Doctoral Dissertation

Essays of Aid Effectiveness in Developing Countries

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Abstract

Development, as a matter of centrality of political economy, has been strongly discussed in global development dialogue for several decades. Supplemental economic theories such as Harrod - Dorma growth model, Slow growth model, Big push theory, etc., consider capital as a vital factor for higher economic growth. Therefore, those theories are more optimistic, relating to the contribution of foreign aid towards the development process. But, developing economies are suffering from a lack of investment. As a result, assume that official development assistance (ODA) supplements domestic savings, export earnings, and tax revenue and thereby catalyst the growth process. In the 1950s, the success story of the Marshall plan in Europe had created a ray of optimism regarding the ability of foreign aid towards the promotion of economic development in the developing countries as well. In contrast, many studies have found that there are serious economic hazards of a foreign aid led growth model in addition to long-term aid dependency.

Traditional works, on the empirical front, just include the aid variable as an explanatory variable in the growth regression and ignore the effects of the causal path in between aid and growth. Those works just focus on the direct effect by controlling different variables. An influential paper done by Addison *et.al* (2017) pointed out that cross-country analysis can only suggest a pattern or tendency that holds on average. On the other hand, such traditional specifications are suffering from estimation biases due to omitting investment or double counting as it omits investment or includes both aid and investment. Burnside (2000) made an influential contribution and conclude that a good policy environment induces a positive growth effect and vice versa. But, some other studies such as Dalgaard et al. (2004), Easterly et al. (2004), Islam (2005), Outtara (2008), and Shaomeng *et.al* (2019) reveal that aid is not conditional on good policies. However, the bulk of studies on aid effectiveness have often ended up with a contradictory nature of findings and inconclusive conclusions.

This study aims to examine whether foreign aid meets the intended development objectives. Any study that tries to unveil the aid effectiveness needs to consider, whether foreign aid supplement savings, and in turn increase the investment as well as Aid supplement the export earnings, and in turn increase import. This means that foreign aid positively transmits through investment, import, and public consumption. Our first research objective, which discusses in chapter two, covers the above scope by addressing the aforesaid research gaps. Beyond the claim raised by Addison (2017), we establish the causation of the association between aid and growth through statistical mediation analysis, which emphasis that foreign aid operates via indirect mechanisms. Simultaneously, we remove the double counting and omitting variable biases by employing the Residual with regression (RWR) approach. Thereby, we unveil not only the total effect but also the indirect effect of multilateral aid and bilateral aid on per capita GDP by employing fixed effect estimation procedure and compared the influence for low middle income (LMI) and upper middle income (UMI) countries, in addition to the regional comparison among Asia, Africa, and Latin America. The evidence proves that the foreign aid is no longer effective - indeed ineffective - when aid transmit through mediator variables like a domestic investment and public consumption, while they themselves have a positive effect on per capita GDP. The findings enlighten the prominent question - why foreign aid induces a negative effect in developing countries. Even if we expect that foreign aid should increase investment, in contrast, the domestic investment declines due to shrinking the private investment - (foreign aid increases the public investment). It suggests that the rate of return on private capital is reduced or is treated unfavourably by AID. Based on this novel interpretation, we argue that aid ineffectiveness is not conditional on policies, but policies are conditional on aid effectiveness.

We needed to take a close snapshot of aid effectiveness for further confirmation of the previous research objective. Therefore, we decided to consider an individual country case and selected Sri Lanka as the research area by considering two basic factors. Sri Lanka is a country that belongs to the second poorest region of the world. On one hand, Sri Lanka reached the end of its long-term civil war in 2009 and enjoyed political stability. In this context, the Sri Lankan government accelerated economic growth through increased public investment drastically and reached the growth level of around 7 percent. At a glance, and as a whole, the country was merely a workplace. On the other hand, there was a black hole under the macroeconomy, and

the story had reached its illusionary end by 2015. Accordingly, the country is downgraded by world-famous three credit rating agencies such as Moody, S&P, and Fitch continuously from 2015 to 2020 and is reached the level of 'substantial risk' by November 2020. Now the country is running through a critical debt crisis. This story provides evidence for a macro-micro paradox. This impressive phenomenon stimulates us to get feedback on aid effectiveness in Sri Lanka in two different dimensions, i.e. macro and micro perspectives. In chapter three, we analyse the aid effectiveness, which depends on the financial decisions that are affected by foreign aid by regressing the fiscal response model under the 3SLS estimation procedure. Movrotas (2002) pointed out that foreign aid first goes to the recipient government's budget, and any effect of aid on the macroeconomy depends on the fiscal decisions. Here, we test whether the foreign aid supplement public savings and in turn increase the public investment. Simultaneously, we test whether foreign aid substitutes or supplement the tax revenue. Similarly, we test whether foreign aid increases the socio-economic consumption which might help to delay the threshold level of diminishing return as per the Solow growth model.

We found that public investment decreases while consumption increases in the presence of foreign aid. Similarly, fiscal policymaker substitutes tax revenue in the presence of foreign aid. Accordingly, it is expected that the budget deficit and domestic borrowings will increase. In that context, the fiscal authority prioritizes eradicating the pressure on domestic borrowing rather than increasing investment due to the inability to fulfil the domestic resource requirement for investment.

The story discussed above provides insight that foreign aid works well at the micro-level while macroeconomic positions are collapse in Sri Lanka. To get a clear confirmation on it, we carried out an impact assessment on the first expressway experience in Sri Lanka by using a causal approach. Thereby, chapter 4 allocated to assess the intended outcomes such as RGDP, the industrial sector value addition, unemployment rate, and SMEs. Causal evidence, which derives from the fixed effect estimation based on the difference-in-difference framework, supports that RGDP for the affected regions was greater than for the non-affected regions by around 421 billion Sri Lankan Rupees per annum. The industrial sector value addition is increased by approximately 160 billion Sri Lankan rupees per annum, which accounts for 38% of the total impact on the regional gross domestic product (RGDP). The expressway

induced 285 small and medium enterprises (SMEs), while the unemployment rate declined by 1.05% due to the expressway.

