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Impact of Foreign Aid on Economic Growth in Nepal

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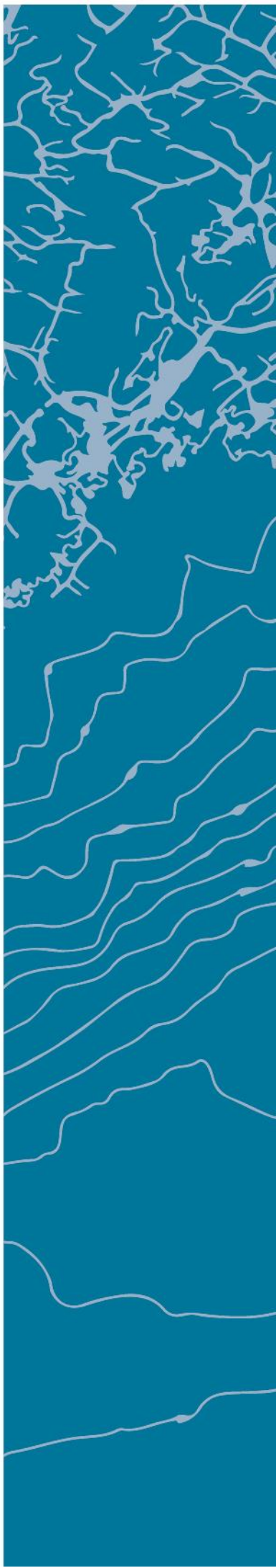

Preface

Two pleasant years at University of Agder as a master student have come to the end and it's time to acknowledge the opportunity I got to be enrolled at the University of Agder and show my appreciation to everyone who had been a part of this journey.

I would like to express my sincere gratitude to my supervisor, Professor Jochen Jungeilges for the encouragement and continuous support he has provided since the beginning. All the prolonged meetings and discussions we had have helped me enormously. I am also grateful to him for understanding my personal circumstances and the cooperation he had shown.

My sincere acknowledgement to the department of Economics and Finance, School of Business and Law at UIA, all the staffs for providing advices whenever asked for, and the academic staffs and professors for providing the best academic environment. The staffs standing in the IT help desk, who helped me solve the technical issues on my computer, and the subject librarians at the university deserve the word of appreciation.

Last but not the least, my biggest thanks to the families and friends in Norway who constantly motivated me on this biggest achievement. My husband and my dear son who comprehended with the busy schedule and made such arrangements to provide me enough time for the completion of this thesis. Special thanks to my husband, Ramesh Kumar, and my cousin, Devendra Karki, for providing remarkable comments on my work. I am also indebted to my families and friends in Nepal who have helped me directly and indirectly for the development of this thesis.

Abstract

Nepal, being one of the least developed countries, has been receiving aid for more than six decades. It is very important to see how the country is being able to utilize the aid receipts in the economic development of the nation.

Using annual time series data from 1983 to 2013, the effect of foreign aid on economic growth of Nepal has been analysed. The empirical work has been performed in two phases (1983-2002 and 1983-2013). The result from Johansen's cointegration test for the shorter time interval, when there was relatively a poor economic situation in the country, reveals that aid has a negative long-run effect on per capita real GDP. In a longer time interval, including a period of improvement on macroeconomic indicators, the effectiveness of aid is increased showing a significant positive effect of foreign aid on per capita real GDP. There is a negative impact of aid on per capita real GDP in the short run.

A good policy environment helps increase the aid effectiveness. However, the prevailing trade policy in the country is negatively affecting the aid effectiveness due to the extremely increased trade deficit.

Keywords: Foreign aid, Economic Growth, Cointegration, Error Correction Model, Nepal

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Chapter 1. Introduction

1.1 Background

Nepal is a small country in South Asia having 29.7 million population and per capita GDP of 1004 USD. It occupies only 0.3 percent area of the world and 3 percent land area in Asia. More than 75 percent of the country's land consists of the mountainous and hilly region where the transportation is still a major problem. Nepal borders with India on east, south, and west and with China on the north. Being a landlocked country, Nepal has to depend on India to get access to the closest sea. There had been few blockades in the economic history of Nepal, imposed by India, which affected all imports coming through India resulting in difficult economic situation and hardships in lives. The sea accessibility in China for third country trade is still a problem for Nepal due to the topography of the country with lack of road facilities.

Being one of the least developed countries in the world, Nepal is highly dependent on foreign aid. The country has been deploying foreign assistance both as aid for budget support and non-budgetary aid for more than six decades. However, the share of foreign aid on the government's total budget has been declining by the improved mobilization of domestic resources which shows that the country is transforming into a self-reliant economy. Likewise, the average development assistance through the off-budget mechanism has also been declining over the years (Ministry of Finance, 2018a). In order to achieve the Sustainable Development Goals, set by the United Nations, foreign aid still plays an important role for Nepal. Policy makers believe that the country's poverty and underdevelopment are major motivations for donors of foreign aid. Besides, the competition between donor nations has also seemed to be a reason for Nepal receiving more aid. As long as Nepal expresses its willingness and commitment to adhere to the aid conditions, the donors will continue to provide aid for the developmental activities either in the form of loan or grant (Khadka, 1997).

1.2 Objective and scope of the work

The main objective of this thesis is to identify the impact of foreign aid on economic growth of Nepal and how effective aid has been to boost the economy. It is also interesting to see how the aid effect changes when measured in a controlled environment having other categorical variables and during different time intervals. There are not so many research projects carried out in this context for Nepal and even the existing researches don't cover the recent time period. This thesis tries to fill the time gap in the economic studies on this particular subject matter in Nepalese economy.

1.3 Methodology of the study

Using cointegration and error correction mechanism, I am going to analyze the effectiveness of foreign aid both in the long and short-run in the context of Nepal. As a preliminary task, I am going to replicate the empirical work (Bhattarai, 2009) has performed using annual data from 1983 to 2002. This part of the work will be called as 'first phase' or 'sub-period' interchangeably throughout rest of the paper. In the second part of this thesis, I will include a longer period (1983-2013), which will be named as 'full-period' and perform a similar empirical test to see what changes can occur when we include the longer time period. The data will be analyzed using the statistical software STATA.

1.4 Outline of the thesis

The first chapter contains background information about Nepal and basic information of this thesis including the objective of work and research methodology. Chapter 2 briefly introduces Nepalese economy, where I have tried to give the reader a short and precise history and information about the country's economy. Chapter 3 explains the overview of foreign aid to Nepal. This chapter discusses how the practice of foreign aid started in Nepal including the historical and recent trend of aid inflows and presents some facts and figures of aid on different sectors of the economy. It also states some of the major projects being undertaken by recent foreign aid commitments.

The literature review has been presented in chapter 4 both in theoretical and empirical perspective. Chapter 5 explains the data collection procedure. It contains the sources of data and any explanation required in data selection. Chapter 6 is about the statistical methodology that this thesis will be

developed upon. This chapter briefly explains all the statistical tests that will be carried out and the procedure to conduct the tests. Similarly, chapter 7 includes the specification and development of models. The choice of control variables and other policy variables have been also stated in this chapter.

The empirical results and their interpretations from the statistical point of view have been presented in chapter 8. The discussion has been presented in chapter 9 with economic interpretation of the results. The findings have been compared and contrasted with the existing literatures. This chapter also mentions the challenges and limitations faced in the course of writing this thesis. Chapter 10 summarizes the thesis with some concluding remarks and recommendations.

Chapter 2. Brief history of the Nepalese economy

2.1 Background

Economic historians have framed the history of Nepalese economy into various ways. M.K. Dahal and Horst M (as cited in Agarwal & Upadhyay, 2006) summarize the economic history of Nepal into five segments as below:

The period of unification, economic integration and consolidation	1768 – 1846
The period of exploitation, also known as the 'black period'	1846 – 1951
The period of economic transition with emerging democracy	1951 – 1961
The period of planned economic development	1956 – 1990
An era of globalization with build in features of marketization, liberalization and privatization	1990 onwards

Nepal had started its unification of scattered small nations, thus economic integration, by the mid of eighteenth century when the rest of the world economy was also poor (Festival, 2017). While other big nations like America, Japan and Germany were stepping into the economic prosperity, Nepal on the other side turned into the period of political exploitation when Jang Bahadur Rana took over as prime minister and established the hereditary rule of the Ranas as prime ministers which lasted for more than a hundred years. This period was also known as the 'black period' when the country had deprived its citizens from basic right for education, the country facing huge capital flights, and the practice of unproductive expenses on building sophisticated palaces.

With the establishment of democracy in mid-twentieth century, Nepal turned into the phase of economic transition when the country got the first government in the year 1952. The first 5-year plan was introduced in the year 1956 after one year of the establishment of Planning Commission. Nepal Rastra Bank as the central bank was established in the same year and started to print Nepali notes after a few years of establishment. Several other developments in the field of banking and insurance took place during this period including the establishment of various state-owned industries with the formation of National Industrial Development Cooperation. However, during 1970 to 1980 the country experienced an economic crisis. Export stagnated and imports surged. GDP and population both grew at the same rate during the 1970s, causing stagnation in per capita

income (Osmani & Bajracharya, 2007). To overcome the crisis, Nepal adapted the structural adjustment and economic reform programs under the guidance of IMF and World Bank (Chaudhary, 2018).

The Maoist insurgency, erupted around 1996, against the socio-economic and political conditions pushed Nepal for a 10 year long civil war. It caused the death of around thirteen thousand people and a huge destruction on infrastructures. There exist several arguments that corruption, lack of long-term vision on the ruling elite, disparity among the rural and urban life, unemployment, and development failure led to frustration and resentment among youths which fuelled for the civil war in Nepal.

Nepalese economy suffered most during the insurgency. The GDP growth of 8.22 percent in 1994 declined to 3.02 percent in 1998. It further went down to 0.12 percent in 2002 when it took the form of civil war. With the increasing violence and strikes, business activities decreased, tourism and hotel business got affected due to the decrease in number of internal and external tourist arrival. Foreign aid and foreign investments also declined. The portion of defence budget from the total budget increased and a lot of developmental activities halted.

The conflict ended in 2006 when the government of Nepal and the Communist Party of Nepal (Maoist) signed the peace agreement. After the conflict had resolved, some improvements on macroeconomic indicators showed that the country will escalate economic growth. The Ministry of Finance data shows that the average GDP growth rate increased from 0.97 percent in the fiscal year 2006/07 to 5.8 percent the next fiscal year. The growth rate on money supply also increased, inflation decreased, and total trade increased. However, the growth could not sustain for long and it has not met the expectation of public until now. On the other hand, the tourism and business sector seem to have gained some confidence since then. The number of tourist arrival increased. Foreign investments increased in the form of foreign direct investments.

The devastating earthquake in 2015, which killed more than 8 thousand people leaving nearly 17 thousand injured and 2.8 million displaced, is also one of the biggest hindrances for Nepalese economy in recent times. It destroyed 473,000 houses and damaged many schools, hospitals, roads and other infrastructure in the areas affected. Reconstruction of the damaged properties and infrastructure has not yet completed after four years of the earthquake and there are many families

whose houses have not been rebuild yet. For the reconstruction, foreign aid increased by almost 35 percent in 2015 while the increment on aid on previous year was around 8 percent. As stated in Figure 2-1, GDP growth declined to 3.32 percent in 2015 from around 6 percent previous year and down to 0.59 percent in 2016.

2.2 Gross domestic product

Having GDP of 21.46 billion USD, Nepal was the fifth biggest economy among South Asian nations in 2017. Nepal is said to be an agricultural country. However, the history of GDP composition of agriculture and non-agriculture sector as presented in Table 2-1 tells a different story. Nepal had an agriculture-based economy prior to 1990. The non-agriculture sector started to dominate the agriculture sector as it comprises a higher portion of GDP for the period afterwards. Over the period of some 40 years, the share of agriculture on the country's GDP has declined from an average of 60 percent to less than 30 percent (for more derail, refer to Appendix 8).

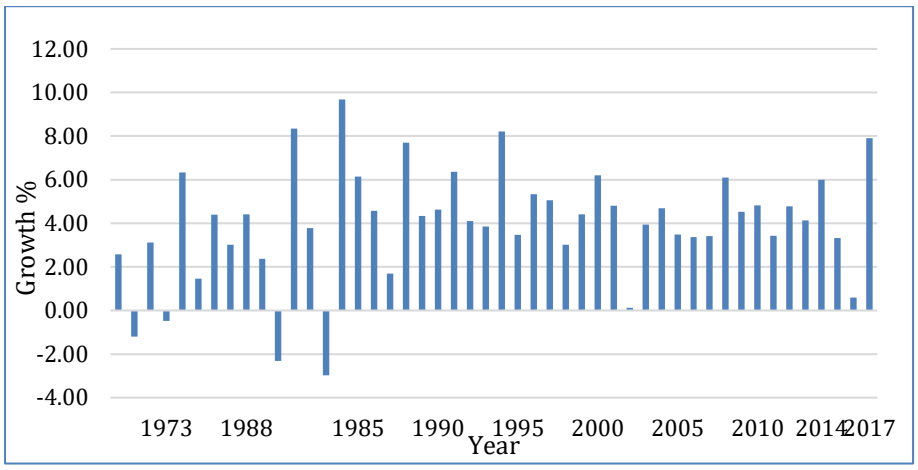
Table 2-1: Share of agricultural and non-agricultural GDP (percentage of total GDPs)

Year	Agricultural GDP	Non-agricultural GDP
1975-82	60.12	35.2
1983-90	50.46	44.8
1991-98	40.63	55.67
1999-2006	35.54	60.86
2007-14	31.99	62.34
2014-18	28	63.84

(Source: Ministry of Finance)

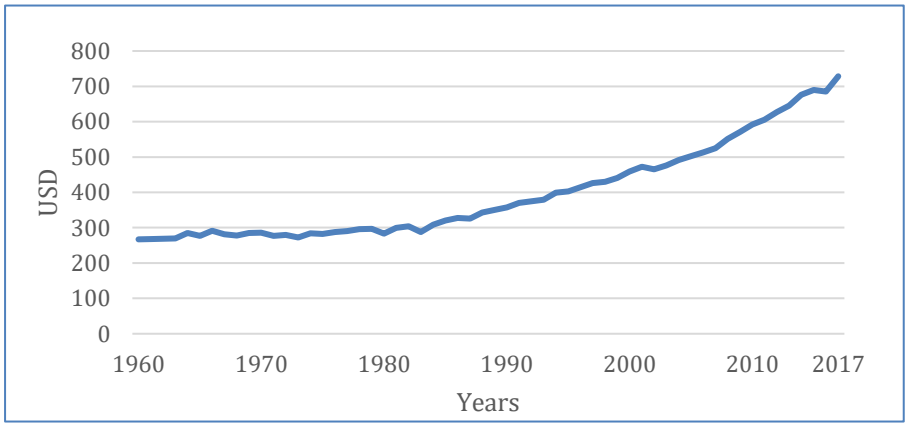
There have been several fluctuations in the GDP growth of Nepal which we can see in Figure 2-1. Nepal in its economic history has witnessed some negative growth of GDP together with minimal growth and some very good growth including -2.98 percent, 9.68 percent, and 0.12 percent in the year 1983, 1984 and 2002 respectively. As shown in Figure 2-2, the per capita GDP stagnated during the 1960s to 1970s and started to grow afterwards. Although there have been some small declines, per capita GDP of Nepal is growing on a linear trend which signifies that the average living standard and economic wellbeing of Nepalese people has been increasing.

Figure 2-1: Economic growth of Nepal



(Source: WDI, World Bank)

Figure 2-2: GDP per capita, Constant 2010 USD



(Source: WDI, World Bank)

2.3 Employment

Out of economically active population in Nepal, 2.4 percent are unemployed in the year 2018 while the rate was 3 percent in 2013. More than 70 percent of total employment is in the agriculture sector Table 2-2 explains the share of employment in service, industry, and agriculture sector. Although service sector covers around 20 percent of total employment, it contributes more than 50 percent of total GDP which is an evidence that the service sector is growing in the country's economy.

Table 2-2: Employment in sectors, percentage of total employment

Year	Employment in services	Employment in industry	Employment in agriculture
2000	16.5	11.3	72.2
2009	18.2	7.4	74.4
2010	17.7	7.5	74.8
2011	17.5	7.4	75.1
2012	18.3	7.5	74.3
2013	18.7	7.7	73.6
2014	19.3	7.9	72.8
2015	19.8	7.9	72.3
2016	19.9	7.8	72.3
2017	20.1	8.1	71.7
2018	20.5	8.2	71.3

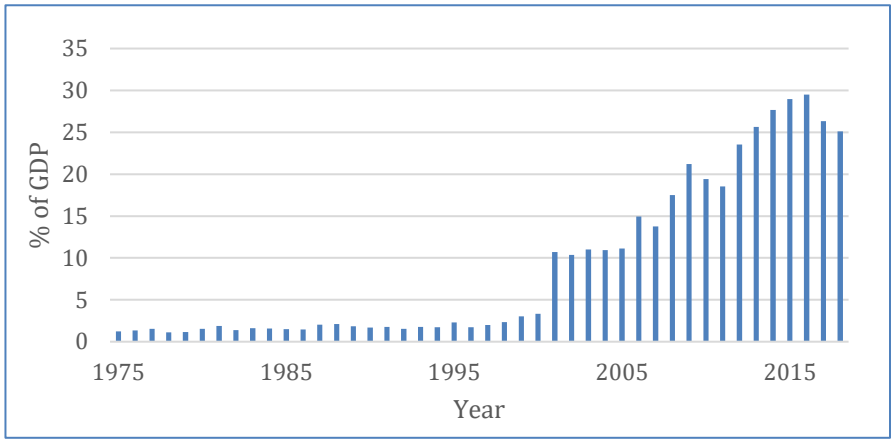
(Source: WDI, World Bank)

According to the economic survey report 2017-18 published by the Ministry of Finance, the contribution of industrial production to GDP was 5.4 percent whereas 27.6 percent of total GDP comes from the agriculture sector. Due to the political instability and low supply of electricity, the industrial production could not gear up. Lack of proper education and modern technology in agriculture is one of the reasons why agriculture sector has less contribution to GDP. Apart from that the geographically difficult terrain, traditional subsistence farming and lack of professionalization on agriculture are main reasons why the sector has very less contribution to the economy. There is the practice of traditional subsistence farming with crop farming as a main agricultural activity which supports about 80 percent of the total population (Agarwal & Upadhyay, 2006).

