The Role of Exchange Rate on Export, Import and Trade Balance: Empirical Evidence from Australia, Argentina, Chile, Denmark, New Zealand

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ARTICLE INFO	ABSTRACT
Article History: *Received: 10 February 2022* *Revised: 17 April 2022* *Accepted: 27 May 2022* *Published online: 31 July 2022* **Keywords**: Balance of Payment (BOP) Exchange Rate Export Import Trade Balance.	The main findings of this paper are: (i) Role of exchange rate on export, import and trade balance. Other important variables that determine trade balance such as domestic income shows a long run negative relationship between trade balances, and foreign income shows a long run positive relationship (ii) the real exchange rate is an important variable to the trade balance, and devaluation will improve trade balance in the long run. Globalization has affected the relationship between the trade balance and the real exchange rate in two ways. On the one hand, the growth of trade taking place within industries makes the trade balance more sensitive to real exchange rate movements. On the other hand, a higher degree of vertical specialization and more global supply chains act to reduce this sensitivity. The relative importance of these two effects varies across countries. According to the estimates presented in this paper, changes in the real exchange rate could play a larger role on trade balance in the case of Chile, New Zealand and Argentina. This confirms that real exchange rate adjustment is only part of the solution for global rebalancing, and needs to be accompanied by other policy actions.

1. INTRODUCTION

International trade is an exchange of capital, goods and services across international borders or territories without much hindrance. It has flourished over the years due to the many benefits it has offered to different countries across the globe. In this case export means selling goods and services in foreign countries that are sourced or made in the home country. And Imports are the goods and services a business or customer purchased from foreign country. Thus the trade balance is identical to the difference between the value of a country's exports and the value of a country's imports for a given period. When export is greater than import the nation is to have a balance of trade surplus. On the other hand if imports are greater than exports, the nation is to have a balance of trade deficit.

Trade balance is the largest component of a country's balance of payment (BOP).It is influenced by all the factors that affect international trade. These include factor endowments and productivity, trade policy, exchange rates, foreign currency reserves, inflation, and demand.

For nations with low exchange rate values, balance of trade remains unfavorable. Proactive market policies are required to ensure that a country's trade balance remains favorable. A sound trade balance represents an important benchmark as it reflex economic stability between nations. It fortifies trade ties with other countries to stem job losses, inflation, and unemployment.

The exchange rate plays a significant rule in an open economy for policy making. After the liberalization

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reforms, it can affect a number of variables like investment decision, foreign direct investment, trade flows, capital flows and international remittance and foreign reserve etc. of the economy. As the above defined reasons at this juncture, exchange rate is the most significant issue of the economic research.

Alfred Marshall and Abba Lerner and their followers are In this paper we will examine (a) the effect of real exchange rate and foreign income on export. (b) Effect of real exchange rate and domestic income on import.

And finally we will set a relationship among trade balance, real exchange rate, foreign income and domestic income.

2. LITERATURE REVIEW

There is no consent in the theoretical and empirical literature about any unique significance of exchange rate polices on macroeconomics variable. For instance, Rose & Yellen (1989) and Rose (1990-1991) depict the exchange rate as an insignificant determinant of balance of tread. On the contrary, Singh (2002) and Onafowora (2003) find the real exchange rate as a significant determinant of trade balance. The empirical studies on this issue is a section of the literature investigates whether the exchange rate is a significant determinant for the balance of trade in the long run .Some of them report a significant impact of exchange rate movements of balance of trade,(for example ,Matesanz and fugarolas 2007, Musila and Newark 2003, singh 2002, vergil 2002) while some others find an insignificant result (for example Rose 1990, Rose 1991, Wilson 2001, Zhang 1996).

Such Contradictory and even opposite kind of empirical findings as the ones noted above clearly constrains any consensus and unambiguous prediction about the impact of exchange rate on either trade balance.

In fine, it can be said that most of the researchers have used the data from a specific country or a specific continent. But in this article, the authors have used data from five selected countries from various continents.

3. OBJECTIVE OF PAPER

Our paper studies -
- How import is affected by real exchange rate change,
- How export is affected by real exchange rate change,
- Role of real exchange rate on trade balance.