Findings, derived from the above three empirical studies, shed a light on rigorous consistent conclusions. Fourth chapter advocate for the supplemental economic theories, that emphasize the foreign aid work well. Even If foreign aid works well at the micro-level, chapter three support that aid does not work at the macro level since Sri Lankan public policymakers desires to maximize their utility in the short run by sacrificing the long-run utility that is expected to be gained through improved production possibility, which is built by aid-financed investment at the margin. Which means that aid management and administration is the matter. When foreign aid mediates through fiscal policies, it leads to some sort of fiscal policy asymmetries that unfavourable for private investment.

According to the empirical findings in given chapters, we can see that there is a micro-macro paradox. Even if some particular projects are successful on the ground, the aid management and administration process badly influence at the macro level. Therefore, reliance on foreign aid does not offer a better solution for sustainable growth given the prevailing fiscal behaviour. Accordingly, we emphasize to implement a gradual growth perspective that ensures more bearable, stable, and sustainable economic achievements, instead of getting rapid growth through isolated megaprojects that take a long time for mobilizing income-generating activities and domestic resources. Accordingly, the recipient governments should divert foreign aid to the manufacturing sector through financial support schemes for private entrepreneurs and to key initiatives of private-public joint ventures instead of over-investing in infrastructure. Further, we emphasize the requirement of mobilizing domestic resources rather than depending excessively on domestic borrowings for aid-financed public investment. Thus, fiscal authorities should improve their domestic revenues by expanding the tax base and should not substitute tax revenue with foreign aid. Furthermore, expenditures on general public services need to be reduced. At last but not least, we emphasize the requirement of strengthening good governance practices and effectively enabling the fiscal responsibility act (2003).

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Contents

List of Figure

List of Tables

Abbreviations

ADB	**A**sian **D**evelopment **B**ank
ADF	**A**ugmented **D**icky **F**uller
AODA	**A**ggregated **O**fficial **D**evelopment **A**ssistance
DAC	**D**evelopment **A**ssistance **C**ommittee
DID	**D**ifference **I**n **D**ifference
FE	**F**ixed **E**ffect
GDP	**G**ross **D**omestic **P**roduct
IMF	**I**nternational **M**onetary **F**und
ODA	**O**fficial **D**evelopment **A**ssistance
OECD	The **O**rganisation for **E**conomic **C**o-operation and **D**evelopment
OLS	**O**rdinary **L**east **S**quare
RGDP	**R**egional **G**ross **D**omestic **P**roduct
RWR	**R**esidual **W**ith **R**egression
SME	**S**mall and **M**edium **E**nterprises
SSA	**S**ub **S**aharan **A**frican
USD	**U**nited **S**tate **D**ollars
VAR	**V**ector **A**uto **R**egressive
WB	**W**orld **B**ank

Chapter 1

Introduction

1.1 Background

Foreign aid effectiveness, as a matter of political economy, has been strongly discussed in global development discourse. The theory and the practice of foreign aid suggest that it may be useful for the economic development of developing countries in the initial stages, but development comes through indigenous efforts and not through foreign aid. Pronk, J.P. (2001) argues that "…economic growth higher than would have been possible given the domestic saving rate would lead to higher income and production and increase future savings and exports, making aid less necessary to reach a given target in later years" [2001 p. 618]. By the way, many studies have found that there are serious economic hazards of foreign aid led growth model in addition to long-term aid dependency. Before we move to such contradictory nature of discussion, it is better to understand the theoretical support behind the aid industry.

1.2 Brief Introduction for Development Economic Theories

Economic theories related to foreign aid can be classified as domestic or supplemental economic theories and external or displacement economic theories. Supplemental economic theories advocate that aid supplement domestic resources of the recipient economy. The supporters of this stream are more optimistic relating to the contribution of foreign aid towards the development process. In contrast, displacement economic theories argue that foreign aid induce negative impact on the recipient economy. They consider foreign aid as a substitute for the domestic resources of the recipient economies. Whatever it is, the common hypothesis of both theorems for growth and development is the ability to attain the self-sustaining growth for

recipient countries. The main development theories and growth models with respect to the foreign aid and its expected growth targets are discussed very briefly as follows.

Harrod-Domar Model: This exogenous growth model introduces by Roy F. Harrod in 1939 and developed by Evsey Domar in 1946. It states that there are three kinds of growth i.e. warranted growth, actual growth and natural rate of growth. It explains that growth depends on the quantity of labour and capital; more investment leads to higher capital accumulation. This growth model ascertains that a higher rate of capital accumulation is the key determinant of higher economic growth. This model explains the rate at which investment and income should increase. Then it will help to attend a steady state of economic growth by utilizing all the resources. This model considers the dual role of investment: multiplier effect income generation; the productivity improvement of the economy by expanding capital stock. But the insufficient amount of domestic savings creates a problem in the attainment of a steady-state growth rate in most of the developing economies. Therefore, it is assumed that foreign aid supplements their scarce domestic resources and finance their developmental programs. It will help them to attend a steady rate of economic growth in the long run.

