Doctoral Dissertation

Three Essays on “Exchange Rates, Trade and Global Value Chains”

Graduate School of International Social Sciences
Yokohama National University

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Declaration

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Table of Contents

LIST OF TABLES

Chapter One

Chapter Two

Chapter Three

INTRODUCTION

In recent decades, global trade has changed profoundly, and the nature and structure of global trade have also changed enormously. One of the striking trends of trade in recent decades is the growing fragmentation of production. This is because of lower transportation costs, improved information technologies, and more open economies. Before the emergence of Global Value Chains (GVCs), most goods were generally produced entirely in a single country using domestically produced inputs. Nevertheless, the goods which are generated in GVCs are multi-country products. That means the different stages of production are produced in different countries, which leads to GVCs with more and more countries involved. Moreover, in the global production network, countries import many intermediate inputs for production. These traded intermediate inputs sometimes cross the international border more than once and are counted several times in the trade statistics. As the production networks risen in the production process and several countries are involved in the production chains, that's why gross trade data may not be the accurate measures of real bilateral trade positions and do not give reliable information about the actual value-added created by a country in the global production process. Instead, trade in value-added data incorporates the actual value that is added by a country in the production of any goods and services and that is the better reflection of global interdependences. Furthermore, the integration of GVCs in the production network is reducing the sensitivity of gross exports flows to exchange rate movements. If substitutability of domestic and foreign intermediate goods is lower, it may reduce the elasticities of gross trade. With the above-mentioned background, this dissertation consists of three independent research papers on exchange rates, trade and global value chains.

The first chapter of this dissertation investigates the effect of exchange rate volatility on gross exports as well as value-added exports for 11 Asian countries over the period of 2000 to

2016 using the UNCTAD-Eora GVC database. There is a large empirical research on the issue of how exchange rate volatility affects trade. Almost all of them rely on traditional measures of gross trade data instead of value-added trade. That's why it is essential to examine the impact of exchange rates volatility on trade using two measures of trade data suchlike value-added trade data and gross trade data. This chapter finds that exchange rate volatility affects the value-added exports negatively and significantly. The estimation results for gross exports is not significant at all. The findings suggest that value-added exports are more sensitive to exchange rate volatility as compared to gross exports for this particular sample countries and time period.

The second chapter of this dissertation examines the link between exchange rates and exports in the presence of global value chains for the case of emerging countries by using aggregate as well as disaggregated sectoral data of bilateral exports. This chapter makes use of bilateral trade data from the WTO-OECD (World Trade Organization-Organization of Economic Cooperation and Development) ICIO (Inter Country Input Output) table from 1995 to 2011 (2016 edition). By using panel gravity model and fixed effects estimation, this chapter finds that participation in GVCs dampen the exchange rate elasticity of total exports and manufacturing exports by 52.43% and 47.95%, respectively for the case of emerging countries. Though the service sectors' participation in GVCs is increasing over time, this study does not find any significant results for trade in service sector exports.

The third chapter of this dissertation empirically estimates the elasticities of exchange rate as well as income for value-added exports and traditional measures of gross exports for eight East Asian emerging countries. This chapter makes use of bilateral gross export data as well as value-added exports data from the Trade in Value Added (TiVA) database over the period of 1995 to 2011. Existing empirical research on this area focused on the conventional measure of gross trade

flows, but as new measures of value-added trade data is available, they have created the opportunity of estimating value-added trade elasticities. By using the panel Autoregressive Distributed Lag (ARDL) model, this chapter finds that the estimated long run elasticities of value-added exports to exchange rate are higher than that of gross exports for all countries except China and Singapore. Correspondingly, the estimated elasticities of value-added exports to income are higher than that of gross exports for China, Indonesia, Malaysia, Philippines and Thailand. The income elasticities for Hong Kong, Korea and Singapore are higher for gross exports than for value-added exports. Furthermore, long run exchange rate elasticities of gross exports as well as value-added exports are inelastic for China, Hong Kong, Korea, Malaysia and Thailand and elastic for Indonesia. Additionally, long run income elasticities of gross exports as well as value-added exports are elastic for Indonesia, Korea, Singapore, Philippines and Thailand and inelastic for Hong Kong and Malaysia. The only exception is China where the income elasticity of gross exports is inelastic, but elastic for value-added exports.

CHAPTER ONE:

Does Exchange Rate Volatility Affect Gross Exports or Value-Added Exports? Evidence from Some Asian Countries

1. Introduction

The debate on exchange rate volatility and exports is gaining attention after the collapse of the Bretton Woods exchange rate system (1973) in the last century. Also, in the early part of this century many countries switched from fixed to flexible exchange rate regime and adopted liberalized trade policy in their economies. These liberalizations of the exchange rate and trade policies intensify the capital flows and trade flows among the countries and appear to have amplified volatility of the exchange rate. That's why increasing volatility of the exchange rate is a major concern of policymakers as well as academics. Though the volatility of exchange rates is a major concern of academics and policymakers, there is no common consensus about the impact of exchange rate volatility on exports either theoretically or empirically. Different empirical studies suggested that the effects of exchange rate volatility on exports differ noticeably across countries and regions for different sample periods and variables.

The common perception about the relationship between exchange rate volatility and exports is that exchange rate volatility has a negative effect on exports. The idea behind this consensus is the risk aversion of firms. If the firms are risk averse, then the volatility of the exchange rate creates uncertainty in the profitability of the firms which results in the reduction of output and exports (Clark, 1973). Clark (1973) first suggested that exchange rate volatility adversely affects exports. Later, Hooper and Kohlhagen (1978) established the basic model which explains the negative relationship between exchange rate volatility and exports. Some other

empirical researchers also reported (Cushman, 1983; Arize et al., 2000; IMF, 2004; Thorbecke, 2008; Ozturk and Kalyoncu, 2009; Hayakawa and Kimura, 2009; Chit et al., 2010) the same conclusion. However, these conclusions rely on many theoretical assumptions, such as perfect competition, the absence of imported inputs, high aversion to risk, and the absence of financial instruments for hedging (Auboin & Ruta, 2011). Once these assumptions are relaxed, the relationship between exchange rate volatility and trade becomes more complicated and ambiguous.

On the other hand, De Grauwe (1988) established a positive relationship between exchange rate volatility and exports. The argument is that very risk-averse traders are exporting more to compensate for the expected fall in revenue per exported unit in response to increased volatility. As De Grauwe (1988) argued "exporters are universally made unhappy by the volatility of exchange rates, some may decide that they will be better off exporting more" (P. 67). In this case the income effect is more dominant than the substitution effect. Broll and Eckwert (1999) also confirmed the positive relationship between exchange rate volatility and exports. But this is only for those firms which can react flexibly due to exchange rate change and can reallocate their products among markets. Some other empirical studies (Asseery and Peel, 1991; McKenzie and Brooks, 1997; Klein and Shambaugh, 2006; Rahman and Serletis, 2009) also confirmed the same specification.

Also, many other researchers could not find a significant relationship between exchange rate volatility and exports (Tenreyro, 2007; Hondroyiannis et al., 2008; Boug and Fagereng, 2010).

The relationship between exchange rate volatility and exports for Asian countries is also examined in many studies. Doganlar (2002) estimated the impact of exchange rate volatility on exports for five Asian countries (Turkey, South Korea, Malaysia, Indonesia and Pakistan) and found that exchange rate volatility reduces the real exports in these countries. Thorbecke (2008) found that exchange rate volatility decreases the flow of electronic components within East Asia.

Hayakawa and Kimura (2009) found that intra-East Asian trade is discouraged by exchange rate volatility more seriously than the trade in other regions. Chit et al. (2010) investigated the relationship between exchange rate volatility and exports for emerging East Asian countries (China, Indonesia, Malaysia, Philippines and Thailand) and found that exchange rate volatility has a significant negative impact on the export flows to the world market. Pino et al. (2016) investigated the effects of exchange rate volatility on exports in six East Asian countries (Indonesia, Malaysia, South Korea, Singapore, Thailand and Philippines) and found that the effect of exchange rate volatility on exports flows is predominantly negative in the long run except for Singapore.

Though a large number of theoretical and empirical studies have examined the relationship between exchange rate volatility and exports since the collapse of the Bretton Woods exchange rate system to the recent period, there is no clear consensus on the topic. That's why it is important to re-examine the relationship between exchange rate volatility and exports.

More importantly, almost all existing exchange rate and trade literature rely on the conventional approach of gross measuring of trade flows data. But due to the emergence of the global supply chain, the rise in the production network and the multi-country production chains, gross trade data is increasingly very different than how much value-added is exchanged between countries (Johnson, 2014). That's why gross trade may no longer be accurate in measuring "real" bilateral trade positions. This is because traded intermediate goods and services used as inputs for export may be counted several times (when they cross borders) in the trade statistics. That means, large exports need not reflect large amounts of domestic value- added (Ceglowski, 2017). For example, to produce an exported good may require a significant amount of inputs and that may have been imported from abroad. That's why much of the revenue, from selling the exported good

may have to be spent on purchasing intermediate imports used in production, yielding only marginal benefits in the exporting economy. As Dedrick et al. (2009) showed, of the $144 (Chinese) factory-gate price of an iPod less than 10% contributed to Chinese value added, with the substantial amount of components (about $100) being imported from Japan and rest of them from the US and Korea. Many other studies also showed the similar evidence. That's why Johnson (2014) points out that gross trade data can overestimate or underestimate bilateral trade relations and foreign exposure as intermediate trade dominates two-thirds of world trade.

In recent times, economists have thus put the emphasis on value-added content of exports rather than gross exports. Increasing use of imported components and offshoring parts of the production process means that a final export may contain a high percentage of foreign value added and a correspondingly small percentage of value added by the exporting country (Ceglowski, 2017). Value-added exports help better quantify the strength of demand spillovers, the consequences of relative price movements for competitiveness (Johnson, 2014). Moreover, it is value-added in final exports that really matters for job creation, value generation, and wealth accumulation (Yizhe, 2016). By extension, a country's export competitiveness measured by the domestic value-added contained in its exports could look quite different from one measured by gross exports. So, exchange rate movements are likely to have different impacts on trade, particularly in magnitude between gross trade data and trade in value-added. Therefore, it is necessary and critical to re-examine the impact of exchange rates on trade using value-added trade data and compare the findings with the results using gross trade data.