2.4 Remittance

Remittance has become a major source of income for most of the households in Nepal for recent years. The number of youths leaving Nepal for employment is increasing every year. Over the ten years period (2008-2017) Nepal issued around 3.5 million labour permits to migrant workers in Gulf countries (Baruah & Arjal, 2018). Besides the Gulf nations, a higher amount of remittance comes from other countries like USA, UK, and other European nations. Figure 2-3 shows that the remittance inflow was below 2 percent of the country's GDP until late 1990s which started increasing massively afterwards. It reached up to 29.5 percent in the fiscal year 2015/16.

Figure 2-3: Remittance inflow, percentage of GDP



(Source: Ministry of Finance, Nepal)

2.5 Trade and external sector

Nepal is dependent on imports from basic household goods like salt, rice, corn, etc. to oil and petroleum gas, garments and other equipment like vehicles, machinery and construction materials. Coffee, tea, spices, hand-made carpets and garments are major export items. Table 2-3 explains the status of overall trade. Import is much higher than export and the ratio of export to import is decreasing every year resulting into a higher trade deficit.

Table 2-3: Import, export and trade balance

Years	Import (percentage of total trade)	Export (percentage of total trade)	Trade deficit (percentage of GDP)
1975-84	72.15	27.85	8.8
1985-94	75.02	24.98	12.76
1995-2004	73.38	26.62	17.65
2005-12	80.07	19.93	21.14
2013-18	90.87	9.13	32.82

(Source: Ministry of Finance, Nepal)

India has always been the biggest trade partner of Nepal. Other than in the 1980s and 1990s, more than half of total trade is carried out with India. While looking in the trade with India, average export is higher than average import during the periods 1975-84 and 2005-12 as shown in Table 2-4. China, on the other hand is the second biggest trade partner of Nepal. There are no records for

trade with China in the MOF website prior to the fiscal year 2012/13, however, there existed trade with Tibet which is the Chinese border in Northern Nepal.

In the last five years period, 64.29 percent of total trade was carried out with India while 11.64 percent of total trade was with China on average. Business with China has been booming in recent years. Due to new trade horizons and relatively a competitive price of Chinese goods, trade with China is increasing. The trade volume with China has increased by more than double between 2010 and 2014 (Tripathi, 2015).

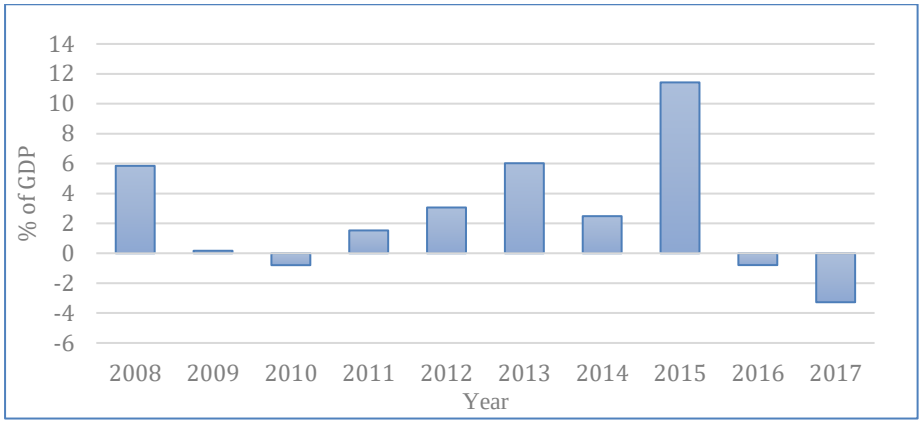
Table 2-4: Trade with India and China

Years	India			China		
	percentage import	percentage export	percentage of total trade	percentage import	percentage export	percentage of total trade
1975-84	49.9	55.63	49.46	-	-	-
1985-94	34.84	28.26	32.93	-	-	-
1995-2004	40.07	38.53	39.91	-	-	-
2005-12	61.34	66.22	62.39	-	-	-
2013-18	64.52	61.18	64.29	12.51	2.69	11.64

(Source: Ministry of Finance, Nepal)

The country's current account balance is also decreasing for past few years. As we see in Figure 2-4, the current account balance was more than 11 percent in 2015 which declined to 1 percent in deficit the next year and almost 3.5 percent of GDP in deficit in 2017. Total export as of 17 October 2018 has increased by 16.10 percent as compared to the corresponding period of last year. However, total import increased by 43.60 percent resulting in 45.90 percent of trade deficit. On the other hand, remittance inflow has increased by 33.4 percent compared to the previous year (Ministry of Finance, 2018c).

Figure 2-4: Current account balance, percentage of GDP



(Source: WDI, World Bank)

A clearly understandable reason for the current account deficit for Nepal is the increase in purchasing power of citizen. The increase in remittance inflow gears up the purchasing power of citizen and since the country's internal resources can't meet the demand, import increases resulting in a negative balance of payment.

Chapter 3. Foreign aid to Nepal

3.1 History of foreign aid in Nepal

The practice of foreign aid started in Nepal in 1951, when over a hundred years long Rana dynasty had overturned (Adhikari, 2014), and the period of economic transition started with emerging democracy. Since then, the economic development and modernization came up with foreign presence in the country.

Nepal signed its first aid agreement, the Four Point Agreement for Technical Cooperation, with the United States in January 1951 four years after Nepal and U.S. had established diplomatic relations (Khadka, 1997). United States' diplomatic aid presence in Nepal was beneficial to the country in a sense that India strengthened its ties with Nepal because by the time the agreement had been signed, the Indo-U.S. relations were tensed. In 1950s and 1960s, India had provided economic and technical aid to Nepal and the aid allocated was used to build roads, airfields, and communication networks. Although the United States did not have any direct economic interest in Nepal, it was always the largest donor for Nepal over the period. But, the U.S. aid to Nepal declined after several Western donors had initiated aid programs for Nepal (Khadka, 1997).

In the mid-1950s, communist China and the former Soviet Union entered the aid politics in Nepal by their own strategic calculations and foreign policy interests. China was keen to project its image as a leader of the Third World and international communist movement and the Soviet Union had considered itself a superpower in indirect competition with the U.S at that time. Initiated in 1958, the Soviet Union's aid program to Nepal was the support to Kathmandu in its endeavor to become self-reliant on some products like sugar and cigarettes (Khadka, 1997).

India and China were always in their 'aid competition' and they have been doing so even in recent years. India has provided aid to almost every economic sector and been very sensitive to the involvement of any major powers (Khadka, 1997), however, China is channeling aid to the Terai region of Nepal. China has been providing aid for the construction of roads and hydroelectricity.

In most of the cases, there were some political interests of the big countries for providing aid to Nepal. But, among all, Nepal itself is taking advantage of the aids in different forms from several donors.

3.2 Foreign aid inflows

Table 3-1 summarizes the aid receipts by SAARC nations over two decades. Afghanistan is the highest aid recipient among the SAARC nations in the last decade followed by Pakistan and India as second and third highest recipient of foreign aid respectively. While in the previous decade, India was receiving the highest amount of aid among the cooperation followed by Pakistan as second and Afghanistan as a third biggest recipient. The increment on average aid receipts for Bangladesh has dramatically increased to 13.90 percent in the last decade while it was 0.21 percent in the previous decade. There have not been any significant changes in the aid receipts trend for rest of the cooperation nations. Nepal was in the fourth position as highest aid recipient two decades ago. With a small decline in the share of foreign assistance, it arrived in the fifth position the last decade which also signifies that Nepal is in the process of becoming self-reliant.

Table 3-1: Average aid receipts, percentage of net ODA receipts by SAARC Nations

Countries/ Period	1996-2005	2006-2015
Afghanistan	13.93	38
Bangladesh	0.21	13.9
Bhutan	0.01	0.83
India	30.09	17.91
Maldives	0.53	0.3
Nepal	6.89	5.81
Pakistan	19.98	19.82
Sri Lanka	6.79	3.43

Source: International Development Statistics (IDS), OECD

Foreign aid is always important for less developed or developing countries like Nepal. It has been a main source of capital formation, contributing as high as 95 percent to the government annual budget; although in recent years it has fallen (Sharma & Bhattarai, 2013). “In the recent past years, the share of foreign grants is in declining trend whereas the share of foreign loan is in increasing trend. Likewise, foreign aid mobilizations have been minimal as compared to foreign aid

commitment. As per the case, in the first eight months of the FY 2017/18, out of the commitment of Rs.150.88 billion, only Rs. 55.0035 billion has been disbursed" (Ministry of Finance, 2018b).

The Ministry of Finance in Nepal is the government's authority responsible for donor coordination and aid management. All the development projects are negotiated and agreed upon the supervision of this ministry. The facts and figures about foreign aid allocation and the developmental projects discussed in this chapter are based on the information provided by the Ministry of Finance. However, it is explicitly stated if the sources of information differ in some situation.

The increment in average aid to GDP ratio as shown in Table 3-2 continues until the late 1980s and declines afterwards. The decline in aid to GDP ratio is due to the higher growth in GDP than in foreign aid.

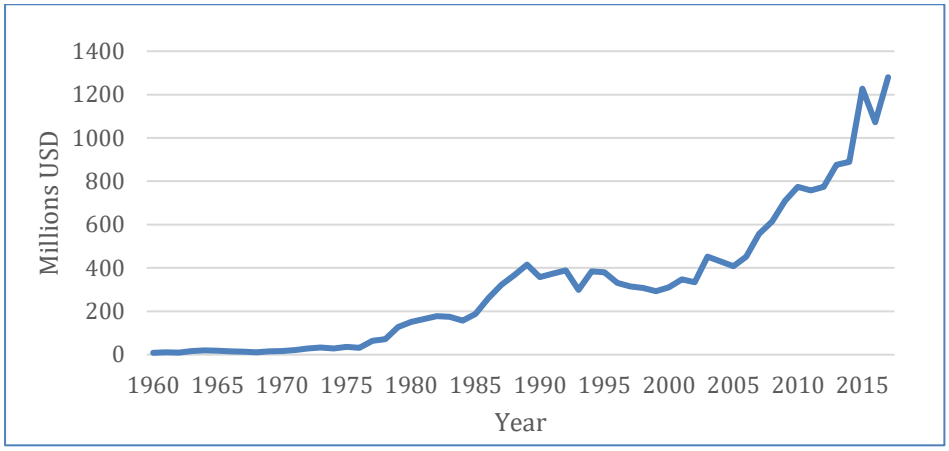
Table 3-2: Average aid/GDP ratio

years	Aid/GDP ratio
1960-69	2.17
1970-79	3.32
1980-89	10.73
1990-99	10.33
2000-2013	8.46

(Source: IDS, OECD)

Figure 3-1 explains a long history of foreign aid in Nepal. The relatively stagnated rate of foreign aid inflow considerably increased after the second half of 1970s. This could be explained as, the King Birendra of Nepal abolished the autocratic tradition started by his father and re-established democracy, which made the country more attractive for foreign aids. The period of 1990s had not been progressive on receiving foreign aid as there had been economic and political turmoil in the country. After the end of Maoist insurgency and the re-establishment of peace in 2006, the country has been experiencing a very good upward trend on receiving foreign assistance.

Figure 3-1: Foreign aid inflow to Nepal (total loans and grant)



Source: International Development Statistics (IDS), OECD

3.3 Aid on the government budget

The share of foreign aid allocated on total national budget has been presented in Table 3-3. Aid contribution to the budget has fluctuated between 18 percent to 29 percent during the past ten years. Aid contribution on the total budget has decreased until fiscal year 2013/14. However, it increased substantially after the fiscal year 2015/16 and the year after due to the 2015 earthquake for the reconstruction of infrastructure. The mobilization of domestic resources has successfully managed to keep the foreign aid allocation on the government's budget below 30 percent.

Table 3-3: The contribution of foreign aid on the government's total annual budget allocation

Fiscal year	Foreign aid (percentage of total budget)
2009/10	27
2010/11	26
2011/12	26
2012/13	18
2013/14	22
2014/15	20
2015/16	25
2016/17	29
2017/18	22

(Source: Ministry of Finance, Nepal)

3.4 Disbursement of the aid on sector-wise national development plan

Based on the policies outlined in the Three-Year Development Plan by National Planning Commission, aggregate development priorities have been categorized under various development sectors such as Social Development, Infrastructure Development, Macroeconomic and Economic Development, Peace, Rehabilitation, Good Governance, and Human Rights, Inclusive Development and Crosscutting (Ministry of Finance, 2018a). Table 3-4 summarizes the sectoral alignment of aid with several national development plans. Nepal was receiving the highest amount of foreign assistance on social development sector until 2015. However, the overall aid on infrastructure development increased afterward while the aid on social development is decreased. However, there is no specific trend on the macroeconomic and economic development sector and other sectors.

Table 3-4: Alignment of aid with national development plan (in percentage)

Fiscal Year	Infrastructure development	Social development	Macroeconomic and economic development policy	Other
2010/11	23	40	27	10
2011/12	29.9	40	19.3	10.8
2012/13	28	39	21	12
2014/15	29	44	17	10
2016/17	33.9	31.7	21.8	12.6
2017/18	35.3	31.7	24.7	8.3

Source: Ministry of Finance (several Development Cooperation Reports)

Table 3-5 highlights some of the top projects from the last fiscal year. The table summarizes that in the last fiscal year Nepal Government has received the commitment for a huge amount of foreign aid for the reconstruction in the aftermath of the devastating earthquake in 2015 followed by the development of economic sector and agriculture respectively. It is also obvious from the table that Asian Development Bank has been the top donor last fiscal year followed by International Development Association. India has been the third largest donor of foreign aid to Nepal last fiscal year (Aid Management Platform, 2019).

Table 3-5: Major foreign aid commitments to Nepal in fiscal year 2017/18

Start date	Donor agency	Sector	Actual commitment (USD)
09/05/2017	Asian Development Bank, Clean Energy Fund	Earthquake reconstruction	1.5 Billion
10/05/2018	International Development Association	Economic Reform	200 Million
18/07/2018	International Development Association	Irrigation	66 Million
	European Union	Agriculture	46.6 Million
	International Fund for Agricultural Development	Agriculture	43.6 Million
	India	Drinking water, education, health, local development	42 Million
	India	Energy, road transportation	27 Million

Source: Aid Management Platform (AMP), Ministry of Finance

Chapter 4. Literature review

Since foreign aid and economic growth has been a widespread topic on economic research, there exist a huge number of studies. I have presented some of the existing literatures that I found relatively important for understanding the subject matter and for the evolution of this thesis.

4.1. Theoretical perspective

Before starting to study how aid affects economic growth, it is important to know the basic of foreign aid. Williams (2015) defines foreign aid as international transfer of value in the form of capital, goods or services from a country or an international organization which aims to benefit the recipient country or population in the recipient country. It is a voluntary transfer of resources either in the form of loan or grant.

The idea behind the development and evolution of foreign aid is interesting. Initially, aid was channelled through capital transfers and investment projects in order to overcome the capital shortage which hindered development in many nations. Several growth-oriented aid programs were initiated including poverty reduction, military development, educational upliftment, etc. (Paul, 2006). The lack of countries internal savings is one of the motivations for the foreign aid donor to take part in the assistance. Initially, the foreign aid has been the most important source of external finance for developing countries to meet the basic human needs, infrastructure development in accordance with nation building and so on. Over time, the focus of such aid has been changed to the macroeconomic stabilization, structural adjustment and debt reduction, political and economic transition, poverty reduction and social infrastructure. During two decades the donors started to put more emphasis on performance-based aid allocation, focusing on the Millennium Development Goals, global health, governance and security (Akramov, 2012, pp. 6-6).

In the early years, it was expected that the need for foreign assistance would decline as private capital became available to developing countries. However, the increment in private capital has not been able to decrease the level of foreign aid to developing countries because the bulk of these flows are concentrated in a few countries that have a particular attraction for investors (Akramov, 2012).

However, some economists suggest that there could be several negative influences of aids and it could be a waste of money. Aid flows in some cases may contribute to the failure of development efforts by enlarging government bureaucracies and corruption. There have been numbers of critics that foreign aids have created corruption in the recipient countries with unaccountability and lack of transparency in aid delivery mechanisms (Akramov, 2012, pp. 7-7).

There is evidence that foreign aid has a negative impact on growth or the country's per capita income, even though, donors continue to disburse aid. One of the reasons for such disbursement could be that the real aim of granting aid to the recipient might not be to increase growth in many instances. "Part of aid is disbursed to alleviate human disasters in the wake of natural catastrophes. Other parts might directly be granted to increase consumption of the poor in recipient countries" (Nowak‐Lehmann, Dreher, Herzer, Klasen, & Martínez‐Zarzoso, 2012). Still some parts of the aid are disbursed for political and commercial reasons in the donor countries. Alesina and Dollar (2000) presents an evidence that political and strategic considerations of the donor determine the pattern of aid giving. Bandyopadhyay and Vermann (2013) also support that the strategic interests of the donor have always been relevant in giving foreign aid. There is a mixed motive for foreign aid when aid is categorized as bilateral and multilateral aid. Bilateral aid flows mostly carry the donor's perceived political, foreign economic or security interests, however, multilateral aids are allocated essentially on the need criteria of recipients (Maizels & Nissanke, 1984).

Unobservable or unquantifiable country characteristics that vary over time are most likely related to the reasons aid has been granted such as donor motivations and perceptions as well as management of aid transfers. However, Nowak-Lehmann et al. (2012) claims that the negative impact of aid on per capita income can be reduced by controlling these characteristics.

4.2. Aid-growth relationship (Empirical literature)

There seem to exist several methodologies for identifying a long-run relationship between several variables. In the beginning, researchers used to follow the simple linear regression and non-linear regression method to find the relationship among any variables. For example, (Hansen & Tarp, 2001) and (Asiedu & Nandwa, 2007) use the OLS regression on their studies of aid effectiveness. Using non-linear aid-growth model, (Hansen & Tarp, 2001) examine the relationship between

foreign aid and growth and what modern cross-country growth regressions can say about the impact of aid on aggregate growth and whether or not the impact of aid across countries is regular. They found that aid increases growth rate and there is regularity in the impact of foreign aid across the sample countries. They use growth rate from 56 countries in the period 1974-1993 and formulate aid-growth relation at a macro level from cross-country regressions based on large panel data set. To see if the investment has an impact on aid-growth relation, they included investment and human capital in their growth regression and concluded that the impact of aid on growth is affected by investment, however, better theoretical explanations are needed for the aid-investment-growth process (Hansen & Tarp, 2001).