Big Push Theory: Paul N. Rosenstein-Rodan propounded the 'big push' theory in 1943. Its emphasis on the requirement of a big comprehensive investment package and will help to accelerate the development process of the developing economy. It assumes that small resource allocations on investment from time to time will not help to accelerate the development process. Instead of that, it is required a huge amount of investment at once to push forward the economy. But for a developing economy, it is really very difficult to arrange such a huge amount of capital. In this context, foreign aid facilitates the capital deficit problems of these developing economies by providing an adequate amount of foreign exchange reserves at a concessional rate.

Solow-Swan Growth Model: Solow growth model is an extended version of the Harrod-Domar growth model. Robert Solow and Trevor Swan developed this model in 1956 and superseded the Keynesian type Harrod-Domar growth model. Additionally, this model includes labour and technology as an independent factor. Solow growth model assumes that there is a diminishing return to scale if we consider the factors of production, such as labour and capital separately. But both factors jointly contribute to constant returns. Technology is exogenously determined. Therefore, the

Solow growth model is also known as “an exogenous” growth model. Solow categorized the economy into two broad sectors such as industrial (capital) sector and agricultural (labour) sector. In the industrial sector, the rate of capital accumulation exceeds the rate of labour absorption. But, in a developing economy, the agricultural sector is characterized by the existence of hidden unemployment and shortage of skilled labour which adversely affects the productivity and wage rate of the agricultural labourer. This underutilization of existing resources creates an obstacle in the path of attainment of higher economic growth. Therefore, the steady growth is possible if we raise the capital-labour ratio in the economy. But a shortage of capital is a common feature of most of the developing economies. Therefore, they have to depend upon foreign aid to supplement their scarce resources. In this context, foreign aid contributes to the growth process of these developing economies through supporting scarce domestic resources.

Balanced Growth Theory: Rosenstein Rodan, Ragnar Nurkse, and Arthur Lewis did involve in developing the doctrine of balanced growth. This growth doctrine states that there should be a simultaneous development of different sectors of the economy so that all the sectors grow in a uniform manner. To make a balance among all the sectors of an economy, a huge amount of investment funds is required, which is very difficult for all developing economies.

McKinnon’s Foreign Exchange Constraint Model: Economist Ronald I. McKinnon (1964) emphasis trade limitation as a growth resistance for all those developing economies. In analysing the foreign exchange constraint, the model suggested that developing economies whose exports consisting of primary goods should expand their productive capacity by adopting advanced technology. So, foreign aid provides financial assistance to remove such trade bottlenecks by providing strategic goods and services in which they are unable to produce. In this context, foreign aid plays a significant role in earning foreign exchange reserves at concessional terms and brings foreign advanced technology, which reduces the cost of production in the economy. This foreign exchange gap model leads to the dual gap model propounded by Chenery and Strout in1966.

Self-help Model: John C.H. Fei *et.al* (1965) emphasize the productive utilization of domestic savings defined as 'self-help' to tackle the indigenous financial problems. The model assumes that the saving function has a constant proportion of increments in per capita income and suggests that it should be nearly 35 percent to

finance the developmental programs without depending on foreign aid. But in reality, most of the developing economies have experienced a low rate of domestic saving, which compel them to depend upon foreign aid. The analysis suggests the appropriate methods by which foreign aid program will be able to achieve its developmental goals of providing a targeted rate of growth in per capita income and consumption. This model is a revised version of the Harrod-Dorma growth model, and the applicability of the model is verified by considering thirty-one United State aid receiving countries.

Chenery and Strout Model: Chenery and Strout (1966) provide the theoretical justification for providing foreign aid for economic development. They assumed that foreign aid supplements the scarce domestic resources by filling the two major gaps, such as the domestic resource gap (savings-investment) and the foreign resource gap (export-import). Thereby, foreign aid helps in raising the capital-absorptive capacity of the aid recipient economy. The core argument of the model is that foreign aid is not only helping in raising the rate of investment during the 'take-off' stage but also provided basic requisites needed for the attainment of the 'self-sustained growth' in the long run. The model investigates the mechanism by which a poor, stagnant economy can be transformed into one developed economy, having a sustained growth rate. The following mechanism of foreign aid inflows help to face the three major impediments present in the path of sustained economic growth; (1) aid brings skills and organizational ability; (2) aid supplements domestic savings; and (3) aid brings imported commodities and services at a concessional price. They have found that the main thrust of the foreign aid program should be the path of the structural adjustment program.

Endogenous Growth Model**:** Arrow, Lucas, and Romer developed this theory as a reaction to the limitation of the Solow-Swan neoclassical growth model. The endogenous growth model states that the economic growth process determines the endogenous factors, generated within the economic system rather than the exogenous factors, as explained in the neoclassical growth models. This model emphasizes technical progress depends upon the rate of investment, size of capital stock, and the human capital. The endogenous growth theory examines production functions that show increasing returns because of specialization and investment in knowledge capital. Adequate funds for investment are required to invest in human capital, research activities, and innovations. In the case of developing economies, it is really difficult to arrange the funds to invest in these above sectors. Their domestic capital

can only partially fulfil their investment needs. To support their domestic capital, they rely on foreign aid as it brings foreign assistance at a lower interest rate, technical knowledge, managerial skills, and research ideas (Morrisey, 2001).

1.3 Aid Industry

All these growth models consider capital as a vital factor for higher economic growth. However, most of the developing economies are considered as low saving and low investment countries. Accordingly, official development assistance (ODA) supplement scarce domestic saving and investment, and thereby catalyst the growth process. ODA is not a new concept in development dialogue in the world. It can be defined as an international transfer of resources from one government or an international financial institution to another government in the forms of loans and grants directly for development purposes. [loans at concessional terms which constitutes 25 percent of grant amount and grants such as non-refundable in nature]. These resources include money, materials, technology that are donated to developing countries around the world.