Though it is important to quantify the magnitude of exchange rate volatility on value-added exports, very few studies exist on this topic. To the best knowledge of this author, only Duval et al. (2016) and Yizhe (2016) have done the research on this topic. But their studies are not focused

on Asian countries. That's why this study attempts to examine the impact of exchange rate volatility on gross exports and value-added exports for 11 Asian countries and intends to contribute the existing empirical literature by providing new estimation results for value-added exports.

The Chapter one is organized as follows. Section 2 presents the empirical strategy which includes: the definition of the variables and data sources; methodology; theoretical considerations; model specification and calculating exchange rate volatility. Section 3 reports and discusses estimation results. Section 4 performs some robustness checks and section 5 concludes.

2. Empirical Strategy

a) The definition of the variables and data sources

This paper used annual data for all variables for 11 Asian countries from 2001 to 2016 except the value-added exports variable to estimate the empirical model. The value-added exports variable is from 2001 to 2012 due to the unavailability of this data. The variables used in this study are; gross exports, value-added exports, trade-weighted income of importing countries, exchange rate volatility and a relative price measure. All variables are in natural logarithm except exchange rate volatility. By deflating gross exports and value-added exports with CPI this paper computed the real exports and real value-added exports. For calculating importer's countries income this paper covered up to 90 percent of exports of a country to its export destination countries. Exchange rate volatility is calculated annually from the monthly nominal exchange rate by using the standard deviation formula. This paper used monthly exchange rate data rather than quarterly because the monthly data reflect the real fact of the exchange rate situation.

Nominal exchange rate and CPI data are collected from IMF's International Financial Statistics. Gross exports and GDP are in USD and collected from World Development Indicators. Value-added exports are also in USD and was collected from the UNCTAD-Eora GVC database.

The summary statistics of the variables used in this study are presented in Table 1.1.

b) Methodology

Panel data regression analysis is used to examine the impact of exchange rate volatility on gross exports and value-added exports for the case of 11 Asian countries (Bangladesh, India, Indonesia, Malaysia, Pakistan, Philippines, South Korea, Sri Lanka, Vietnam, Thailand and Turkey). Panel data are better suited to study economic dynamics and minimize the bias that occurs due to omitted, unobserved characteristics and has the flexibility to focus on individual country-specific effects (Gujrati, 2009). Also, according to the literature, panel data methods are more suitable for this analysis to account for the addressing heterogeneity of different countries. Moreover, panel data methods have a large number of data points which increases efficiency and reduces the multicollinearity problem.

The literature suggests two types of estimation technique for panel data method namely: fixed-effects and random-effects. The fixed-effects model assumes that the effects of omitted country-specific variables are fixed over time, and that they are correlated with the regressors in the model (Sauer & Bohara, 2001). The random-effects model, on the other hand, treats the country-specific effects as random variables, which are independent of the other regressors (Sauer & Bohara, 2001) . To choose between fixed-effects and random-effects, the Hausman test is often used. The Hausman test tests the null hypothesis that the coefficient estimated by the efficient random-effects estimator is the same as the one estimated by the coefficient fixed-effects estimator. That's why for the estimation technique, first, this study carried out the Hausman test (Hausman, 1978) to select the appropriate model between the random-effects model estimation or fixed-effects model estimation. Then, according to the result of the Hausman test, fixed-effects or

random-effects model is estimated finally. To check robustness, this study also carried out a Seemingly Unrelated Regression (SUR).

c) Theoretical considerations

According to the existing literature, some theoretical studies (Clark, 1973; Hooper and Kohlhagen, 1978) posit that the relationship between exchange rate volatility and exports are negative. The view is that when traders are risk averse, then the exchange rate volatility adversely affects international trade because increasing volatility unexpectedly can increase the costs. This is because the exchange rate is agreed on at the time of the trade contract, but payment is not made until the future delivery actually takes place (Arize et al., 2000). If payment is not made until delivery, then unpredictable changes in the exchange rate between the time of the contract and delivery can increase uncertainty for the expected profits from exports (Doganlar, 2002).

On the other hand, other theoretical studies (De Grauwe, 1988; Broll and Eckwert, 1999) suggested that the relationship between exchange rate volatility and exports is positive. The argument is that very risk-averse traders are exporting more to compensate for the expected fall in revenue per exported unit in response to increased volatility (Auboin & Ruta, 2011). As De Grauwe (1988) argued that "exporters are universally made unhappy by the volatility of exchange rates, some may decide that they will be better off exporting more" (P. 67). In this case, due to the uncertainty of exchange rate some traders may decide to export more and the income effects are greater than the substitution effects.

d) Model Specification

To analyze to impact of exchange rate volatility on exports, various papers (e.g., Asseery and Peel, 1991; Chowdhury, 1993 and Arize et al., 2000) used the following export functions:

$$lnrex_{it} = \beta_0 + \beta_1 exvol_{it} + \beta_2 lnincome_{it} + \beta_3 lnP_{it} + \alpha_{it} + \mu_{it} \ldots\ldots\ldots (1)$$

$$lnrexval_{it} = \beta_0 + \beta_1 exvol_{it} + \beta_2 lnincome_{it} + \beta_3 lnP_{it} + \alpha_{it} + \mu_{it} \ \ldots.. (2)$$

Where,

lnrex = Natural logarithm of Real Exports (deflated gross exports by CPI)

lnrexval = Natural logarithm of Real Value-Added exports (deflated gross value-added exports by CPI)

lnincome = Natural logarithm of the trade-weighted Income of importing countries (which covered 90% of exports)

exvol = Exchange Rate Volatility (calculated from monthly nominal exchange rate)

lnp = Natural logarithm of relative price and is measured by the ratio of that country's unit export price in U.S. dollars to the world unit exports price in U.S. dollars

α_{it} = Unobserved or heterogeneity effect and

u_{it} = Error term.

Here, exports (gross or value-added) is a function of exchange rate volatility, the income of export destinations countries and relative price. By setting up the above equations (equation 1 and 2) this paper will determine the impact of exchange rate volatility on gross exports and value-added exports.

e) Calculating Exchange Rate Volatility

According to the standard literature, there are two well-known approaches to measure exchange rate volatility. The first approach is to use the historical standard deviation of the time series of exchange rates. The second one is to employ the volatility model to generate conditional

volatility series (by using the ARCH and GARCH model). This paper used the first approach, and collected the monthly exchange rate data for 11 Asian countries and then used the following standard deviation formula:

$$exvol_t = \sqrt{1/m \sum_{i=m}^{m} (lnex_t - lnex_{t-1})^2}$$

This study calculated the annual standard deviation of the monthly exchange rate for every year and every country. This paper uses monthly exchange rate data rather than quarterly because the monthly data more accurately reflect the exchange rate situation.

3. Estimation Results and discussion

In our model the value of Hausman test is Prob>chi2 = 0.0000 which is less than 0.05 that means p-value is significant, therefore we should use the fixed-effects model.

The main results of the fixed-effects and random-effects regressions for the period from 2001 to 2016 for gross exports are presented in Table 1.2.

All estimation results confirm that the impact of exchange rate volatility on gross exports is negative in both the fixed-effects and random-effects regression, but not significant, which implies that the volatility of exchange rate has no impact on gross exports in these Asian countries. All other variables which also affect the gross exports are the trade-weighted income of importing countries and the relative price of exports. The other previous findings for gross exports (Doganlar, 2002; Thorbecke, 2008; Hayakawa and Kimura, 2009; Chit et al., 2010; Pino et al., 2016) for Asian countries found that the impact of exchange rate volatility on gross exports is negative and significant. But in this study, we found that though the impact of exchange rate volatility on gross exports is negative, but not significant at all.

The main results of the fixed-effects and random-effects regression for the period from 2001 to 2012 for value-added exports are presented in Table 1.3.

All independent variables which affect the value-added trade are statistically significant for both fixed and random-effect specifications. In the case of value-added exports to determine the appropriate model, this study also conducted the Hausman test.

The most important finding of this study is that the coefficient of exchange rate volatility in the case of value-added exports is significant as contrasted with that of gross exports for 11 Asian countries. This implies that value-added exports are more sensitive in response to exchange rate volatility compared to gross exports. The trade-weighted income of importers countries is also more responsive in the case of value-added exports than gross exports. The relative price is no longer significant in the case of value-added exports. The results are as expected and provide evidence that the relationship between exchange rate volatility and valued-added exports are negative and significant compared to gross exports. This is because, valued-added exports directly affects the price level of capital inputs and labor inputs by removing the indirect foreign inputs (Yizhe , 2016). The findings of this study are also consistent with Duval et al. (2016) findings. By using a gravity model for 41 countries and for the period of 1995-2013, Duval et al. (2016) also found that the relationship between exchange rate volatility and value-added exports was negative.

4. Robustness Check

This paper estimated an export function by using two dependent variables, namely gross exports and value-added exports. According to the calculation viewpoint value added exports is a part of gross exports. That's why there has a possibility that the regressions may be related because the errors associated with the dependent variables are correlated. To check up the robustness of the regressions, it is necessary to estimate the models by using the Seemingly Unrelated Regression

(SUR) because accounting for country time-invariant characteristics is important in signifying the estimation results for the fixed-effects model.

SUR results for both models are shown in Table 1.4 and Table 1.5. SUR results also confirm the same results which were found in the fixed-effects model.

5. Conclusion

This study investigated the impact of exchange rate volatility on gross exports and value-added exports for 11 Asian countries. By using the fixed-effects model, this study found that exchange rate volatility does not affect the gross exports but affects the value-added exports negatively and significantly. This implies that value-added exports are more sensitive to exchange rate volatility compared to gross exports. As value-added exports are more important for a country's job creation, value generation and wealth accumulation, these findings can act as an important guideline for the policymakers.

Policymakers should pay more attention to exchange rate volatility due to the significance of its effect on value-added exports. Countries should support the development of financial markets and hedging products to help firms reduce their exposure to exchange rate volatility from the perspective of the producer or exporter.

