, the overall mean bilateral trade of Cambodia is approximately 419 million USD in the period of 1995 to 2015. Moreover, the mean bilateral geographical distance between the capital city of Phnom Penh and the capital city of its trading partners is approximately at the average of 1250 kilometers. Thailand is the closest trading partner

of Cambodia, where the geographical distance between them is about 535 kilometers away from Phnom Penh capital city. On the other hand, the longest geographical distance partner of Cambodia is Indonesia. The distance between Phnom Penh capital city of Cambodia and Jakarta capital city of Indonesia is 1982 kilometers (Table 3.1).

Variable	Mean	Median	Maximum	Minimum
Total bilateral trade	419.63	166.95	5951.15	0.34
(Million USD)				
Cambodia's Real GDP	8.59	8.14	15.90	3.66
(Billion USD)	ab gin	2/8		
Cambodia's per Capita	625.04	610.98	1020.91	342.16
GDP (USD)	·/ Z		3	
Trading Partners' Real	260.88	205.78	987.51	43.70
GDP (Billion USD)	1 2	- 10 h	部	
Trading partners' per	9633.11	3508.23	51855.08	606.93
Capita GDP (USD)		U.K.L.	3	
Bilateral Distance	1250.40	1103.61	1982.27	535.97

 Table 4.1 Descriptive statistic of trading partners

Source: CEIC Data Manager (WDI), Chiang Mai University

Furthermore, if we compare the means of Cambodia's real GDP to other trading partners in ASEAN, Cambodia seem to have the lowest real GDP which is approximately worth 8.5 billion USD. Indonesia is not only the biggest country in ASEAN in its geographical size, but also the largest country in real GDP, which has its mean real GDP worthily about 627 billion USD (table 4.1). Remarkably, the real GDP of Indonesia, Singapore, Philippines, and Vietnam is smaller than the overall mean of real GDP (260 million USD). On the other hand, Thailand's and Indonesia's real GDP are over than the overall mean of real GDP (table 4.2).

Thailand has the highest GDP per capita if comparing to Cambodia's major trading partners in ASEAN region, where Thailand's per capita GDP is at the average of 39587.15 USD. Contrarily, Cambodia has the smallest GDP per capita in the region, where its mean GDP per capita is 625.04 USD. Most of the country partners' mean

GDP per capita is below the overall mean of per capita GDP, except Thailand.

Country						
Variable	Indonesia	Malaysia	Singapore	Thailand	Vietnam	Philippines
Trading						
partners'						
real GDP	627.24	212.55	182.91	285.92	90.23	166.41
(Billion						
USD)						
Trading						
partners'						
per capita	2725.44	8112.46	1909.29	39587.15	4389.39	1074.91
GDP						
(USD)						

**Table 4.2** Mean of real GDP and per capita GDP of each trading partner

Source: CEIC Data Manager (WDI), Chiang Mai University

## 4.2 Analysis the results in Pooled OLS and Random effects model

The gravity model in this study has been included time-invariant variables such as distance, common border and financial crisis (both global and Asian Financial crisis). The fixed effects model fails to estimate time-invariant variables in the gravity model. In this thesis, it will reflect two possible econometric approaches in the gravity equation estimation. The first econometric model is pooled OLS model used to estimate the gravity model. Another way to estimate the gravity trade model is random effects model. The results of Pooled OLS and Random effects model are shown in table 4.3.

The study found that Cambodia's GDP per capita and its trading partners GDP per capita are significantly positive impact on the bilateral trades between the countries at 1 percent significance level in both Pooled OLS and Random Effects Model. One percent increase in Cambodia's GDP per capita will lead to increase the Cambodia's bilateral trade with its trading partners approximately 2.16 percent (model 1), and about 1.17 percent (model 2). Likewise, one percent increase per capita GDP of its trading partners will lead to increase the Cambodia's bilateral trade with its trading partners approximately and 1.32 percent (model 2). The rising income of each

country essentially encourage and increase trading activities with more trading values between Cambodia and its major trading partners in ASEAN.