The strategic intervention of foreign aid in accelerating the economic growth and development process has been recognized in the Post World War II period. Prior to the Second World War, it was used as a profitable instrument of investment by the wealthy nations. The Second World War affected the fundamental nature of the global political and economic pattern. The Marshall Plan which aims to recover the Western Europe following the devastation of World War II, started contributing primarily for the re-construction and development of infrastructure, alleviation of poverty, emergency relief, peace-keeping efforts, and such socio-economic reconstruction programs for war-devastated countries in a planned way.

The successful operation of the Marshall Plan in both dimensions in Europe encouraged the aid industry. Harrod-Dorma growth model, which emphasis the provision of foreign aid catalyst the economic growth in recipient countries, advocated for this emerging trend. In addition to economic revitalization, the Marshall Plan had a goal to halt the spread of Soviet power on Eastern Europe. It was the moral obligation on the part of the rich countries [not only the western powers but also the Soviet Union] to support the growth and development process of the poor countries. By the way, we can observe that, aid inflow is drastically dropping down from the beginning of

collapsing the Soviet Union. [See figure 2.1 -2.5]. ODA increased steadily until the end of the Cold War and after 1991, it started to slide up to 22 percent by 1997. By the way, this trend was halted by the inspired discussion of the Millennium development.

1.3.1 Landscape of the Aid Industry

Indeed, International development is a big business. The total global development aid inflow from 1960 to 2018 is around 3356 USD billion in current price. In the 1970s, the US, UK and France accounted for three-quarters of the global aid basket. Today, their contribution is only around 40 percent. But, according to the Development Assistance Committee (DAC), there are no fewer than two hundred bilateral and multilateral organizations (including only the "official" agencies) are working in the aid industry, all with their own strategies and principles. Donor community can be divided in two parts such as the OECD groups of counties, including more than 20 advanced nations and non-DAC countries including around 25 countries such as China, India, Brazil Iran and Turkey. They are promptly improving their role as aid providers with regional strategic interests. In some developing countries a number of donors are operating, financing hundreds of projects. Donors like the United States, for example, have multiple agencies within the government responsible for various aid activities. The policies of agencies tend to be inaccessible to outsiders and apparently always changing; procedures for project approval, for example, can be extraordinarily long. By the way, it is difficult to measure the amount of aid that these countries give. Some accounting anomalies make it hard to value total aid by non-DAC members. For example, China only includes as aid the subsidy element of its concessional loans, transferred from the budget to China Exim Bank which then on-lends to recipient countries. DAC countries typically count the full-face value of the concessional credit.

However, the industry is motivated by three type of motives as follows.

Humanitarian (Moral or Ethical):

Economic self-interest:

Political or strategic self-interest:

The donor community can be divided into following two sources:

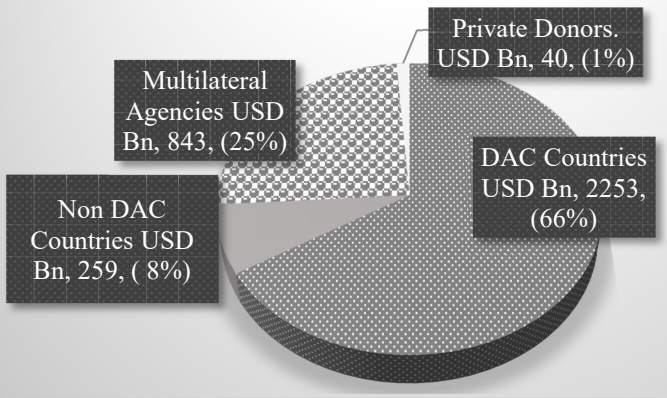
1. Bilateral aid Donors: The official development assistance that flows directly from a donor country government to a particular recipient country. In this case, the aid transfers between two countries without the interruption of any third party. DAC countries had provided 66% out of total aid flow of the last six decades, while non-

DAC countries had provided 8%. Their annual contribution of 2018 is quite similar to the total contribution for the last six decades. [See Figure 1.1 and 1.2]

2. Multilateral Aid Donors: They are provided through the mediation of an international organization such as World Bank (WB), International Monetary Fund (IMF) and Asian Development Bank (ADB) which collects donations from rich countries' governments (on the basis of their membership quota) and then redistributes them to the developing economies for welfare purposes. Multilateral Agencies had contributed 25% of total aid flow for last six decades.

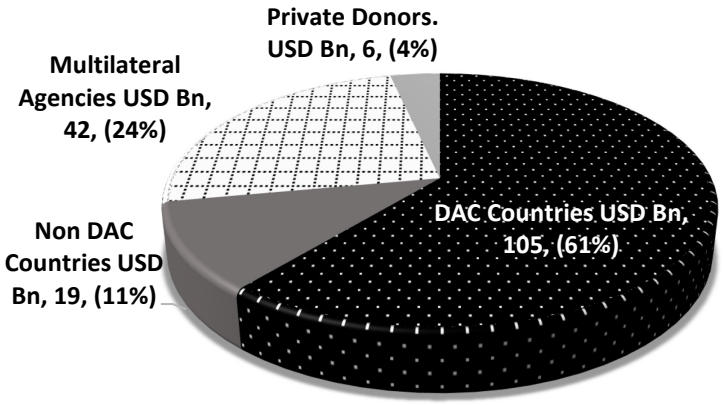
3. Private donor agencies: This source of financing is categorised as aid from the private sector such as the Gates Foundation, Oxfam, CARE and Save the Children. That should be excluded from analyses of Official Development Assistance (ODA).