Education is one of the important sectors for the development of any country and a lot of foreign aid has been disbursed in this sector for developing and underdeveloped countries. Seven percent of total aid has been allocated to the education sector in the year 2013-2014 for both fragile states and developing countries (OECD-DAC, 2016). To examine whether foreign aid on education has a significant impact on growth, (Asiedu & Nandwa, 2007) used regressions for low and middle-income countries. They disaggregated aid data into primary, secondary and higher education and the result shows that the effect of aid varies by income as well as by the type of aid (Asiedu & Nandwa, 2007)

Nowak‐Lehmann et al. (2012) analyzed the relationship between per capita income and foreign aid in high aid-dependent countries using annual time series data from 1960 to 2006 and found that aid has an insignificant or minute negative significant impact on per capita income. They have included investment in their model alike (Hansen & Tarp, 2001) and found a small positive impact of aid on investment but a negative impact on domestic savings. Since their study is based on large panel data set, they use DFGLS on their estimation to correct for autocorrelation of the disturbances.

Another possible way of dealing with endogenous variables is generalized method of moments (GMM), however, GMM is appropriate only if there is a small number of observations. This procedure has been used in several studies like (Nowak‐Lehmann et al., 2012) (Asiedu & Nandwa, 2007), (Hansen & Tarp, 2001) and (Qayyum & Haider, 2012). Dynamic ordinary least

square (DOLS) procedure can also be used to deal with the problem of endogeneity like (Moolio & Kong, 2016) have used in their panel cointegration analysis.

The research carried out by (Mbaku, 1993) uses OLS method in a neoclassical production type function to test the relationship between foreign aid and economic growth in Cameroon. The result from annual time series data covering the period 1971-1990 in Cameroon shows that foreign aid has an insignificant impact on economic growth. The study supports the fact that domestic resources have a stronger impact on economic growth in the country than foreign resources. However, tests should be conducted including longer time periods using more advanced techniques in order to effectively determine the role of foreign resources in economic growth. The presence and extent of autocorrelation in variables has been determined by the Durbin-Watson (DW) test and the Cochrane-Orcutt or first-order autoregressive correction technique has been used to deal with serial correlation. Using the technique of unit-root test and Johansen's maximum likelihood procedure (Murthy, Ukpolo, & Mbaku, 1994) present empirical evidence to support the hypothesis developed by (Mbaku, 1993) and the result contradicts from the existing result and shows the positive contribution of foreign aid to economic growth in Cameroon (Murthy et al., 1994).

Quazi (2005) on his aid-growth model applies the cointegration method to a neoclassical growth model to quantify the effects of foreign aid on GDP growth in Bangladesh and finds the marginal effect of aid on GDP growth. When aid is disaggregated into loans and grants, loans significantly raise GDP growth while grants don't. To provide more evidence on the result, he simultaneously employs the aid-fiscal model and finds that "foreign grants mostly finance non-productive civil expenditures, but foreign loans generally finance public investment projects and human capital building programs, which eventually lead to higher output growth" (Quazi, 2005). The two-step Engle-Granger method for cointegration has been applied for the estimation procedure.

The effectiveness of foreign aid on economic growth in the Indian economy has been examined by (Mohapatra, Giri, & Sehrawat, 2016) using ARDL approach to cointegration developed by (Pesaran, Shin, & Smith, 2001). The unrestricted error correction model (UECM) has been used to identify the short-run and long-run relationship. The effectiveness of foreign aid seems to be different for different economies. Hamid Ali (2013) uses Johansen's cointegration and VECM

technique to identify the long-run and short-run effect of foreign aid in promoting economic growth in Egypt. These two results are totally different from one another. Mohapatra et al. (2016) find a positive and significant impact of foreign aid on economic growth in India both in long-run and short-run, however, (Hamid Ali, 2013) finds a negative and significant impact of foreign aid on the economic growth of Egypt in long-run and short-run.

Kwablah, Amoah, Panin, and Development (2014) on their aid-growth study in Ghana used fully modified OLS to test whether foreign aid receipts have had a significant impact on the level of gross national income. They used autoregressive distributed lags (ARDL) bounds and Johansen cointegrating equations to test for the long run equilibrium for three different sample periods: pre-structural break, post-structural break and full period covering 1980-2005. The result varies for three different periods. There is a positive and significant relationship between foreign aid and national income in pre-structural break, positive and insignificant relationship in post-structural break and negative and insignificant relationship in full period (Kwablah et al., 2014).

Bhattarai has investigated the effectiveness of foreign aid in Nepal for the period 1983-2002 which is the period Nepal has initiated the structural adjustment program under the guidance of IMF and the World Bank. The Johansen's likelihood ratio test for cointegration has been applied to a neoclassical production function and it has been found that foreign aid has a positive and statistically significant effect on per capita real GDP in the long run but a negative impact in the short run. To address the existing debate on whether aid works only in the good policy environment, different policy variables have been included in the model and found that aid effectiveness is increased in the presence of good policy environment (Bhattarai, 2009).

Another recent contribution on the aid-growth literature for Nepal is the case study carried by Sharma and Bhattarai where they analysed the effect of foreign aid on GDP growth in the presence of good economic policy. To avoid the potential endogeneity between aid and investment variables, they use savings as a percentage of GDP instead of investment in their model unlike in (Bhattarai, 2009). Both (Bhattarai, 2009) and (Sharma & Bhattarai, 2013) have included the political dummy in their models as the political system of the country being autocratic and democratic. Bhattarai (2009) defines the autocratic regime as politically stable (the period between 1970s and 1980s) and democratic regime as politically unstable period (since 1990 until present) because there have been

several changes in the government. Using autoregressive distributed lags (ARDL) approach to cointegration (Sharma & Bhattarai, 2013) finds the same result as (Bhattarai, 2009) that foreign aid is effective in the presence of good economic policy. However, the effect of political dummy differs in these two results. Bhattarai (2009) finds a negative and statistically significant coefficient of political dummy meaning that political instability has a direct negative impact on the economic growth which is justifiable in case of Nepal where there have been a lot of changes in the political system and the government within a very short span of time. On the other hand, (Sharma & Bhattarai, 2013) finds no statistical evidence on the effectiveness of aid in different political regimes.

The concern of different political regimes on aid effectiveness also exists in (Islam, 2003). Based on the data of 21 African and 11 Asian countries the author tries to find out if the differences in political system have any implication on the effectiveness of foreign aid. The effect varies substantially across different political regimes. In tinpot countries, aid has very little impact on growth but in totalitarian countries aid has a robust positive significant impact on growth (Islam, 2003).

Several cross-country panel estimations have found different set of evidences on aid effectiveness. For example (Elbadawi, Kaltani, & Schmidt-Hebbel, 2008), (Moolio & Kong, 2016) and (Qayyum & Haider, 2012) find that aid has an important role in economic growth. On the contrary, (Rajan & Subramanian, 2008) find little evidence of a positive or negative relationship between aid inflows into a country and its economic growth. They have taken control of the possible biases that poorer or stronger economic growth can determine aid contributions to recipient countries. They also find no evidence that, if aid works in a better policy environment. Foreign aid, however, depends on the aid apparatus. The adaptability of foreign aid, availability, and know-how of the latest technology is something that needs to be considered for aid to be effective in future (Rajan & Subramanian, 2008).

Chapter 5. Data

5.1. Data collection

The annual time series data for Nepal from 1983 to 2013 have been used in this thesis. All the data are downloaded from publicly available online databases. The data on trade, capital, population, literacy rate, education, inflation, and money supply are taken from The World Bank, World Development Indicator. However, nominal GDP and real GDP has been taken from the Federal Reserve Economic Data (FRED) database and divided by total population to calculate per capita real GDP. Data on foreign aid are obtained from OECD, International Development Statistics. Last but not the least, data on budget deficit has been taken from the Ministry of Finance, Nepal.

5.2. Explanation and selection of data

The definition of the terminologies used for the series have been presented in Table 5-1.

Table 5-1: Data definition

Variable name	Definition
GDP	Nominal GDP (current price USD)
AID	Foreign aid (sum of total loans and grants, current price USD)
AR1	Aid as percentage of GDP (on budget aid taken from MOF)
AR	Aid as percentage of GDP (total foreign loans and grants as percentage of GDP)
RGDP	Real GDP (current price USD)
RGDPP	Per capita real GDP (USD)
TR	Total trade (percentage of GDP)
INF	Inflation (consumer price)
MONR	Money supply (percentage of GDP)
GCFR	Gross capital formation percentage of GDP
EDU	Gross School enrollment, secondary level
BDR	Budget deficit (percentage of GDP)

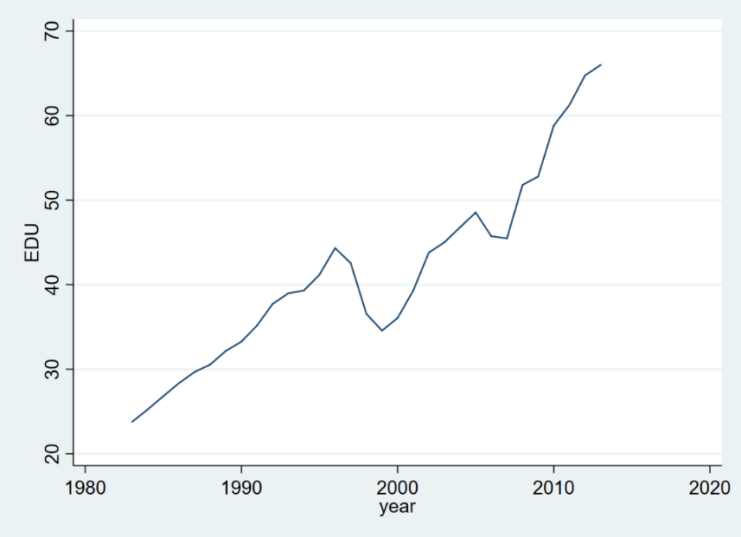
5.2.1. Secondary level school enrollment

Bhattarai (2009) has used adult literacy as an important factor for human development which enhances the skill level on human capital. Adult literacy stands for the ability of adults to read and write with a basic understanding of simple statements about everyday life. On the other hand, the World Bank defines secondary education as it completes the provision of basic education and sets the foundation for lifelong learning and human development. Since secondary level education is considered more significant for the economic activities of the nation, the secondary school enrollment has been used as a measure of skill enhancement of human capital in this thesis.

Figure 5-1 states the percentage of the population on secondary level school enrollment. Although the curve has an upward trend in the long run, there are two significant declines. The percentage of students getting enrolled at secondary level was around 44 percent in the year 1996 which went down to 34 percent in 1999. The year 1996 was the time when Maoist revolution started in Nepal and a lot of youths left school to join the Maoist armed force and some of them left school due to the violence created by internal war. A small decrease in school enrollment was also due to labour migration for employment in foreign countries.

Similarly, 48 percent of school enrollment in 2005 has declined to almost 45 percent in 2006 and a little more decrease in 2007, however, this decline is not as high as in the previous shift. The internal war between the Maoist and the government of Nepal was in its peak during this period and students were forced to join the armed force by Maoist. The enrollment in police and army was also increased by the government during that time which might also played a role in the decline in school enrollment. When we closely observe the pattern of students getting enrolled in the secondary level then we find that the increment in number of students getting enrolled, after the civil war had ended, is relatively higher than earlier. This tells us that a better environment for education has been created after the reestablishment of peace in the nation.

Figure 5-1: Gross secondary school enrollment



5.2.2. Gross capital formation

Gross capital stock is broadly used as an indicator of the productive capacity of a country and is often used as a measure of capital input (OECD, 2001). Bhattarai (2009) calculates the stock of capital taking gross investment adjusting for depreciation. In this thesis, gross capital formation is used as a measure of capital stock in the neo-classical production function.

5.2.3. Aid/GDP ratio

Initially, the aid/GDP ratio was calculated using net ODA and GDP data taken from the online database on OECD and FRED respectively. The correlation coefficient of aid/GDP ratio with real GDP and per capita real GDP did not match the correlation coefficient on (Bhattarai, 2009) both on sign and magnitude. Similarly, average aid to GDP ratio also did not match with aid/GDP ratio on Table 2 on (Bhattarai, 2009) which created a confusion on the series for aid/GDP ratio (refer to Appendix 7).

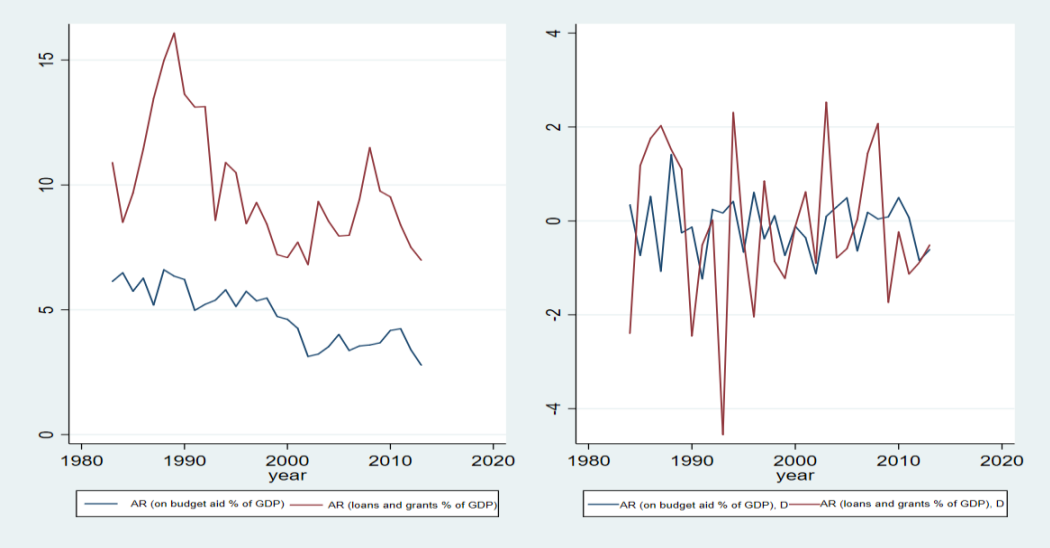
While I took the aid data from the Ministry of Finance; aid as on budget aid, and observed the trend these two series follow, the graph was unrealistic. If we see Figure 5-2 and observe the pattern of two series then we witness something surprising. In the year 1984, budget aid recorded by the Ministry of Finance exceeds the total ODA which is generally unexpected. Because, the Ministry of Finance records foreign assistance received only to support government finance as budgetary

aid and it does not include technical assistance and other aids received through NGOs and INGOs while OECD records all kind of aids on ODA. However, the plot of total loans and grants as foreign aid and budgetary aid follow more accetable trend together as in Figure 5-3. On the other side, average aid/GDP ratio presented in Table 3-2 correspond better with average aid/GDP ratio with (Bhattarai, 2009) even the correlation coefficients do not match. Based on these two arguments, I have chosen to use a total of loans and grants from OECD as foreign aid.

Figure 5-2: Time series plot of aid/GDP ratio (aid as on budget aid and net ODA)

(Source: IDS, OECD)

Figure 5-3 : Time series plot of aid/GDP ratio (aid as on budget aid and total loans and grants)



(Source: IDS, OECD)

Chapter 6. Methodology

6.1. Unit root test for stationarity

In time series data it is not always the case that the series follow stationary nature of constant mean and variance. If this is the case, then the regression results obtained from such series are supposed to be spurious and they are not good enough to use in economic and financial decision making. It is therefore very important to identify the nature of the data. There are several methods to test for stationarity. Out of many, I have followed the following two methods to test for stationarity.

6.1.1. Augmented Dickey-Fuller test for unit root

The unit root test procedure developed by (Dickey & Fuller, 1979) follows a test for stationarity with a null hypothesis of a variable having unit root against the alternative hypothesis of stationarity. The augmented Dickey-Fuller test is based on the following equation:

$$\Delta Y_t = \beta_1 + \beta_2 t + \delta_1 Y_{t-1} + \sum_{i=1}^{k} \alpha_i \Delta Y_{t-1} + \varepsilon_t \qquad (6.1)$$

where, t is time variable, Y_t is the relevant time series, Δ is the first difference operator, δ_1 is the time trend and ε_t is a random error. The equation can be tested in two versions; constant only by taking the constant term and dropping the trend component and the full equation with both constant and time trend. The augmented Dickey-Fuller test may not be adequate if there is the problem of serial correlation in the variable and if there are any structural breaks in the series.

6.1.2. Phillips-Perron (PP) test

The Phillips-Perron (PP) test (Phillips & Perron, 1988), on the other hand, provides more robust estimates despite the series having serial correlation or any structural breaks unlike augmented Dickey-Fuller test.

6.2. Test for cointegration

For any time-series data that are not stationary can be converted into stationary either by transformation or by differencing. If a non-stationary series becomes stationary after differencing one time then it is said to be integrated of order one or I(1). Similarly, if a series is stationary after differencing two times it is integrated of order 2 or I(2) and if any series is stationary itself then it is I(0).

Using a non-stationary time series on estimation and inference is not adequate because the result will be spurious. However, with cointegration, there is no problem of spurious regressions. Once, we make sure that the series we are using on estimation are integrated of the same order I(1), we can test that if there exists any relationship between the variables using cointegration.

6.2.1. Engle-Granger approach to cointegration

The Engle and Granger (1987) approach uses a bivariate model to cointegration using the results obtained from OLS estimate. The following model is estimated using OLS procedure and the residuals are predicted:

$$Y_t = \beta_1 + \beta_2 X_t + \varepsilon_t \qquad (6.2)$$

where, Y_t and X_t are dependent and independent variables respectively, β_1 and β_2 are regression parameters and ε_t is random error. Predicted residuals can be tested for unit root using either ADF or PP test. If the residuals are stationary, then the series are cointegrated otherwise they are not cointegrated. Since this approach is generally used in the bivariate situation and this model cannot identify the number of cointegrating vectors associated in the model, I am using more advanced approach to cointegration proposed by (Johansen, 1988) and (Johansen, Juselius, & statistics, 1990) as described in the next section.

6.2.2. Johansen's cointegration technique

Considering a set of g variables (g ≥ 2) that are integrated of order one i.e. I(1) and which are maybe cointegrated. We can set up a vector autoregressive (VAR) model containing these variables with k lags as in the following equation:

$$y_t = \beta_1 y_{t-1} + \beta_2 y_{t-2} + \cdots + \beta_k y_{t-k} + u_t \quad (6.3)$$

The VAR equation in (6.3) has to be modified into a vector error correction model (VECM) of the following form in order to use the Johansen test for cointegration,

$$\Delta y_t = \Pi y_{t-k} + \Gamma_1 \Delta y_{t-1} + \Gamma_2 \Delta y_{t-2} + \cdots + \Gamma_{k-1} \Delta y_{t-(k-1)} + u_t \quad (6.4)$$

where, $\Pi = (\sum_{i=1}^{k} \beta_i) - I_g$ and $\Gamma_i = (\sum_{j=1}^{i} \beta_j) - I_g$.