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Table 1. 1: Descriptive Statistics

Variables	Number of observations	Mean	SD	Min	Max
lnrex	176	24.97	1.434	21.62	27.37
lnincome	176	28.89	0.291	28.09	29.39
lnrexval	132	24.21	1.448	21.17	26.72
exvol	176	0.101	0.104	0	0.857
lnp	176	-0.148	0.236	-0.707	0.386
Number of id	11	11	11	11	11

Table 1. 2: Results of Fixed effects and Random effects (Gross Exports)

Dependent Variable: lnrex		
	(1)	(2)
Independent Variables	Fixed effect	Random effect
exvol	-0.628	-0.511
	(0.381)	(0.408)
lnincome	5.294***	5.062***
	(0.257)	(0.272)
lnp	0.635**	0.625**
	(0.300)	(0.317)
Constant	-127.808***	-121.128***
	(7.410)	(7.845)
Observations	176	176
R-squared	0.729	
Number of id	11	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. 3: Results of Fixed effects and Random effects (Value-added Exports)

Dependent Variable: lnrexval		
	(1)	(2)
Independent Variables	Fixed effect	Random effect
exvol	-0.549*	-0.466
	(0.292)	(0.329)
lnincome	6.318***	5.994***
	(0.289)	(0.321)
lnp	0.156	0.105
	(0.253)	(0.283)
Constant	-157.921***	-148.568***
	(8.335)	(9.252)
Observations	132	132
R-squared	0.818	
Number of id	11	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. 4: Results of Seemingly Unrelated Regression (Gross Exports)

Dependent Variable: lnrex	
Independent Variables	SUR Regression
exvol	-0.467
	(0.315)
lnincome	6.272***
	(0.284)
lnp	0.584**
	(0.268)
Observations	176
Number of id	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 1. 5: Results of seemingly Unrelated Regressions (Value-added Exports)

Dependent Variable: lnrexval	
Independent Variables	SUR Regression
exvol	-0.541*
	(0.289)
lnincome	6.160***
	(0.279)
lnp	0.112
	(0.249)
Observations	132
Number of id	11

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

CHAPTER TWO:

Global Value Chains, Exchange Rates and Exports: Evidence from Emerging Countries

1. Introduction

One of the fundamental questions of international macroeconomics is why the large movement of exchange rates has limited impacts on trade (Amiti et al., 2014). According to the conventional economic theory, a real depreciation of exchange rates can increase the net export flows of a country (Bang & Park, 2018). Nevertheless, if the real depreciation of exchange rates does not increase net exports as much as the theory predicted, this raises the debate of disconnect argument between exchange rate and trade (Bang & Park, 2018). The unresponsiveness of exports to exchange rate fluctuations has raised the question among academics and policymakers as to whether the exchange rate elasticity of export volumes has changed, or even become zero (Soyres et al., 2018). Fragmentation in the production process across the countries may be responsible for the disconnecting relationship between exports and the exchange rates.

Over the last couple of years, communication costs of trade were drastically reduced across the countries due to the rapid development in information technology and the transportation sector (Weldzius, 2018). Removing trade barriers and increasing in regional trade agreements among the countries have also lowered the trade costs substantially across the countries (Weldzius, 2018). Therefore, the reduction of trade costs among the countries allowed firms to fragment their production into different countries to take advantage of lower factor costs (Feenstra & Hanson, 1997; Grossman & Rossi-Hansberg, 2008). Due to the production fragmentation across the countries, intermediate goods cross the borders several times along the chain (Ignatenko et al.,

2019). Therefore, the emergence of Global Value Chains (GVCs) in the production process makes the relationship between exchange rates and trade more complex.

The existing research suggests that GVCs, and more generally the development of international production, could be one important part of the question of why large depreciations of exchange rates have small effects on exports (Soyres et al., 2018). In the world of global value chains, firms use many imported inputs to produce exported goods. Also, firms exports many inputs that are re-exported further by their trading partners. Thus, the depreciation of currency has a limited boost to exports as exports are comprised of a high foreign value added content (Soyres et al., 2018). Similarly, as domestic value-added embodied in exported intermediates that are then re-exported to third countries a depreciation of domestic currency makes the downstream producers more competitive (Ahmed et al., 2015).

The effectiveness of exchange rates policies are the key macroeconomic policies for a country's external position (Kang & Dagli, 2018). However, former studies found contradictory results about the link between exchange rates and trade. On one hand, Ahmed et al. (2015) and Ollivaud et al. (2015) find that higher participation in GVC lower the exchange rate elasticity of exports. On the contrary, Leigh et al. (2015) do not find any conclusive results that participation in GVCs has weakened the relationship between exchange rates and trade volumes.

The focus of this chapter is to examine the link between exchange rates and exports in the presence of GVCs for the case of emerging countries by using aggregate as well as disaggregated sectoral data of bilateral exports. Though emerging countries play a significant role in world trade and GVCs but not any of the current research address this issue empirically. Therefore, this paper focusing specifically on emerging economies because of their significant and diverse roles in GVCs. However, emerging countries also play a rapid role in world trade; taken as an aggregate,

emerging market economies now account for around 40 percent of world exports, compared to less than 30 percent in 1990 (Bussiire et al., 2016). During the 1980s and 1990s, development strategy of many emerging countries changed from import substitution to export-led industrialization. As a result, during the 2000s, emerging economies became the driver in exporting of intermediate goods, final manufactured goods and primary products (Gereffi, 2015).

Another important issue also ignored by previous studies is the role of service sector exports in GVCs. In this paper, we additionally analyze the link between exchange rates and trade in service sector exports in the presence of GVCs along with the existing link between exchange rate and total exports and manufacturing exports. The development of GVCs in the production process has created the opportunity for production fragmentation not only in the goods sector but also in the services sector, especially trade in business services. Trade in business services sectors like computer services, legal, accounting, management consulting services as well as technical services, represent a higher share of total trade day by day. Trade in services are an integral part of GVCs because of their role in enabling GVCs. For example, in the early stage of a production process, the services activities like research, design and engineering activities act as inputs and at the end stage of this production process, other services activities like marketing and distribution also play key role in ensuring the product reaches to the consumer (Heuser & Mattoo, 2017). Thus, trade in services not only uses as the essential inputs in the production process but also support the activities that gear up GVCs. However, the link between the trade in services sector exports and the exchange rate in the presence of GVCs has not been explored by any previous study.

In this background, by using a panel gravity model and WTO-OECD (World Trade Organization-Organization of Economic Cooperation and Development) ICIO (Inter-Country Input Output) tables from 1995 to 2011 (2016 edition), this chapter analyzes the relationship

between exchange rates and three measures of exports (namely total exports, manufacturing exports and trade in service sector exports) with the integration of GVCs for emerging country case. We find that with integration of GVCs in the production process dampens the exchange rate elasticity of total exports and manufacturing exports for the case of emerging countries. Though trade in service sector's participation in GVCs are increasing over time, this study does not find any significant results that participation in GVCs weaken the exchange rate elasticities of trade in service sector exports for emerging countries.

This chapter contributes to the existing research in two ways. Firstly, this paper represents the link between exchange rates and exports in the presence of GVC first time for emerging countries. Secondly, this paper also analyzes the link between exchange rates and trade in service exports in the presence of GVCs along with the existing link between exchange rate and total exports as well as manufacturing exports.

This chapter is organized as follows. Section two describes the related literature. Section three reports empirical models and data. Section four discusses the empirical results, and section five concludes.

2. Related Literature

It is generally thought that currency movements have a strong effect on exports. However, some recent studies suggested that the exchange rate is having a dampening impact on exports because of the emergence of GVCs (Soyres et al., 2018). The argument is that as firms use more imported inputs in the production process that could reduce the competitiveness gains from more depreciation. There are, however, a very limited number of empirical studies are available in this field of research.

Ahmed et al. (2015) analyze how the development of GVCs affects the exchange rate elasticity of manufacturing exports. By using the panel method covering 46 countries from 1996 to 2012, they found that exchange rate elasticity of manufacturing exports has decreased over time, also, on an average, due to the participation in GVCs, exchange rate elasticity of manufacturing exports reduced the by 22 percent. Ollivaud et al. (2015) also find that increasing participation in the GVCs may have contributed to the reducing trade elasticities in OECD countries. Leigh et al. (2015) examine the link between exchange rates and trade flows from 1980 to 2014. This study do not find the evidence that incorporation of GVCs in the production process has weakened the elasticity of exports. Bang & Park (2018) examine the participation in GVCs and its impact on the linkage between the exchange rate and export for the cases of China, Japan and Korea over the period of 1995 to 2011. The findings of this study show that incorporation of GVCs in the production process dampens the trade elasticity only for Korea. Cheng et al. (2016) study the impact of exchange rate on trade in a world of global value chains from 1995 to 2011 for 57 countries. They also find that the elasticities of exports to exchange rates decline over time. Soyres et al. (2018) inspect the impact of complex value chains on export elasticities from 1995 to 2011 for 40 countries and find that participation in GVCs reduces the exports elasticities. Kang & Dagli

(2018) study the relationship between international trade and exchange rates between 2001 to 2015 for 72 countries. The findings of this study confirmed that incorporation of GVCs has dampen the elasticities of exports to exchange rate. Sato & Zhang (2019) examine the link between exports and real exchange rate volatility in the presence of GVCs. The estimation results of this paper find that the participation in GVC mitigated the negative effect of exchange rate volatility on exports.

3. Empirical Model and Data

Model Specification

The gravity model is considered the influential model of the empirical trade literature over the last couple of years (Shepherd, 2012). This empirical analysis is looking at bilateral trade flows from country *i* to *j*, in particular, exports from country *i* to *j*. That's why this chapter follows the gravity model as it has strong power for explaining bilateral trade flows (UNCTAD, 2012).

By following Kang & Dagli (2018)'s paper, this study estimates the following gravity model with bilateral exports as a function of the real bilateral exchange rate, exporter's and importer's GDP, exporter-importer pair fixed effects and the time fixed effects as below:

$$lnX_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnGDP_{it} + \beta_3 GDP_{jt} + \gamma_{ij} + \tau_t + \mu_{ijt} \quad \ldots\ldots\ldots (1)$$

By using this gravity equation, this paper will test whether GVC participation is weakening the impact of the exchange rate on exports by including GVC variables and its interaction with $lnRER$.