Figure 1.1: Contribution of Aid Providers for 1960 to 2018



Source: OECD and Sri Dayanath

Figure 1.2: Contribution Of Aid Providers In 2018



Source: OECD and Sri Dayanath

1.4 Critiques and Issues in Aid Growth Nexus.

1.4.1 Foreign Aid as A Growth Engine.

In the 1950s, the achievement of higher economic growth was the primary objective of developing nations. Early growth models in development economics argued that developing countries are poor because of the lack of savings and investment to finance various developmental activities such as infrastructure, education, health care, modern technology, and hi-tech capital instruments. Meanwhile, in the 1950s, the success story of the Marshall plan in Europe had created a ray of optimism regarding the ability of the foreign aid towards the promotion of economic development in the developing countries as well. At its beginning, the modernization theory[1], the foundation of foreign aid inflows, states that there is a moral obligation on developed nations to provide all the basic supports to the growth and development process of the developing countries. The only thing that developing countries needed was capital and knowledge, which can be supported by foreign aid inflows. In this critical situation, foreign aid acts as a catalyst to fill the domestic resource gap and will help developing countries to increase investment any achieve growth targets.

Rostow (1960) mentioned that foreign aid accelerates the take-off into self-sustained growth via supplementing domestic scarce resources and encouraging industrial development in the capital-deficient economies. According to the modernization theory and the point of view of Chenery (1962 & 1966), many scholars argue that foreign aid can play an important role by contributing to minimizing two major gaps; (1) domestic resource (saving- investment) gap (2) foreign resource (export-import) gap. Bacha (1992) pronounced the fiscal gap as a constraint of utilization capacity, and foreign aid supplements the fiscal gap, which is a part of the domestic resource gap. According to them, foreign aid (ODA) is the necessary and sufficient condition to speed up the development process of the developing countries as it complements domestic resources and supplements domestic savings. They also improve the productivity of capital and home-grown technology through foreign aid, which brings modern technology, managerial skills, organizational capability, and market access. The supporters of the foreign aid program such as Rostow (1960),

[1] It refers to the transformation of the society from a backward, a pre-modern society (traditional) into a modern and advanced industrial society. It assumes that the development process is a linear one. It explains how such society progresses and how society can react to the progress.

Papanek (1972), Dowling (1982), Gupta (1983), Hansen (2000), Dalgaard et al. (2004), Gomanee, et al. (2005), McGillivray (2005b), Karras (2006) found evidence that foreign aid has a significant positive impact on the economic growth of the recipient countries. Singh (1985), Mosley et al. (1987), and Snyder (1993) have found that when country size is considered in the model, the coefficient of foreign aid becomes positive and significant. Additionally, foreign aid also brings the opportunity to access the up-to-date technology and managerial skills and allows easier entry into the foreign market [Chenery *et.al* (1966); Gulati (1975); Gupta (1975); Levy (1988) and Islam (1995)]. Singh (1985) has found that foreign aid has a strong positive impact on growth when state intervention is not taken into consideration. Burnside (2000) have argued that aid works well in the presence of a good- policy environment, particularly in the recipient country. Ghulam (2005) also suggest that aid may be helpful in lifting economic growth under the presence of appropriate monetary, fiscal and trade policies. By focusing post-liberalization period of Ghana and by employing the ARDL model, Sakyi (2011) found that the impact of both trade openness and aid inflows on economic growth is positive and statistically significant in both the short-run and long-run.

1.4.2 Foreign Aid as A Growth Barrier:

Even if some studies argued that aid could be used to stimulate domestic savings, which in turn would accelerate economic growth, others are not agreed with the theoretical ability of foreign aid to promote growth. The practical experience over the past 70 years shows us that the majority of developing nations failed to achieve their growth targets, instated that some nations move from bad to worse. Early research on foreign aid stated that foreign aid hinders the growth process and not delivering on its promises to the recipient countries. Griffin (1970a) found that foreign aid caused public savings to decline. He indicated that foreign aid actually caused a worsening in economic growth and, aid was being allocated to public consumption, which was reducing the levels of domestic savings. Further, he observed that foreign aid substitutes tax revenue acts as a disincentive for the government to increase tax collection efforts. Rahman (1968) and Gupta (1970) both found that foreign aid had no impact on domestic savings. However, the early research up to 1975 concluded, though, with some ambiguity, that aid had little or no impact on growth.

Using the game theory technique, Pedersen (1996) concluded that foreign aid has a positive impact on economic growth. Svensson (2000), Mallik and Moore (2006), Mallik (2008), and Ekanayake (2010) argue that the impact of foreign aid on economic growth is negative. They mentioned that the unproductive utilization of foreign aid is the cause of its failure and its partial success. Boone (1994) mentioned that foreign aid is directed into unproductive consumption purposes, and it is the major factor of aid ineffectiveness. Svensson (1998) pointed out that the large aid inflows lead the higher expectation, which might cause to increase the rent seeking activities and reduces the quality of public goods. Lensink *et.al* (2000) stated that foreign aid uncertainties are consistently and adversely related to the growth process and controlling of uncertainty has shown negative effects on growth via the level of investment.

Mallik (2008) has examined the effectiveness of foreign aid in highly aid dependent African countries by using Johansen's cointegration tests and found that the long run impact of aid on growth was negative. Ekanayake (2010) analysed the effect of foreign aid on the economic growth of 85 developing countries, covering Asia, Africa, Latin America, and the Caribbean countries for the period 1980-2007. They found that foreign aid has mixed effects on economic growth in developing countries, which depend on many factors such as economic policies, geographic condition, human development and institutional efficiency. Safdari and Mehrizi (2011) have investigated the long-term relationship of five major macroeconomic variables (Gross Domestic Product (GDP), private investment, foreign loan, public investment and import) in the purview of Iran from the period 1972-2007. They used the VAR model, and found that foreign loan has a negative effect on GDP and positive effect on private investment.