The Johansen test can be affected by the lag length employed in the VECM. Therefore, it is always important to select the optimal lag length. Π can be interpreted as a long run coefficient matrix as in equilibrium, all the Δy_{t-i} will be zero and setting the expected value of the random error u_t equal to zero, $\Pi y_{t-k} = 0$. The cointegration test between the variables is calculated by looking at the rank of the Π matrix via its eigenvalues. The eigenvalues denoted by λ_i must be less than 1 in their absolute value. If the variables are not cointegrated, the rank of Π matrix will be significantly close to zero, and $\lambda_i \approx 0$ $\forall_i > 1$ (Brooks, 2008, pp. 350,351).

For example, if the model being estimated contains four variables, then the Π matrix can be written as

$$\Pi = \begin{pmatrix} \pi_{11} & \pi_{12} & \pi_{13} & \pi_{14} \\ \pi_{21} & \pi_{22} & \pi_{23} & \pi_{24} \\ \pi_{31} & \pi_{32} & \pi_{33} & \pi_{34} \\ \pi_{41} & \pi_{42} & \pi_{43} & \pi_{44} \end{pmatrix}$$

Under Johansen cointegration approach, there are two test statistics which are

$$\lambda_{trace}(r) = -T \sum_{i=r+1}^{g} \ln(1 - \hat{\lambda}_i) \quad (6.5)$$

And

$$\lambda_{max}(r, r+1) = -T \ln(1 - \hat{\lambda}_{r+1}) \quad (6.6)$$

where, r is the number of cointegrating vectors under null hypothesis and $\hat{\lambda}_i$ is the estimated value of the ith ordered eigenvalue from the eigenvalue from the Π matrix. "Each eigenvalue will have associated with it a different cointegrating vector, which will be eigenvectors. A significantly non-zero eigenvalue indicates a significant cointegrating vector" (Brooks, 2008, p. 351). λ_{trace} is a joint test where the null and alternative hypotheses are,

$$H_0 : the\ number\ of\ cointegrating\ vectors \leq r$$

$$H_1 : the\ number\ of\ cointegrating\ vectors > r$$

$\lambda_{trace} = 0$ when all the $\lambda_i = 0$, for $i = 1, 2, \ldots, g$. λ_{max} conducts a separate test on each eigenvalue and is based on following hypotheses:

$$H_0 : number\ of\ cointegrating\ vectors = r$$

$$H_1 : number\ of\ cointegrating\ vectors = r + 1$$

The decision rule is, we reject the null hypothesis that there are *r* cointegrating vectors if the test statistic is greater than the critical value from Johansen's tables and we fail to reject the null hypothesis if the test statistic is smaller than the critical value.

6.3. Error correction mechanism

For any first order integrated I(1) series that possess evidence of being cointegrated or are linearly dependent with each other, we re-parametrize the model including an equivalent error correction model (ECM) as suggested by (Engle & Granger, 1987) originally stated and proved by (Granger & Weiss, 1983). The ECM combines long-run information provided by series in the level form with short-run properties of the relationships in their first differences. It also involves lags of dependent and independent variables to capture short-run adjustments and changes in explanatory variables. That way the ECM helps to estimate the speed of adjustment towards the long-run condition within the set of variables.

For the set of cointegrated variables, the associated error correction model can be shown in the following equation:

$$\Delta Y_t = \emptyset_0 + \sum_{i=1}^{p} \emptyset_i \Delta Y_{t-i} + \sum_{j=1}^{p} \emptyset_j \Delta X_{t-j} + \rho_1 \mu_{t-1} + \varepsilon_t \qquad (6.7)$$

where, Y_t and X_t are relevant time series, Δ is the first-difference operator, μ_{t-1} is the error correction term (ECT), where $\mu_t = Y_t - \alpha_0 - \alpha_1 X_t$, p is the lag length and ε_t is a random error. The ECT, $\mu_{(t-1)}$, is the residual series of the cointegrating vector. For the series to hold the long-run equilibrium relation, $-1 \leq \rho_1 \leq 0$ should hold. However, having cointegration implies that ρ_1 should never be zero.

6.4. Granger causality test

On the contrary to the error correction model, we perform the granger causality test if the series are not cointegrated despite being integrated of same order. A vector autoregressive model having p lags VAR(p) is estimated based on the following model to test Granger causality:

$$\Delta Y_t = \emptyset_{10} + \sum_{i=1}^{p} \beta_{1i} \Delta Y_{t-i} + \sum_{j=1}^{p} \lambda_{1j} \Delta X_{t-j} + \varepsilon_{1t} \qquad (6.8)$$

$$\Delta X_t = \emptyset_{20} + \sum_{i=1}^{p} \beta_{2i} \Delta X_{t-i} + \sum_{j=1}^{p} \lambda_{2j} \Delta Y_{t-j} + \varepsilon_{2t} \qquad (6.9)$$

where, Y_t and X_t are the variables associated, Δ is the first difference form and the random errors ε_{1t} ε_{2t} are uncorrelated. The test examines whether lagged values of one variable in the VAR model help to predict another variable. The time series X_t is said to Granger cause Y_t if the lagged values of X_t help predict Y_t. In other words, X_t have causality on Y_t if the lagged values of X_t are statistically significant in equation (6.8). Unidirectional causality from X to Y and from Y to X exist when the estimated coefficients on the lagged X in equation (6.8) and the estimated coefficients on lagged Y in equation (6.9) respectively are statistically different from zero ($\sum \lambda_{1j} \neq 0$ and $\sum \lambda_{2j} \neq 0$) but the set of estimated coefficients on lagged Y in equation (6.8) and the estimated coefficients on lagged X in equation (6.9) respectively are not significantly different from zero ($\sum \beta_{1i} = 0$ and $\sum \beta_{2i} = 0$).

On the other hand, bidirectional causality on X and Y exists when the set of lagged coefficients on X and Y are not different from zero and statistically significant in both regression equations.

Chapter 7. Model Specification

7.1. Model selection

Bhattarai (2009) has applied the neo-classical production function model as stated in equation (7.1). In the first part of my work, I am going to replicate Bhattarai's model using the dataset for the same period (1983-2002). Based on the information provided about the data, there are some deviations on the variables used for the final estimation as explained in section 5.2 of the data chapter. In the second part, I will extend my work including a longer time period for the data.

We have the neo-classical production function as:

$$Y_t = A_t{}^{\alpha} F(K_t{}^{\beta_1} l_t{}^{\beta_2}) \quad (7.1)$$

where, Y_t is real GDP, K_t is the stock of capital, L_t is the labor force and A_t represents the level of technology. α, β_1 and β_2 are the parameters that explain the elasticity of dependent variable related to independent variables and the subscript *t* represents time. Based on the assumption that the neo-classical function follows a constant return to scale, we can re-write equation (7.1) in per capita form as,

$$Y_t/L_t = A_t{}^{\alpha} . \left(K_t{}^{\beta_1} / l_t{}^{\beta_2} \right)$$

$$RGDPP_t = A_t{}^{\alpha} . \left(K_t{}^{\beta_1} / l_t{}^{\beta_2} \right)$$

Taking natural logarithm, the equation can be derived in the form,

$$ln\ RGDPP_t = \alpha\ ln\ A_t + \beta \ln KP_t \quad (7.2)$$

where, *ln* is the natural logarithm, $RGDPP_t$ is the per capita real GDP, A_t is the level of technology and KP_t is the stock of capital.

The model stated in equation 7.2 explains that the country's per capita real GDP depends on the level of technology and the ratio of factor inputs. Solow (1962) says that to accelerate the growth of aggregate productivity and output, a high rate of capital formation is required. Hence, the country's gross capital formation is used as capital. Equation (7.2) can be re-written as:

$$ln\ RGDPP_t = \alpha\ ln\ A_t + \beta \ln GCFR_t \quad (7.3)$$

where, $GCFR_t$ is the gross capital formation as a percentage of GDP.

It is a well-known fact that foreign aid has some effect on the economic growth of a country. Aid can also come in the form of technological assistance, for example, by providing advanced machinery, training or education to the citizens of the recipient country. The effectiveness of foreign aid depends on the recipient countries' absorptive capacity. And how effectively the imported technology from developed countries in the form of foreign aid can be mobilized by the recipient country is also calculated by the skill of the available labour force. Education develops the level of skills and competencies in human being. As a determinant of the level of skills in human capital, we have included the variable for secondary level school enrollment in percentage of the total population in this model as a factor that affects the level of technology by providing skilled labour force to the economy. For simplicity, we can disaggregate the level of technology assuming foreign aid affects GDP growth through technological progress, and it is also influenced by the level of education.

$$\ln A_t = \alpha_0 + \alpha_1 \ln EDU_t + \alpha_2 \ln AR_t \quad (7.4)$$

where, EDU = secondary level school enrollment and AR = aid/GDP ratio.

Substituting equation (7.4) into equation (7.3), we get

$$ln\ RGDPP_t = \alpha\alpha_0 + \alpha\alpha_1 \ln EDU_t + \alpha\alpha_2 \ln AR_t + \beta \ln GCFR_t \quad (7.5)$$

If we rewrite equation (7.5) for the purpose of estimation, we get

$$ln\ RGDPP_t = \theta_1 + \theta_2 \ln GCFR_t + \theta_3 \ln AR_t + \theta_4 \ln EDU_t + u_t \quad (7.6)$$

where, $\theta_1 = \alpha\alpha_0$, $\theta_2 = \beta$, $\theta_3 = \alpha\alpha_2$, $\theta_4 = \alpha\alpha_1$, and u_t is a random error.

The estimation inference on chapter 8 of this thesis is based on the model presented in equation (7.6).

7.2. Policy indicators

Different variables for macroeconomic policy indicator, financial deepening and openness have been used in the extended model. The macroeconomic stability is very crucial for the rapid economic growth and effective aid implementation of the aid recipient country.

Inflation and budget deficit have been used as indicators to macroeconomic stability as these two variables are pretty much interrelated and they explain the stability of the economy and government budget. The broad money supply (M2) indicates the state of monetary assets of the nation. It is a useful indicator in predicting future inflation and therefore, M2/GDP has been used as a measure to financial deepening. Last but not the least, trade as a percentage of GDP has been used as an indicator of openness in the model.

The data we are using has relatively a shorter time period, therefore, we have a smaller number of observations. There could be a degree of freedom problem for such data sets when we use several variables in our model. To avoid degree of freedom problem, we are going to estimate the model using only two policy variables at a time. We add policy variables in our model (in equation 7.6) and develop the following models:

$$ln\, RGDPP_t = \theta_1 + \theta_2 \ln GCFR_t + \theta_3 \ln AR_t + \theta_4 \ln EDU_t + \theta_5 \ln TR_t + \theta_5 \ln MONR_t + u_t \quad (7.7)$$

$$ln\, RGDPP_t = \theta_1 + \theta_2 \ln GCFR_t + \theta_3 \ln AR_t + \theta_4 \ln EDU_t + \theta_5 \ln TR_t + \theta_5 \ln BDR_t + u_t \quad (7.8)$$

$$ln\, RGDPP_t = \theta_1 + \theta_2 \ln GCFR_t + \theta_3 \ln AR_t + \theta_4 \ln EDU_t + \theta_5 \ln BDR_t + \theta_5 \ln MONR_t + u_t \quad (7.9)$$

7.3. Specification of VAR model

Before we perform Johansen's cointegration test it is necessary to build a VAR(P) model taking all endogenous variables that we are going to use in our estimation. The VAR(P) model have been developed for all the equations that we are going to estimate in Chapter 8.

Firstly, we have developed three independent VAR models in order to test cointegration for the sub-period in equations (7.10), (7.11) and (7.12) below.

$$\mathrm{lnRGDPP_t} = \emptyset_0 + \sum_{i=1}^{4} \emptyset_i \ \mathrm{lnRGDPP_{t-i}} + \sum_{j=1}^{4} \emptyset_j \ \mathrm{lnAR_{t-j}} + \varepsilon_{11t} \quad (7.10)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{3} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{3} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{3} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \varepsilon_{12t} \quad (7.11)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{2} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{2} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{2} \emptyset_m \mathrm{lnGCFR}_{t-m} + \sum_{n=1}^{2} \emptyset_n \mathrm{lnEDU}_{t-n} + \varepsilon_{13t} \quad (7.12)$$

Simillarly, the different sets of VAR equations have been developed for the full- period in equations (7.13), (7.14) and (7.15). As mentioned above in the sub-section 7.2, we have added different policy variables in our model in equation (7.15) taking two policy variables at once in equation (7.16), equation (7.17) and equation (7.18).

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{4} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{4} \emptyset_j \ \mathrm{lnAR}_{t-j} + \varepsilon_{21t} \quad (7.13)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{4} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{4} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{4} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \varepsilon_{22t} \quad (7.14)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{4} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{4} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{4} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \sum_{n=1}^{4} \emptyset_n \ \mathrm{lnEDU}_{t-n} + \varepsilon_{23t} \quad (7.15)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{2} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{2} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{2} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \sum_{n=1}^{2} \emptyset_n \ \mathrm{lnEDU}_{t-n} + \sum_{p=1}^{2} \emptyset_p \ \mathrm{lnTR}_{t-p} + \sum_{q=1}^{2} \emptyset_q \ \mathrm{lnMONR}_{t-q} + \varepsilon_{24t} \quad (7.16)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{2} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{2} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{2} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \sum_{n=1}^{2} \emptyset_n \ \mathrm{lnEDU}_{t-n} + \sum_{p=1}^{2} \emptyset_p \ \mathrm{lnTR}_{t-p} + \sum_{q=1}^{2} \emptyset_q \ \mathrm{lnBDR}_{t-q} + \varepsilon_{25t} \quad (7.17)$$

$$\mathrm{lnRGDPP}_t = \emptyset_0 + \sum_{i=1}^{2} \emptyset_i \ \mathrm{lnRGDPP}_{t-i} + \sum_{j=1}^{2} \emptyset_j \mathrm{lnAR}_{t-j} + \sum_{m=1}^{2} \emptyset_m \ \mathrm{lnGCFR}_{t-m} + \sum_{n=1}^{2} \emptyset_n \ \mathrm{lnEDU}_{t-n} + \sum_{p=1}^{2} \emptyset_p \ \mathrm{lnBDR}_{t-p} + \sum_{q=1}^{2} \emptyset_q \ \mathrm{lnMONR}_{t-q} + \varepsilon_{26t} \quad (7.18)$$

7.4. Specification of VEC model

Once a VAR(P) model has been developed, we perform the cointegration test. If the variables in the VAR model are cointegrated then we estimate a VEC model. In this section, we have developed VEC model for each VAR model presented in equation (7.10) – equation (7.18). One thing that we must take care of is that the VEC model has a lag order of p - 1 meaning that VEC model is a differenced form of VAR model containing one less lag order.

$$\Delta \ln\mathrm{RGDPP_t} = \emptyset_0 + \sum_{i=1}^{4-1} \emptyset_i \, \Delta \ln\mathrm{RGDPP_{t-i}} + \sum_{j=1}^{4-1} \emptyset_j \, \Delta \ln\mathrm{AR_{t-j}} + \rho_1 \mu_{t-1} + \varepsilon_{11t} \quad (7.10a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{3-1} \emptyset_i \, \Delta \ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{3-1} \emptyset_j \Delta \ln\mathrm{AR}_{t-j} + \sum_{m=1}^{3-1} \emptyset_m \, \Delta \ln\mathrm{GCFR}_{t-m} + \rho_1 \mu_{t-1} + \varepsilon_{12t} \quad (7.11a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{2-1} \emptyset_i \, \Delta\ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{2-1} \emptyset_j \Delta\ln\mathrm{AR}_{t-j} + \sum_{m=1}^{2-1} \emptyset_m \, \Delta\ln\mathrm{GCFR}_{t-m} + \sum_{n=1}^{2-1} \emptyset_n \, \Delta\ln\mathrm{EDU}_{t-n} + \rho_1 \mu_{t-1} + \varepsilon_{13t} \quad (7.12a)$$

$$\Delta \ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{4-1} \emptyset_i \, \Delta \ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{4-1} \emptyset_j \, \Delta \ln\mathrm{AR}_{t-j} + \rho_1 \mu_{t-1} + \varepsilon_{21t} \quad (7.13a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{4-1} \emptyset_i \, \Delta\ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{4-1} \emptyset_j \Delta\ln\mathrm{AR}_{t-j} + \sum_{m=1}^{4-1} \emptyset_m \, \Delta\ln\mathrm{GCFR}_{t-m} + \rho_1 \mu_{t-1} + \varepsilon_{22t} \quad (7.14a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{4-1} \emptyset_i \, \Delta\ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{4-1} \emptyset_j \Delta\ln\mathrm{AR}_{t-j} + \sum_{m=1}^{4-1} \emptyset_m \, \Delta\ln\mathrm{GCFR}_{t-m} + \sum_{n=1}^{4-1} \emptyset_n \, \Delta\ln\mathrm{EDU}_{t-n} + \rho_1 \mu_{t-1} + \varepsilon_{23t} \quad (7.15a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{2-1} \emptyset_i \, \Delta\ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{2-1} \emptyset_j \Delta\ln\mathrm{AR}_{t-j} + \sum_{m=1}^{2-1} \emptyset_m \, \Delta\ln\mathrm{GCFR}_{t-m} + \sum_{n=1}^{2-1} \emptyset_n \, \Delta\ln\mathrm{EDU}_{t-n} + \sum_{p=1}^{2-1} \emptyset_p \, \Delta\ln\mathrm{TR}_{t-p} + \sum_{q=1}^{2-1} \emptyset_q \, \Delta\ln\mathrm{MONR}_{t-q} + \rho_1 \mu_{t-1} + \varepsilon_{24t} \quad (7.16a)$$

$$\Delta\ln\mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{2-1} \emptyset_i \, \Delta\ln\mathrm{RGDPP}_{t-i} + \sum_{j=1}^{2-1} \emptyset_j \Delta\ln\mathrm{AR}_{t-j} + \sum_{m=1}^{2-1} \emptyset_m \, \Delta\ln\mathrm{GCFR}_{t-m} + \sum_{n=1}^{2-1} \emptyset_n \, \Delta\ln\mathrm{EDU}_{t-n} + \sum_{p=1}^{2-1} \emptyset_p \, \Delta\ln\mathrm{TR}_{t-p} + \sum_{q=1}^{2-1} \emptyset_q \, \Delta\ln\mathrm{BDR}_{t-q} + \rho_1 \mu_{t-1} + \varepsilon_{25t} \quad (7.17a)$$

$$\Delta \ln \mathrm{RGDPP}_t = \emptyset_0 + \sum_{i=1}^{2-1} \emptyset_i \, \Delta \ln \mathrm{RGDPP}_{t-i} + \sum_{j=1}^{2-1} \emptyset_j \Delta \ln \mathrm{AR}_{t-j} + \sum_{m=1}^{2-1} \emptyset_m \, \Delta \ln \mathrm{GCFR}_{t-m} + \sum_{n=1}^{2-1} \emptyset_n \, \Delta \ln \mathrm{EDU}_{t-n} + \sum_{p=1}^{2-1} \emptyset_p \, \Delta \ln \mathrm{BDR}_{t-p} + \sum_{q=1}^{2-1} \emptyset_q \, \Delta \ln \mathrm{MONR}_{t-q} + \rho_1 \mu_{t-1} + \varepsilon_{26t} \quad (7.18a)$$

Now that we have defined our data, methodology and developed all the necessary models that we are going to estimate, the next step is to perform the statistical tests and present the result in the following chapter.

