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Examine the effects of real effective exchange rates on export growth: A closer look into Asian Developing Economies

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Examine the effects of real effective exchange rates on export growth: A closer look into Asian Developing Economies

By Van Tran*[1]

Abstract

My paper examines the impact of real effective exchange rate as well as its fluctuations on the growth of exports with a focus on the Asian region. The data is extracted from World Bank, International Monetary Fund and International Financial Statistics spanning 41 years from 1979 to 2020. Using the OLS estimator, my study finds that an increase in real effective exchange rate will lead to a decline in the exports growth rate. However, this effect is positive for Asian countries, possibly due to lower production costs. I also reach the conclusion that volatility will have no impact on exports.

Key words: real effective exchange rate, volatility, exports growth

JEL Classification: F13, F10.

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1. Introduction

For many years, the effects of the exchange rate on economic growth have always been one of the most controversial issues in literature. The common view assumes that in the presence of a currency appreciation, a country's export growth might be negatively affected due to an increase in its relative prices compared to other trading partners. However, many researchers have also failed to find a correlation between exchange rate and exports growth. It is this divergence in literature that motivated me to conduct a study of my own. My paper examines the impact of real effective exchange rate as well as its volatility on exports using a panel data of 64 countries, with a closer look in to the case of Asia.

Evidence supporting the traditional presumption can be shown through an example of the United States during the 90s. Figure 1 illustrates how the US dollar started to rise in mid-1995 and continued its upward trend until 2002. After the Asian financial crisis in 1997-1998, important currencies in Asia such as the Thai baht, Korean won, or Russian ruble collapsed, making the dollar rise even higher relative to these currencies.

Figure 1

As for the US, when the dollar appreciated, it left a devastating effect on its manufacturing sector as goods produced in America now appeared less competitive when exported. Following the statistics from Table 1, we easily see how the growth rate of nonagricultural exports declined in half from 1996-2002 (after the currency appreciation), compared to the previous period from 1990-1995 when the dollar was falling in value. Not to mention, a higher dollar also led to decreases in profits across US

firms. This is because their products were considered more expensive; hence they either had to lower prices or reduce export volumes.

Average growth rates of U.S. real exports and imports of goods, 1990-95 and 1996-2002 (average annual percentage rates)

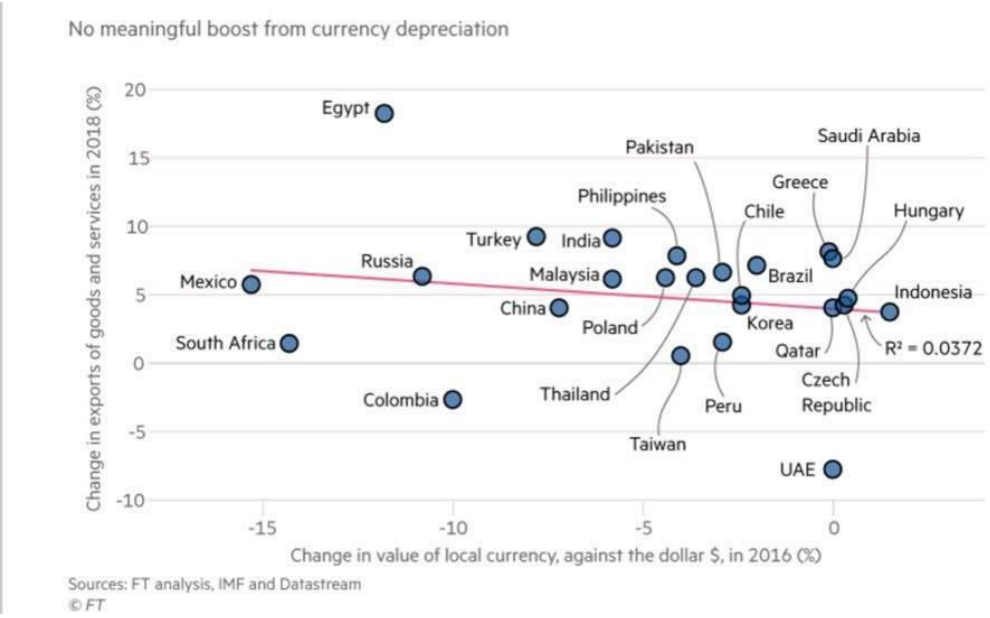
	Nonagricultural exports	Nonpetroleum imports
1990 to 1995	8.9	8.0
1996 to 2002	4.4	9.7

Note: The average annual growth rates shown are the simple averages of the quarterly growth rates (measured at annual rates) for the years indicated.