From the past theoretical and empirical studies relating to aid effectiveness, it is evident that measuring the aid-growth nexus is a daunting task. There are three types of contrary nature of perspectives on aid. One extreme claim that the given amount of aid is not enough, for example, those who advocate for debt relief and reversing the net transfer from poor to rich countries. Another one argues that the given amount of aid is too much. This group emphasizes the "aid fatigue" that was common in the 1980s and 1990s, and those who like William Easterly believes development needs to be "home-grown" recourses. In the middle, some are focusing on the ways in which aid is provided and the need for better assessment. Similarly, they argue that aid really

isn't all that important that other rich country policies, such as on trade or migration, are much more significant.

However, the literature does not provide any definitive and concrete evidence that foreign aid has a positive or a negative impact on economic growth. The analysis of both theoretical and empirical literature on foreign aid, however, deals with controversies and paradoxes.

1.5 Research Gap

In this context, the most critical question has arisen, what or who is responsible for the aid ineffectiveness? -the donors or the recipient government; aid providing system or the implementation strategy; or something else-. Both donors and recipients have become familiar with the requirement of establishing a promising relationship between foreign aid and economic growth. But, studies on such relationships have often ended up with a negative or inconclusive conclusion. In this context, it is important to analyse the hidden factors behind the aid-growth nexus.

Such traditional works, on the empirical front, just include the aid variable as an explanatory variable in the growth regression and ignore the effects of the causal path in between aid and growth. Those works just focus on the direct effect by controlling different variables. Addison *et. al* (2017) pointed out that cross-country analysis can only suggest a pattern or tendency that holds on average. But the gap model predictions assume that foreign aid supplement domestic savings, export earnings and tax revenue. Then economic growth. Therefore, the crucial motivation is to realize whether foreign aid positively transmits through investment, import, and public consumption. In other words, any effect of foreign aid on growth depends on the effects of foreign aid transmitted through some mediators such as investment, public consumption etc. On the other hand, such traditional type aid-growth specifications are suffering from estimation biases due to omitting investment or double counting as it omits investment or includes both aid and investment. But one of the branches beyond this claim establishes the causation of the association between aid and growth. Gommane *et.al* (2005) take into account the mechanism by which aid impacts on growth. But they allow passing through the regression line of supplementary equations through the origin and yield positive effects via incorrect positive causal path from aid to growth.

Studies carried out by Burnside (2000) found evidence that foreign aid has shown a significant positive impact on the economic growth of the recipient economies only in the presence of a good policy environment. After that, the recipient country policy environment becomes the centrality of aid-growth studies. Contradicting their findings, some other studies such as Dalgaard *et al*. (2004), Easterly *et al.* (2004), Islam (2005), and Outtara and Strobl (2008) found that the positive impact of foreign aid does not depend upon any policy environment. This means the policies are not a matter of aid ineffectiveness. If so, how to interpret the interaction between the policy environment and aid effectiveness. So, we have to unveil the causation of the association between aid and growth to extend this discussion.

Sethi (2019) and some others have tested the direct effect approach of aid-growth nexus, particularly for Sri Lanka. However, Movrotus (2002) mentioned that any effect of aid on growth depends on the fiscal decisions that are affected by the presence of foreign aid. But we failed to find any study that tries to capture the indirect effect of aid on fiscal variables in case of Sri Lanka. By the way, some earlier panel data analyses in the fiscal response literature have taken into account the effects of aid on fiscal variables, including the Sri Lankan scenario. Otim (1996) uses panel data for India, Pakistan, and Sri Lanka over the period of 1977-1990. Khan *et al.* (1992) use pooled time series and cross-sectional data over the period of 1955-1976 for five countries, including Sri Lanka. However, these works discuss the situation that had beyond three decades. Another difficulty of such earlier studies is that the data used have consisted of a few time-series observations.

Sri Lankan authorities have moved to construct mega-development projects, especially after 2006, while world famous credit rating agencies have continuously downgraded the country. In such a situation, it is essential not only to test the association between aid and macroeconomic variables but also need to test the impact of such projects as a policy tool.

1.6 Research Objectives

On the basis of the impression received in the literature review and the research gap found in the prior studies, this study aims to examine whether foreign aid meets the intended development objectives within a research frame that account for following specific objectives:

1. To analyse how does foreign aid drive through mediators [Cross country analysis]

2. To analyse the aid effectiveness which depends on the fiscal decisions that are affected by foreign aid [Single country analysis]

3. To analyse whether aid financed project work well [Project level analysis]

1.7 Research Questions

To meet the research objectives aforesaid, the following research questions are framed.

1. How multilateral and bilateral foreign aid mediate through investment, public consumption, and import on per capita GDP in Asia, Africa, and Latin America?
2. How multilateral and bilateral foreign aid mediates through investment, public consumption, and import on per capita GDP in lower middle income and upper middle-income countries?
3. How fiscal decisions are affected by foreign aid in Sri Lanka?
4. What is the causal effect of the expressway from Katunayaka International Airport, located in the western province, to Matara, located in southern Sri Lanka, with regard to the intended outcomes of the project?
5. How to analyse the coherence among foreign aid, policy environment, and economic growth?

1.8 Justification for The Scope of The Objectives

There are three major macro-economic gaps that hazardous to economic development.
1. Domestic resource gap
2. Foreign resource Gap
3. The Fiscal Gap.