Conversely, AFTA negatively impact on the bilateral trade between Cambodia and its trading partners in ASEAN in both model, which contributing to decrease the trades about 0.67 percent (model 1) and 0.68 percent (model 2). This might be the AFTA agreement between Cambodia and its trading partners in ASEAN less encourage or incentive to foster investors increasing their trading activities. This finding is in line with (Coulibaly, 2004) and (Heng, 2014) who find that Cambodia seems to have a trade diversion. Cambodia's main exports partners are United States, England, Europe, Korea, and Japan.

Moreover, crisis variable has a negative relationship with bilateral trade between Cambodia and its major trading partners. Both Asian Financial crisis and global crisis negatively impact on Cambodia's bilateral trade by 0.45 percent (model 1), and 0.46 percent (model 2). Some related empirical studies also found that crisis will lead the bilateral decreases (Heng, 2014; Hossein Jalilian, 2009; Sophal et al., 1999).

The negative coefficient sign of real bilateral exchange rate (RBER<sub>ijt</sub>) (in both model 1 and model 2) represents its negative influence on bilateral trade between Cambodia and its trading partners in ASEAN. This implies that the appreciation of Cambodian's trading partner's currency reduces the export volume from them, while the depreciation of Cambodian currency against its trading partner currency leads to decrease the import volume.

The bilateral distance  $(Dist_{ij})$  has a negative effect on Cambodia's bilateral trade at 1 percent significance level in both model 1, while it is insignificant in model 2. Surprisingly, the coefficient of common border-sharing (Border<sub>ij</sub>) is statistically insignificant in both model 1 and 2, which mean that the border-sharing between Cambodia and its trading partners has no influence on Cambodia's bilateral trade with its trading partners.

The study found statistically insignificant in common border-sharing variable in both Pooled OLS and Random Effects Model. Thus, even if Cambodia have a common border-sharing with its trading partners, but it seems has no effect on bilateral trade between them. On the other hand, the coefficient of bilateral distance  $ln(Dist_{ij})$  is highly significant with negative sign in Pooled OLS, while it is statistically insignificant in Random Effects Model.

Independence Variables	Pooled OLS	<b>Random Effects Model</b>
	(Model 1)	(Model 2)
ln(PCGDP <sub>it</sub> )	2.163435***	2.170762***
	(0.000)	(0.000)
ln(PCGDP <sub>jt</sub> )	1.490843***	1.327057***
5	(0.000)	(0.000)
ln(RBER <sub>ijt</sub> )	4649524***	3501492**
	(0.000)	(0.021)
ln(Dist <sub>ij</sub> )	-2.575793***	-1.850976
	(0.000)	(0.298)
Border <sub>ij</sub>	.5171341	1.147969
E.	(0.258)	(0.496)
AFTA	671545***	6800849***
	(0.002)	(0.001)
crisis	4581254***	4635308***
<b>ລ</b> ປສກຣນ	(0.005)	(0.002)
	100 C	

Table 4.3	Pooled	OLS	and	Random	Effects	regression
						0

Not: \*\*\* is statistically significant at 1% level, \*\* is statistically significant at 5%, \* is statistically at 10%

The Breusch-Pagan LM test for Random Effects is employed to choose the best model among Pooled OLS and Random Effects Model (table 4.3). The result of the probability in Breusch-Pagan LM test is less than 5% level. We reject null hypothesis of variances across entities is zero at the 1% level. Consequently, the Random Effects Model is preferred, while Pooled OLS model fails to provide the proper results.

#### 4.3 Various Diagnostic Tests

Various diagnostic tests have been done to confirm that Random Effects Model in this study does not consist of spurious problems like multicollinearity, heteroscedasticity,

serial correlation, and cross-section dependence.