Source: Author's calculations based on data in U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts, Table 4.4, downloaded from http://www.bea.gov.

Table 1

However, this correlation between exchange rate and export growth doesn't seem to be a universal case. For example, Abeysinghe and Yeok, in their 1998 paper, discovered that exchange rate appreciation did not negatively affect Singapore's exports as their exports possess high import content (which refers to the share of imported inputs in the overall exports of a country). According to the Bank of International Settlements' Annual Economic Report 2019, depreciation may even result in falling exports for emerging markets.



As the above chart demonstrates, emerging markets such as Brazil or India only saw a small rise in exports, despite their currencies depreciating against the dollar in 2016. Colombia even witnessed a shrink in its exports, although the COP lost around 10% of its value. Researchers at the BIS offer several factors to explain why export growth might be hurt after a currency devaluation. First of all, export prices don't always change in response to the exchange rate. In emerging markets, since almost

all trade is in USD, a weakening currency would not help increase the competitiveness of exporters. Moreover, trade finance will also become more expensive to access when the currency loses its value. To further understand the impact of exchange rates on exports, I also look at its volatility on the trade balance. By definition, exchange rate volatility is the risk associated with unexpected movements in the exchange rate. Economic indicators such as inflation rate, interest rate, the balance of payments, technology advancements, and currency speculation are all sources of this volatility (Hook and Boon 2000). Ethier (1973) argued that volatility would lead to higher costs for risk-averse traders and consequently decrease their exports to avoid incurring losses. Not to mention, hedging against country risk is usually impossible or too costly; hence, investors will choose the safest bet for them, which is to reduce the export quantities.

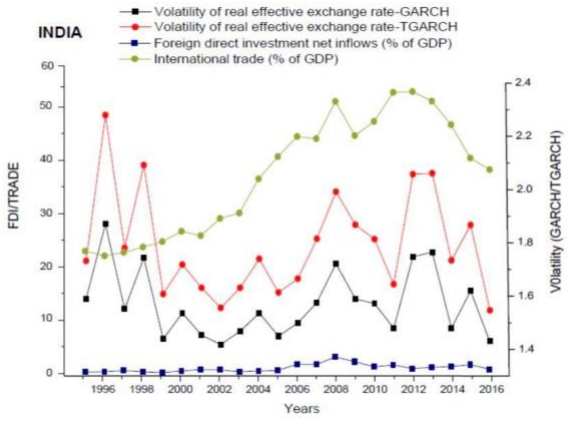


Figure 2

Figure 2 demonstrates how volatility and international trade growth move in opposite directions for India. When the volatility is relatively low, there is an upward trend in trade. Nevertheless, other economists like Franke (1992) and Giovanni (1988) argued that trade could benefit from exchange rate volatility. According to these studies, trade could be considered an option held by firms; hence the value of trade, like many other options, would rise with volatility. More recent papers also suggest contrasting findings. Pozo (1992), Chowdhury (1993), Arize et al. (2003) all found adverse effects of having a volatile exchange rate on US, G7, and NIC exports. Klaassen (2004), on the other hand, didn't report any causal relationship between exchange rate volatility and US exports to other G7 countries.

There is no clear pattern or general consensus regarding the impact of REER or volatility on the growth of exports. My paper focuses on analyzing the effect of real effective exchange rate and its fluctuations on exports growth especially for the Asian region. While the result of my paper corroborates the theoretical model that REER overall negatively affects exports, they turn out to have

a positive correlation for countries in Asia. Moreover, my finding once again confirms that the presence of volatility will not cause any changes to the exports growth.