Therefore, we specify the following model:

$$lnX_{ijt} = \beta_0 + \beta_1 lnRER_{ijt} + \beta_2 lnGDP_{it} + \beta_3 lnGDP_{jt} + \beta_4 GVC_{ijt} + \beta_5 lnRER_{ijt} * GVC_{ijt} + \gamma_{ij} + \tau_t + \mu_{ijt} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Where, subscript *i* and *j* are the exporter and importer, respectively, and t denotes time. lnX_{ijt} are the annual bilateral real exports of country *i* to *j* at time t. $lnGDP_{it}$ is the GDP of country *i* at time *t*. $lnGDP_{jt}$ is the GDP of country *j* at time *t*. $lnRER_{ijt}$ is the real exchange rate of country *i* against country j ($\frac{NER_{i\$}}{NER_{j\$}}\frac{P_j}{P_i}$, where, $NER_{i\$}$ is the nominal exchange rate of country i with US dollar and $NER_{j\$}$ is the nominal exchange rate of country j with US dollar; P_i and P_j is the price index of country *i* and *j*). γ_{ij} is specific, unobservable, exporter-importer pair fixed effects. This pair fixed effects which captures the time-invariant, country-specific and country fair factors. The time-invariant factors suchlike common language dummy, distance and adjacency dummy are not included into the above-mentioned gravity model. τ_t is the time fixed effects which are control for all common shocks like change in global demand, change in technology and the oil price shocks, etc. and μ_{ijt} is the error term.

According to the gravity model of international trade, exports flows are positively related to exporter's and importer's GDP. Real exports are also positively related to the real exchange rate. It is expected that GVC participation is positively related to real exports and interaction term $lnRER$ and GVC can be positively or negatively related to real exports.

The *IV* estimation: Controlling for Potential Endogeneity

When assessing the link between exchange rate and trade in the presence of the global production network, then it is imperative to take into account the possible endogeneity issue. If there exists potential problem of endogeneity in that case the fixed-effects estimation results might not be reliable. For example, if countries are involved in the regional economic integration or bilateral trade agreement in that cases changes in the bilateral exchange rates might not have much impact on bilateral exports. Also, exports may be driven by other factors that are omitted in the

model. The bilateral exchange rate and these omitted variables may be correlated. The inclusion of country-fair fixed effects and year fixed effects dummy variables could not control for this potential endogeneity problem. In order to get rid of this problem, this paper make use of instrumental variables (*IV*) approach. By following the relative Purchasing Power Parity (PPP) theory, inflation differentials are used as an instrumental variable in this paper.

Data and Variables

Data Sources

Bilateral exports data is calculating from ICIO tables which is a joint initiative of the WTO and the OECD. For calculating the real bilateral exchange rate, the nominal exchange rates are collected from the International Financial Statistics (IFS). GDP and GDP deflators are from the World Development Indicators (WDI). GVC variables are calculated from ICIO tables.

Variables

Bilateral Real Exports

This paper makes use of WTO-OECD ICIO tables (2016) from 1995 to 2011 for bilateral exports data for emerging countries. By taking the summation of intermediate goods exports and final goods exports from the ICIO tables, this paper calculated total exports, manufacturing exports and trade in service exports. These WTO-OECD ICIO tables contain nominal US dollar-denominated exports data. Given that our interest is in real bilateral exports data, we convert these nominal exports data into local currency by using the average annual exchange rate and deflated nominal exports data by the GDP deflator (own countries) and then converted into US dollar.

Bilateral Real Exchange Rates

The bilateral real exchange rate is calculated by using the nominal exchange rate of the exporting country's currency vis-à-vis the US dollar against importing country's currency vis-à-vis the US dollar, multiplied by the relative price of the importing country to the relative price of the exporting country ($\frac{NER_{i\$}}{NER_{j\$}}\frac{P_j}{p_i}$, where, $NER_{i\$}$ is the nominal exchange rate of exporting country with US dollar and $NER_{j\$}$ is the nominal exchange rate of importing country with US dollar; p_i and P_j is the price index of exporting and importing country).

Real GDP

Real GDP of exporting and importing countries are calculated by deflating GDP in current domestic prices with each country's GDP deflator and then converted into the US dollar.

Calculating GVC participation

The seminal paper in the area of the global value chains and the creation of the decomposition of gross trade flows is the Koopman et al. (2010). This paper explains the framework on how to decompose a country's gross exports into value-added components by source. Then, Wang et al. (2013) developed the decomposition method to decompose gross exports at disaggregated, and sectoral level. They decompose the gross exports into 16 different value-added and double-counted components (See Appendix). By following Wang et al.'s (2013) decomposition method, this paper calculates the GVC participation index. This paper calculates the GVC participation index by the following ways:

Backward Participation (BP) in GVC: $\frac{FC}{Gross\ Exports}$

Forward Participation (FP) in GVC: $\frac{IV/DVX}{Gross\ Exports}$

Total Participation in GVC: $BP + FP$

4. Empirical Results

Exchange Rate and Bilateral Exports

This chapter examines the exchange rate elasticities of three different types of exports (total exports, manufacturing exports, and trade in services exports) by using model 1. The estimated results of model 1 by using panel regression over 1995-2011 for emerging countries are presented in column 1 of Table 2.2, 2.3 and 2.4. Column 1 of Table 2.2 shows the estimation results for total exports. The coefficient of $lnRER$ is positive but not significant at all, which implies that a depreciation of exporting country's currency does not significantly impact on exports in these emerging countries. GDP of exporting country and GDP of importing country are expected signs and significant at a 1% level for the total exports model. Column 1 of Table 2.3 represents the estimation results for manufacturing exports. The coefficient of $lnRER$ is positive and significant at the 1% level. This suggests that a 1% increase (depreciation) in the exchange rate of the exporting country's currency, results in an 0.096% increase in manufacturing exports in these sample countries. Exporter's GDP is not correctly signed, but the importer's GDP is correctly signed and significant at 1% level for the manufacturing exports model. Column 1 of Table 2.4 denotes the estimation results for trade in services exports. The estimated results imply that the depreciation of the exchange rate decreases the trade in services exports. Other variables like GDP of exporting country and GDP of importing country are correctly signs and significant for trade in services exports model. The results of model 1 for manufacturing exports are consistent with the

traditional macroeconomic theory that a real depreciation of the exporting country's currency increases the net exports.

Exchange Rate and Bilateral Exports in the presence of GVCs

By using model 2, this paper examines whether the participation in GVCs dampen the exchange rate elasticities (three types of exports) or not. The estimated results of model 2 by using panel regression over 1995-2011 for emerging countries are presented in column 4 of Table 2.2, 2.3 and 2.4. Column 4 of Table 2.2 and 2.3. The results show that a depreciation of exporter's currency results in higher exports. Moreover, column 4 of Table 2.4 shows that the depreciation of the exchange rate has no significant impact on trade in services exports. Correspondingly, column 4 of Table 2.2 and 2.3 also shows that participation in GVCs dampen the exchange rate elasticities of exports for total exports and manufacturing exports. This is confirmed by seeing the coefficient of interaction term of $lnRER * GVC$. The coefficient of this interaction term is negative and significant, that implies that the participation in GVCs dampens the exchange rate elasticities of total exports and manufacturing exports. However, for the case of trade in services exports, do not have any significant and dampening effect of GVCs on its exchange rate elasticity. Other variables in column 4 like exporting country's GDP, importing country's GDP and GVC are of the expected signs and significant at a 1% level.

In the case of total exports, the average GVC participation of sample countries is 0.34, and it predicts that the bilateral exchange rate elasticity of exports is 0.043[1]. Thus, participation in GVCs lowers the elasticity of total exports to the exchange rate by 52.43%[2]. In the case of

[1] Considering the estimated coefficient of interaction term is -0.128 and the average value of GVCs is 0.34, the elasticity is calculated as follows (0.083 – 0.128*0.34) = 0.043

[2] It is calculated as follows {(0.043/0.083) * 100} = 52.43%

manufacturing exports, the average GVC participation is 0.38; it predicts that the bilateral exchange rate elasticity of exports is 0.082[3]. Participation in GVCs lowers the elasticity of manufacturing exports to exchange rate by 47.95%[4]. Though trade in the service sector's participation in GVCs are increasing over time, this study did not find any significant results for trade in service exports that participation in GVCs weaken the exchange rate elasticities of trade in service exports for emerging countries.

These results for emerging countries are consistent with other previous findings like Ahmed et al. (2015), Kang & Dagli (2018) and Bang & Park (2018). The gravity panel model estimation results of this paper support that participation in GVCs has dampen the elasticities of total exports and manufacturing exports. However, these results only indicate that participation of GVCs might be one of the contributing factors for reducing elasticities of export to exchange rates. There might be other factors also.

Robustness Check

To do a robustness check, this paper makes use of the *IV* estimation technique. The estimation results from *IV* estimation are reported in table 2.5, 2.6 and 2.7.

Column 1 of Table 2.5, 2.6 and 2.7 exhibits the exchange rate elasticities of exports. Column 4 of Table 2.5, 2.6 and 2.7 display the exchange rate elasticities of exports in the presence of GVCs. It is observed from the column 1 of Table 2.5 and Table 2.6 that 1% increase in exchange rate 0.006% and 0.036% increase in total exports and manufacturing exports respectively, but the

[3] Considering the estimated coefficient of interaction term is -0.236 and the average value of GVCs is 0.38, the elasticity is calculated as follows (0.171 – 0.236*0.38) = 0.082

[4] It is calculated as follows {(0.082/0.171) *100} = 47.95%

result is not significant. Nevertheless, it can be seen from column 1 of table 2.7 that 1% increase in exchange rate 0.101% decreases in trade in services exports.

Column 4 of Table 2.5, 2.6 and 2.7 show that the participation of GVCs has dampen the exchange rate elasticity of exports. In the case of total exports, the average GVC participation of sample countries is 0.34, and it predicts that the bilateral exchange rate elasticity of exports is 0.051[5]. Thus, participation in GVCs lowers the elasticity of total exports to the exchange rate by 40.42%[6]. In the case of manufacturing exports, the average GVC participation is 0.38; it predicts that the bilateral exchange rate elasticity of exports is 0.129[7]. Participation in GVCs lowers the elasticity of manufacturing exports to exchange rate by 40.06%[8].

This *IV* estimation results support the fixed effects estimation results.

5. Conclusion

This paper explored the link between exchange rate and exports in the presence of GVCs for aggregate and disaggregated sectoral data by using the gravity panel model estimation for 15 emerging countries from 1995-2011. There is evidence that depreciation of currency increases exports, but the results are significant only for manufacturing exports. Correspondingly, this paper finds the evidence that participation in GVCs has dampened the exchange rate elasticity of total exports and manufacturing exports but not trade in service. Participation in GVCs has dampened the exchange rate elasticity of total exports and manufacturing exports by 52.43% and 47.95%

[5] Considering the estimated coefficient of interaction term is -0.151 and the average value of GVCs is 0.34, the elasticity is calculated as follows (0.127 – 0.151*0.34) = 0.051

[6] It is calculated as follows {(0.051/0.127) * 100} = 40.42%.