4. DATA, VARIABLE & METHODOLOGY

GDP (constant 2000), CPI (constant 2000), export, import, official exchange rate data for Australia, Denmark, New Zealand, Argentina, Chile are collected

of the opinion that devaluation or depreciation of domestic currency causes the competitive advantage in international market. When one nation devalues its currency as result domestic export becomes cheaper for foreign importers. On the other hand import for the same country becomes expensive and cause to decrease in import demand.

from the "World Development Indicators" (December 2012). It's worth mentioning that annual data is used because quarterly or monthly data of some relevant variables are not available in the existing data sources. The annual data used to model equation from year 1980 to 2010 obtained from databank.worldbank.org. Here we use GDP deflator as a substitute of CPI for Chile.

The study attempts to empirically estimate the two country model or trade by Rose & Yellen (1991) which is applied by empirical literature in both the developing and developed countries context. The theoretical basis of the empirical model can be given as fellows:

The import basically depends on domestic income & real exchange rate.

$$M = f(RER, Y)$$

Where, M = Import, RER = Real exchange rate, Y = Domestic income.

Here, $RER = OER \times (CPI\ of\ USA \div Native\ CPI)$

OER= Official exchange rate.

That is $M = f(RER, Y)$ .... (1)

Similarly, the export can be defined as:

$X = f(RER, Y^*)$ .... (2)

Where, X=Export, RER= Real exchange rate, Y*= Foreign income.

Thus, Real balance of trade can be written as:

$$TB = X - M$$
$$= f(RER, Y^*) - f(RER, Y)$$
$$= f(RER, Y^*, Y) .... (3)$$

A log-linear time series specification of the model can be stated as fellows:

$$ln\ B_t = \beta_0 + \beta_1 lnRER_t + \beta_2 lnY^*_t + \beta_3 lnY_t + U_t$$

Where $ln\ B_t, lnX_t, lnM_t$, imply logarithm of balance of trade($ln\ X_t - lnM_t$), export and import at time t, respectively . $lnRER_t, ln\ Y^*, ln\ Y$ are the logarithms of the real exchange rate, foreign income and domestic income.

For analyzing the data we have used an econometric program, Gretle (2012), and then we have run OLS method. Here VIF test is not necessary, because all independent variables are not highly dependent to each others.

The theoretical notion suggests that exports and imports increase as the foreign income and the domestic income rises respectively. Hence, we could expect $\beta_2 > 0$ and $\beta_3 < 0$. On the contrary, imports may decline as income increases if real income rises due to an increase in the production of import-substitute goods and in that case we would expect $\beta_3 > 0$. The effect of movement in the real exchange rate on the balance of

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trade (B_t) is ambiguous. B_1 is the focus this study and it could be positive or negative. If real depreciation takes place, exports increase, imports fall and thus it improves the trade balance. So we can expect $\beta_1 > 0$.

5. ANALYSIS AND ESTIMATION

In the previous section we discussed the model, variables, data sources as well as statistical software. So our model is a regressive model which is a log function as follows:

$$\ln B_t = \beta_0 + \beta_1 \ln RER_t + \beta_2 \ln Y^*_t + \beta_3 \ln Y_t + U_t$$

We took the logarithm values of all variables by using an econometric program, Gretle (2012), and then we have run OLS method.

Here, Fig: 1 to Fig: 5 illustrate the quantity of export and import in different periods. For New Zealand from 1980 to 2003 amount of export was greater than that of import. After 2003 import increased and export fell. For Argentina the difference between export and import was always high over time and export was greater than import. In figure-3 we see that the difference between export and import for Australia was moderate from 1980 up to 2002.But after that period imports increased significantly. Figure-4 explains that Chile made a significant change in their exports sector. From 1982 to 2004 amount of export was greater than that of import. Figure-5 illustrates that Denmark dominated in export sector at all periods.

Fig: 6 to Fig: 10 illustrate the Nominal and Real Exchange Rate in different periods.

From figure-6, we find real exchange rate higher than official exchange rate till 1990 in Argentina. It could happen because of faster domestic inflation rate than trading partners in that period. After 1990 it was moderate. Figure-7 explains that the difference between real and official exchange rate for Australia tend to minimum level after 1985. In figure-8, we see that real exchange rate was higher than official exchange rate till 2004 due to high inflation. But after that period whether they could slow down inflation rate or the inflation rate of trading partners was faster than that of their one's. From figure-9, we find official exchange rate for Denmark remains higher than real exchange rate till 2005. Figure-10 shows there were ups and downs of real exchange rate and official exchange rate till 1999. But after 1999 the difference became at minimum level.

Fig: 11 to Fig: 15 illustrate the Domestic and Foreign Income (USA). US Gross Domestic product was always higher than that of countries we worked on.

6. ANALYSIS AND RESULT

Estimated results with ordinary least square method (OLS) have been reported in the following tables:

From the table 01, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.674676 implying that a one percent increase in RER increases balance of trade by 67%.