Firstly, the multicollinearity problem is detected by using two simple econometrical tools such as Variance Inflation Factor (VIF) and correlation matrix between variables. Considerably, the variance inflation factor illustrates that variable Border<sub>ij</sub> and Dist<sub>ij</sub> are suspected of causing multicollinearity since the VIFs value are greater than 10 or the tolerance value (1/VIF) is less than 1 (Appendix 4). Likewise, the correlation matrix between variables method confirm that the real bilateral exchange rate between Cambodia and its trading partners (RBERijt) highly correlated with per capita GDP of its trading partner j (PCGDPjt) at the positive rate of 80 percent. Additionally, the common border-sharing variable (Borderij) correlates with the bilateral distance variable (Distij), where the correlation between them is 70 negatively (Appendix 5). The high correlation of those variables will cause to the bias result in panel data which is call the problem of multicollinearity. In conclusion, both VIF and correlation matrix between variables approaches verify the present of multicollinearity in the model.

Afterward, another diagnostic test for heteroscedasticity has been detected by using the Modified Wald Test for GroupWise Heteroscedasticity. The heteroscedasticity problem can lead to the bias result. The detecting for heteroscedasticity will assist to the right way of estimating the gravity without the contemporaneous problem which leads to fault result. The Modified Wald Test for GroupWise Heteroscedasticity indicates that the probability is statistically significant at 5 percent level (Appendix 6). We reject the null hypothesis of "sigma(i)<sup>2</sup> is equal to singma<sup>2</sup> for all i" or "no GroupWise heteroscedasticity", which mean there is heteroscedasticity problem.

Thirdly, the cross-sectional dependent is observed by using Pesaran's and Friedman's test. The Pesaran's and Friedman's test of cross sectional independence are statistically significant at 5% and 1% level, respectively (Appendix 7). We reject the null hypothesis of "No cross-sectional dependence". Hence the cross-sectional dependence occurs in the panel data. The cross-sectional dependence can lead to bias results.

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Finally, we observe autocorrelation problem by using serial correlation test which is known as the Wooldridge test for autocorrelation in panel data using Stata 13 program. The result of Wooldridge test fails to reject the null hypothesis of no first-order autocorrelation due to the value of probability is greater than 5 percent (Appendix 8). It means that there is no serial correlation problem occurs in the panel data in this study.

In conclusion, the diagnostic tests above reveal that Random Effects Model consists of spurious problems such as multicollinearity, heteroscedasticity and cross sectional dependence. Hence, the use of Random Effects Model in this study will lead to unexpected result or fault result. In order to eliminate those problems in estimating the gravity equation, the Feasible Generalized Least Square is recommended.

## 4.4 Result Feasible Generalized Least Square (FGLS)

The Random Effects Model leads to the bias result according to the various diagnostic tests in section 4.3. The problems of heteroscedasticity and contemporaneous correlation occur in model. Those problems can be eliminated by using Feasible Generalized Least Square (FGLS) with error structure across the panels of heteroscedasticity with cross-sectional correlation, and in the form of no first-order autocorrelation (Stata 13).

According to the result of Feasible Generalized Least Square (FGLS) regression, all the independent variables such as per capita GDP of Cambodia and its trading partners, bilateral exchange rate between them, the bilateral distance, common border-sharing, AFTA and crisis are statistically significant (table 4.4). It means that all factors have influenced on the bilateral trade between Cambodia and its trading partners. The depth explanation of each factor effecting the Cambodia's bilateral trade is discussed as below:

The per capita GDP of Cambodia and its trading partners' significantly positive impact on bilateral trade between Cambodia and its trading partners. Theoretical foundation confirms that per capita GDP of home country and its trading partners have a positive influence on bilateral trade between them. One percent increase in per capita GDP or production capacity of Cambodia will lead the bilateral trade between Cambodia and its trading partners approximately increases by 2.2 percent. The per capita GDP of Cambodia's trading partners increase by 1 percent will boost its bilateral trade between them by 1.4 percent. The per capita GDP of its trading partners represent the purchasing power of those countries. Hence, when the purchasing power of its trading partners increases by 1 percent will increase the bilateral trade between them. The finding is in the line with Sohn (2001), De Groot et al. (2004), Chen et al. (2008), and Thapa (2013).