Chapter 8. Empirical results

8.1 Correlation of variables

The correlation coefficients of all the independent variables with real GDP and per capita real GDP are presented in Table 8-1 and Table 8-2 for two sample periods 1983-2002 and 1983-2013 respectively. It is explicitly stated that all the variables are significantly correlated with Real GDP and per capita real GDP at 1 percent and 5 percent. Aid to GDP ratio is negatively correlated with real GDP and per capita real GDP at 1 percent significance level. It can be interpreted as the increment in foreign aid is not as high as the increase in GDP which makes the time series line for Aid to GDP ratio to decline as shown in Figure 8-1 while the time series for both real GDP and per capita real GDP are in upward trend. The correlation coefficient for inflation and budget deficit are also negative which could be justified as higher inflation and budget deficit signify relatively poor economic performance which hinders growth in the economy. All the significant correlation coefficients tell us that we have strong evidence to support the variables in the model we are going to estimate.

Table 8-1: Correlation coefficients of variables (1983-2002)

Variables	Real GDP	Per capita real GDP
AR	-0.64*	-0.61*
AR1	-0.78*	-0.76*
TR	0.84*	0.84*
INF	-0.50**	-0.48**
GCFR	0.46**	0.47**
MONR (M2)	0.97*	0.96*
EDU	0.80*	0.82*
INVR	0.47**	0.45**
POP	0.99*	0.99*
BDR	-0.83*	-0.84*

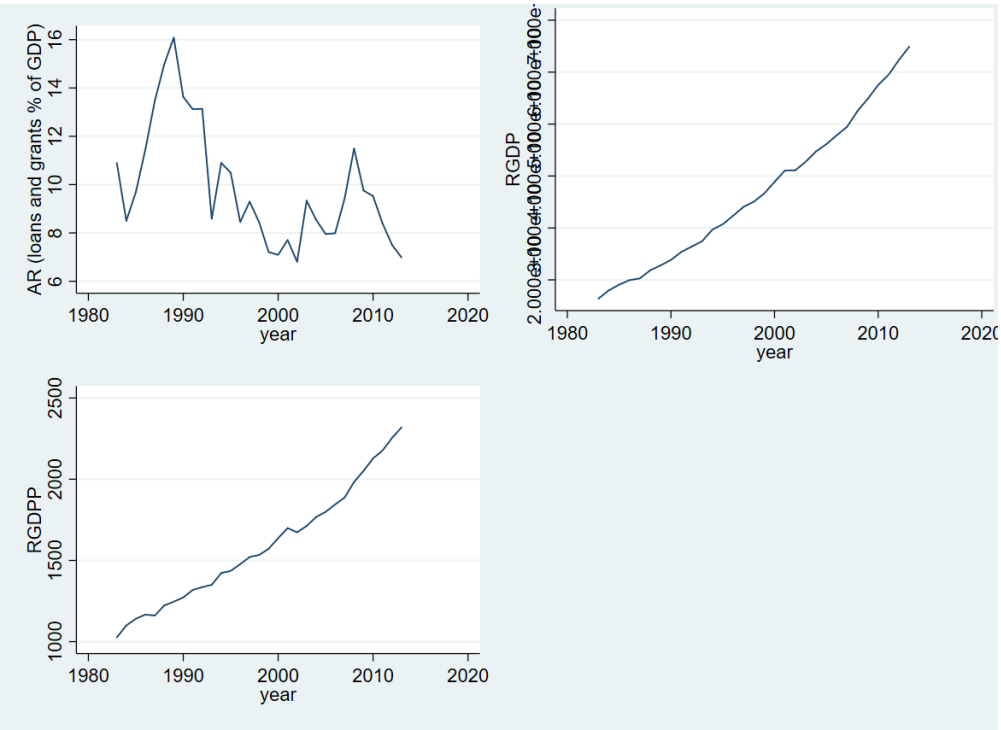
Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-2: Correlation coefficients of variables (1983-2013)

Variables	Real GDP	Per capita real GDP
AR	-0.56*	-0.54*
AR1	-0.87*	-0.852*
TR	0.42**	0.42**
INF	-0.24	-0.22
GCFR	0.86*	0.87*
MONR (M2)	0.98*	0.98*
EDU	0.95*	0.95*
INVR	0.30	0.29
POP	0.98*	0.97*
BDR	-0.79*	-0.78*

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Figure 8-1: Time-series plot for AR, RGDP and RGDPP



8.2 Descriptive statistics

Table 8-3 presents the statistical properties of variables for the period 1983 - 2013. The real per capita GDP growth rate between the period remains between -1.53 percent to 7.18 percent having a mean growth rate of 2.77 percent and standard deviation of 1.76 while aid/GDP growth rate has a much higher deviation dramatically having the minimum value of -34.65 percent to a maximum of 37.12 percent and a standard deviation of 16.1. These figures also signify that the per capita real GDP and aid/GDP ratio are negatively correlated. Mean real GDP for the period was 36.9 billion USD and real per capita GDP was 1588.10 USD on average without seasonal adjustments (University of Groningen and University of California, 2019). Foreign aid inflow remained minimum of 6.81 percent to maximum 16.08 percent of GDP with an average aid/GDP ratio over the period of 9.90 percent. Average trade/GDP ratio is 44.41 percent which consists of a very high proportion of GDP showing a reasonably open economy, even though, as discussed in section 2.5 the export is much lower than import which results in a high trade deficit. This also explains the inadequacy of domestic resources to mitigate the internal demand.

Average broad money supply (M2) as a percentage of GDP is 47.76 percent, mean inflation (8.32 percent), budget deficit/GDP (7.67 percent) and gross domestic capital formation as a percentage of GDP is 25.10 percent on average which indicates balanced development in the financial sector and stability in the economy. The average percentage of students on secondary school enrollment for the sample period is 41.49 percent which was at its minimum with 23.78 percent in the year 1983 that increased almost up to 66 percent by the year 2013 (details in Figure 5-1). The numbers tell us that people have started to consider education more important which helps in the economic upliftment of the nation along with their personal development.

The statistics and probability values for skewness and kurtosis test fulfil the assumption of normality on all the variables other than that of we reject the null hypothesis of normality for aid/GDP ratio and gross capital formation ratio. Both distributions are positively skewed. Overall, we have an evidence that the raw data come from a normal distribution for other than these two variables.

Table 8-3: Summary of statistics of variables

Variables	Minimum	maximum	Mean	Median	Std. deviation	Skewness	pr(Skewness)	Kurtosis	pr(Kurtosis)
RGDP (bn)	16.4	64.9	36.9	35.1	14.3	0.3501887	0.3607	1.988945	0.1002
RGDP growth	0.1198	9.6812	4.7105	4.549362	1.858714	0 .3516035	0.3648	4.229454	0.0831
RGDPP	1025.853	2319.074	1588.101	1533.744	364.5131	0.3882428	0.3126	2.129174	0.2277
RGDPP growth	-1.5290	7.1798	2.7706	2.700835	1.759398	0.0042077	0.9912	3.731073	0.1849
AR	6.8079	16.0847	9.8969	9.334765	2.470997	0.8799221	0.0324	2.872751	0.7458
AR growth	-34.6490	37.1165	-0.21722	-3.046992	16.09919	0 .2809826	0.4665	2.711726	0.9362
TR	30.1016	64.0355	44.4115	44.76199	9.456327	0.1346541	0.7216	2.151487	0.2530
MONR (M2)	27.2	85.5	47.7612	44.8	18.10239	0.650751	0.1011	2.208714	0.3233
INF	2.2692	18.9989	8.3236	8.34929	4.133869	0.5921618	0.1325	3.391272	0.3237
BDR	3.6576	12.2190	7.6709	7.095125	1.956574	.4668207	0.2285	2.778679	0.8586
GCFR	18.1258	38.27121	25.10095	22.5709	5.713734	1.093623	0.0104	3.195189	0.4470
EDU	23.7807	65.98645	41.49391	39.31402	11.18826	0.5527247	0.1582	2.686394	0.9801

8.3 Unit root test for stationarity

Prior to the unit-root test, the optimal lag length has been selected using AIC, HQIC and SBIC criterion for lag length selection. In most of the cases, the criterion selected the lag length of 1, therefore the unit-root test for stationarity have been conducted for all variables at lag order of 1. Separate sets of unit root test have been performed for the sub-period and full-period using ADF and PP test. The ADF test results for the sub-period have been presented in Table 8-4 and Table 8-5 with constant only and constant and time trend respectively. Similarly, the ADF test results for the full-period have been presented in Table 8-6 and 8-7 with constant only and constant and time trend respectively. Table 8-8 and Table 8-9 summarize the PP test result for sub-period, while Table 8-10 and Table 8-11 summarize the PP test result for the full-period respectively.

In the sub-period, all the variables in their level form indicate the presence of unit root while in the first difference, only lnTR indicates unit root and all other variables reveal the stationary nature when tested for ADF with constant only. With a constant and deterministic time trend all the variables except lnRGDPP and lnINF have unit root in level and lnTR, lnMONR and lnBDR have unit root in their first difference. For the full period, all variables except lnINF indicate unit root with constant only while all of them have a unit root with constant and deterministic trend in their level. On the other hand, lnBDR with constant only and lnTR and lnBDR with constant and time trend indicate unit root in their first difference.

The PP unit root test results for the sub-period indicate that all variables other than lnINF have a unit root with constant only while all the variables except lnRGDPP seem to have a unit root with constant and time trend in their level. In their first difference, lnTR and lnEDU seem to have unit root with constant only and constant and deterministic trend. For the full period, all variables except lnINF with constant only and constant and time trend support unit root in their level at 5 percent significance level. The time series lnRGDPP and lnMONR also seem to have stationarity in level form with constant and time trend at 10 percent significance level. Since 5 percent significance level is generally used in economic and financial decision making, we do not consider that result as significant. None of the variables seem to have unit root in their first difference both with constant and constant and time trend. Alternatively, all the variables in their first difference show

the nature of stationarity with both constant and constant and time trend at 1 percent and 5 percent significance level.

We see more consistency in the PP unit root test results while we have experienced several inconsistencies in the results from ADF test. Therefore, the order of integration of series have been identified based on the PP test results. The two time series lnTR and lnEDU in the sub-period seem to be I(2) while all other series are I(1). However, lnEDU was stationary on first difference in the Dickey-Fuller test results. On the other hand, lnINF in the full period seems to be I(0). Therefore, lnTR in sub-period and lnINF in both time periods will not be used in the cointegration test performed later in this chapter.

Table 8-4: Augmented Dickey-Fuller test for stationarity, constant only (1983-2002)

Constant only, lags = 1					
	Critical values			Test statistics	
Variables	**1%**	**5%**	**10%**	**Level**	**First difference**
lnRGDPP	-3.750	-3.000	-2.630	-0.872	-5.588*
lnAR	-3.750	-3.000	-2.630	-0.660	-3.215**
lnTR	-3.750	-3.000	-2.630	-1.509	-1.666
lnINF	-3.750	-3.000	-2.630	-1.968	-5.347*
lnMONR	-3.750	-3.000	-2.630	0.423	-2.820***
lnEDU	-3.750	-3.000	-2.630	-1.408	-3.464**
lnGCFR	-3.750	-3.000	-2.630	-2.130	-3.331**
lnBDR	-3.750	-3.000	-2.630	-1.143	-3.122**

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-5: Augmented Dickey-Fuller test for stationarity, Constant and time trend (1983-2002)

Constant and time trend, lags = 1					
	Critical values			Test statistics	
Variables	**1%**	**5%**	**10%**	**Level**	**First difference**
lnRGDPP	-4.380	-3.600	-3.240	-6.192*	-5.427*
lnAR	-4.380	-3.600	-3.240	-2.559	-3.866**
lnTR	-4.380	-3.600	-3.240	-0.610	-1.780
lnINF	-4.380	-3.600	-3.240	-3.723***	-6.070*
lnMONR	-4.380	-3.600	-3.240	-2.007	-2.570
lnEDU	-4.380	-3.600	-3.240	-3.021	-3.584***
lnGCFR	-4.380	-3.600	-3.240	-1.672	-3.302***
lnBDR	-4.380	-3.600	-3.240	-2.249	-3.002

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-6: Augmented Dickey-Fuller test for stationarity, constant only (1983-2013)

Constant only, Lags = 1 (level)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistic**
lnRGDPP	-3.723	-2.989	-2.625	0.569
lnAR	-3.723	-2.989	-2.625	-1.342
lnTR	-3.723	-2.989	-2.625	-1.952
lnINF	-3.723	-2.989	-2.625	-2.840***
lnGCFR	-3.723	-2.989	-2.625	-0.510
lnMONR	-3.723	-2.989	-2.625	0.278
lnEDU	-3.723	-2.989	-2.625	-0.830
lnBDR	-3.723	-2.989	-2.625	-0.736
Constant only, Lags=1 (first difference)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistic**
lnRGDPP	-3.730	-2.992	-2.626	-5.855*
lnAR	-3.730	-2.992	-2.626	-4.046*
lnTR	-3.730	-2.992	-2.626	-3.117**
lnINF	-3.730	-2.992	-2.626	-6.990*
lnGCFR	-3.730	-2.992	-2.626	-4.418*
lnMONR	-3.730	-2.992	-2.626	-4.245*
lnEDU	-3.730	-2.992	-2.626	-3.691**
lnBDR	-3.730	-2.992	-2.626	-2.514

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-7: Augmented Dickey-Fuller test for stationarity, constant and time trend (1983-2013)

Constant and time trend, Lags = 1 (level)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistic**
lnRGDPP	-4.343	-3.584	-3.230	-2.070
lnAR	-4.343	-3.584	-3.230	-2.446
lnTR	-4.343	-3.584	-3.230	-1.677
lnINF	-4.343	-3.584	-3.230	-3.096
lnGCFR	-4.343	-3.584	-3.230	-1.715
lnMONR	-4.343	-3.584	-3.230	-3.064
lnEDU	-4.343	-3.584	-3.230	-2.839
lnBDR	-4.343	-3.584	-3.230	-2.447
Constant and time trend, Lags = 1 (first difference)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistic**
lnRGDPP	-4.352	-3.588	-3.233	-5.980*
lnAR	-4.352	-3.588	-3.233	-4.083**
lnTR	-4.352	-3.588	-3.233	-3.168
lnINF	-4.352	-3.588	-3.233	-6.859*
lnGCFR	-4.352	-3.588	-3.233	-4.612*
lnMONR	-4.352	-3.588	-3.233	-4.276**
lnEDU	-4.352	-3.588	-3.233	-3.616**
lnBDR	-4.352	-3.588	-3.233	-2.245

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-8: Phillips-Perron unit root test result, constant only (1983-2002)

Constant only, lags = 1					
	Critical values			Test statistics	
Variables	**1%**	**5%**	**10%**	**Level**	**First difference**
lnRGDPP	-3.750	-3.000	-2.630	-1.787	-5.685*
lnAR	-3.750	-3.000	-2.630	-0.907	-5.040*
lnTR	-3.750	-3.000	-2.630	-1.147	-2.600
lnINF	-3.750	-3.000	-2.630	-2.735***	-6.090*
lnMONR	-3.750	-3.000	-2.630	0.514	-5.300*
lnEDU	-3.750	-3.000	-2.630	-1.667	-2.192
lnGCFR	-3.750	-3.000	-2.630	-2.410	-5.769*
lnBDR	-3.750	-3.000	-2.630	-1.783	-5.791*

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-9: Phillips-Perron unit root test result, constant and time trend (1983-2002)

Constant and time trend, lags = 1					
	Critical value			Test statistics	
Variables	**1%**	**5%**	**10%**	**Level**	**First difference**
lnRGDPP	-4.380	-3.600	-3.240	-6.628*	-5.582*
lnAR	-4.380	-3.600	-3.240	-1.801	-5.629*
lnTR	-4.380	-3.600	-3.240	-0.800	-2.668
lnINF	-4.380	-3.600	-3.240	-3.186	-6.635*
lnMONR	-4.380	-3.600	-3.240	-2.758	-5.242*
lnEDU	-4.380	-3.600	-3.240	-1.807	-2.013
lnGCFR	-4.380	-3.600	-3.240	-2.419	-5.903*
lnBDR	-4.380	-3.600	-3.240	-3.096	-5.567*

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-10: Phillips-Perron unit root test result, constant only (1983-2013)

Constant only, Lags = 1 (level)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistic**
lnRGDPP	-3.716	-2.986	-2.624	-0.364
lnAR	-3.716	-2.986	-2.624	-1.687
lnTR	-3.716	-2.986	-2.624	-1.553
lnINF	-3.716	-2.986	-2.624	-3.982**
lnGCFR	-3.716	-2.986	-2.624	-0.535
lnMONR	-3.716	-2.986	-2.624	0.558
lnEDU	-3.716	-2.986	-2.624	-0.814
lnBDR	-3.716	-2.986	-2.624	-1.078
Constant only, Lags = 1 (first difference)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistics**
lnRGDPP	-3.723	-2.989	-2.625	-7.177*
lnAR	-3.723	-2.989	-2.625	-6.344*
lnTR	-3.723	-2.989	-2.625	-4.044*
lnINF	-3.723	-2.989	-2.625	-8.460*
lnGCFR	-3.723	-2.989	-2.625	-6.630*
lnMONR	-3.723	-2.989	-2.625	-5.387*
lnEDU	-3.723	-2.989	-2.625	-3.700**
lnBDR	-3.723	-2.989	-2.625	-4.589*

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-11: Phillips-Perron unit root test result, constant and time trend (1983-2013)

Constant and trend, Lags = 1 (level)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistics**
lnRGDPP	-4.334	-3.580	-3.228	-3.419***
lnAR	-4.334	-3.580	-3.228	-2.347
lnTR	-4.334	-3.580	-3.228	-1.299
lnINF	-4.334	-3.580	-3.228	-3.953**
lnGCFR	-4.334	-3.580	-3.228	-2.182
lnMONR	-4.334	-3.580	-3.228	-3.240***
lnBOP	-4.380	-3.600	-3.240	-3.185
lnEDU	-4.334	-3.580	-3.228	-2.131
lnBDR	-4.334	-3.580	-3.228	-2.724
Constant and trend, Lags = 1 (first difference)				
	Critical values			
Variables	**1%**	**5%**	**10%**	**Test statistics**
lnRGDPP	-4.343	-3.584	-3.230	-7.139 *
lnAR	-4.343	-3.584	-3.230	-6.387*
lnTR	-4.343	-3.584	-3.230	-4.131**
lnINF	-4.343	-3.584	-3.230	-8.265 *
lnGCFR	-4.343	-3.584	-3.230	-6.575 *
lnMONR	-4.343	-3.584	-3.230	-5.387*
lnBOP	-4.343	-3.584	-3.230	-7.324*
lnEDU	-4.343	-3.584	-3.230	-3.634**
lnBDR	-4.343	-3.584	-3.230	-4.394*

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

8.4 Johansen's Cointegration and Error correction model

After having the evidence that the variables being used in the models are I(1), I have tested for the cointegration in this section for the two different time intervals.