Similarly a 1% increase in domestic income for Chile decreases balance of trade by approximately 54%. But coefficient of GDP of USA is 0.386031 that is a one percent increase in US GDP increases balance of trade of Chile by approximately 39 %.

Here, the 't' ratio of the coefficient of RER is 8.0255 which is significant, that is clear that RER increase, increases Trade Balance.

Similarly, the 't' ratio of the coefficient of domestic income for Chile is -2.4918 which is also significant. But 't' ratio of the coefficient GDP of USA is 0.9624. That is it is insignificant and GDP of USA has insignificant influence on Chile's trade balance.

If all other variables remaining constant the estimated regression equations is as follows:
OLS equation for Chile-

$$\ln B_t = -2.47571 + 0.674676 \ \ln RER_t + 0.386031 \ \ln Y^*_t - 0.534973 \ln Y_t + U_t$$

From the table 02, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.0661338 implying that a one percent increase in RER increases balance of trade by 6%. Similarly, a 1% increase in domestic income for Denmark decreases balance of trade by approximately 70%. Coefficient of GDP of USA is 0.36563 that is a one percent increase in US GDP increases balance of trade of Chile by approximately 37 %

Here, the 't' ratio of the coefficient of RER is 0.9458 which is insignificant. Similarly, the 't' ratio of the coefficient of domestic income for Denmark is -1.1941 which is also insignificant. 't' ratio of the coefficient GDP of USA is 0.9624. That is it is insignificant and GDP of USA has insignificant influence on Denmark's trade balance.

If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for Denmark-

$$\ln B_t = 7.08177 + 0.0661338 \ln RER_t + 0.36563 \ln Y^*_t - 0.701862 \ln Y_t + U_t$$

From the table 03, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.168771implying that a one percent increases in RER increases balance of trade by 16%.

Similarly, a 1% increase in domestic income for New Zealand decreases balance of trade by approximately 79%. But coefficient of GDP of USA is 0.405744 that is a one percent increase in US GDP increases balance of trade of New Zealand by approximately 41%

Here, the 't' ratio of the coefficient of RER is 3.1411 which is significant, that is clear that RER increase, increases Trade Balance.

Similarly, the 't' ratio of the coefficient of domestic income for New Zealand is -4.2350 which is also significant. 't' ratio of the coefficient GDP of USA is 2.5566. That is it is significant and GDP of USA has

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significant influence on New Zealand's trade balance.
If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for New Zealand -

$$ln \ B_t = 7.4228 + 0.168771 \ lnRER_t$$
$$+0.405744 \ lnY^*_t - 0.798525 \ lnY_t + U_t$$

From the table 04, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.270395 implying that a one percent increase in RER increases balance of trade by 27%. Similarly a 1% increase in domestic income for Australia decreases balance of trade by approximately 246%. Coefficient of GDP of USA is 2.44554 that is a one percent increase in US GDP increases balance of trade of Australia by approximately 244 %.

Here, the't' ratio of the coefficient of RER is 1.6788 which is insignificant, that is clear that RER has less influence on Trade Balance.
Similarly, the't' ratio of the coefficient of domestic income for Australia is -3.7410 which is also significant. But 't' ratio of the coefficient GDP of USA is 3.2692. That is it is significant and GDP of USA has significant influence on Australia's trade balance.
If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for Australia -

$$ln \ B_t = -7.76227 + 0.270395 \ lnRER_t$$
$$+2.44554 \ lnY^*_t - 2.46379 lnY_t + U_t$$

From the table 05, it can be said that the estimated coefficients have all expected sign. The coefficient of RER is 0.577404 implying that a one percent increase in RER increases balance of trade by 57%.

Similarly, a 1% increase in domestic income for Argentina decreases balance of trade by approximately 161%. But coefficient of GDP of USA is 0.994167 that is a one percent increase in US GDP increases balance of trade of Argentina by approximately 99 %.
Here, the't' ratio of the coefficient of RER is 10.3978 which is significant, that is clear that RER increase, increases Trade Balance. Similarly, the't' ratio of the coefficient of domestic income for Argentina is -8.2340 which is also significant. But't' ratio of the coefficient GDP of USA is 5.5370. That is it is significant and GDP of USA has significant influence on Argentina's trade balance.
If all other variables remaining constant the estimated regression equations is as follows;
OLS equation for Argentina -

$$ln \ B_t = 12.4864 + 0.577404 lnRER_t$$
$$+0.994167 lnY^*_t - 1.6144 lnY_t + U_t$$

7. CONCLUSIONS

The findings of this Paper shows that real depreciation/appreciation of exchange rate has positive/negative impact on balance of trade. But the policy makers and economists are reluctant to depreciate local currency because it can adversely affect other macroeconomic variables such monetary aggregate, interest rate and inflation etc. Furthermore complete integrity of trading country is also the key factor to determine the trade flows. This paper finds significant role of exchange rate on trade balance of Chile, New Zealand and Argentina. On the other hand the role is insignificant in the case of Denmark and Australia.