The bilateral exchange rate between Cambodia Riel and its trading partners' national currency negatively impacts on bilateral trade between them. This implies that the appreciation of Cambodian's trading partner's currency reduces the export volume from them, while the depreciation of Cambodian currency against its trading partner currency leads to decrease the import volume. The negative sign of bilateral exchange Ozturk (2006), he collected many studies on exchange rate volatility and trade in both developed and developing countries. He found some of empirical studies has been discussed on the fluctuation of exchange rate volatility discourage the growth of foreign trade.

The result of distance and common border-sharing are consistent to the foundation of gravity trade. Firstly, the bilateral distance between Cambodia and trading partners is represents the high trade costs effect on bilateral trade between them. The trade costs of Cambodia bilateral trade with its partners come from the poor of transportation services, poor infrastructures, culture distance, and lack of Information and Communications Technology (ICT). Hence the bilateral distance will lead to drop of bilateral trade between them by approximately 2 percent. In short, it reflects that the bilateral distance or the trade costs is a strong barrier causes a negative impact on bilateral trade. The result is consistent to Kim (2006) ,Huot and Kakinaka (2007), and many other studies.

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The common border-sharing theoretically represents the two countries have share a common border where can motivate more trade activities, especially the border trade. The result reflects that the common border-sharing has a positive impact on bilateral trade. It boosts the bilateral trade between them by 1.03 percent. The bilateral trade evidence trade between Cambodia and its bordering countries such as Thailand and Vietnam has shown a growth trend from the past until the present. Kim (2006), Simwaka (2006), and many other empirical studies have found the positive impact of common border on trade.

Surprisingly, we found the negative relationship between total bilateral trade and AFTA

shows that Cambodia seems to have diverted trade. According to Heng (2014), he also found that Cambodia's exports is an export diversion; and the exports to ASEAN declined after becoming the member of AFTA. Cambodia's exporting goods are exported to the large market countries such as United States, European Union, Canada, Japan, and others countries outside ASEAN region. Moreover, this study also in the line with Coulibaly (2004). He supported that Cambodia, Brunei Darussalam, Laos, and other AFTAs members experienced in extra-regional exports after RTA recreating.

Independent	Coefficient	Short explanation of the result
Variables	à	Marcing 2/2
$\ln(PCGDP_{it})$	2.220918***	Per capita GDP of Cambodia (i) significantly
	(0.000)	positive impact on Cambodia's bilateral trade. 1
		percent increase in PCGDP <sub>i</sub> will lead to 2.22
	-368-	percent increase in TT.
$\ln(PCGDP_{jt})$	1.434908***	Per capita GDP of trading partners (j) positively
	(0.000)	influence on bilateral trade. 1 percent increase in
	131	PCGDP <sub>i</sub> will lead to 1.43 percent increase in TT
$ln(RBER_{ijt})$	4031778***	Real bilateral exchange rate negatively effect on
	(0.000)	Cambodia's bilateral trade.
$\ln(Dist_{ij})$	-2.008036***	Bilateral distance is a proxy of trade costs. If 1
3	(0.000)	percent increase in trade costs will lead to 2
	Copyright <sup>©</sup>	percent drop in Cambodia's bilateral trade.
Border <sub>ij</sub>	1.03043**	Common border-sharing have a positive effect on
	(0.023)	bilateral trade. It will boost the trade to increase by
		1.03 percent
AFTA	6674636***	Unexpected result of AFTA, has a negative impact
	(0.003)	on bilateral trade. Cambodia has a diverted trade,
		trade flows outside the ASEAN region.
crisis	4450586***	Crisis has a negative impact on bilateral trade. It
	(0.008)	will decrease trade by 0.44 percent.
Note: *** is si	gnificant at 1% leve	el; **is significant at 5% level; () Probability

**Table 4.4** Feasible Generalized Least Square (FGLS) regression of ln(TTijt)

Source: Calculated by author

The crisis contributes a negative relationship with Cambodia's bilateral trade, significantly at 1 percent level. The crisis variable included the global financial crisis 2008-2009 and the Asian financial crisis 1997-1998, leads the bilateral trade on Cambodia dropped by 0.66%. The economy of many countries in the world was impacted severely by the both crisis. This was led to reduce of Cambodia foreign trade, especially the trade with ASEAN countries (Jalilian, Sophal, Reyes, & Dorina, 2009; Sophal et al., 1999). The global financial crisis has a negative impact on ASEAN's exports and imports, which approximately 20% dropped in imports and exports of ASEAN (Perkins, 2009).