1. Literature Review

The rising importance of international trade has greatly inspired many scholars to delve into the field and examine which factors might contribute to its development. Eilat and Einav (2004) argue that the exchange rate matters more for exports and growth in developed economies. For developing countries such as Southeast Asia, the political risk seems to play a more significant role. Narayan and Narayan (2007) investigated the relationship between currency devaluation and economic growth for Fiji from 1970-2000 using the co-integration method. They find out that when a currency lost its value, both in the short and long term, it led to an increase in the output level. The result from this study showed that a 10% devaluation increased output by 3.3%. Similarly, Di Nino et al. (2011) concluded that undervaluation would increase exports in Italy, especially in high-productivity sectors. Aman et al. (2013) and Obansa et al. (2013) reached the same conclusion for Pakistan and Nigeria. They both concurred that economic growth is significantly associated with the depreciation of the real exchange rate. However, Rodrik (2008) observed that this is only true for developing economies. Interestingly, several other researchers have shown the opposite result: depreciation could actually lead to contraction. Yiheyis (2006) analyzed economic activities in 20 African countries from 1981 to 1999 and noticed that the depreciation of local currencies caused a shrinking effect on economic growth in this region. Vaz and Baer (2014) used a panel model covering 1995-2008 for a sample of 39 Latin American countries and suggested that depreciation would hurt growth since it caused a nominal cost increase in the production process.

The study of exchange rate volatility has also produced inconsistent results. Oskooee and Bourdon (2005) examined the RMB-dollar exchange rate volatility on US agricultural exports to China using the moving standard deviation of the real exchange rate. Their results indicated that export earnings would increase in the long run in the presence of volatility, especially for the nonagricultural sector. Chit & Judge (2011) studied the role of the financial industry and how it influences the impact of exchange rate volatility on the growth of exports. They conducted their study in 5 Asian countries: China, Indonesia, Malaysia, the Philippines, and Thailand, and found that exchange rate volatility could leave a more negative effect on economies that are less financially developed. For countries such as Germany and the US, the impact is positive (McKenzie, 1999). Mordecki and Miranda (2018) could not find evidence of a causal relationship between volatility and growth for Chile and New Zealand

from the 1990 – 2013 period. Sharma and Pal (2018) used pooled mean group estimators and concluded that in the long run, Indian exports to its major partners such as Germany or China would be adversely affected if volatility was high. But in the short run, the effects are ambiguous.

3. Data and Methodology

3.1. Data

Data for this paper was sought from World Bank, International Monetary Fund as well as International Financial Statistics. My sample comprises annual data for 64 countries from 1979 (which is the earliest year that they started calculating real effective exchange rate) to 2020, and one unit of observation is the exports growth of a country in one year. There is a total of 2729 observations in my sample.

World Bank defines the real effective exchange rate (REER) as the nominal effective exchange rate index adjusted for relative movements in national price or cost indicators of the home country. It compares a country's currency value against the weighted average of the currencies of its major trading partners. In other words, it is a helpful tool to measure a nation's competitiveness in the international market. The general formula to calculate REER is:

$$REER_i = NEER_i.CPI_i/CPI_i^{foreign} \quad (1)$$

where CPI_i is the consumer price index of the country under study and subscript i denotes that country. NEER is its nominal effective exchange rate, measured by taking weighted average of the nominal bilateral exchange rate between home country and trading partners. Similarly, $CPI_i^{foreign}$ is the geometrically weighted average of CPI indices of trading partners.

The exchange rate volatility is measured by the moving average of the standard deviation of REER. Following the work done by previous researchers like Chowdhury (1993), Arize and Malindretos (1998), the equation is as follows:

$$VOL = [1/m \sum(e_{t-1} - e_{t-2})^2]^{1/m} \quad (2)$$

where m is the number of periods and e denotes the log value of REER. In my study, m = 2.

I also generated a dummy variable for countries in Asia, assigning them the value of 1 if it belongs to the Asian group and a value of 0 if otherwise. This variable will help me in evaluating how the effects of exchange rate on exports growth change for Asian countries.

Below is the summary statistics for countries in the sample by variable. The standard deviation for REER, GDP and population size is relatively large, indicating that there are major differences in characteristics among 64 countries. The minimum value for GDP is USD 0.04 billions, while the maximum is 21,433.

Descriptive Statistics

	(1)	(2)	(3)	(4)	(5)
VARIABLES	N	mean	sd	min	max
Real Effective Exchange Rate	2,569	117.2	121.8	18.73	3,520
Gross Domestic Product (billions)	2,675	556.1	1,781	0.0400	21,433
Exports Growth (%)	2,334	5.318	11.80	-66.10	157.3
Population Size (millions)	2,674	42.21	155.1	0	1,398

Notes: The data is reported for 41 years from 1979 – 2020 and comprises of 64 countries. Real Effective Exchange Rate is calculated by International Monetary Fund and International Financial Statistics using 2010 as the base year. GDP is compiled by Word Bank and all values are in US dollars. Exports growth include the value of goods and services excluding wage, investment income and transfer payments. The dataset for population size contains some limitations , for example there is no information available for Chile's 1979 population.