8.4.1. Sub-period (1983-2002)

In the beginning, the first two variables lnRGDPP and lnAR have been tested for cointegrating rank to see if aid and per capita real GDP have a long-run relationship. The results from Johansen's likelihood ratio test have been presented in the first part of Table 8-12. The results indicate that we cannot reject the null hypothesis of cointegrating rank less than or equal to 1 which implies that aid and per capita real GDP are cointegrated indicating the existence of a long-run relationship between two variables.

Long-run normalized cointegrating coefficients presented in the second part of the table. A video, posted with an education purpose on YouTube channel of CrunchEconometrics, explains that the signs of the coefficients in the long-run normalized table are reversed while interpreting the effect of independent variable. Therefore, the positive long-run aid coefficient in the second part of Table 8-12 suggests that aid has a negative and statistically significant impact on per capita real GDP. Our result signifies that there is a negative long-run relationship between aid inflows and per capita real GDP. The short-run aid coefficient, on the other hand, is negative and insignificant.

In the next step, gross capital formation has been added as an explanatory variable along with foreign aid in the production function and the estimation results from this model are presented in Table 8-13. Both trace statistics and max statistics support the null hypothesis of cointegrating ranks less than or equal to 1 implying that there exists long-run association between the variables. The long-run normalized coefficients of aid and gross capital formation show the significant negative impact of aid on per capita real GDP with the inclusion of capital. The short-run aid coefficient is negative and insignificant.

Similarly, when adding the variable for education in our model, trace statistics support the null hypothesis of having cointegrating rank of 1. The long-run normalized aid coefficient shows a significantly negative impact of aid on per capita real GDP as shown in Table 8-14. The short-run

aid coefficient, however, is still negative and significant at 5 percent. The VEC diagnostic tests for serial correlation and normality provide evidence that the variables are good representation in all models.

Table 8-12: Johansen's Likelihood ratio test estimates: lnRGDPP and lnAR (1983-2002)

VAR = 4			Variables: lnRGDPP and lnAR			
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.75003	22.1878	15.41	22.1824	14.07
r ≤ 1	r = 2	0.00034	0.0054 *	3.76	0.00054*	376

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR
Coefficients	1.000	0.438*
z-statistics	-	(10.50)*

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistics**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.768*	(5.11)*	$\Delta lnRGDPP_{t-1}$	-0.680**	(-2.31)**
ECT	-0.107	(-1.45)	$\Delta lnAR_{t-1}$	-0.031	(-1.52)

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	7.0246 [lag 1]	0.13459
	2.1500 [lag 4]	0.70820

Normality	**Jarque-Bera test**	
Variables	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	2.346	0.30941
ΔlnAR	1.290	0.52457
All	3.636	0.45743

	Skewness test			**Kurtosis test**		
Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.91073	2.212	0.13696	2.5511	0.134	0.71397
ΔlnAR	-0.69422	1.285	0.25694	2.9119	0.005	0.94267
All	-	3.497	0.17404	-	0.140	0.93262

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-13: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR and lnGCFR (1983-2002)

VAR = 3			Variables lnRGDPP, lnAR and lnGCFR			
Hypotheses		eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.77450	32.7832	29,68	25.3201	20.97
r ≤ 1	r = 2	0.32976	7.4631**	15,41	6.8019**	14,07

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR
Coefficients	1.000	0.407*	-0 .022
z-statistics	-	5.00 *	-0.10

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistics**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.045*	4.35*	$\Delta lnAR_{t-1}$	-0.025	-1.20
ECT	-0.055	-1.44	$\Delta lnGCFR_{t-1}$	0.015	0.46
$\Delta lnRGDPP_{t-1}$	-0.455	-1.64			

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	7.3666 [lag 1]	0.59901
	7.0882 [lag 3]	0.62793

Normality	**Jarque-Bera test**	
Variables	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	2.127	0.34533
ΔlnAR	2.437	0.29562
ΔlnGCFR	1.174	0.55612
All	5.737	0.45324

	Skewness test			**Kurtosis test**		
Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	-0.86628	2.126	0.14479	3.0183	0.000	0.98773
ΔlnAR	-0.92256	2.411	0.12045	3.191	0.026	0.87230
ΔlnGCFR	-0.46643	0.616	0.43238	3.8869	0.557	0.45542
All	-	5.154	0.16085	-	0.583	0.90027

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-14: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR, lnGCFR and lnEDU (1983-2002)

VAR = 2			Variables lnRGDPP, lnAR, lnGCFR and lnEDU			
Hypotheses		eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.74809	48.2750	47.21	24.8165**	27.07
r ≤ 1	r = 2	0.51012	23.4585**	29.68	12.8446	20.97

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR	lnEDU
Coefficients	1.000	0.245*	0.207	-0.745*
z-statistics	-	5.48*	1.29	-9.21

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistic**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0 .027*	3.39*	$\Delta lnAR_{t-1}$	-0.064**	-2.40**
ECT	0.029	0.38	$\Delta lnGCFR_{t-1}$	0.046	1.23
$\Delta lnRGDPP_{t-1}$	-0.204	-0.95	$\Delta lnEDU_{t-1}$	-0.035	-0.47

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	13.4488 [lag 1]	0.63971
	23.7326 [lag 2]	0.09551

Normality			**Jarque-Bera test**		
Variables	**Chi-square**	**Prob > chi2**	**Variables**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.366	0.83289	ΔlnEDU	0.811	0.66656
ΔlnAR	1.155	0.56139	All	2.981	0.93556
ΔlnGCFR	0.649	0.72286			

	Skewness test			**Kurtosis test**		
	Skewness	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.30904	0.287	0.59247	3.325	0.079	0.77839
ΔlnAR	-0.17103	0.088	0.76705	4.1927	1.067	0.30165
ΔlnGCFR	-0.46199	0.640	0.42360	3.1081	0.009	0.92538
ΔlnEDU	-0.35337	0.375	0.54050	3.763	0.437	0.50875
All	-	1.389	0.84607	-	1.592	0.81032

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

8.4.2. Full period (1983-2013)

In this section, a similar approach to test cointegration has been followed using the data for the full period. While taking only per capita real GDP and aid variable, the trace statistics suggests that there exists one cointegrating vector meaning that there exists a long-run relationship between aid and per capita real GDP. The detailed summary of the test result has been stated in Table 8-15. The long-run coefficient for aid tells us that there exists a significant negative impact of aid on per capita real GDP. The positive and significant error correction term implies an explosive model with no long-run convergence of any disequilibrium. In the short-run, aid has a negative and significant coefficient which signifies the negative impact of aid on per capita real GDP.

In the next step when we include capital in our model, we see that there exists at least one cointegrating vector. The long-run normalized cointegrating coefficient explains that there is a significant positive impact of aid on per capita real GDP when the factor capital is taken in the model (Table 8-16). On the other hand, the short run aid coefficient implies that there exists a significant negative relationship between aid and per capita real GDP. The adjustment parameter of the error correction term is negative and significant (-0.008). It suggests that any deviation from long-run equilibrium is corrected within the current year at a convergence speed of 0.8 percent.

Finally, we add the variable for school enrollment in the model and the estimation results are presented in Table 8-17. The first part of the table suggests that there exists one cointegrating equation and supports the fact that there exists a long-run relationship between aid and per capita real GDP. The long-run aid coefficient tells us that there is a significant positive impact of aid on per capita real GDP. There is still a positive and insignificant impact of aid on per capita real GDP in the short run. The negative and significant error correction term implies that any long-run disequilibrium is corrected within the current year at the adjustment speed of 2.8 percent.

The VEC diagnostic tests presented in the last part of each tables tell us that there is no autocorrelation on all the lag levels used and the errors are normally distributed. These results indicate that all the variables fit well in our model.

Table 8-15: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR (1983-2013)

VAR = 4			Variables lnRGDPP and lnAR			
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.40471	15.8798	15.41	14.0052**	14.07
r ≤ 1	r = 2	0.06708	1.8746**	3.76	1.8746	3.76

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR
Coefficients	1.000	0 .862*
z-statistics	-	4.79*

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistics**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0 .051*	4.86*	$\Delta lnRGDPP_{t-1}$	-0.531**	-2.39**
ECT	0.041**	2.02**	$\Delta lnAR_{t-1}$	-0.040**	-2.14**

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	3.3612 [lag 1]	0.49930
	1.5652 [lag 4]	0.81503

Normality	**Jarque-Bera test**	
Variables	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	1.645	0.43936
ΔlnAR	0.479	0.78687
All	2.124	0.71292

	Skewness test			**Kurtosis test**		
Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.60256	1.634	0.20117	2.9011	0.011	0.91645
ΔlnAR	0.28737	0.372	0.54213	2.6905	0.108	0.74269
All	-	2.005	0.36687	-	0.119	0.94234

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-16: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR lnGCFR (1983-2013)

VAR = 4			Variables lnRGDPP, lnAR and lnGCFR			
Hypotheses		eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.59628	34.9655	29.68	24.4900	20.97
r ≤ 1	r = 2	0.29618	10.4755**	15.41	9.4834**	14.07

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR
Coefficients	1.000	-1.717*	-5.105*
z-statistics	-	-3.05*	-5.48*

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistics**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.038*	3.87*	$\Delta lnAR_{t-1}$	-0.025***	-1.65***
ECT	-0.008***	-1.68***	$\Delta lnGCFR_{t-1}$	-0.002	-0.06
$\Delta lnRGDPP_{t-1}$	-0.331	-1.35			

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	8.5545 [lag 1]	0.47937
	3.7723 [lag 4]	0.92575

Normality			**Jarque-Bera test**		
Variables	**Chi-square**	**Prob > chi2**	**Variables**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.939	0.62539	ΔlnGCFR	0.845	0.65538
ΔlnAR	0.537	0.76464	All	2.321	0.88799

	Skewness test			**Kurtosis test**		
Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.34016	0.521	0.47055	2.3904	0.418	0.51791
ΔlnAR	0.30521	0.419	0.51734	2.6768	0.118	0.73175
ΔlnGCFR	-0.41151	0.762	0.38269	2.7283	0.083	0.77319
All	-	1.702	0.63651	-	0.619	0.89216

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-17: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR lnGCFR lnEDU (1983-2013)

VAR = 4			Variables lnRGDPP, lnAR, lnGCFR and lnEDU			
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.77986	69.6279	47.21	40.8641	27.07
r ≤ 1	r = 2	0.51679	28.7638*	29.68	19.6371*	20.97

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR	lnEDU
Coefficients	1.000	-0.930*	-1.280**	-1.367*
z-statistics	-	-4.32*	-2.44**	-3.12*

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistic**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.0503*	5.94*	$\Delta lnAR_{t-1}$	0 .017	-1.42
ECT	-0.028*	-3.09*	$\Delta lnGCFR_{t-1}$	0 .009	0.39
$\Delta lnRGDPP_{t-1}$	-0.541*	-2.83*	$\Delta lnEDU_{t-1}$	-0 .017	-0.42

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	12.5642 [lag 1]	0.70431
	9.2444 [lag 4]	0.90301

Normality			**Jarque-Bera test**		
Variables	**Chi-square**	**Prob > chi2**	**Variables**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	1.043	0.07375	ΔlnEDU	6.045	0.04869
ΔlnAR	5.214	0.07375	All	12.773	0.11990
ΔlnGCFR	0.472	0.78987			

	Skewness test			**Kurtosis test**		
	Skewness	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0 .13417	0.081	0.77593	2.0755	0.962	0.32680
ΔlnAR	1.0608	5.064	0.02443	3.3656	0.150	0.69819
ΔlnGCFR	-0 .25598	0.295	0.58713	2.6034	0.177	0.67404
ΔlnEDU	-0 .72633	2.374	0.12337	4.8063	3.671	0.05538
All	-	7.814	0.09865	-	4.960	0.29147

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

8.5 Aid-growth and policy variables

We continue our estimation including several policy variables in the main model in equation 7.6. Due to the degree of freedom problem, we have taken only two policy variables at once. First, we have chosen the policy variables for financial services and openness (lnMONR and lnTR) and the estimated results have been presented in Table 8-18. Trace statistics suggests us that there exist two or less cointegrating equations while max statistics accepts the null hypothesis of one cointegrating equation. The VECM model has been fitted taking one cointegrating vector. The long-run normalized coefficient tells us that aid has an insignificant negative long-run impact on per capita real GDP while there is a significant negative impact in the short-run.

Secondly, the variables lnTR and lnBDR have been included in the model and the estimation results are presented in Table 8-19. Both trace and max statistics fail to reject the null hypothesis of cointegrating rank less than or equal to 1, so we know that there exists at least one cointegrating equation. We find that there exists a significant negative relationship between aid and per capita real GDP in the long-run and a significant negative relationship in the short-run in the presence of the stated policy variables.

Similarly, we have estimated our model taking lnMONR and lnBDR as our policy variables. We fail to reject the null hypothesis of at least two cointegrating ranks based on our trace statistics, but the max statistics has evidence in favour of the null of cointegrating rank equal to one. The results presented in Table 8-20 contains the result from VECM model fitted taking one cointegrating vector. There seem to be a significant positive impact of aid on per capita real GDP in the long-run while a significant negative impact in the short-run.

The serial correlation and normality do not seem to be a problem in all three models. The VECM diagnostic tests presented in the last section of each table explains that there is no autocorrelation in the variables at all the lags selected and the random errors follow a normal distribution for all the equations in all three models. This indicates that the variables used in the models explain the relationship very well in all cases.

Table 8-18: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR, lnGCFR, lnEDU, lnTR and lnMONR (1983-2013)

VAR = 2		Variables lnRGDPP, lnAR, lnGCFR ,lnEDU, lnTR and lnMONR				
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.82570	125.8335	94.15	50.6631	39.37
r ≤ 1	r = 2	0.67143	75.1704*	68.52	32.2773*	33.46
r ≤ 2	r = 3	0.51848	42.8931**	47.21	21.1935	27.07

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR	lnEDU	lnTR	lnMONR
Coefficients	1.000	0.014	0.122*	-0.234*	0.013	-0.537*
z-statistics	-	1.03	5.91*	-9.22*	0.98	-30.34*

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistic**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.024	4.58 *	$\Delta lnGCFR_{t-1}$	0.057**	2.0*2*
ECT	-0.096	-0.68	$\Delta lnEDU_{t-1}$	-0.022	-0.41
$\Delta lnRGDPP_{t-1}$	-0.122	-0.80	$\Delta\ lnTR_{t-1}$	-0.042	-1.01
$\Delta lnAR_{t-1}$	-0.035*	-2.11*	$\Delta\ lnMONR_{t-1}$	0.089	1.33

Diagnostic tests

	Chi-square	Prob > chi2
Serial correlation	37.1840 [lag 1]	0.41430
	35.9065 [lag 2]	0.47303

Normality	**Jarque-Bera test**	
Variables	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.008	0.99595
ΔlnAR	0.819	0.66394
ΔlnGCFR	1.521	0.46738
ΔlnEDU	2.062	0.35666
Δ lnTR	2.256	0.32367
Δ lnMONR	1.070	0.58575
All	7.736	0.80539

Variables	Skewness test			Kurtosis test		
	Skewness	Chi-square	Prob > chi2	Kurtosis	Chi-square	Prob > chi2
ΔlnRGDPP	0.03517	0.006	0.93836	2.958	0.002	0.96321
ΔlnAR	-0.1249	0.075	0.78364	2.2155	0.744	0.38846
ΔlnGCFR	-0.14821	0.106	0.74455	1.9178	1.415	0.23422
ΔlnEDU	-0.53606	1.389	0.23859	3.7463	0.673	0.41199
Δ lnTR	0.48805	1.151	0.28328	3.9562	1.105	0.29322
Δ lnMONR	0.47044	1.070	0.30102	3.0064	0.000	0.99442
All	-	3.797	0.70407	-	3.939	0.68496

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-19: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR, lnGCFR, lnEDU, lnTR and lnBDR (1983-2013)

VAR = 2		Variables lnRGDPP, lnAR, lnGCFR ,lnEDU, lnTR and lnBDR				
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.74513	97.8680	94.15	39.6434	39.37
r ≤ 1	r = 2	0.50497	58.2246**	68.52	20.3908**	33.46

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR	lnEDU	lnTR	lnBDR
Coefficients	1.000	0.579*	0.221***	-1.143*	0.250*	-0.351*
z-statistics	-	7.09*	1.94***	-10.01*	3.46*	-3.21*

Error correction model for lnRGDPP

Variables	Coefficients	z-statistic	Variables	Coefficients	z-statistics
Intercept	0.030*	5.35*	$\Delta lnGCFR_{t-1}$	0.050	1.53
ECT	0.032	0.84	$\Delta lnEDU_{t-1}$	-0.017	-0.30
$\Delta lnRGDPP_{t-1}$	-0.159	-0.91	$\Delta\ lnTR_{t-1}$	-0.041	-1.01
$\Delta lnAR_{t-1}$	-0.045***	-1.89***	$\Delta\ lnBDR_{t-1}$	-.016	-0.68