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Appendices

Table 1 Regression Results Coefficients

Model 1: OLS, using observations 1980-2010 (T = 31)				
Dependent variable: Trade balance of Chile				
	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	-2.47571	6.48048	-0.3820	0.70543	
l_RER_CHL	0.674676	0.0840662	8.0255	<0.00001	***
l_GDP_USA	0.386031	0.401101	0.9624	0.34438	
l_GDP_CHL	-0.534973	0.214698	-2.4918	0.01915	**

01,   **Table 2:** Regression Results Coefficients

Model 2: OLS, using observations 1980-2010 (T = 31)				
Dependent variable: Trade balance of Denmark				
	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	7.08177	3.43642	2.0608	0.04908	**
l_RER_DNK	0.0661338	0.0699257	0.9458	0.35265	
l_GDP_DNK	-0.701862	0.587779	-1.1941	0.24283	
l_GDP_USA	0.36563	0.399106	0.9161	0.36771	

Table 3: Regression Results Coefficients

Model 3: OLS, using observations 1980-2010 (T = 31)				
Dependent variable: Trade balance of New Zealand				
	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	7.4228	0.990228	7.4961	<0.00001	***
l_GDP_USA	0.405744	0.158706	2.5566	0.01651	**
l_RER_NZL	0.168771	0.0537291	3.1411	0.00405	***
l_GDP_NZL	-0.798525	0.188555	-4.2350	0.00024	***

Table 4: Regression Results Coefficients

Model 4: OLS, using observations 1980-2010 (T = 31)				
Dependent variable: Trade balance of Australia				
	Coefficient	*Std. Error*	*t-ratio*	*p-value*
const	-7.76227	5.10344	-1.5210	0.13989	
l_RER_AUS	0.270395	0.161065	1.6788	0.10473	
l_GDP_AUS	-2.46379	0.658592	-3.7410	0.00087	***
l_GDP_USA	2.44554	0.748049	3.2692	0.00294	***

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Table 5: Regression Results Coefficients