[7] Considering the estimated coefficient of interaction term is -0.341 and the average value of GVCs is 0.38, the elasticity is calculated as follows (0.322 – 0.341*0.38) = 0.129

[8] It is calculated as follows {(0.129/0.322} *100 = 40.06%.

respectively. Though trade in service sector's participation in GVCs are increasing over time, this study did not find any significant results for trade in service exports.

The results of this study suggest that if countries are involved in global value chains deeply, in that case, the exchange rate depreciation policy should provide a more limited boost to its exports.

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Table 2. 1: Basic Statistics

	Number	Mean	S.D.	Min	Max
lnrealexports_total	15,505	14.55	2.311	4.374	21.58
lnexporter_GDP	15,505	22.17	0.981	20.44	25.67
lnimporter_GDP	15,505	21.52	1.705	17.66	25.75
lnRER	15,505	1.378	3.605	-9.597	10.87
GVC	15,505	0.344	0.0958	0.0701	0.742
lnrealexports_manufacturing	15,250	13.99	2.351	4.552	21.21
lnexporter_GDP	15,250	22.17	0.985	20.44	25.67
lnimporter_GDP	15,250	21.54	1.689	17.66	25.75
lnRER	15,250	1.448	3.56	-9.597	10.87
GVC	15,250	0.379	0.0909	0.11	0.715
lnrealexports_services	15,402	13.19	2.366	4.22	19.7
lnexporter_GDP	15,402	22.17	0.98	20.44	25.67
lnimporter_GDP	15,402	21.54	1.696	17.66	25.75
lnRER	15,402	1.375	3.612	-9.597	10.87
GVC	15,402	0.267	0.105	0.0293	0.76

Table 2. 2: Participation in GVCs and exchange rate elasticity (total exports)

Dependent Variable: lnrealexports_total				
Independent Variables	(1)	(2)	(3)	(4)
lnRER	0.032	0.034	-0.053**	0.083***
	(0.024)	(0.022)	(0.027)	(0.025)
lnexporter_GDP	0.034***	0.120***	0.031**	0.123***
	(0.013)	(0.012)	(0.013)	(0.012)
lnimporter_GDP	0.821***	0.708***	0.815***	0.709***
	(0.017)	(0.015)	(0.017)	(0.015)
GVC		6.018***		6.134***
		(0.112)		(0.115)
*lnRER * GVC*			0.223***	-0.128***
			(0.031)	(0.029)
Constant	-3.930***	-5.469***	-3.739***	-5.608***
	(0.417)	(0.382)	(0.417)	(0.383)
Observations	15,505	15,505	15,505	15,505
R − squared	0.151	0.292	0.154	0.292
Number of Pair_ID	913	913	913	913
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 3: Participation in GVCs and exchange rate elasticity (Manufacturing exports)

Dependent Variable: lnrealexports_man				
Independent Variables	(1)	(2)	(3)	(4)
lnRER	0.096***	0.075***	-0.059*	0.171***
	(0.026)	(0.023)	(0.030)	(0.027)
lnexporter_GDP	-0.028**	0.091***	-0.037***	0.100***
	(0.014)	(0.012)	(0.014)	(0.012)
lnimporter_GDP	0.857***	0.690***	0.844***	0.694***
	(0.018)	(0.016)	(0.018)	(0.016)
GVC		8.206***		8.454***
		(0.129)		(0.135)
*lnRER * GVC*			0.378***	-0.236***
			(0.038)	(0.035)
Constant	-3.993***	-6.120***	-3.502***	-6.491***
	(0.449)	(0.398)	(0.450)	(0.401)
Observations	15,250	15,250	15,250	15,250
R − squared	0.142	0.330	0.148	0.332
Number of Pair_ID	898	898	898	898
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 4: Participation in GVCs and exchange rate elasticity (service exports)

$Dependent\ Variable: lnrealexports\_ser$				
$Independent\ Variables$	(1)	(2)	(3)	(4)
$lnRER$	-0.058**	-0.022	-0.133***	-0.025
	(0.025)	(0.024)	(0.027)	(0.026)
$lnexporter\_GDP$	0.105***	0.136***	0.107***	0.136***
	(0.013)	(0.013)	(0.013)	(0.013)
$lnimporter\_GDP$	0.769***	0.718***	0.766***	0.718***
	(0.017)	(0.017)	(0.017)	(0.017)
GVC		4.583***		4.573***
		(0.129)		(0.133)
$lnRER * GVC$			0.266***	0.010
			(0.032)	(0.032)
$Constant$	-5.620***	-6.485***	-5.607***	-6.483***
	(0.437)	(0.420)	(0.436)	(0.420)
$Observations$	15,402	15,402	15,402	15,402
$R-squared$	0.132	0.202	0.136	0.202
$Number\ of\ Pair\_ID$	906	906	906	906
$Pair\ FE$	Yes	Yes	Yes	Yes
$Year\ FE$	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 5: Participation in GVCs and exchange rate elasticity (total exports) (IV Estimation)

Dependent Variable: lnrealexports_total				
Independent Variables	(1)	(2)	(3)	(4)
lnRER	0.006	0.075***	-0.072**	0.127***
	(0.029)	(0.026)	(0.033)	(0.030)
lnexporter_GDP	0.033**	0.122***	0.030**	0.126***
	(0.013)	(0.012)	(0.013)	(0.012)
lnimporter_GDP	0.822***	0.707***	0.816***	0.708***
	(0.017)	(0.015)	(0.017)	(0.015)
GVC		6.018***		6.155***
		(0.112)		(0.115)
*lnRER * GVC*			0.233***	-0.151***
			(0.032)	(0.030)
constant	-3.882***	-5.544***	-3.701***	-5.699***
	(0.418)	(0.383)	(0.418)	(0.384)
Observations	15,505	15,505	15,505	15,505
Number of Pair_ID	913	913	913	913
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 6: Total GVCs participation and exchange rate elasticity (manufacturing exports) (IV Estimation)

Dependent Variable: lnrealexports_man				
Independent Variables	(1)	(2)	(3)	(4)
lnRER	0.036	0.191***	-0.117***	0.322***
	(0.031)	(0.027)	(0.037)	(0.034)
lnexporter_GDP	-0.032**	0.098***	-0.041***	0.111***
	(0.014)	(0.012)	(0.014)	(0.013)
lnimporter_GDP	0.860***	0.686***	0.844***	0.691***
	(0.018)	(0.016)	(0.018)	(0.016)
GVC		8.196***		8.555***
		(0.130)		(0.135)
*lnRER * GVC*			0.416***	-0.341***
			(0.041)	(0.038)
Constant	-3.876***	-6.342***	-3.371***	-6.864***
	(0.450)	(0.399)	(0.453)	(0.405)
Observations	15,250	15,250	15,250	15,250
Number of Pair_ID	898	898	898	898
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 7: Total GVCs participation and exchange rate elasticity (service exports) (IV Estimation)

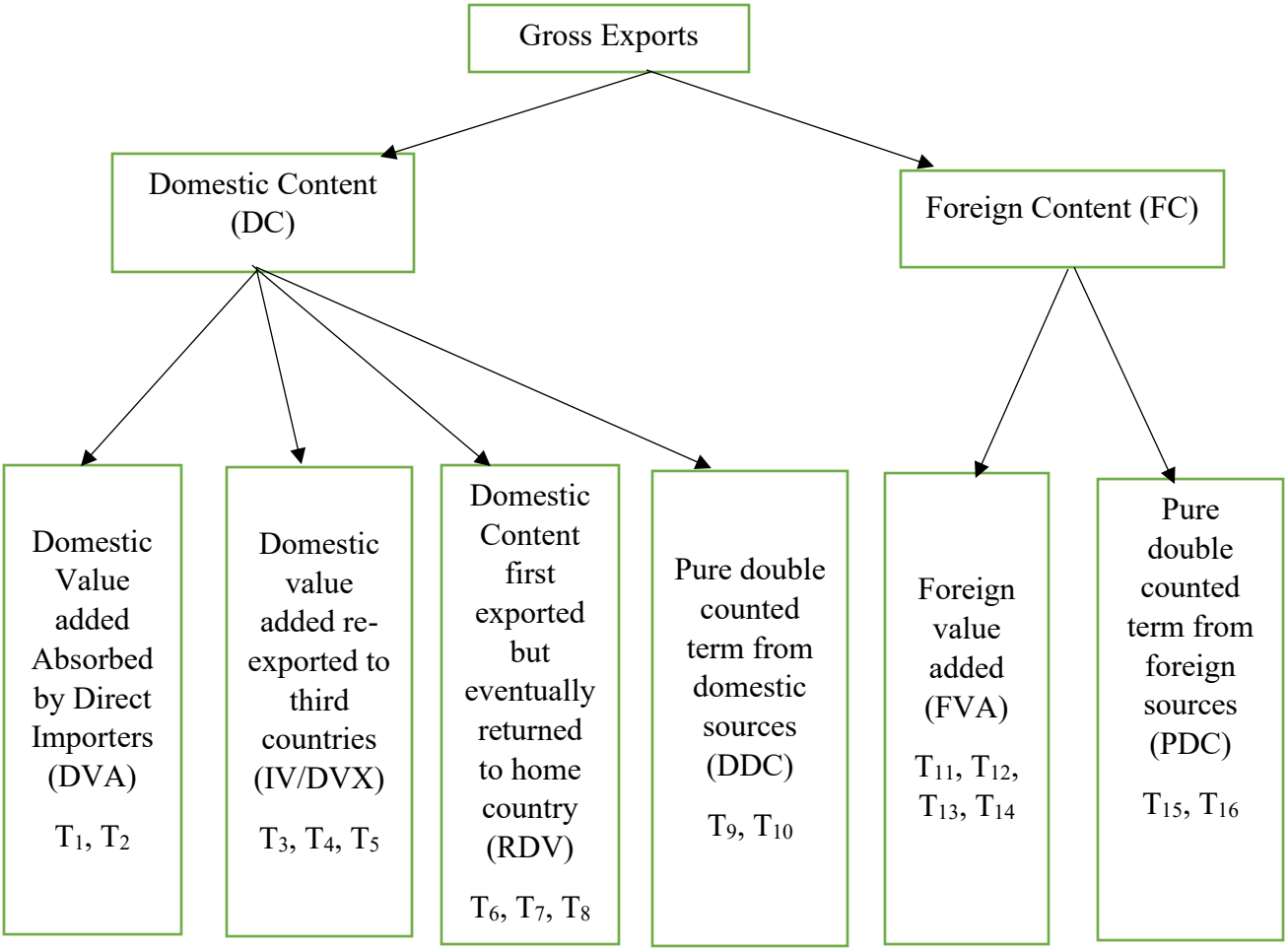
Dependent Variable: lnrealexports_ser				
Independent Variables	(1)	(2)	(3)	(4)
lnRER	-0.101***	-0.072**	-0.173***	-0.081**
	(0.030)	(0.029)	(0.032)	(0.031)
lnexporter_GDP	0.102***	0.133***	0.105***	0.133***
	(0.014)	(0.013)	(0.013)	(0.013)
lnimporter_GDP	0.771***	0.720***	0.767***	0.720***
	(0.017)	(0.017)	(0.017)	(0.017)
GVC		4.572***		4.538***
		(0.129)		(0.133)
*lnRER * GVC*			0.281***	0.034
			(0.033)	(0.032)
Constant	-5.541***	-6.391***	-5.542***	-6.385***
	(0.438)	(0.421)	(0.437)	(0.421)
Observations	15,402	15,402	15,402	15,402
Number of Pair_ID	906	906	906	906
Pair FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2. 8: List of Exporting and Importing Countries