3.2. Model Specification and Estimation

I first used the Ordinary Least Squares (OLS) estimators in order to examine the relationship between real effective exchange rate and export growth. The model is specified below:

$$X_{it} = \beta_{0+}\beta_1 GDP_{it} + \beta_2 REER_{it} + \beta_3 PS_{it} + \beta_4 AsiaREER + \alpha_i + \lambda_t + u_{it} \quad (3)$$

In this expression, subscript i refers to country and subscript t refers to year. X_{it}, GDP_{it}, $REER_{it}$, PS_{it}, AsiaREER, α_i, λ_t, u_{it} are exports growth, gross domestic product, real effective exchange rate, population size, interaction term of the real effective exchange rate and the Asian region, country fixed effects, time fixed effects and error term, respectively. Regarding the functional form, all control and dependent variables are expressed in logarithm forms. Since exports growth usually doesn't follow a linear trend [Appendix 1], and it is easy to see how the distribution of all 3 variables are highly skewed [Appendix 2], a logarithmic transformation is a convenient means of transforming them into those

that are more approximately normal. Moreover, this log-log model allows the dependent variable to react proportionally to changes in the regressors.

3.3. Hypotheses

Hypothesis 1: Since GDP is an indicator of both potential and sustainability of the production level, it is expected that GDP will have a positive impact on the growth of exports.

Hypothesis 2: A fall in the relative domestic prices following a depreciation of the exchange rate makes goods from a country cheaper, hence increasing its exports. I expect a negative correlation between REER and the exports growth.

4. Theoretical Framework

Following Clark (1973), assume there is a competitive firm with no market power. It only produces one product, not importing intermediate inputs and only selling to one foreign market. This firm will be paid in foreign currency, then converting the proceeds of its exports at the current exchange rate. There are several additional assumptions. First, hedging is impossible. Second, firm makes production decision prior to any changes of the exchange rate and hence cannot alter outputs in response to its movements. In this scenario, firm's profits depend greatly on the exchange rate. If managers of this firm are risk-averse, they will cut down own on output production, or exports, to minimize risk.

However, in reality, this hypothesis might not hold for several reasons. There are plenty of possibilities to reduce uncertainties of the exchange rates. For instance, exchange rates seem to adjust to differences in inflation rates much quicker than expected. Hence, if exports are priced in a foreign depreciating currency, losses that exporters suffer due to declining exchange rate will be partly offset by the higher foreign currency export price. When a firm trades with a large number of firms, this tendency of exchange rates to move in offsetting directions will act as a protection against currency risk. For multinational corporations, they could also diversify their portfolio of assets and liabilities in different currencies.

In addition, in the real world, firms can alter factor inputs in response to the exchange rates movements. If a firm can adjust its inputs to both low and high prices, it can greatly increase its profits with greater volatility, since it can sell more when price is high and vice versa.

5. Empirical Results

Real Effective Exchange Rate Analysis

	(1)	(2)	(3)	(4)
	Model_1	Model_2	Model_3	Model_4
Log Real Effective Exchange Rate	-.39**	-.167		
	(.161)	(.149)		
Log Gross Domestic Product	-.225***	-.248***	-.276***	-.276***
	(.072)	(.075)	(.071)	(.071)
Asia REER	.917***			
	(.306)			
Log Population Size	.026	.141	.312	.33
	(.308)	(.322)	(.283)	(.283)
Log REER Volatility		-.01	-.007	-.024
		(.036)	(.036)	(.039)
Asia Volatility				.107
				(.092)
Observations	1407	1367	1367	1367
Fixed Effects	Yes	Yes	Yes	Yes
Log Volatility	No	Yes	Yes	Yes
Log REER	Yes	Yes	No	No

Notes: Negative values of REER became missing values after being transformed to logarithm form. All regressions include country and time fixed effects and the models in column 1 and 4 include a region dummy. Significant at ***1%, **5%, *10%.