# 4.5 Predicting the Cambodia's potential trade and performance

## 4.5.1 Mean predicted trade and mean actual trade

The result of coefficients from GLS regression was used to calculate to predict the trade potential between Cambodia and its major trading countries in ASEAN. The bilateral trade between them can be written as below:

$$\ln(TT_{ijt}) = -5.15 + 2.22 \ln(PCGDP_{it}) + 1.43 \ln(PCGDP_{jt}) - 0.403 \ln(RBER_{ijt}) - 2.008 \ln(Dist_{ij}) + 1.03Border_{ij} - 0.66(AFTA) - 0.44(crisis)$$
(12)

The results of Actual trade and predicted trade are illustrated in table 4.5. It shows that the mean of actual trade valued 419.63 million USD comparing to the mean of predicted trade valued 392.09 million USD during the whole period of study. Additionally, the predicted trade shows the maximum of trade volume between Cambodia and its partner worth about 3354.67 million USD, while the minimum trade volume between them is only 3 million USD.

 Table 4.5 Cambodia Actual trade (A\_Trade) and Predicted trade (P\_Trade) (Million USD)

Variable	Mean	Standard Deviation	Minimum	Maximum
A_Trade	419.634	851.762	.3410009	5951.151
P_Trade	392.091	583.986	2.883893	3354.671

Source: Calculated by author

On the other hand, the table 4.6 shows the actual trade and predicted trade of each country partner of Cambodia. Not surprisingly, we found the highest predicted trade between Cambodia and Thailand which value 1064. 43 million USD followed by Singapore (525.27 million USD), Vietnam (504.86 million USD), Indonesia (143.99 million USD), Malaysia (102.22 million USD), and Philippines (11.75 million USD).

**Table 4.6** Cambodia Actual trade (A\_trade) and Predicted trade (P\_Trade) with each partner (Million USD)

Trading Partners	Thailand	Vietnam	Singapore	Indonesia	Malaysia	Philippine s
A_Trade	1009.053	709.334	505.923	137.886	142.824	12.785
P_Trade	1064.434	504.864	525.270	143.997	102.226	11.752
Common	Calardate d her	Deat. La	17 0 8		-3026	•

Source: Calculated by author

The greatest trade potential of Cambodia is Thailand. This might be the nature of trading between border countries, which encourages more trading activities. Cambodia has a border-sharing to 7 provinces of Thailand which measured about 925 km. Krainara and Routray (2015), they clarified that the bilateral trade between Cambodia and Thailand during 1996-2012 was worth 14.37 million USD. They added that the main border checkpoints that contributed busy trading activities are Aranyaprathet and Klongyai. The power of border-sharing brought these countries to develop the transport facilitations such as national route, provincial routes along the border, railway, and improve the border checkpoint. Additionally, the special border economic zones were established to encourage the trade between them. Another main trading partner which stays in the second place after Thailand is Vietnam referred to the value of actual trade. Explaining by the predicted trade potential Vietnam became the third after Singapore; the predicted Cambodia trade with Singapore is larger than with Vietnam. Anyways, bilateral trade between Cambodia and Vietnam still goes well due to the border-sharing between them. Because of the border-sharing brought Cambodia and Vietnam be closed together, and they established the special border economic zones which can boost the trade between them. Contrarily, the predicated trade potential between Cambodia and

Philippines is the lowest trade volume. The least potential trade between these two countries might be caused by the distance or high relative trade cost between them.

#### 4.5.2 An analysis of trade performance by Relative Differences Index (Rd %)

Cambodia's trade performance with its trading partners in ASEAN by Relative differences index (Rd %) in table 4.7 shows the Cambodia bilateral trade performance in four periods. First of all, this study will illustrate the trade performance between Cambodia and its trading partners for the whole period of 1995-2015. Secondly, it aims to explain the Cambodia's trade performance during the period of 1999-2015. Thirdly, the trade performance between Cambodia and its trading partners. Lastly, we will describe the trade performance between Cambodia and its trading partners in the period of 2010 to 2015.