Exporting Countries	Importing Countries
Argentina (ARG), Brazil (BRA), Czech Republic (CZE), Hungary (HUN), Indonesia (IDN), India (IND), Korea (KOR), Mexico (MEX), Malaysia (MYS), Philippines (PHL), Poland (POL), Romania (ROU), Thailand (THA), Turkey (TUR), South Africa (ZAF).	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).

Appendix



Source: Wang et al. (2013)

CHAPTER THREE:

Distinction between the Elasticities of Gross Exports and Value-Added Exports: Evidence from Emerging East Asian Countries

1. Introduction

The responses of trade flows due to the change in exchange rates, or income of trading partners (i.e., trade elasticities) are essential indicators for macroeconomic policymakers as well as applied academic work in international economics in assessing the benefits from trade and trade policies. It is widespread in the empirical trade literature that trade (i.e., imports and exports) is determined by the policy of exchange rate and income of trading partners. Therefore, trade policies play a substantial role in the way of strengthening the economic prosperity of the country. Numerous standard empirical papers have been estimated trade elasticities over the last few decades with empirically successful evidences, and these empirical evidences now act as policy making and applied academic work in international economics (Bayoumi, 1999). Nevertheless, in recent decades, the nature and structure of global trade have changed enormously. One of the striking trends of trade in recent decades is the growing fragmentation of production due to the lower transportation costs, improved information technologies, and more open economies (Corral & Núñez, 2016). That means firms produce different stages of their production to several countries, which leads to global value chains (GVCs) with more and more countries involved. Therefore, the goods which are produced in GVCs are multi-country products, and this is the contrast with the old view of international trade in which goods are produced entirely within a country using domestically produced inputs (Cheng et al., 2016). Moreover, in the global production network, countries import many intermediate inputs for production. These traded intermediate inputs cross the international border more than once and counted many times in the trade statistics (Johnson,

2014). As the production networks have risen in the production process and several countries are involved in the production chains, that's why gross trade data may not be the accurate measures of real bilateral trade positions and do not give reliable information about the actual value that is added by a particular country in the global production process. Instead, trade in value-added data incorporates actual value that is added in the production of any goods in a particular country and that is the better reflection of global interdependences (OECD, 2013b). Correspondingly, trade elasticities estimated by gross trade data should be different from estimated trade elasticities from value-added trade data.

Existing empirical research in this area suggest that integration of GVCs in the production network is reducing the overall gross trade elasticities (Ahmed et al., 2015; Ollivaud et al., 2015). If substitutability of domestic and foreign intermediate goods is lower, it may reduce the elasticities of gross trade compare to value-added trade (Adler et al., 2019). Therefore, it is imperative to isolate the trade elasticities by using the gross trade data as well as value-added trade data. Furthermore, after the emergence of GVCs, more intermediate goods are traded across the countries that are then often re-exported. Thus, trade elasticities measured by gross trade data may not be reasonable proxies for trade elasticities measured by value-added trade data. Additionally, most existing empirical researches estimate elasticities which are based on the conventional measure of gross trade flows, but new value-added trade data has created an opportunity of estimating value-added trade elasticities (Ceglowski, 2019). The measures of value-added trade elasticities will give policymakers a better understanding of trade patterns and this will be useful to implement more adequate macroeconomic policies (Corral & Núñez, 2016).

Current literature in this area of research emphasized the important distinction between traditional measures of exports and value-added exports elasticities. Ceglowski (2019) empirically

estimates the income elasticity and the price elasticities of gross exports as well as value-added exports for the USA and other G-7 countries by using the Trade in Value-Added (TiVA) database. She finds that among the income elasticities there are no significant differences but price elasticity for value-added exports significantly higher compare to gross exports. Cheng et al., (2016) examine the exchange rate elasticities of GVC-related trade and non-GVC related trade from 1995 to 2011. They find that for GVC-related trade, appreciation of the exchange rate reduced both exports and imports. Moreover, for non-GVC trade, appreciation of the exchange rate decreases the exports and increases the imports. According to the existing empirical research in this area, only Ceglowski (2019) estimates the value-added exports elasticity along with traditional gross exports elasticity.

In this context, this chapter takes an attempt to empirically estimate the exports elasticities by using gross exports data and value-added exports data for eight East Asian emerging countries. This paper focuses on eight East Asian countries that form the so-called 'Factory Asia', an area at the forefront of production sharing (Rotunno, 2015). Also, Japanese investors first taking the leading role in the East Asia for the emergence of GVCs in the form of supply chain (Banga, 2014). According to the GVC participation Index, the East and south-East Asian region is rank the highest in GVC participation. This is because, the countries in this region import a large part of their exports (foreign value-added), also a substantial part of their exports are intermediate goods that are used in third countries' exports (UNCTAD, 2013). Finally, supply chains in Asia, more particularly in East Asia are more dispersed compared to other regions like North America or Europe (Riad et al., 2012).

Using bilateral trade data from TiVA database over 1995 to 2011, this paper estimates the exchange rate elasticities of value-added measures of exports as well as traditional measures of

gross exports. By using the Panel Autoregressive Distributed Lag (ARDL) method, this chapter finds that in the long run value-added exports to exchange rate elasticities are higher than that of gross exports for all countries except China and Singapore. Correspondingly, the estimated elasticities of value-added exports to income are higher than that of gross exports for: China, Indonesia, Malaysia, the Philippines and Thailand. The income elasticities for Hong Kong, Korea and Singapore are higher for gross exports than for value-added exports. Furthermore, long run exchange rate elasticities of gross exports as well as value-added exports are inelastic for China, Hong Kong, Korea, Malaysia and Thailand and elastic for Indonesia. Additionally, long run income elasticities of gross exports as well as value-added exports are elastic for Indonesia, Korea, Singapore, the Philippines and Thailand and inelastic for Hong Kong and Malaysia. The only exception is China where the income elasticity of gross exports is inelastic but elastic for value-added exports.

This chapter is organized into four sections: Section two presents the empirical model, methodology and data; Section three reports results and discussions; Section four concludes.

2. The Empirical Model, Methodology and Data

The Empirical Model and the Methodology

Standard economic theory tells us that the main factors that determine the exports flows are foreign income and price. Many empirical studies on this area of research commonly employed the framework of imperfect substitutes model of trade, which was formalized by Goldstein & Khan (1985) to estimate the trade elasticities by using the trade data measured as gross flows. The underlying assumption of this model is both imports and exports are not perfectly substituted for domestic goods. That is why, under the assumption of the imperfect substitutions model, foreign income and the price of exports are the main determinants of exports (Aiello et al., 2015).

Ceglowski (2019) follows the following log-linear export function in a panel framework for estimating export elasticities:

$$lnX_{it} = \alpha_0 + \alpha_1 lnY_{it}^{f} + \alpha_2 lnRER_{it} + \mu_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

Where, X_{it} is the real bilateral gross or value-added exports of a country to its trading partner i at time t, RER_{it} is the real bilateral exchange rate of a country with its trading partner i at time t, Y_{it}^{f} is the income of trading partner i at time t and μ_{it} is the error term. The logarithmic specification of the export function is generally made on the grounds of convenience and ease of interpretation. It also reduces heteroskedasticity. Here, α_2 is the export elasticity of the real exchange rate, α_1 is the export elasticities to income. It is expected that α_1 is positive and the sign of α_2 is also expected to be positive.

On the methodological framework, first, this paper checks the cross-sectional dependence among the variables. Generally, the panel unit root tests do not address the cross-sectional dependence which lead to an incorrect interpretation of the stationary properties of large panel data. In response to this, Pesaran (2004) prescribed a test which can be applied when *N* (cross-section) is larger than *T* (time). This test is known as cross-sectional dependence (CD) test. Since this study includes 61 cross-sections (exports to 61 trading partners) and 17 years (1995 to 2011) it is appropriate to use the CD test. After confirming the cross-sectional dependence among the variables, the panel unit root test is carried out to test the stationarity of the panel variables. This test was proposed by Im, Pesaran & Shin (2003). The reason for using the Im, Pesaran & Shin (2003) test is that this is the only test that is robust to the presence of cross-sectional dependence in the data. After conducting a panel unit root test, this study finds that some variables are stationary in levels and some of them are not. This implies that the variables are mixed orders of I(0) and I(1). Existing literature suggests that if the variables are mixed order of integration that means the

order of I(0) and I(1) in the panel model, then it the appropriate way to use the Panel Autoregressive Distributed Lag (ARDL) model prescribed by Pesaran et al. (1999). The panel ARDL representation of equation (1) is as follows:

$$\Delta lnX_{it} = \alpha_i + \sum_{j=1}^{m} \beta_{ij} \Delta lnX_{i,t-j} + \sum_{l=0}^{n} \varphi_{il} \Delta lnY^{f}_{i,t-l} + \sum_{r=0}^{p} \gamma_{ir} \Delta lnRER_{i,t-r} + \delta_{1i} lnX_{i,t-1} + \delta_{2i} lnY^{f}_{i,t-1} + \delta_{3i} lnRER_{i,t-1} + \varepsilon_{it} \quad \ldots\ldots\ldots\ldots\ldots\ldots (2)$$

Here, Δ is the first difference operator, ε_{it} is the error term and α_i is the country-specific intercept. For identifying short-run and long-run effects by including lags of dependent and independent variables this study makes use of the ARDL model.