The first column of the table reports the effects of REER on exports growth, with an interaction term to examine its impact in Asian countries. The other dependent variables are GDP and Population Size, all in logs. The coefficient of -0.39 shows that in general, a 1% increase in REER will lead to a 0.39% decrease in exports growth. However, this effect is positive for Asia with a coefficient of 0.917, meaning that when the real effective exchange rate goes up by 1%, growth of exports also increases by 0.527%. An explanation for this dilemma is that a strong currency means that exporters from that country can buy raw materials from abroad with lower costs, which can be considered a compensation for lower competition after an increase in exchange rate. For example, Japan lacks many raw materials such as oil, iron ore, copper or wood. Vietnam also imports coal, chemical, raw cotton fibre, knitted cotton fabrics and use them to produce final products. In fact, this is a perfect example of the comparative advantage theory. More favorable conditions in foreign markets mean that their raw materials are not only cheaper, but also higher-quality. Moreover, if for instance, companies from Thailand decide to buy a large quantities of raw materials from Brazil, the Brazillian government might want to reciprocate this by establishing trade agreements with Thailand, hence promoting its exports growth. Global value chain has made it easier for developing Asian economies to move away from reliance on unprocessed, low-quality products and become specialized in their strong areas. Hence, their domestic value added falls, but their GDP per capita might increase as their economy is

benefiting from participating in this international production network. The second column repeats the regression but now I have included both log volatility and log REER to test how our dependent variable will change in the presence of these two controls. Both REER and volatility have no impact on exports, and GDP is the only variable that is statistically significant. Lastly, my third column presents the results with log volatility and excludes log REER. Once again, it shows that volatility doesn't affect the growth of exports. The result holds for Asian countries, as demonstrated in the fourth column. My finding confirms the study of other researchers such as Mordecki and Miranda (2018). It is possible that for risk-averse exporters, the increase in utility from increased average profits will be approximately offset by the decline in the utility because of exchange rate uncertainties. As a result, volatility will have no effect on trade.

6. Conclusions

This paper aims to examine the impact of real effective exchange rate and its volatility on exports performance. I use the Moving Average of Standard Deviation to measure exchange rate volatility and OLS estimators to test its relationship with growth of exports as well as exports with REER. It is found that an increase in the real effective exchange rate will have a negative impact on exports, but this impact turns out to be positive for the Asian region. I found no evidence of a causal relation between volatility and exports. My result refutes the traditional view discussed above, and it's likely that this is attributable to the offset effects I mentioned.

It is worth considering that for Asia, there are still many developing countries and they still need to import raw materials from abroad for their production. For now, it could be a compensation for the lower competition in the international market in the presence of a strong currency. However, in the long run when that country has the capacity to produce its own materials, this advantage might not hold. Exporters should focus on promoting exports by investing in building their brand, defining comparative advantages, or increasing quality of their products.

References

Aman, Qaiser, Irfan Ullah, Muhammad Imran Khan, and Saif-ud-Din Khan. "Linkages between Exchange Rate and Economic Growth in Pakistan (an Econometric Approach)." *European Journal of Law and Economics* 44, no. 1 (2013): 157–64. https://doi.org/10.1007/s10657-013-9395-y.

Arize, Augustine C., John Malindretos, and Krishna M. Kasibhatla. "Does Exchange-Rate Volatility Depress Export Flows: The Case of Ldcs." *International Advances in Economic Research* 9, no. 1 (2003): 7–19. https://doi.org/10.1007/bf02295297.

Blecker , Robert A. "The Benefits of a Lower Dollar: How the High Dollar Has Hurt U.S. Manufacturing Producers and Why the Dollar Still Needs to Fall Further." Economic Policy Institute. Accessed November 22, 2021. https://www.epi.org/publication/briefingpapers_may03bp_lowerdollar/?fbclid=IwAR1WhyFUeZMkcbSdmufsAwHDGfQd4ZW6yCphCn90Agp9QZUcPZklXyM9oBM.

Chit, Myint Moe, and Amrit Judge. "Non-Linear Effect of Exchange Rate Volatility on Exports: The Role of Financial Sector Development in Emerging East Asian Economies." *International Review of Applied Economics* 25, no. 1 (2011): 107–19. https://doi.org/10.1080/02692171.2010.483463.

Chowdhury, Abdur R. "Does Exchange Rate Volatility Depress Trade Flows? Evidence from Error-Correction Models." *The Review of Economics and Statistics* 75, no. 4 (1993): 700. https://doi.org/10.2307/2110025.

Dani Rodrik. "The Real Exchange Rate and Economic Growth." *Brookings Papers on Economic Activity* 2008, no. 2 (2009): 365–412. https://doi.org/10.1353/eca.0.0020.