	Coefficient	Std. Error	t-ratio	p-value	
Model 5 :OLS, using observations 1980-2010 (T = 31)					
Dependent variable: Trade balance of Argentina					
const	12.4864	2.47519	5.0446	0.00003	***
l_RER_ARG	0.577404	0.0555314	10.3978	<0.00001	***
l_GDP_ARG	-1.6144	0.196065	-8.2340	<0.00001	***
l_GDP_USA	0.994167	0.179549	5.5370	<0.00001	***
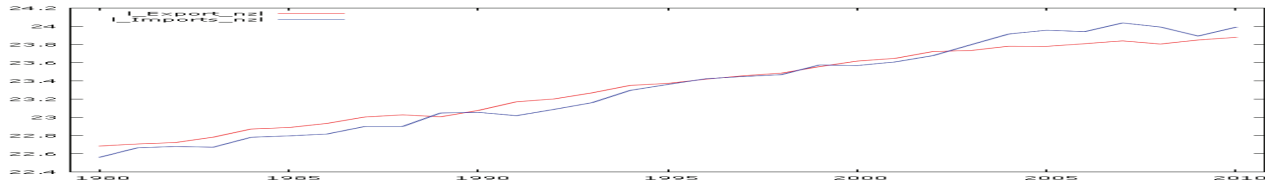
Figure 1: Export and Import of New Zealand at different periods
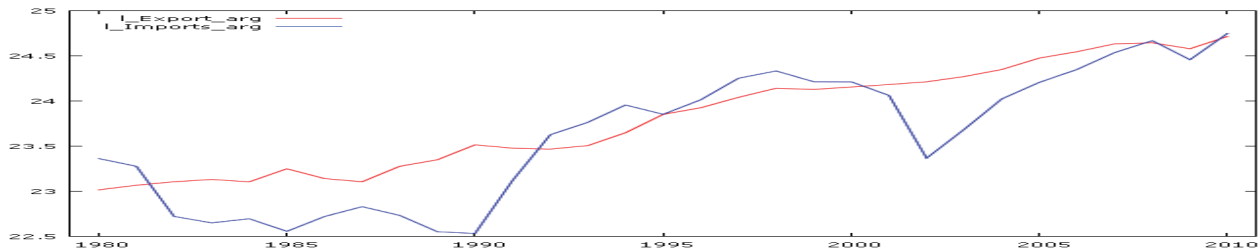
Figure 2: Export and Import of Argentina at different periods
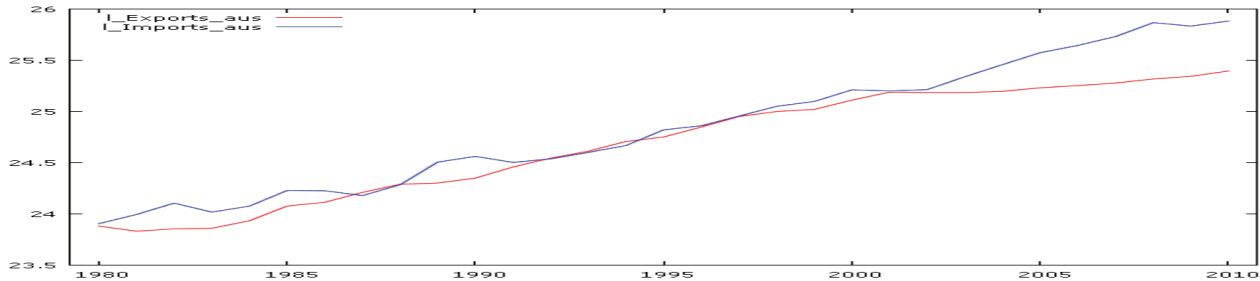
Figure 3: Export and Import of Australia at different periods
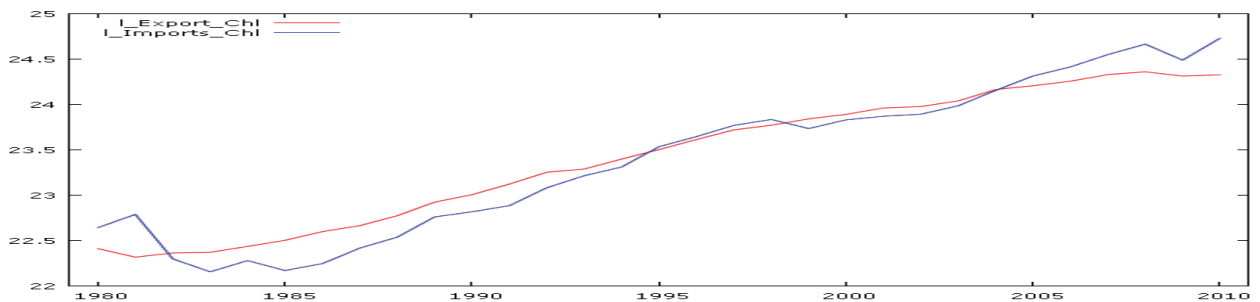
Figure 4: Export and Import of Chile at different periods