The study of the whole period (1995-2015) shows that Cambodia's bilateral trade has been performed well with its trading partners. After the Asian Financial Crisis during 1997 to 1998, the trade performance has dropped from 3.39 percent in the period of 1995-2015 to 2.04 percent in the period of 1999-2015. Even though the relative differences index is decrease, but it is in the good trade performance rate. According to the report from Overseas Development Institute (ODI) on the topic of Global Financial Crisis Discussion on Cambodia, the Cambodia trade has grown gradually during the period of 1999 to 2006, yet slow-down by the global financial crisis (2008-2009). The Merchandise trade during the period of 2002 to 2006 has been growing from 100 percent to 120 percent of GDP (Hossein Jalilian, 2009).

Further, the relative difference index has dropped from 2.04 percent in the period of 1999-2015 to 2.01 percent in the period of 2004-2015. It reflects that after ASEAN Free Trade Agreement (AFTA), Cambodia's bilateral trade seems to perform at 0.03 percent lower than the whole period of study. The result of relative difference index is consistent to the negative sign of AFTA which causes Cambodia to have a diverted trade. Coulibaly (2004) supported that Cambodia, Brunei Darussalam, Laos, and other AFTAs members experienced in extra-regional exports after RTA recreating.

After the global financial crisis, Cambodia seems to have a strong potential trade

due to the increase of the relative differences index from 2.01 percent in the period of 2004-2015 up to 7.33 percent during 2010-2015. As evidence in figure 1.2, it shows that Cambodia trade with ASEAN countries is increasing from approximately 20 percent in 2010 up to almost 40 percent in 2015.

Period	Mean actual trade	Mean potential trade	Trade performance
	(Million USD)	(Million USD)	(Rd %)
1995-2015	419.63	392.09	3.39
1999-2015	477.95	458.85	2.04
2004-2015	622.29	597.77	2.01
2010-2015	1006.47	868.97	7.33

Table 4.7 Cambodia's overall trade performance by Relative difference index (Rd %)

Source: Calculated by author

## 4.5.3 The trade performance of Cambodia with individual partners

According to the result of relative differences index (Rd %) of the whole period of study 1995-2015, Cambodia seems to have a good trade performance with Malaysia and Vietnam at the relative differences rate of 14.87 and 8.18 percent, relatively (figure 4.1). Cambodia exports some goods to Malaysia including crude rubber, textile and clothing, cereal, chemicals and chemical products and palm oil, while imports beverages and tobacco, transportation equipment, processed food, chemicals and chemical products and machinery, appliances and parts from Malaysia (ASEANBriefing, 2014, July). Additionally, Cambodia and Malaysia enhance and strengthen the bilateral relation to boost the bilateral trade volume and investment between them. According to Datuk Seri Mustapa Mohamed, Malaysian international trade and Industry Minister, he expected that Cambodia and Malaysia will increase the trade volume in the next five years (Mansor, 2016). On the other hand, Vietnam is also one of Cambodia's best trade performance partners in ASEAN. Vietnam is become one of the largest and strongest foreign investors and trading partners of Cambodia inside ASEAN. This might be because Cambodia and Vietnam has good relationship both economic and politic. Especially, Cambodia has a common border-sharing with Vietnam, where the border area is 1,137 kilometers long. The good geographic condition and its bilateral relations