Di Nino, Virginia, Barry Eichengreen, and Massimo Sbracia. "Real Exchange Rates, Trade, and Growth: Italy 1861-2011." *SSRN Electronic Journal*, 2011. https://doi.org/10.2139/ssrn.2236718.

"Does Currency Devaluation Actually Increase Exports in Emerging Markets?" Enterprise, July 15, 2019. https://enterprise.press/stories/2019/07/15/does-currency-devaluation-actually-increase-exports-in-emerging-markets/?fbclid=IwAR0Pa6oe8_Ta3l1srW68d62oMXTtN2A1LyNU2TyOpYg3LwHWdcwCSLUoJf8.

Eilat, Yair, and Liran Einav *. "Determinants of International Tourism: A Three-Dimensional Panel Data Analysis." *Applied Economics* 36, no. 12 (2004): 1315–27. https://doi.org/10.1080/0003684040001808 97.

"Exchange Rate Volatility and Trade Flows--Some New Evidence." *Policy Papers* 2004, no. 23 (2004). https://doi.org/10.5089/9781498330282.007.

Franke, Günter. "Exchange Rate Volatility and International Trading Strategy." *Journal of International Money and Finance* 10, no. 2 (1991): 292–307. https://doi.org/10.1016/0261-5606(91)90041-h.

Giovannini, Alberto. "Exchange Rates and Traded Goods Prices." *Journal of International Economics* 24, no. 1-2 (1988): 45–68. https://doi.org/10.1016/0022-1996(88)90021-9.

Huchet-Bourdon, Marilyne, and Mohsen Bahmani-Oskooee. "Exchange Rate Uncertainty and Trade Flows between the United States and China." *The Chinese Economy* 46, no. 2 (2013): 29–53. https://doi.org/10.2753/ces1097-1475460202.

Klaassen, Franc. "Why Is It so Difficult to Find an Effect of Exchange Rate Risk on Trade?" *Journal of International Money and Finance* 23, no. 5 (2004): 817–39. https://doi.org/10.1016/j.jimonfin.2004.03.009.

McKenzie, Michael D. "The Impact of Exchange Rate Volatility on International Trade Flows." *Journal of Economic Surveys* 13, no. 1 (1999): 71–106. https://doi.org/10.1111/1467-6419.00075.

Mordecki, Gabriela, and Ronald Miranda. "Real Exchange Rate Volatility and Exports: A Study for Four Selected Commodity Exporting Countries." *Panoeconomicus* 66, no. 4 (2019): 411–37. https://doi.org/10.2298/pan160927010m.

Narayan, Paresh Kumar, and Seema Narayan. "Is Devaluation Expansionary or Contractionary? Empirical Evidence from Fiji." *Applied Economics* 39, no. 20 (2007): 2589–98. https://doi.org/10.1080/00036840600707266.

Obansa, S. A., O. K. Okoroafor, O. O Aluko, and Millicent Eze. "Percieved Relationship between Exchange Rate, Interest Rate and Economic Growth in Nigeria: 1970-2010." *American Journal of Humanities and Social Sciences* 1, no. 3 (2013). https://doi.org/10.11634/232907811301374.

Pozo, Susan. "Conditional Exchange-Rate Volatility and the Volume of International Trade: Evidence from the Early 1900s." *The Review of Economics and Statistics* 74, no. 2 (1992): 325. https://doi.org/10.2307/2109665.

Sharma, Chandan, and Debdatta Pal. "Exchange Rate Volatility and India's Cross-Border Trade: A Pooled Mean Group and Nonlinear Cointegration Approach." *Economic Modelling* 74 (2018): 230–46. https://doi.org/10.1016/j.econmod.2018.05.016.

Thuy, Vinh Nguyen, and Duong Trinh Thuy. "The Impact of Exchange Rate Volatility on Exports in Vietnam: A Bounds Testing Approach." *Journal of Risk and Financial Management* 12, no. 1 (2019): 6. https://doi.org/10.3390/jrfm12010006.

Vaz, Paulo Henrique, and Werner Baer. "Real Exchange Rate and Manufacturing Growth in Latin America." *Latin American Economic Review* 23, no. 1 (2014). https://doi.org/10.1007/s40503-014-0002-6.

Yiheyis, Zelealem. "The Effects of Devaluation on Aggregate Output: Empirical Evidence from Africa." *International Review of Applied Economics* 20, no. 1 (2006): 21–45. https://doi.org/10.1080/02692170500362264.