Data

Data Sources

This paper makes use of bilateral gross exports as well as value-added exports data for trade elasticities. These bilateral trade data are collected from the TiVA database. For calculating the real bilateral exchange rate, the exchange rate of the domestic currency vis-a-vis the US dollar is collected from the International Financial Statistics (IFS). Gross Domestic Product (GDP) and GDP deflators are from the World Development Indicators (WDI).

Variables

This paper makes use of bilateral value-added exports along with traditional gross exports data. Value-added exports measure domestic value-added embodied in foreign final demand (OECD, 2016). The indicators of the TiVA database contain nominal US dollar-denominated values of trade data. As this paper is interested in real value of trade data that's why we converted

US dollar denominated data into domestic currency by using average annual exchange rates and then deflated these nominal trade data by the GDP deflator and then convert again into US dollar.

The bilateral real exchange rate is calculated by using the nominal exchange rate of the exporting country's currency vis-à-vis the US dollar against importing country's currency vis-à-vis the US dollar, multiplied by the relative price of the importing country to the relative price of the exporting country. This study makes use of real exchange rates. This is because nominal exchange rates and relative prices exert the same impact on trade flows.

Real GDP of the sample countries are calculated by deflating GDP in current domestic prices with each country's GDP deflator and then converted into US dollar.

3. Results and Discussion

This paper estimates the income and exchange rate elasticities of exports measured by gross and value-added terms for eight East Asian countries.

Table 3.1 represents the results of CD test. The results reported in Table 3.1 reject the null hypothesis of no cross-sectional dependence among the variables. It means there is high dependence among the variables. As the cross-sectional dependence exists among the variables, that's why the panel unit root test was conducted. The results of panel unit root test are shown in Table 3.2 and 3.3. It is confirmed from the results of panel unit root tests that some of the data series are stationary in levels, but some are not, which suggests we should use the panel ARDL model. The short run and long run elasticities of export function using ARDL (1,1,1) model are presented in Table 3.4 and Table 3.5.

Long Run Results

The long run coefficients in Table 3.4 and Table 3.5 have the anticipated signs and highly significant. The estimated long run elasticities of value-added exports to exchange rate are higher

than that of gross exports for all countries except China and Singapore. Correspondingly, the estimated elasticities of value-added exports to income are higher than that of gross exports for countries like: China, Indonesia, Malaysia, the Philippines and Thailand. The income elasticities for Hong Kong, Korea and Singapore are higher for gross exports than for value-added exports. Furthermore, long run exchange rate elasticities of gross exports as well as value-added exports are inelastic for China, Hong Kong, Korea, Malaysia and Thailand and elastic for Indonesia. Nevertheless, exchange rate elasticity of gross exports is elastic for Singapore while the exchange rate elasticity for value-added is inelastic. The results of the estimated exchange rate elasticities are just the opposite of Singapore in the case of the Philippines. Moreover, long run income elasticities of gross exports as well as value-added exports are elastic for Indonesia, Korea, Singapore, Philippines and Thailand. For Hong Kong and Malaysia income elasticities for both measures of exports are inelastic. The only exception is the Chinese case where income elasticity of gross exports is inelastic but elastic for value-added exports.

Short Run Results

Looking at the short run results, this study finds that exchange rate elasticities for both measures of exports are inelastic for all countries, but the estimated coefficients are not the expected signs for China, Hong Kong and Indonesia. Also, income elasticities for both measures of exports are elastic, significant and correctly sign for China, Malaysia, Singapore and the Philippines. On the other hand, income elasticities of gross exports as well as value-added exports are inelastic for Hong Kong, Indonesia and Korea. Only the case of Thailand is income elasticity of gross exports is elastic but inelastic for value-added exports.

The short run estimated coefficients are far more diverse than the long run results. In the short run, exchange rate elasticities of exports for China, Hong Kong and Indonesia are not correct

signs. The short run exchange rate elasticities of exports are higher for value-added exports than for gross exports for Korea and Philippines and this is consistent with the long run results. In the context of Malaysia, exchange rate elasticity of value-added exports is lower than for gross exports which is opposite of the long run results. The short run exchange rate elasticity of exports for gross exports are higher than for value-added exports for the case of Singapore and this is consistent with the long run results. For the case of Thailand, the exchange rate elasticity is the higher for gross exports than for value-added exports and these results are the opposite of the long run results.

The short run income sensitivity of gross exports is higher than the value-added exports for China which is opposite of the long run results. The income elasticities of value-added exports are higher for Hong Kong which is also the opposite of the long run results. In the context of Indonesia, the income elasticity is higher for value-added exports than for gross exports and the results are consistent with the long run results. For Korea, income elasticities are same for both measures of exports. With reference to the Philippines, the income elasticity of gross exports is higher than for value-added exports and this is opposite of the long run results. For Singapore, income elasticities are higher for gross exports than for value-added exports and the results are consistent with the long run results. For the case of Malaysia and Thailand, income elasticities exhibit higher values for gross exports than for value-added exports and the results are opposite of the long run results.

Discussion

In Hong Kong, Indonesia, Korea, Malaysia, the Philippines and Thailand, the long run exchange rate elasticities of value-added exports are higher than that of gross exports, which implies that depreciation of the domestic currency has more impact on value-added exports than gross exports in these countries. There are several possibilities for the higher exchange rate elasticities of value-added exports for these countries. First, this may occur because of high

involvement in GVCs and high production fragmentation in these four countries. As Adler et al. (2019) suggested, countries that are highly involved in GVCs may reduce the exchange rate elasticities of gross exports. Second, if the elasticities of final products are higher than intermediate products, then the value-added exchange rate elasticities will be higher. This is because bilateral gross exports is the sum of direct exports of final and intermediate products, while value-added exports consist of only direct and indirect exports of final products (Ceglowski, 2019). Moreover, there are significant differences in the estimated income elasticities across the sample countries.

Though the empirical studies on this framework are few, we can compare the findings of this paper with existing studies. Ceglowski (2019) finds that the estimated income elasticities of gross exports and value-added exports are very similar, but this study finds that estimated income elasticity are quite different for the two measures of exports. Also, the estimated exchange rate elasticities of value-added exports for countries like Hong Kong, Indonesia, Korea, Malaysia, the Philippines and Thailand are higher compared to gross exports. This finding is similar with Ceglowski's (2019) findings.

Overall, this paper finds that exchange rate elasticities for both measures of exports are inelastic for all sample countries except Indonesia. Also, income elasticities for gross exports as well as value-added exports are elastic for Indonesia, Korea, Singapore, the Philippines and Thailand and inelastic for China, Hong Kong and Malaysia.

4. Conclusion

This chapter estimates the income and exchange rate elasticities of gross exports as well as value-added exports for eight East Asian countries.

It finds that the estimated long run elasticities of value-added exports to exchange rate are higher than that of gross exports for all countries except China and Singapore. Correspondingly,

the estimated elasticities of value-added exports to income are higher than that of gross exports for China, Indonesia, Malaysia, the Philippines and Thailand. The income elasticities for Hong Kong, Korea and Singapore are higher for gross exports than for value-added exports. Furthermore, long run exchange rate elasticities of gross exports as well as value-added exports are inelastic for China, Hong Kong, Korea, Malaysia and Thailand and elastic for Indonesia. Additionally, long run income elasticities of gross exports as well as value-added exports are elastic for Indonesia, Korea, Singapore, the Philippines and Thailand and inelastic for Hong Kong and Malaysia. The only exception is China where income elasticity of gross exports is inelastic but elastic for value-added exports.

The findings of this chapter have several implications. As the long run income elasticities are elastic for Indonesia, Korea, Singapore, the Philippines and Thailand, therefore changes in real income have much more impact on exports flows in these countries. On the contrary, exchange rate elasticities are inelastic in almost all sample countries except Indonesia. The findings imply that the exchange rate policy may not be entirely successful in altering trade balance. Also, the depreciation of the local currency has large impact on value-added exports than gross exports in all sample countries except China and Singapore.

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Table 3. 1: Pesaran Cross-Sectional Dependence Test results

Country:China			
	Test	Statistics	P-value
Gross Exports Function	CD	132.92	0.00
Value-Added Exports Function	CD	136.60	0.00
Country:Hong kong			
	Test	Statistics	P-value
Gross Exports Function	CD	12.34	0.00
Value-Added Exports Function	CD	21.23	0.00
Country:Indonesia			
	Test	Statistics	P-value
Gross Exports Function	CD	20.12	0.00
Value-Added Exports Function	CD	37.05	0.00
Country:Korea			
	Test	Statistics	P-value
Gross Exports Function	CD	34.78	0.00
Value-Added Exports Function	CD	45.37	0.00
Country:Malaysia			
	Test	Statistics	P-value
Gross Exports Function	CD	55.37	0.00
Valu-Added Exports Function	CD	51.56	0.00
Country:Philippines			
	Test	Statistics	P-value
Gross Exports Function	CD	33.06	0.00
Value-Added Exports Function	CD	56.39	0.00
Country:Sinapore			
	Test	Statistics	P-value
Gross Exports Function	CD	30.71	0.00
Value-Added Exports Function	CD	58.71	0.00
Country:Thailand			
	Test	Statistics	P-value
Gross Exports Function	CD	33.01	0.00
Value-Added Exports Function	CD	36.16	0.00