Diagnostic tests						
		Chi-square	Prob > chi2			
Serial correlation		23.6002 [lag 1]	0.94438			
		27.3467 [lag 2]	0.84965			
Normality		**Jarque-Bera test**				
Variables		**Chi-square**	**Prob > chi2**			
ΔlnRGDPP		0.347	0.84079			
ΔlnAR		0.856	0.65179			
ΔlnGCFR		3.084	0.21397			
ΔlnEDU		4.962	0.08365			
Δ lnTR		0.468	0.79152			
Δ lnBDR		1.164	0.55889			
All		10.880	0.53922			
	Skewness test			**Kurtosis test**		
Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.031	0.005	0.94547	2.4679	0.342	0.55859
Δ lnAR	-0.038	0.007	0.93333	2.1617	0.849	0.35682
Δ lnGCFR	0.687	2.283	0.13081	3.8142	0.801	0.37078
Δ lnEDU	-0.913	4.033	0.04461	3.8768	0.929	0.33515
Δ lnTR	0.258	0.324	0.56950	3.3453	0.144	0.70425
Δ lnBDR	-0.418	0.845	0.35791	3.5133	0.318	0.57256
All	-	7.496	0.27736	-	3.384	0.75938

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Table 8-20: Johansen's Likelihood ratio test estimates: lnRGDPP, lnAR, lnGCFR, lnEDU, lnMONR and lnBDR (1983-2013)

VAR = 2		Variables lnRGDPP, lnAR, lnGCFR ,lnEDU, lnMONR and lnBDR				
Hypotheses		Eigenvalues	(λ_{trace})	Critical value (5%)	(λ_{max})	Critical value (5%)
Null	Alternative					
r = 0	r =1	0.70885	106.9048	94.15	35.7833*	39.37
r ≤ 1	r = 2	0.63974	71.1215*	68.52	29.6072	33.46
r ≤ 2	r = 3	0.48600	41.5143**	47.21	19.3002	27.07

Long-run normalized coefficients for cointegrating equation

Variables	lnRGDPP	lnAR	lnGCFR	lnEDU	lnMONR	lnBDR
Coefficients	1	-0.083*	0.073**	-0.168*	-0.522*	0.087**
z-statistics	-	-3.51*	2.01**	-4.21*	-20.04*	2.54**

Error correction model for lnRGDPP

Variables	**Coefficients**	**z-statistic**	**Variables**	**Coefficients**	**z-statistics**
Intercept	0.028*	4.93*	$\Delta lnGCFR_{t-1}$	0.046***	1.73***
ECT	-0.166	-1.36	$\Delta lnEDU_{t-1}$	-0.034	-0.67
$\Delta lnRGDPP_{t-1}$	-0.152	-0.99	Δ $lnMONR_{t-1}$	0.066	1.10
$\Delta lnAR_{t-1}$	-.045*	-2.77*	Δ $lnBDR_{t-1}$	-0.018	-0.86

Diagnostic tests

	Chi-square	**Prob > chi2**
Serial correlation	46.1562 [lag1]	0.11962
	28.4526 [lag2]	0.81068

Normality **Jarque-Bera test**

Variables	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.117	0.94308
ΔlnAR	0.234	0.88943
ΔlnGCFR	0.655	0.72058
ΔlnEDU	2.957	0.22796
Δ lnMONR	1.913	0.38418
Δ lnBDR	1.973	0.37282
All	7.851	0.79668

Variables	**Skewness**	**Chi-square**	**Prob > chi2**	**Kurtosis**	**Chi-square**	**Prob > chi2**
ΔlnRGDPP	0.15536	0.117	0.73268	3.0213	0.001	0.98134
ΔlnAR	-0.16564	0.133	0.71575	3.2902	0.102	0.74974
ΔlnGCFR	-0.04069	0.008	0.92872	2.268	0.647	0.42105
ΔlnEDU	-0.74877	2.710	0.09973	3.4524	0.247	0.61898
Δ lnMONR	0.6206	1.862	0.17245	2.793	0.052	0.82001
Δ lnBDR	-0.62663	1.898	0.16832	3.2498	0.075	0.78359
All	-	6.727	0.34688	-	1.124	0.98046

Note: (*, **, *** significant at 1%, 5% and 10% respectively)

Chapter 9. Discussion

9.1. Discussion

The effect of foreign aid in economic growth of Nepal has been estimated in the previous chapter. The empirical investigation has been performed in two phases taking different time intervals; from 1983 to 2002 and from 1983 to 2013. The test results on the impact of foreign aid on per capita real GDP with and without several control variables and policy variables have been summarized in Appendix 1.

The motivation behind the first phase is to reproduce the findings of (Bhattarai, 2009) and see if the effect of aid we observe follow the same direction. The result I have found is somewhat different from what he had found. He had found a positive long-run effect of foreign aid on per capita real GDP and concluded that aid contributes to per capita real GDP with capital importation by enhancing technical knowledge. On the other hand, I have observed a negative long-run impact of aid on per capita real GDP. Islam (2003) found a negative significant impact of aid on growth in developing countries from Africa and Asia on average. Similarly, (Nowak‐Lehmann et al., 2012) also found a minute negative significant impact on per capita income particularly in countries with high aid dependency. Hamid Ali (2013) presents evidence of the negative and significant long-run impact of foreign aid on economic growth in Egypt where the economic performance has remained poor.

For the developing countries like Nepal, foreign aid is playing an important role to meet the shortfall in revenue as it is found to be used as a source of revenue in the government budget. This somehow relaxes the government budget constraint. Aid, nonetheless, should not be used only to meet the non-development expenditures. Bhattarai (2007) observed that aid has a stronger positive impact on non-development expenditures than on development expenditures of Nepal. Having said that, we can get an idea that a greater portion of aid could have been used in non-development expenditures which typically do not help in the economic growth of a nation. Quazi (2005) in his mixed result of aid-growth relationship mentioned that foreign loans can raise GDP, but grants don't. He further explains that foreign grants mostly finance the non-productive public expenditure while loans are used in public investment projects for the growth purpose. The percentage of grants

on foreign aid to Nepal is more than 60 percent (refer to Appendix 7). Therefore, foreign aid being highly used in public expenditures than in developmental activities, we can conclude that foreign aid do not help in economic growth.

When a longer time period is covered, I have found a significant positive effect of aid on per capita real GDP (refer to section 8.4.2). However, this is not true in every case. Referring to the result presented in Table 8-15, foreign aid seems to have a negative significant impact on per capita real GDP when the effect of aid is examined exclusively on per capita real GDP. This is an indication that foreign aid independently is not adequate for economic growth. Introduction of other control variables in the model remarkably changes the result. With the higher level of capital formation in-lined with enhanced technology and improved skills on human capital, foreign aid helps significantly to increase per capita real GDP in long-run.

Bhattarai (2009) had found that good policy environment increases the aid effectiveness. In my analysis, all the policy variables used in the model don't play a positive role in aid effectiveness. Only a combination of money supply and budget surplus/deficit play a significant positive impact on aid effectiveness. Whenever trade policy is included in the model, I have experienced a negative aid effect on per capita real GDP. One possible situation that trade leads to negative economic growth is when the economy is facing a higher trade deficit. As explained in Table 2-3, Nepal is having trade deficit in an increasing trend as the detail is further stated in Appendix 2 in a graphical view. The tendency for Nepal's trade deficit until the time period covered by Bhattarai's analysis was relatively very less compared to later years.

Going back to the Figure 2-3 and compare the trend of remittance inflow with the trend of budget deficit in Appendix 2, there seems to be a connection between these two indicators. By the time remittances started to increase in the country, the trade deficit started to get higher. Remittances increase the consumption of non-tradable goods, raising their prices. It reduces the labour supply in the market resulting in less production capacity (Amuedo-Dorantes, 2014). This causes a sharp increase in imports. Thus, steeply increased remittance inflows exacerbate trade deficit. This could be an indication that directly or indirectly a higher remittance inflow might have negative impact on aid effectiveness.

The policy for trade openness itself has a significant negative impact on per capita real GDP in Nepal especially when the full period is covered. Due to insignificant data for trade for the sub-period, trade policy can not be included in my model to see how it would affect when there was relatively a less trade deficit. And due to the serial correlation among variables, the independent effect of trade in model above (in equation 7.6) could not be estimated for the full period.

I have found a significantly negative effect of foreign aid on per capita real GDP in the short-run for both time durations which corresponds with the result from (Bhattarai, 2009). However, aid effect analyzed independently and with capital inclusion for the sub-period and aid with capital and education for the full-period (refer to Table 8-12, Table 8-13 and Table 8-17 respectively), the short-run impact of aid on per capita real GDP is insignificant. The negative effect of aid in per capita real GDP is due to the less absorptive capacity of the country. The aid allocation may not be completed promptly because of the involvement of too many agencies which might lead to role mismatch and lack of coordination among them. Due to a poor bureaucracy, the development budget of the country is being frozen. In such circumstances, it is obvious that aid receipts are not being utilized immediately. The longer time taken to utilize the disbursed aid is also because of the aid conditionalities.

The disparity among the results in two phases is due to the difference in economic condition. Kwablah et al. (2014) had also found that the effectiveness of aid differs in periods with structural changes in the economy. The first phase of the test is based on time duration when there was a long period of political and economic instability in the country. The control variables used in the model demonstrate poorer economic performance. The capital formation was relatively less than in later years (refer to Appendix 6). Failure to accumulate capital stock results in less production capacity in the economy. The relatively smaller slope of the curve for education in Figure 5-1 during the earlier time period reflects that the country was less successful in human capital development by providing education to its citizens. These indicators specify that the country is not capable of optimally utilizing foreign aids effectively for sustainable long-run development projects.

9.2. Limitations

There might be hardly any studies without any limitations. This thesis is also not an exception. Out of many limitations faced during the period of writing this thesis, I have mentioned few which were relatively more prominent.

Lack of reliable and adequate data is always a problem while conducting research on underdeveloped countries. Although one of the main objectives of this thesis was to research on the latest economic activities, it was not possible to cover the recent years because of the lack of data. This restricted the outcome of the thesis as I was not able to see the most recent impact of aid on the growth.

Finding the exact similar data for foreign aid used by (Bhattarai, 2009) on his empirical study was not possible during the replication phase. As mentioned in the data explanation section that the aid/GDP ratio in my data set did not match with Bhattarai's even when the data was collected from the same online data base. I assume that it is because of the time difference in the data collection. This could be a possible reason for the differences in results obtained in the first phase.

Working alone on master thesis came to be one of the significant constraints for me. At some point, I was lacking the ideas that could be generated through brainstorming while working on a group. And the division of work in a group work also increases efficiency. I confess the fact that, sometimes, I have taken a longer time to resolve any conflict or a confusion that occurred in between the study period.

Chapter 10. Conclusion

Foreign aid serves as an important source of fund for under-developed and developing countries. There have been countless arguments over the period on whether aid has been utilized effectively for the economic upliftment and growth of the recipient countries. Nepal is one of the least developed countries and it is highly dependent on foreign aid. Therefore, it is important to analyze the effectiveness of aid in the Nepalese economy.

Using cointegration and error correction method, the effect of foreign aid on the economic growth of Nepal has been examined. The empirical work has been performed taking two time-intervals 1983-2002 and 1983-2013. The result for the first interval reveals that aid has a negative long-run effect on per capita real GDP when there was relatively a poor economic situation. In a longer time period, the effectiveness of aid is increased showing a significant positive effect of foreign aid on per capita real GDP. The deviation on the results is due to different economic status of the country. Aid effectiveness increases when the macroeconomic indicators show an improvement resulting in an enhanced economic situation. There is a negative impact of aid on per capita real GDP in the short run which is because of ineffective aid monitoring, problems related to aid management and aid conditionalities.

The country's monetary policy and fiscal policy, measured in the form of broad money supply and government budget status, are supportive on positive aid effectiveness. However, the prevailing trade policy is negatively affecting the effectiveness of aid due to extremely increased trade deficit. The current status of higher trade deficit in the economy is impeding foreign aid to be utilized in the targeted sector. A sudden and steep increase in remittance, resulting in a culture of dependency, also fuels up the trade deficit which directly or indirectly reduces aid effectiveness. However, further investigation should be carried out to draw a conclusion on how remittance affects the effectiveness of foreign aid.

As a concluding remark, the current situation of the economy with higher trade deficit disrupting foreign aid to be utilized in the targeted sector and to achieve its designated goal. The policy should be reviewed so that the size of ever-increasing trade deficit reduces. Similarly, foreign aid should be monitored strictly in order that its goal is fulfilled.

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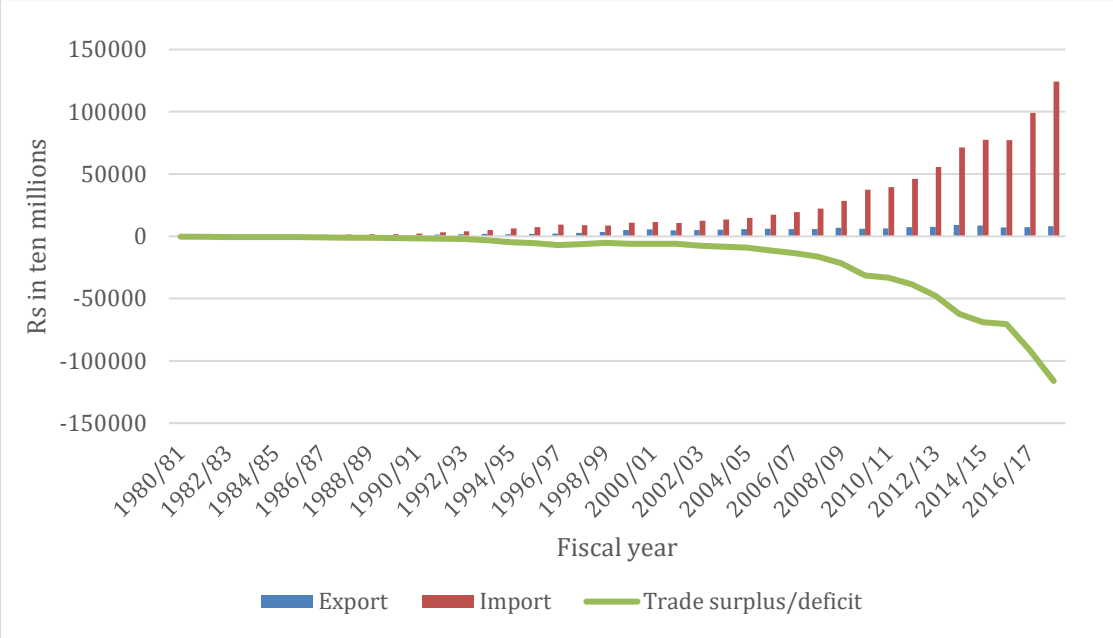
Appendices

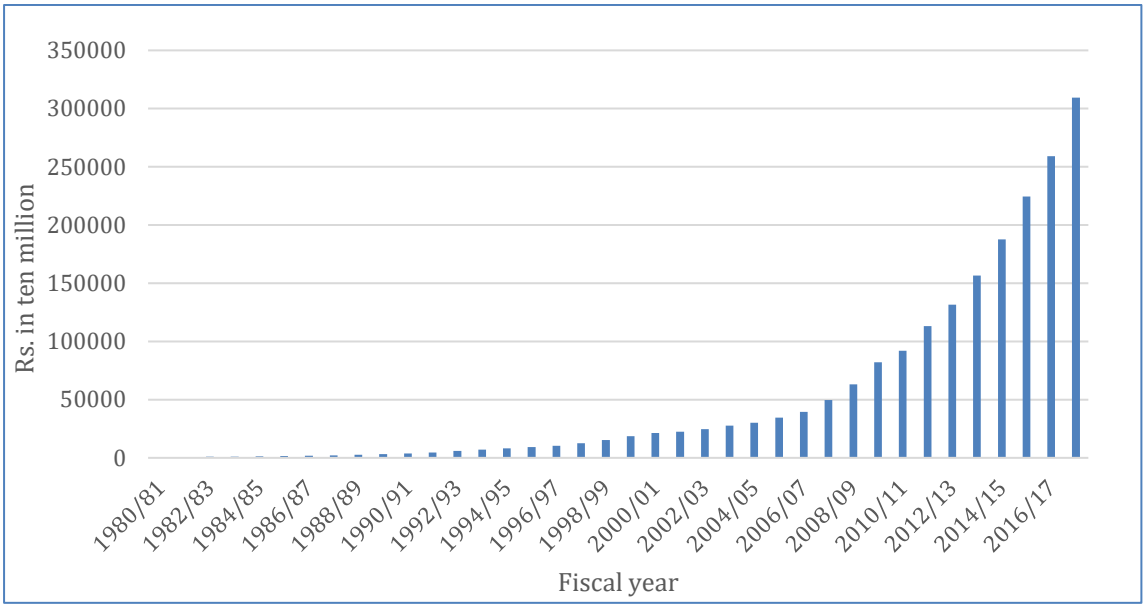
Appendix 1: Summary of the cointegration and error correction test result (aid-growth relationship)

Variables included in the model / time period	Johansen's cointegration		Error-correction model			
1983 – 2002	**Long-run impact**	**Significance**	**ECT**	**Significance**	**Short-run impact**	**Significance**
lnRGDPP lnAR	Negative	Significant	Negative	Insignificant	Negative	Insignificant
lnRGDPP lnAR lnGCFR	Negative	Significant	Negative	Insignificant	Negative	Insignificant
lnRGDPP lnAR lnGCFR lnEDU	Negative	Significant	Positive	Insignificant	Negative	Significant
1983 – 2013						
lnRGDPP lnAR	Negative	Significant	Positive	Significant	Negative	Significant
lnRGDPP lnAR lnGCFR	Positive	Significant	Negative	Significant	Negative	Significant
lnRGDPP lnAR lnGCFR lnEDU	Positive	Significant	Negative	Significant	Positive	Insignificant
Aid-growth and policy						
lnRGDPP lnAR lnGCFR lnEDU lnTR and lnMONR	Negative	Insignificant	Negative	Insignificant	Negative	Significant
lnRGDPP lnAR lnGCFR lnEDU lnTR and lnBDR	Negative	Significant	Positive	Insignificant	Negative	Significant
lnRGDPP lnAR lnGCFR lnEDU lnMONR and lnBDR	Positive	Significant	Negative	Insignificant	Negative	Significant