Appendix

Figure A1: Exports growth of Bahamas from 1990 – 20

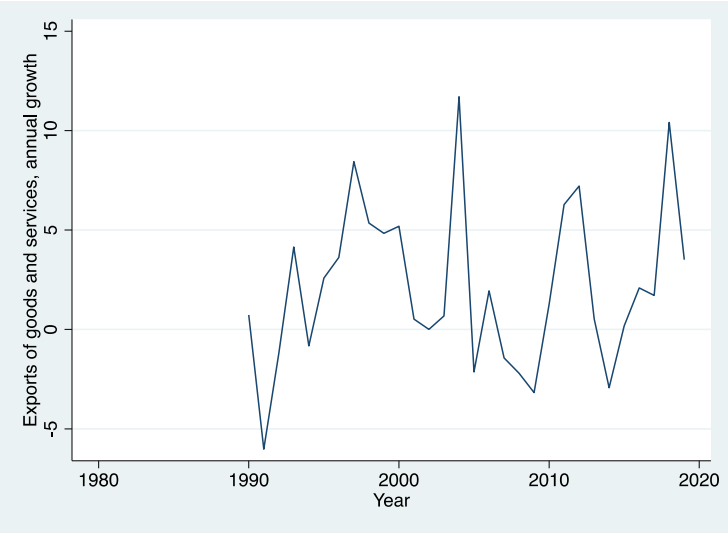


Figure A2: Distribution of GDP

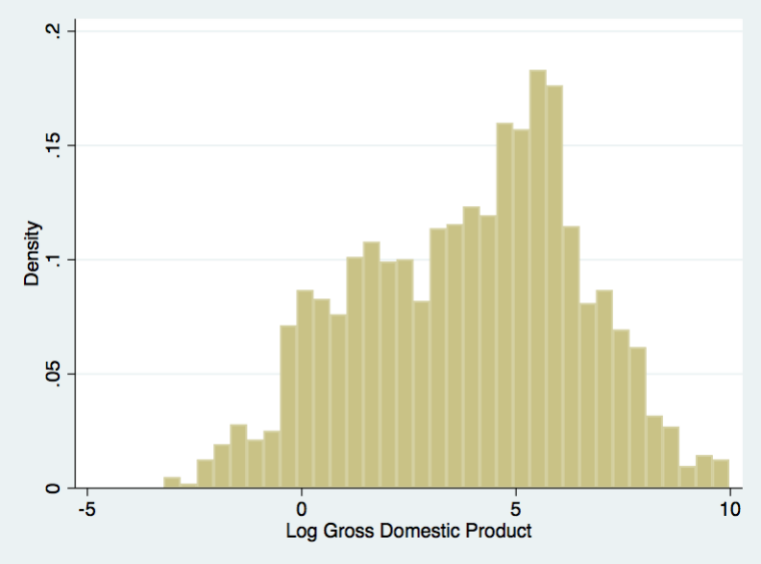


Figure A3: Distribution of Population Size

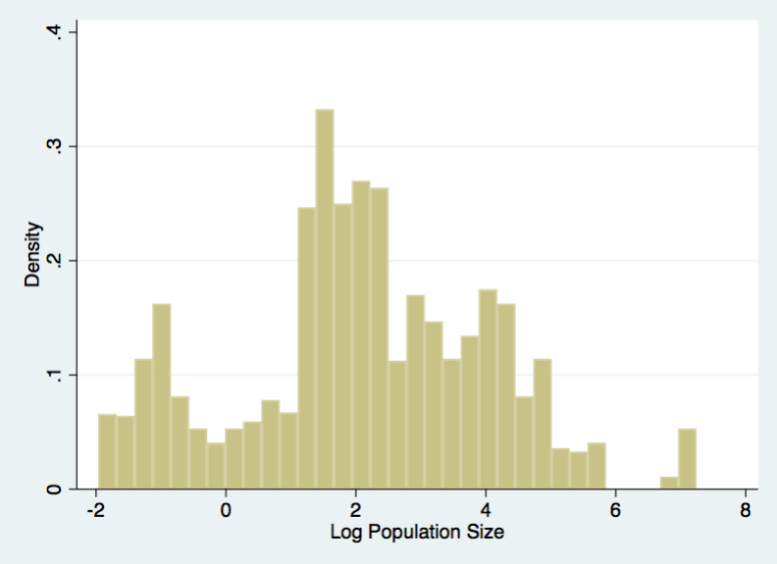


Figure A4: Distribution of REER