will lead to sustainably grow in the bilateral trade between these two countries. Contrarily, Cambodia has a bad trade performance with Singapore at a negative relative difference rate of 0.60 percent, followed by Indonesia at negative 2.92 percent, Thailand at negative 13 percent, and Philippines at negative 14.99 percent. Anyways, the result of Cambodia trade performance Thailand and Singapore seems to be an unexpected result. There are two reasons to support this result. First, Cambodia is one of the least developed countries in ASEAN, where it has a diverted trade. Cambodia exports has been increasing to other countries outside ASEAN such as United States, Europe, Korea, Japan, and so on. It shows that the trade performance with extra-ASEAN causes Cambodia trade performance with ASEAN region performs lower than the potential trade between them. On the other hand, the unexpected result might cause from the nature of the data and the forecasting approach. The forecasting technique is using the coefficient from the feasible GLS to predict the potential. It shows the value of potential trade is unexpectedly higher than the actual trade in Thailand and Singapore. Since we cannot include some other factors that might affect bilateral trade between them like quality of institutions, generalized system of preferences(GSP), political deadlock of Cambodia and its trading partners, foreign aid, Information and Communications technology (ICT) and FDI. On the other hand, some previous studies showed the mix result of relative differences index such as BONUEDI (2013) and Chen et al. (2008).



Source: Calculated by author

Figure 4. 1 Relative differences index (Rd %) full sample (1995-2015)

On the other hand, this paper is also demonstrated the Cambodia trade performance in the period of 1999 to 2015 (see in figure 4.2). After the Asian Financial crisis, Cambodia has a good trade performance with Malaysia, Vietnam, and Philippines. Cambodia has good trade with Malaysia at the relative differences rate of 16.31 percent, followed by Vietnam at the rate of 16.08 percent, and Philippines at the rate of 5.77 percent. Awkwardly, the negative Rd % confirms that Cambodia has a poor trade performance (bad trade performance) with Indonesia, Singapore, and Thailand. Cambodia has a bad trade performance at negative 2.68 percent with Indonesia, followed by Thailand (negative 3.41 %), and Singapore (negative 6.31 %), respectively. The trade performance during 1999-2015 also illustrates the unexpected result caused by the data usage and forecasting approach (the same case in figure4. 1). The mixed results of relative differences were shown in Chen et al. (2008) and BONUEDI (2013)



Source: Calculated by author

Figure 4.2 Relative differences index (Rd %) in the period of 1999-2015

Similarly, the result of relative differences index shows that Cambodia has good trade performance with Vietnam at 17.05 percent in the period of 2004-2015, followed by Malaysia (14.37 %) and Philippines (6.93%). However, Cambodia has a bad trade performance with Indonesia, Singapore and Thailand due to the relative differences index between Cambodia and those trading partners is less than zero (figure 4.3). Cambodia seems to have unexpected result of trade performance with its major trading

partners like Thailand and Singapore. The data usage and forecasting technique might be a reason to present an unexpected result. The mixed results were shown in a few empirical studies (Chen et al., 2008) and (BONUEDI, 2013).



Source: Calculated by author

Additionally, Cambodia's bilateral trade performance with each individual partner countries during the period of 2010 to 2015 is illustrated in the figure 4.4. Cambodia seems to have good trade performance with Malaysia and Vietnam at 14.61 and 11.38 percent, respectively during the period of 2010 to 2015. Anyways, Cambodia has bad trade performance with Indonesia, Singapore, Thailand, and Philippines. Likewise, the trade performance during the period 2010-2015 similarly presents an unexpected result to the results in the three periods above. The unexpected result can be caused by the data usage and forecasting technique are not matched. This mixed results were revealed in other studies such as (Chen et al., 2008) and (BONUEDI, 2013).

Figure 4.3 Relative differences index (Rd %) in the period of 2004-2015



Source: Calculated by author

Figure 4.4 Relative differences index (Rd %) in the period of 2010-2015

## 4.5.4 Analyse the trade gain or lose by Absolute difference

The bilateral trade performance between Cambodia and its trading partners is demonstrated by another approach which is known as Absolute difference (Ad). This approach is used to explain the exactly value of trade gains or losses, while relative differences index cannot clarify it (Chen et al., 2008). The result of Rd % of the entire period of 21 years is equal 3.39 %, showing the comparative relation of actual trade and predicted trade between Cambodia and its trading partners. For Ad of the entire period of study shows that Cambodia gains from trade with the entire group of these six countries about 27.54 Million USD.

Table 4.8 presents the trade performance between Cambodia and each individual trading partner by the absolute difference index. The Absolute difference index (Ad) is greater than overall unexhausted trade illustrates the good trade potential between Cambodia and its individual trading partners, while the Ad between Cambodia and its trading partners is less than unexhausted trade illustrates the bad trade.