Table 3. 2: IPS Panel Unit root Test Results in Levels

	Level			
	Without Trend		With Trend	
Variables	Statistic	P − values	Statistic	P − values
Country: China				
lnexports	7.045	1.000	0.661	0.745
lnva_exports	8.971	1.000	3.159	0.999
lnRER	−1.437	0.075 *	−0.746	0.227
lnGDP	4.612	1.000	−4.769	0.000 ***
Country: Hong Kong				
lnexports	0.002	0.500	−3.063	0.001 ***
lnva_exports	2.894	0.998	−3.550	0.000 ***
lnRER	6.431	1.000	−5.983	0.000 ***
lnGDP	4.417	1.000	−4.790	0.000 ***
Country: Indonesia				
lnexports	4.614	1.000	0.201	0.579
lnva_exports	8.901	1.000	0.231	0.591
lnRER	−0.240	0.404	−6.692	0.000 ***
lnGDP	4.840	1.000	−4.741	0.000 ***
Country: Korea				
lnexports	1.774	0.962	−0.912	0.180
lnva_exports	2.187	0.985	−0.617	0.268
lnRER	−3.453	0.000 ***	−7.571	0.000 ***
lnGDP	4.612	1.000	−4.769	0.000 ***
Country: Malaysia				
lnexports	1.328	0.908	−1.989	0.023 **
lnva_exports	3.944	1.000	−2.442	0.007 ***
lnRER	−6.327	0.000 ***	−5.578	0.000 ***
lnGDP	4.474	1.000	−4.733	0.000 ***
Country: Philippines				
lnexports	−0.434	0.332	−0.478	0.316
lnva_exports	3.622	0.999	−0.271	0.393
lnRER	−1.531	0.06 *	1.744	0.959
lnGDP	4.589	1.000	−4.868	0.000 ***
Country: Singapore				
lnexports	4.468	1.000	−2.081	0.018 **
lnva_exports	7.450	1.000	−1.134	0.128
lnRER	−1.508	0.065 *	0.282	0.611
lnGDP	4.269	1.000	4.908	0.000 ***
Country: Thailand				
lnexports	5.371	1.000	−0.654	0.256
lnva_exports	5.338	1.000	−0.768	0.221
lnRER	−7.703	0.000 ***	−2.369	0.008 ***
lnGDP	4.571	1.000	−4.589	0.000 ***

Table 3. 3: IPS Panel Unit root Test Results in First Differences

	$Ist\ differences$			
	$Without\ Trend$		$With\ Trend$	
$Variables$	$Statistic$	$P-values$	$Statistic$	$P-values$
$Country: China$				
$lnexports$	-9.281	$0.000\ ***$	-6.069	$0.000\ ***$
$lnva\_exports$	-8.610	$0.000\ ***$	-4.611	$0.000\ ***$
$lnRER$	-9.444	$0.000\ ***$	-5.120	$0.000\ ***$
$lnGDP$	-10.386	$0.000\ ***$	-7.160	$0.000\ ***$
$Country: Hong\ Kong$				
$lnexports$	-12.460	$0.000\ ***$	-9.854	$0.000\ ***$
$lnva\_exports$	-12.277	$0.000\ ***$	-9.549	$0.000\ ***$
$lnRER$	-9.681	$0.000\ ***$	-3.924	$0.000\ ***$
$lnGDP$	-10.292	$0.000\ ***$	-7.088	$0.000\ ***$
$Country: Indonesia$				
$lnexports$	-13.342	$0.000\ ***$	-11.969	$0.000\ ***$
$lnva\_exports$	-11.650	$0.000\ ***$	-12.488	$0.000\ ***$
$lnRER$	-14.693	$0.000\ ***$	-13.849	$0.000\ ***$
$lnGDP$	-10.220	$0.000\ ***$	-6.948	$0.000\ ***$
$Country: Korea$				
$lnexports$	-12.146	$0.000\ ***$	-8.876	$0.000\ ***$
$lnva\_exports$	-10.753	$0.000\ ***$	-8.000	$0.000\ ***$
$lnRER$	-16.916	$0.000\ ***$	-11.526	$0.000\ ***$
$lnGDP$	-00.000	$0.000\ ***$	-00.000	$0.000\ ***$
$Country: Malaysia$				
$lnexports$	-14.889	$0.000\ ***$	-14.195	$0.000\ ***$
$lnva\_exports$	-13.852	$0.000\ ***$	-10.516	$0.000\ ***$
$lnRER$	-13.437	$0.000\ ***$	-10.228	$0.000\ ***$
$lnGDP$	-10.304		-6.959	$0.000\ ***$
$Country: Philippines$				
$lnexports$	-12.390	$0.000\ ***$	-13.539	$0.000\ ***$
$lnva\_exports$	-10.996	$0.000\ ***$	-11.881	$0.000\ ***$
$lnRER$	-10.526	$0.000\ ***$	-6.997	$0.000\ ***$
$lnGDP$	-10.423	$0.000\ ***$	-6.985	$0.000\ ***$
$Country: Singapore$				
$lnexports$	-11.317	$0.000\ ***$	-8.437	$0.000\ ***$
$lnva\_exports$	-10.131	$0.000\ ***$	-8.303	$0.000\ ***$
$lnRER$	-11.958	$0.000\ ***$	-9.973	$0.000\ ***$
$lnGDP$	-10.402	$0.000\ ***$	-6.937	$0.000\ ***$
$Country: Thailand$				
$lnexports$	-10.430	$0.000\ ***$	-7.808	$0.000\ ***$
$lnva\_exports$	-9.126	$0.000\ ***$	-6.671	$0.000\ ***$
$lnRER$	-14.060	$0.000\ ***$	-14.351	$0.000\ ***$
$lnGDP$	-10.311	$0.000\ ***$	-7.066	$0.000\ ***$

Table 3. 4: Panel ARDL (1,1,1) Estimation Results (China, Hong Kong, Indonesia, Korea)

Country: China			*Country: Indonesia*		
	Gross Exports	VA_*Exports*		*Gross Exports*	VA_*Exports*
Long Run			*Long Run*		
lnRER	0.467	0.013	*lnRER*	1.183***	1.322***
lnGDP	0.826***	1.867***	*lnGDP*	1.039***	1.160***
Short Run			*Short Run*		
Error Correction Term	−0.098***	−0.123***	*Error Correction Term*	−0.334***	−0.305***
ΔlnRER	−0.790***	−0.671***	*ΔlnRER*	−0.088	−0.008
ΔlnGDP	1.912***	1.803***	*ΔlnGDP*	0.666***	0.809***
Constant	−0.037	−2.759***	*Constant*	0.531***	0.156
Country: Hongkong			*Country: Korea*		
	Gross Exports	VA_*Exports*		*Gross Exports*	VA_*Exports*
Long Run			*Long Run*		
lnRER	0.302***	0.571***	*lnRER*	0.184***	0.244***
lnGDP	0.476***	0.258***	*lnGDP*	1.315***	1.270***
Short Run			*Short Run*		
Error Correction Term	−0.547***	−0.538***	*Error Correction Term*	−0.429***	−0.426***
ΔlnRER	−0.554**	−0.603***	*ΔlnRER*	0.020	0.156***
ΔlnGDP	0.776***	0.836***	*ΔlnGDP*	0.936***	0.936***
Constant	2.192***	4.707***	*Constant*	−4.721***	−4.246***

*** p<0.01, ** p<0.05, * p<0.1

Table 3. 5: Panel ARDL (1,1,1) Estimation Results (Malaysia, Singapore, Philippines, Thailand)

Country: Malaysia			*Country: Philippines*		
	Gross Exports	VA_*Exports*		*Gross Exports*	VA_*Exports*
Long Run			*Long Run*		
lnRER	0.028	0.360***	*lnRER*	0.859***	1.324***
lnGDP	0.467***	0.958***	*lnGDP*	1.339***	1.684***
Short Run			*Short Run*		
Error Correction Term	−0.365***	−0.389***	*Error Correction Term*	−0.356***	−0.334***
ΔlnRER	0.550***	0.483***	*ΔlnRER*	0.591**	0.739***
ΔlnGDP	1.233***	1.066***	*ΔlnGDP*	1.348***	1.275***
Constant	1.965***	−2.298***	*Constant*	−4.852***	−6.397***
Country: Singapore			*Country: Thailand*		
	Gross Exports	VA_*Exports*		*Gross Exports*	VA_*Exports*
Long Run			*Long Run*		
lnRER	1.245***	0.836***	*lnRER*	0.355***	0.545***
lnGDP	1.389***	1.286***	*lnGDP*	1.051***	1.456***
Short Run			*Short Run*		
Error Correction Term	−0.355***	−0.298***	*Error Correction Term*	−0.324***	−0.312***
ΔlnRER	0.803***	0.757***	*ΔlnRER*	0.502***	0.349***
ΔlnGDP	1.632***	1.427***	*ΔlnGDP*	1.235***	0.958***
Constant	−5.781***	−4.003***	*Constant*	−2.127***	−4.691***

*** p<0.01, ** p<0.05, * p<0.1

Table 3. 6: List of Trading Partners' of China and Hong Kong

Sample Countries	Trading Partners
China	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).
Hong Kong	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).

Table 3. 7: List of Trading Partners' of Indonesia and Korea

Sample Countries	Trading Partners
Indonesia	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).
Korea	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).

Table 3. 8: List of Trading Partners' of Malaysia and Philippines

Sample Countries	Trading Partners
Malaysia	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).
Philippines	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).

Table 3. 9: List of Trading Partners' of Singapore and Thailand

Sample Countries	Trading Partners
Singapore	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE), Thailand (THA), Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).
Thailand	Argentina (ARG), Australia (AUS), Austria (AUT), Belgium (BEL), Brazil (BRA), Brunei Darussalam (BRN), Bulgaria (BGR), Cambodia (KHM), Canada (CAN), Chile (CHL), China (CHN), Colombia (COL), Costa Rica (CRI), Croatia (HRV), Cyprus (CYP), Czech Republic (CZE), Denmark (DNK), Estonia (EST), Finland (FIN), France (FRA), Germany (DEU), Greece (GRC), Hong Kong (HKG), Hungary (HUN), Iceland (ISL), India (IND), Indonesia (IDN), Ireland (IRL), Israel (ISR), Italy (ITA), Japan (JPN), Korea (KOR), Latvia (LVA), Lithuania (LTU), Luxembourg (LUX), Malaysia (MYS), Malta (MLT), Mexico (MEX), Morocco (MAR), Netherlands (NLD), New Zealand (NZL), Norway (NOR), Peru (PER), Philippines (PHL), Poland (POL), Portugal (PRT), Romania (ROU), Russian Federation (RUS), Saudi Arabia (SAU), Singapore (SGP), Slovak Republic (SVK), Slovenia (SVN), South Africa (ZAF), Spain (ESP), Sweden (SWE), Switzerland (CHE),Tunisia (TUN), Turkey (TUR), United Kingdom (GBR), United States (USA),Vietnam (VNM).