The gap model argument predicts that foreign aid supplements domestic savings, export earnings, and tax revenue. Any study that tries to unveil the aid effectiveness needs to consider whether foreign aid positively transmits investment, import, and public consumption rather than its direct association. Our first research objective covers the above scope in chapter 2, which postulates the transmission mechanism of foreign aid that supports the development process of the recipient countries. We

assume that when foreign aid supplement domestic savings, then investment increases and thereby enhance the economic growth. Whereas, we assume that foreign aid supplement export earnings that need to finance import (intermediate and capital goods) and in turn reaches the economic growth. Further, we assume that foreign aid supplement tax revenue that need to increase the socioeconomic consumption as expected in Solow-Swan growth model. Research questions with respect to the chapter two are based on those assumptions.

We needed to take a close snapshot of aid effectiveness for further confirmation of previous research objectives. Therefore, we decided to consider an individual country case and selected the Sri Lanka as the research area of the case study. Sri Lanka is a country that belongs to the second poorest region of the world. When we select the country Sri Lanka as a research area, we basically considered two key factors. Sri Lanka reached to the end of its long-term civil war in 2009 and enjoyed a political stability. In this context, the Sri Lankan government approached to accelerate economic growth through investing public infrastructure drastically, especially on mega projects. The country at once become 'a single workplace' and reached the growth level of around 7 percent. But there was a black hole under the macroeconomy, and the story had reached its illusion end by 2015. Accordingly, the country is downgraded by world-famous three credit rating agencies such as Moody, S&P, and Fitch continuously from 2015 to 2020 and is reached the level of 'substantial risk' by November 2020. Now the country is running through a critical debt crisis. At a glance and as a whole, the country was a merely a workplace. But macroeconomic position of the country was sliding drastically. It reflects a macro- micro paradox.

This impressive phenomenon stimulates us to get feedback of aid effectiveness in Sri Lanka. Accordingly, we focus on Sri Lanka in two different dimensions, i.e. macro and micro perspectives. We, in chapter three, analyse the aid effectiveness which depends on the fiscal decisions that are affected by foreign aid. Here, we test whether the foreign aid supplement public savings and in turn increase the public investment. Simultaneously, we test whether foreign aid substitute or supplement tax revenue. Similarly, we test whether foreign aid increases the socio-economic consumption which might help to postpone the threshold level of diminishing return. Accordingly, objective one and two address the similar issue in aid effectiveness in two different perspectives and two different levels.

The story discussed above provide insight that foreign aid work well in micro level while macroeconomic positions are collapse. Therefore, it is required to make an assessment of the causal impact of foreign aid on a selected project to establish complete knowledge on aid effectiveness in a country case study. In that sense we, analyse the impact of an expressway project in terms of expected outcomes. Accordingly, the present work contributes to produce a complete picture on aid effectiveness in different levels and dimensions.

1.9 Significance, Limitations, Contribution and Suggestions for Future Works

1.9.1 Significance of The Research:

Selection of study area with regarding aid effectiveness spread from macro to micro and from country cross-section to individual project analysis. This approach helps to test the basic overall hypothesis in different levels and to establish consistent knowledge in the aid-growth literature. The influential paper done by Addison *et.al* (2017) pointed out that cross-country analysis can only suggest a pattern or tendency that holds on average. Such traditional specifications merely include the aid variable as an explanatory variable in the growth regression. In contrast, we unveil the causation of the association between foreign aid and per capita GDP by taking into account the mechanism by which aid impacts growth. Whereas, even if the volumes of literature reveal the contradictory nature of research findings on aid effectiveness, such studies omit investment from the specification or include both investment and foreign aid and lead to potential omitted variable bias or to double-counting error. The solution depicts in our cross-country analysis that aid operates via transmission mechanisms, such as investment or government consumption, instead of the specifications that recognize the presence of a direct effect. Our indirect approach support for capturing the scenario of the gap model predictions. Gap model prediction assume that foreign aid supplement domestic savings, export earnings and tax revenue. Then economic growth. To that end, the model should be capable to see whether foreign aid positively transmits through investment, import, and public consumption. Our first research objective covers this scope in chapter 2.

On the other hand, we reached our conclusion for the cross-country analysis by comparing estimation results which derived from different dimensions at one work:

regional comparison and income group comparison; comparison between disaggregated aid such as bilateral aid and multilateral aid; comparison between direct effect and indirect effect; comparison between the effect of current aid and lag aid itself. Therefore, our estimation results are so robust and consistent. The mediating effect approach, which reveals the causation of the association between aid and growth, is a decisive approach in terms of better understanding the aid -growth nexus and in terms of policy development.

We hope that individual country analysis based on Sri Lanka shed some light to confirm the finding and conclusion of the previous analysis at least for Asia / LMI countries. Fiscal response analysis also an indirect effect approach that consist with previous chapter. Some earlier works in the fiscal response literature discuss the situation in which earlier than three decades and those studies had used a few time-series observations. But in this works, we use 55-year time series observation until 2017. Similarly, some cross-country analyses in this field including Sri Lanka [Otim (1996), Khan *et al.* (1992)] may not offer a better picture in recipient economies. Fiscal response analysis enlightens the conclusion derived in chapter two. With the light of generalized conclusion of previous analysis, the chapter three support us to develop appropriate policies for the particular recipient country. Indeed, a time series approach could be more informative as to individual country experiences and leads to more sophisticated policy development. Because of these features, the chapter three provide demanding impression for the present work by enlightening close and deep understanding on the research theme.

Finally, the present work tries to address the crucial public policy question that is whether the construction of the first expressway in Sri Lanka is achieved its intended outcomes as a country that is downgraded by credit rating agencies. It permits us to view the causal impact of aid financed project and helps to broader comparison of aid effectiveness, i.e. micro level aid effectiveness vs. macro level aid effectiveness. Accordingly, the present work support for the both arguments of aid effectiveness – aid work, aid does not work- in a face of micro-macro paradox.