The absolute difference index between Cambodia and Vietnam is 204.46 Million USD which is greater than overall unexhausted trade (27.54 million USD). Consequently, Cambodia gains from trade with Vietnam by approximately 204 million

USD. Additionally, the Absolute difference index between Cambodia and Malaysia is also greater than overall unexhausted trade, Cambodia gains from trade with Malaysia by 40.59 Million USD. On the other hand, Cambodia has lost from bilateral trade with Thailand by 55.38 million USD, followed by Singapore (19.34 Million USD) and Indonesia (6.11 Million USD) due to the Absolute difference of between Cambodia and those countries are less than overall unexhausted trade.

Cambodia gains from trade with Vietnam might be because of these two countries have a common border-sharing. Especially, the mutual trust and understanding have brought a good relationship between Cambodia and Vietnam including the political and diplomatic ties. According to the Radio of the Voice of Vietnam Channel announced on 23 December 2013, the bilateral friendship and comprehensive cooperation lead to increase the bilateral trade between these two countries from 2010 (1.8 billion USD) to 2013 (3.34 billion USD). Additionally, the establishment of Border Economic Zones between Cambodia and Vietnam are boosted the bilateral trade between these two countries.

The bilateral trade between Cambodia and Malaysia seems flourish, which Cambodia can gain from trade with Malaysia. This increasing is because of the mutual relations and bilateral agreements between Cambodia and Malaysia. In 2015, the bilateral trade between Cambodia and Malaysia increased by 8.3 percent to 385.8 million USD from 2014. Cambodia's exports to Malaysia consisted mainly of rubber, rice, textiles, clothing and footwear, whereas the imports consisted of largely of textiles, manufactures of metal, processed food and chemicals (Malaysia External Trade Development Corporation).

The absolute differences index (Ad) between Cambodia and Thailand is less than the overall unexhausted trade, while the relative differences index (Rd %) is below zero. It illustrates that Cambodia bilateral trade is below the trade potential. It reflects that Cambodia loss from trade with Thailand by 55.38 million USD, but Cambodia has an expandable trade with Thailand. The bilateral trade performance between Cambodia and Thailand is below the trade potential predicted from the model. First, Cambodia is one of the least developed country in ASEAN, which has a trade diversion. Cambodia trade more with other major trading partners outside ASEAN region. Moreover, this unexpected result might come from the weak of model and forecasting method. The gravity model using in this study is failed to include other important variables such as quality of institutions, generalized system of preferences (GSP), political deadlock of Cambodia and its trading partners, foreign aid, Information and Communications technology (ICT) and Foreign Direct Investment (FDI).

Moreover, Cambodia also has a trade lose with Singapore and Indonesia by 19.34 million USD and 6.11 million USD, respectively. Additionally, the relative differences index (Rd %) between Cambodia and Singapore, and Indonesia are below the zero-horizontal line which is confirmed that Cambodia has a bad trade performance with those countries.

Finally, the actual bilateral trade between Cambodia and Philippines is greater than the predicted trade. Cambodia is over the trade potential with Philippines. Anyways, Cambodia has a bad trade with Philippines due to the relative differences index is negative. Besides that, the Absolute difference is lower overall unexhausted trade (1.03 Million USD <27.54 Million USD) which confirms that Cambodia poorly performs its trade with Philippines. The poor trade performance between these two countries might cause by the high relative trade cost (distance). Cambodia and Philippines seems to have a very small bilateral trade volume if compare to the trade volume between Cambodia and other members in ASEAN. The volume of trade between them is just only 1.78 million USD in 2002, and 22 million USD in 2015 (table1.1).

Trade Partners of Cambodia	Absolute difference index (Ad) (Million USD)
Thailand	-55.3813
Vietnam	204.4693
Singapore	-19.3473
Indonesia	-6.11162
Malaysia	40.5984
Philippines	1.0326
Overall unexhausted trade	27.5433

**Table 4.8** Trade Performance by Absolute Difference (Ad)

Source: Calculated by Author