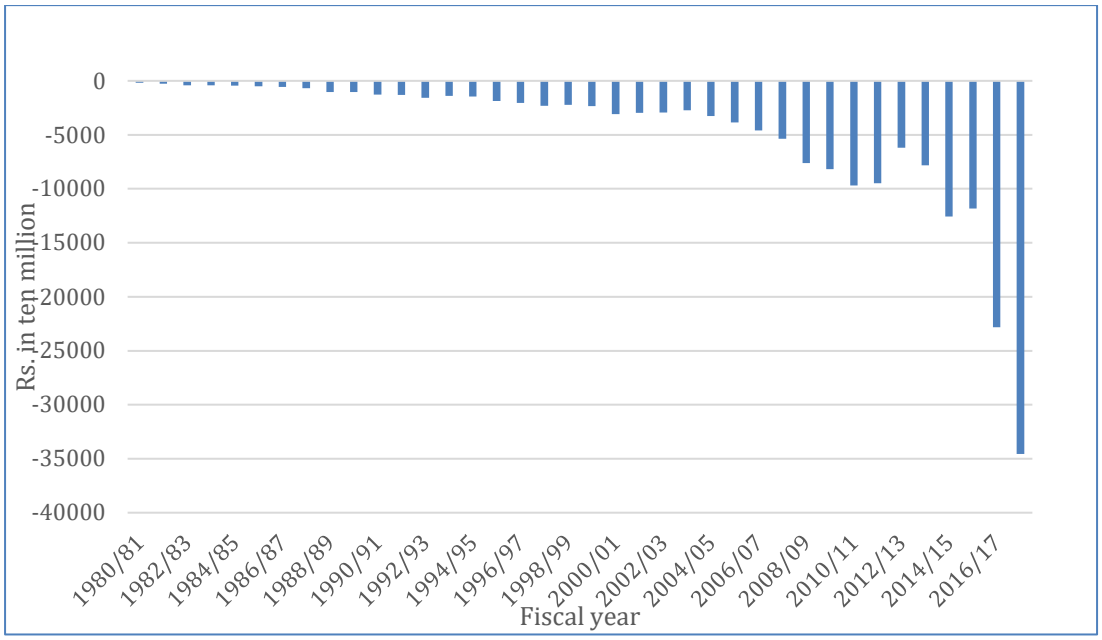
Appendix 2: Trade surplus/deficit (Import/Export)



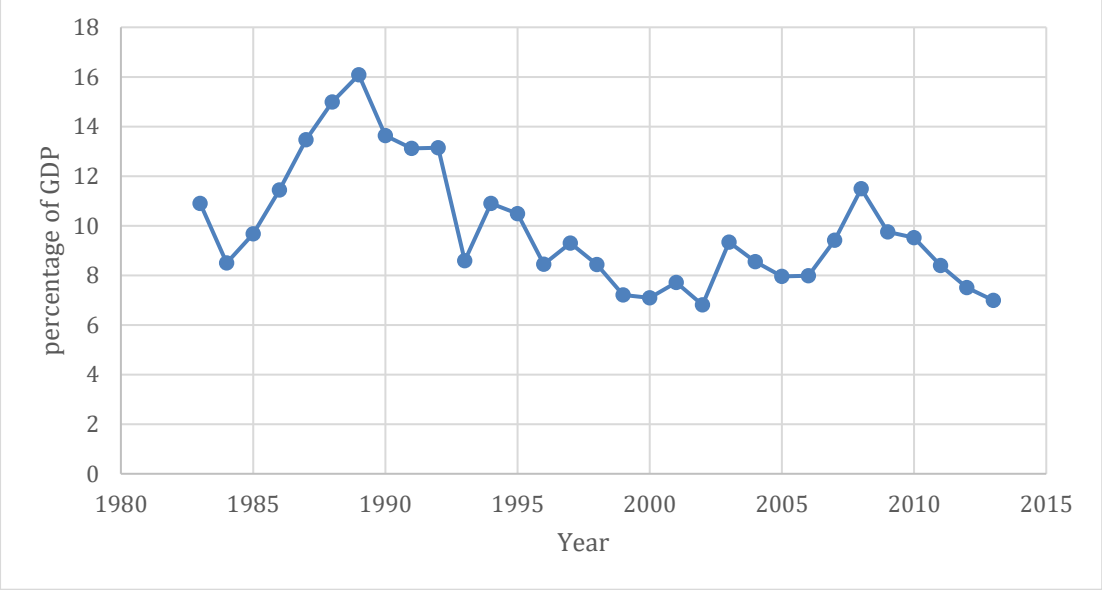
Appendix 3: Broad money supply (M2)



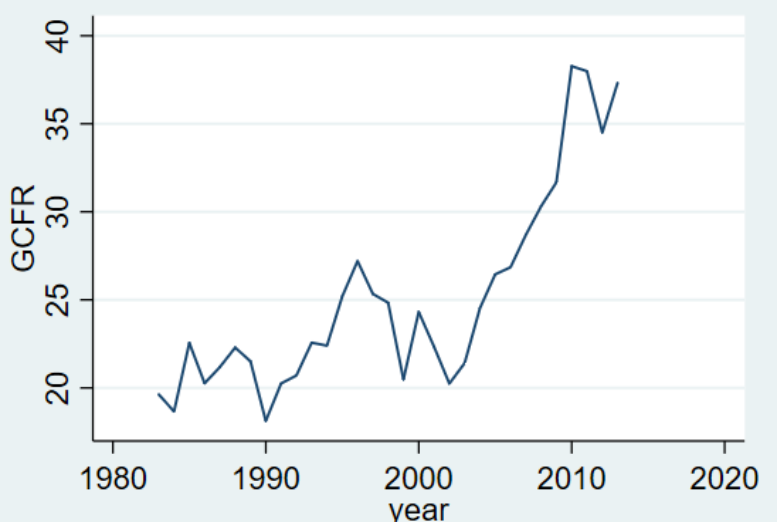
Appendix 4: Status of budget surplus/deficit



Appendix 5: Foreign aid (loans and grants) as percentage of GDP



Appendix 6: Gross capital formation as percentage of GDP



Appendix 7: Average aid to Nepal and Correlation table from Bhattarai (2009)

NEPAL'S AVERAGE TOTAL AID, BILATERAL AND GRANTS AID, 1960-2002

Year	Total aid (%of GDP)	Bilateral aid (% of total aid)	Grants aid (% of total aid)
1960-69	1.95	96.83	99.79
1970-79	4.34	66.31	72.52
1980-89	10.39	54.22	64.17
1990-02	9.76	62.88	70.22
1960-02	6.62	69.99	76.85

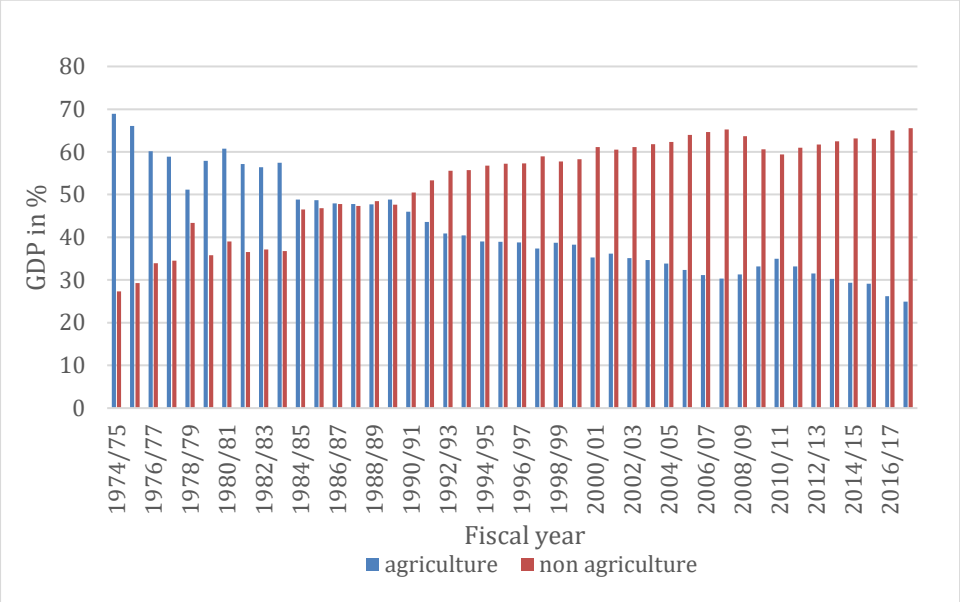
Source: OECD/IDS online database

CORRELATION COEFFICIENTS OF VARIABLES, 1983-2002

Variables	Real GDP	Per capita real GDP
KP (capital)	0.93	0.93
AR (aid/GDP ratio)	0.38	0.38
TR (trade/GDP ratio)	0.90	0.90
POP (population)	0.99	0.98
INF (inflation)	-0.30	-0.30
MONR (M2/GDP)	0.97	0.96
BDR (budget deficit/GDP ratio)	0.25	0.23
ADLR (adult literacy rate)	0.99	0.98

Source: (Bhattarai, 2009)

Appendix 8: GDP composition (agriculture and non-agriculture sector)



Appendix 9: STATA-do-file

```
//set time series nature on data;yearly//
tsset year
format year %ty

//transforming variables into natural logarithms and labeling//
gen lnRGDPP = ln(RGDPP)
gen lnTR = ln(TR)
gen lnINF = ln(INF)
gen lnEDU = ln(EDU)
gen lnMONR = ln(MONR)
gen lnBDR = ln(BDR)
gen lnAR = ln(AR)
gen lnGCFR = ln(GCFR)

//generate a dummy variable//
gen dummy = 0
replace dummy = 1 if ((year >=1990) & (year<=2006))

//test for stationarity//
dfuller lnRGDPP if year<=2002, regress lags(1)
dfuller lnAR if year<=2002, regress lags(1)
dfuller lnGCFR if year<=2002, regress lags(1)
dfuller lnEDU if year<=2002, regress lags(1)
dfuller lnTR if year<=2002, regress lags(1)
dfuller lnMONR if year<=2002, regress lags(1)
dfuller lnBDR if year<=2002, regress lags(1)
dfuller lnINF if year<=2002, regress lags(1)

dfuller lnRGDPP if year<=2002, trend regress lags(1)
dfuller lnAR if year<=2002, trend regress lags(1)
dfuller lnGCFR if year<=2002, trend regress lags(1)
dfuller lnEDU if year<=2002, trend regress lags(1)
dfuller lnTR if year<=2002, trend regress lags(1)
dfuller lnMONR if year<=2002, trend regress lags(1)
dfuller lnBDR if year<=2002, trend regress lags(1)
dfuller lnINF if year<=2002, trend regress lags(1)
dfuller D.lnRGDPP if year<=2002, regress lags(1)
dfuller D.lnAR if year<=2002, regress lags(1)
dfuller D.lnGCFR if year<=2002, regress lags(1)
dfuller D.lnEDU if year<=2002, regress lags(1)
dfuller D.lnTR if year<=2002, regress lags(1)
dfuller D.lnMONR if year<=2002, regress lags(1)
dfuller D.lnBDR if year<=2002, regress lags(1)
dfuller D.lnINF if year<=2002, regress lags(1)

dfuller D.lnRGDPP if year<=2002, trend regress lags(1)
dfuller D.lnAR if year<=2002, trend regress lags(1)
dfuller D.lnGCFR if year<=2002, trend regress lags(1)
dfuller D.lnEDU if year<=2002, trend regress lags(1)
dfuller D.lnTR if year<=2002, trend regress lags(1)
dfuller D.lnMONR if year<=2002, trend regress lags(1)
dfuller D.lnBDR if year<=2002, trend regress lags(1)
dfuller D.lnINF if year<=2002, trend regress lags(1)
```

```
pperron lnRGDPP if year<=2002, regress lags(1)
pperron lnAR if year<=2002, regress lags(1)
pperron lnGCFR if year<=2002, regress lags(1)
pperron lnEDU if year<=2002, regress lags(1)
pperron lnTR if year<=2002, regress lags(1)
pperron lnMONR if year<=2002, regress lags(1)
pperron lnBDR if year<=2002, regress lags(1)
pperron lnINF if year<=2002, regress lags(1)

pperron lnRGDPP if year<=2002, trend regress lags(1)
pperron lnAR if year<=2002, trend regress lags(1)
pperron lnGCFR if year<=2002, trend regress lags(1)
pperron lnEDU if year<=2002, trend regress lags(1)
pperron lnTR if year<=2002, trend regress lags(1)
pperron lnMONR if year<=2002, trend regress lags(1)
pperron lnBDR if year<=2002, trend regress lags(1)
pperron lnINF if year<=2002, trend regress lags(1)

pperron D.lnRGDPP if year<=2002, regress lags(1)
pperron D.lnAR if year<=2002, regress lags(1)
pperron D.lnGCFR if year<=2002, regress lags(1)
pperron D.lnEDU if year<=2002, regress lags(1)
pperron D.lnTR if year<=2002, regress lags(1)
pperron D.lnMONR if year<=2002, regress lags(1)
pperron D.lnBDR if year<=2002, regress lags(1)
pperron D.lnINF if year<=2002, regress lags(1)

pperron D.lnRGDPP if year<=2002, trend regress lags(1)
pperron D.lnAR if year<=2002, trend regress lags(1)
pperron D.lnGCFR if year<=2002, trend regress lags(1)
pperron D.lnEDU if year<=2002, trend regress lags(1)
pperron D.lnTR if year<=2002, trend regress lags(1)
pperron D.lnMONR if year<=2002, trend regress lags(1)
pperron D.lnBDR if year<=2002, trend regress lags(1)
pperron D.lnINF if year<=2002, trend regress lags(1)
//present descriptive summary//
summ lnRGDPP lnAR lnGCFR lnEDU lnTR lnMONR lnBDR, d

//generate correlation matrix//
pwcorr RGDP AR GCFR EDU TR MONR BDR if year<=2002, star (0.05) sig
pwcorr RGDP AR GCFR EDU TR MONR BDR, star (0.05) sig
pwcorr RGDPP AR GCFR EDU TR MONR BDR if year<=2002, star (0.05) sig
pwcorr RGDPP AR GCFR EDU TR MONR BDR, star (0.05) sig


//plot time series graphs//
tsline AR
graph copy ar //copy graph in memory//
tsline RGDP
graph copy rgdp //copy graph in memory//
tsline RGDPP
graph copy rgdpp //copy graph in memory//
graph combine ar rgdp rgdpp //combine graphs//
tsline EDU
```

```
//Selection of optimal lag length//
varsoc lnRGDPP lnAR if year<=2002
varsoc lnRGDPP lnAR lnGCFR if year<=2002
varsoc lnRGDPP lnAR lnGCFR lnEDU if year<=2002

varsoc lnRGDPP lnAR
varsoc lnRGDPP lnAR lnGCFR
varsoc lnRGDPP lnAR lnGCFR lnEDU
varsoc lnRGDPP lnAR lnGCFR lnEDU lnTR lnMONR
varsoc lnRGDPP lnAR lnGCFR lnEDU lnTR lnBDR
varsoc lnRGDPP lnAR lnGCFR lnEDU lnMONR lnBDR

//Identifying cointegrating rank//
vecrank lnRGDPP lnAR if year<=2002, trend(constant) lags(4) max
vecrank lnRGDPP lnAR lnGCFR if year<=2002, trend(constant) lags(3) max
vecrank lnRGDPP lnAR lnGCFR lnEDU if year<=2002, trend(constant) lags(2) max
vecrank lnRGDPP lnAR lnGCFR lnEDU dummy if year<=2002,trend(constant) lags(2)max

vecrank lnRGDPP lnAR, trend(constant) lags(4) max
vecrank lnRGDPP lnAR lnGCFR, trend(constant) lags(4) max
vecrank lnRGDPP lnAR lnGCFR lnEDU, trend(constant) lags(4) max
vecrank lnRGDPP lnAR lnGCFR lnEDU lnTR lnMONR, trend(constant) lags(2) max
vecrank lnRGDPP lnAR lnGCFR lnEDU lnTR lnBDR, trend(constant) lags(2) max
vecrank lnRGDPP lnAR lnGCFR lnEDU lnBDR lnMONR, trend(constant) lags(2) max

//Fitting VECM //
vec lnRGDPP lnAR if year<=2002, trend(constant) lags(4)
vec lnRGDPP lnAR lnGCFR if year<=2002, trend(constant) lags(3)
vec lnRGDPP lnAR lnGCFR lnEDU if year<=2002, trend(constant) lags(2)
vec lnRGDPP lnAR lnGCFR lnEDU dummy if year<=2002, trend(constant) lags(2)

vec lnRGDPP lnAR, trend(constant) lags(4)
vec lnRGDPP lnAR lnGCFR, trend(constant) lags(4)
vec lnRGDPP lnAR lnGCFR lnEDU, trend(constant) lags(4)
vec lnRGDPP lnAR lnGCFR lnEDU lnTR lnMONR, trend(constant) lags(2)
vec lnRGDPP lnAR lnGCFR lnEDU lnTR lnBDR, trend(constant) lags(2)
vec lnRGDPP lnAR lnGCFR lnEDU lnBDR lnMONR, trend(constant) lags(2)

//Perform VEC diagnostic test//
//command to be run right after fitting VEC model//
veclmar //Test for serial correlation//
vecnorm, jbera skewness kurtosis //Normality test//
```

Appendix 10: Reflection notes

This reflection paper presents the objective and findings of the master thesis I have written. It also aims to create a link to the three broad themes of internationalization, innovation, and accountability whenever related to the topic I have worked on.

This thesis was an attempt to work on the existing debate of foreign aid effectiveness relating to its impact on the economic growth of a recipient country. I have investigated the impact of foreign aid on per capita real GDP in the case of Nepal. Using Johansen's approach to cointegration and error correction method, I found that foreign aid helps in growing per capita real GDP only in a circumstance when the country appears to have a good economic performance demonstrating better macroeconomic indicators. I have also found that the effectiveness of foreign aid decreases when the country faces a high trade deficit.

The concept of internationalization does not have a direct connection with foreign aid. As per my understanding, the idea behind the terminology 'internationalization' comes from a commercial perspective that enterprises on the local level intend to reach global market competition with the intention of making a profit. On the contrary, the concept of aid has a philanthropic purpose; whether its humanitarian aid for the welfare of public, budget aid to support the government expenditures of the recipient country or any kind of assistance, unless any political interests of donor. However, with the involvement of developed countries and international organizations to the local level in the recipient country, foreign aid can bring in the international ambiance which the recipient country can benefit from. It can acquire the international practice on certain aspects, for example, foreign aid on education sector can help build human capital to compete in an international market which could add value in the economic performance of the country in the long run.

Innovation can be an interesting topic that foreign aid can help the recipient country with if the aid is utilized to accomplish the intended goal of it. As discussed above in the international theme, the innovation can be attained through aids receiving in several forms. For example, innovation in the form of new technologies can a recipient country gain from developed nations especially when the world is changing into an era of innovation. However, the idea of innovation I just mentioned here

is only applicable for the country that benefits from aids and it might not work the other way around.

There comes an issue of accountability in the field of foreign aid. The bureaucrats without being accountable towards aid coordination and the conditionalities associated with aid, it might not be practicable to think that aid can achieve the targeted goal. All the parties involved in aid activity have the responsibility to justify any kind of queries or arguments associated with the aid and its implication for the creation of a better economic situation together.