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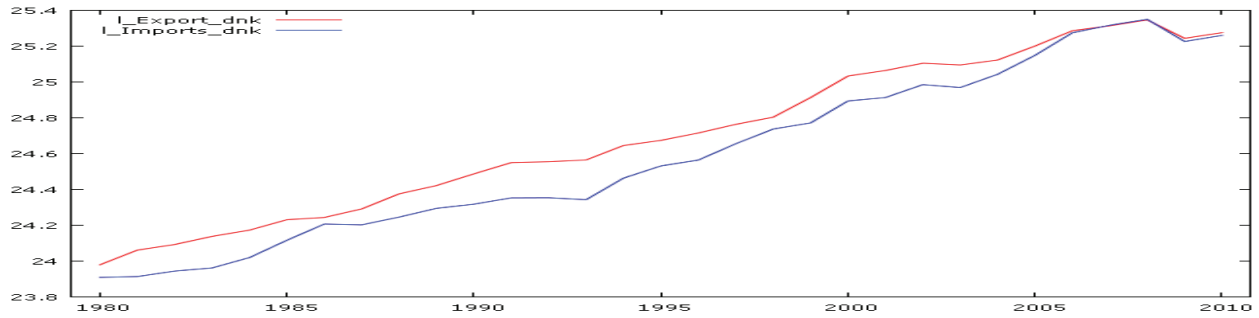
Figure 5: Export and Import of Denmark at different periods
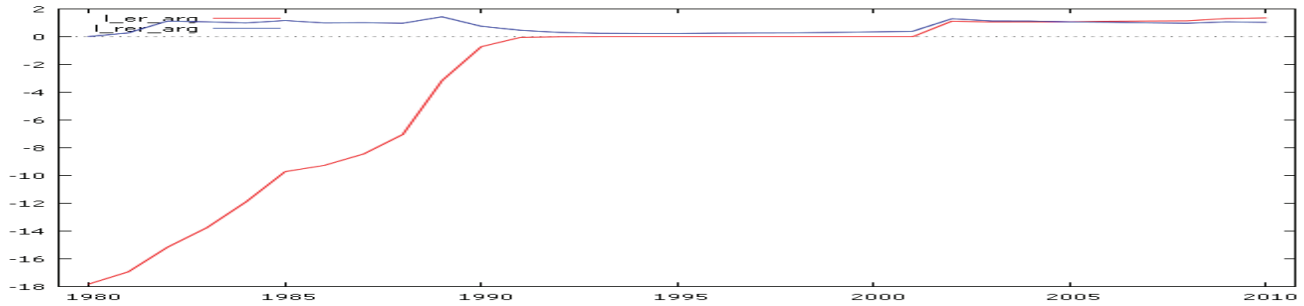
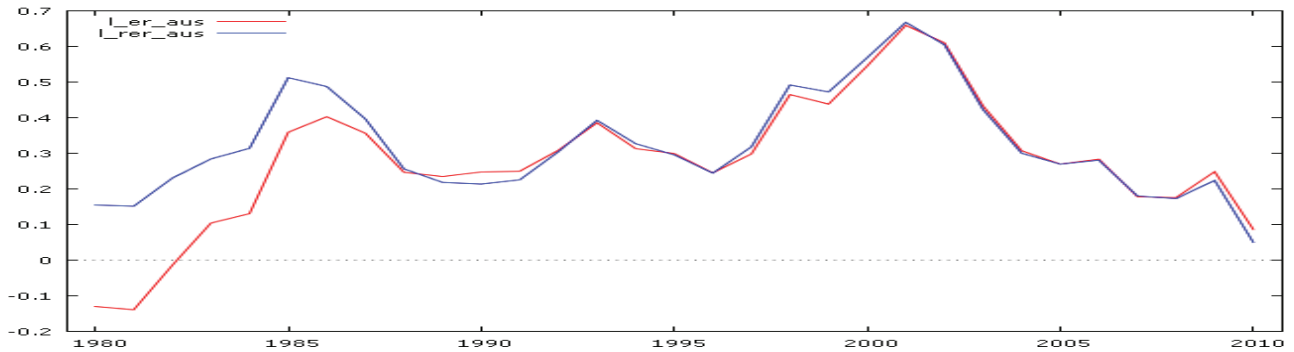**Figure 6:** Official and Real exchange rate for Argentina at different periods

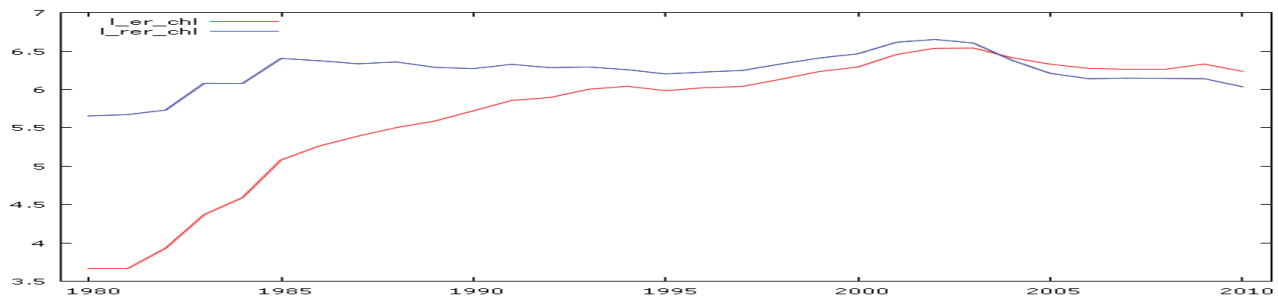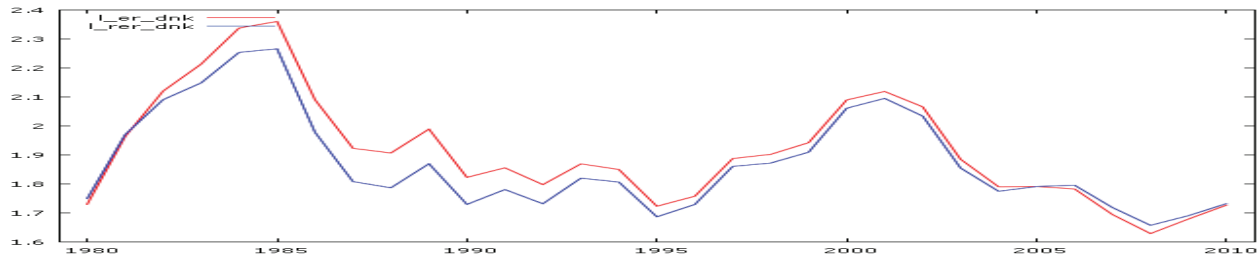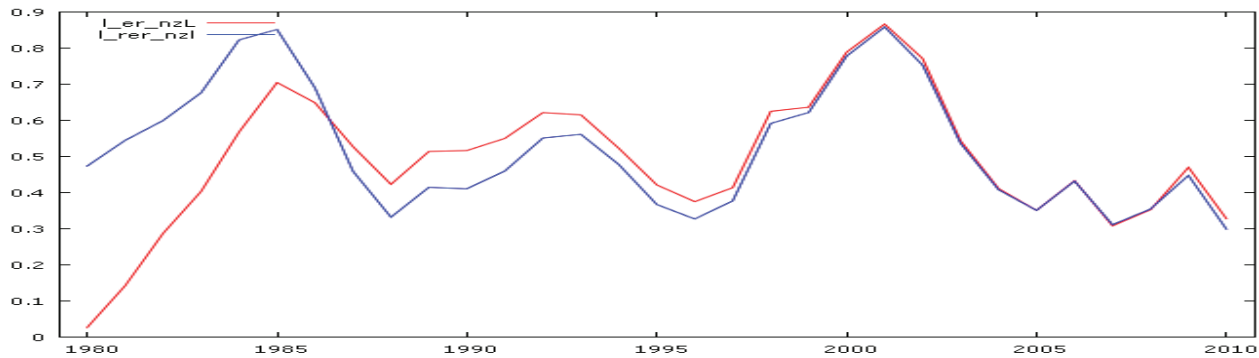**Figure 7**: Official and Real exchange rate for Australia at different periods

Figure 8: Official and Real exchange rate for Chile at different periods

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Figure 9: Official and Real exchange rate for Denmark at different periods

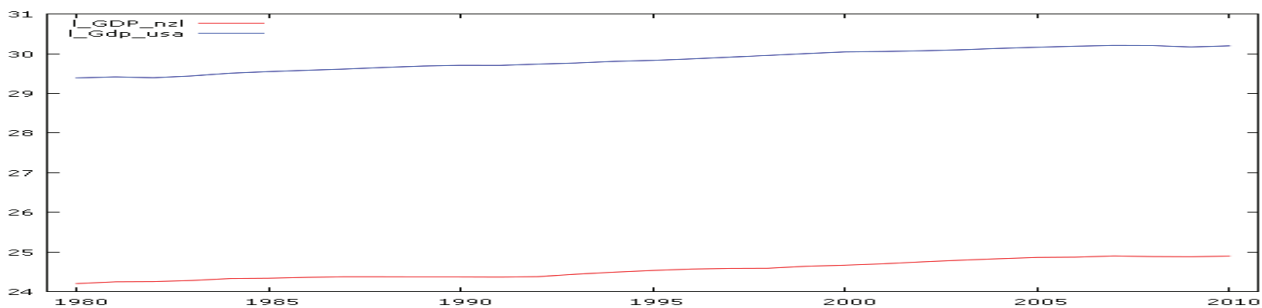**Figure 10:** Official and Real exchange rate for New Zealand at different periods

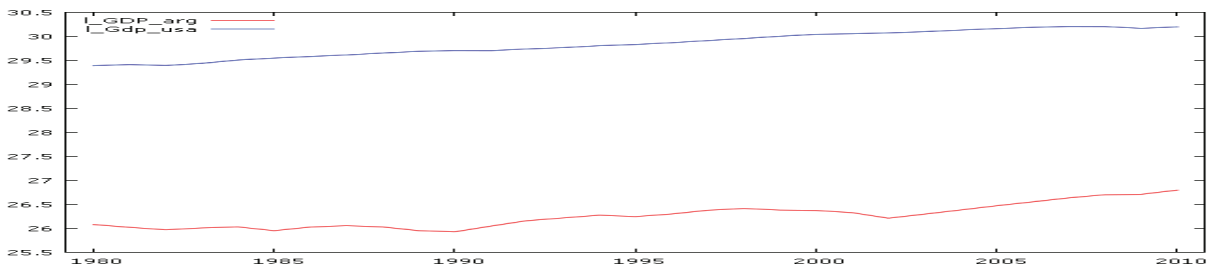**Figure-11:** Gross Domestic Product for New Zealand and USA

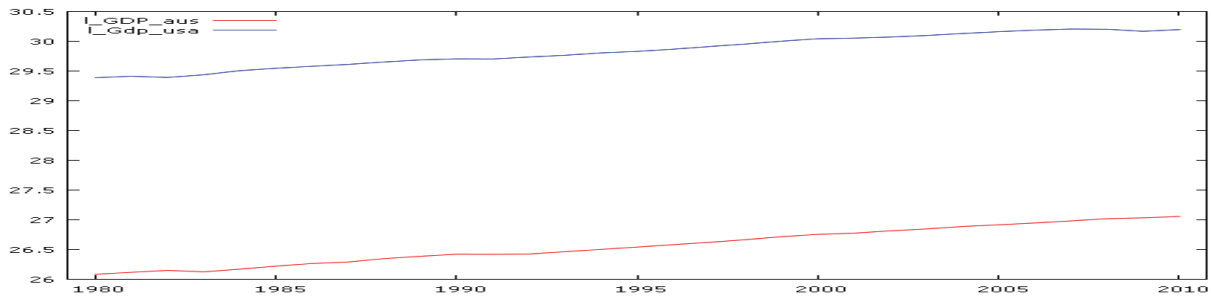**Figure-12:** Gross Domestic Product for Argentina and USA

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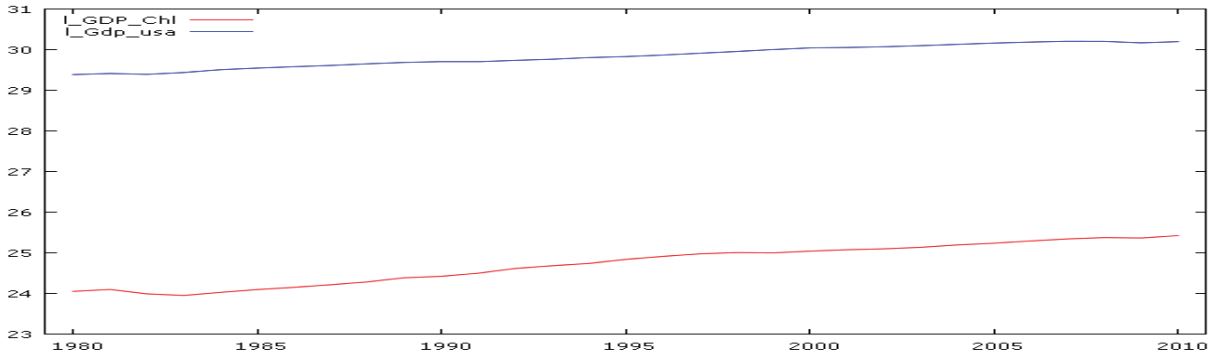**Figure -13:** Gross Domestic Product For Australia and USA

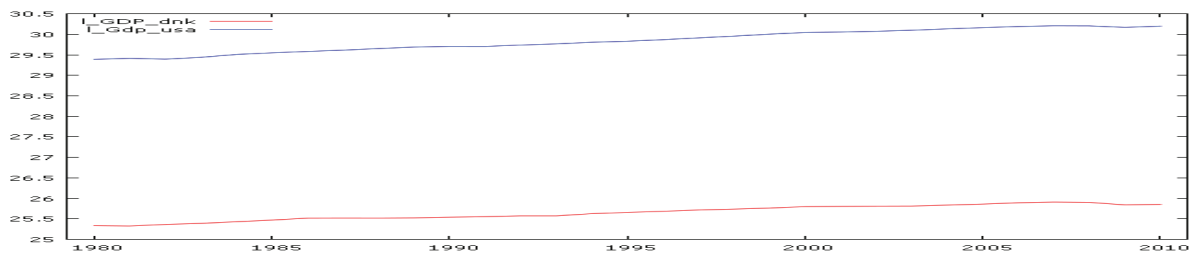**Figure -14:** Gross Domestic Product for Chile and USA

Figure -15: Gross Domestic Product for Denmark and USA