1.9.2 Limitations of The Research:

This study has tried to measure the aid effectiveness from the recipient's perspective and has ignored the donors' perception. The empirical findings of this study are restricted to three different empirical efforts, i.e. cross-country fixed effect

mediation analysis, country-specific 3SLS fiscal response analysis, and project impact assessment fixed effect, difference in difference (DID) estimation. The results of this study, on the whole, are quite interesting and may throw more light on current debates relating to aid effectiveness. However, the analysis and the conclusion presented in this study are subject to identical limitations of each section. Due to the limitation of data, we used only 30 countries as the sample out of 89 lower middle-income countries (LMI) and upper middle-income countries (UMI) for the cross-country analysis, and the outcome would be different if the sample size is increased.

In the case of country-specific fiscal response analysis, the effect of aid on other variables such as GDP growth, private investment, which has been the subject of a debate in the relevant empirical literature for a long time, cannot be assessed within the context of fiscal response model. Therefore, the estimation results are inconclusive, and we have indirectly assumed the aid effectiveness on economic growth. Furthermore, a general conclusion for the developing world, though important, is difficult to drown from the empirical findings on the basis of individual country analysis. Another main concern with this section is setting the target variables. The empirical results and interpretation are subject to the way we assumed. That is, the fiscal authority has set explicit targets according to the given method.

The endogeneity problem is common in aid effectiveness literature. However, we, in chapter 2, do not take into account the reverse causality running from higher per capita GDP to less foreign aid and in chapter 3 do not take into account the reverse causality running from higher fiscal variables to less foreign aid. Hence, our one-way interpretations of the effect of foreign aid on economic growth should be viewed with scepticism as they may just be a consequence of an inadequately addressed negative and quantitatively large simultaneity bias.

Now turn towards the impact assessment of the expressway project in Sri Lanka. Some outcome variables, especially industrial value addition, do not meet the paroral trend assumption, which is critical for DID estimations. In addition, the road section, which belongs to the southern province, is only limited to a particular part of the province. But the secondary macro data that we employed here are relevant to the whole province. Our interpretations are subject to those pitfalls.

1.9.3 The Contribution and Potential Future Works:

What does this work add to the voluminous literature on aid effectiveness? First, most papers in the literature examine aid effectiveness in a typically narrowly defined setting. We attempt to examine the aid-growth relationship under a variety of settings, using one common framework. Secondly, in contrast to the traditional approach of aid-growth nexus, this study unveils the hidden part of association of foreign aid and shed a light on causation of the association between aid – growth. Gomanee *et.al* (2005) avoided the intercept from supplementary regression and forces the regression line to pass through the origin and allows to yield an incorrect direction from aid to growth. Nonetheless, we corrected this small but influential problem in empirical front. Third and most interesting grabbing contribution of this work is the novel interpretation for the negativeness of aid-growth association. We found evidence that foreign aid is no longer effective -in deed ineffective- when aid mediated through the causal path of investment. It implies that the rate of return on private capital is reduced or is treated unfavourably by aid. As a result, the outcome (per capita GDP) decreases. Shaomeng *et.al* (2019) re-examined the work done by Doller *et.al* (2000) with extended data up to 2013 and reveals that aid is not conditional on good policies. Gomanee *et. al* (2005) conclude that aid can be effective even if policies are bad. By complying but beyond them, our findings lead to the conclusion that the aid ineffectiveness is not conditional on policies. But policies that affect private investment are conditional on aid effectiveness that depends on the aid management approach. The study reaches to this novel interpretation for the negativeness of aid growth association through the different type of comparisons in one work as we mentioned earlier.

In theory, it is expected that foreign aid increases the public savings than it would have been without aid. But in contrast, we found that Sri Lankan fiscal policymakers substitute tax revenue and increase consumption in the presence of foreign aid. Accordingly, the budget deficit and domestic borrowings are expected to increase. Thereby in the next turn, the authority faces a critical problem due to the lack of required domestic resources that need to mobilize public investment. Then, the fiscal authority prioritizes eradicating the pressure on domestic borrowing rather than increasing investment, indicating that investment decreases due to the pressure on domestic borrowing. The chapter three precisely contribute to explain the reason for reducing domestic investment and the rate of return on private capital as well as the public capital.

The chapter four make a contribution to this work by assessing the impact of the express way from Katunayaka International Airport to Matara in Sri Lanka at the first time. We found that the express way increased the RGDP in the affected regions (i.e., the western and southern provinces) by 7.5% out of total RGDP. This provides insight that foreign aid work well at micro level in terms of selected projects and does not work well at macro level.

Finally, the author hopes that this research is worth it for future scholars who are interested in this problem with some developments. The author suggests that it would be more interesting to analyse the sector-specific studies on foreign aid programs along with their impact on economic development. Further, it is better to test this hypothesis by increasing the sample size. We would like to suggest exploring the mediating mechanisms, which are interconnected. For example, foreign aid mediates via public investment, and in turn, mediate via domestic investment towards economic growth. Another mediation mechanism that can be assumed is foreign aid which mediates via public investment and consumption, and in turn, mediate via import towards economic growth. We hope that trying such potential mechanisms may sound interesting. Further, we suggest for future researches to get effort to extend the fiscal response analysis to address the issue of aid effectiveness which mediates through fiscal variables on economic growth.

1.10 Dissertation Structure

This dissertation consists of 5 chapters. Chapter 1 provides a background of the study, including brief discussion on potential development economic theories, aid industry, and empirical experiences of development effort in the developing world. Further, it elaborates the problem statement, the research objectives, the significance of the research, limitations, and potential future works of the research. Chapters 2, 3, and 4 are core contents of the dissertation, which presents data analysis to attain the aforesaid research objectives. Specifically, chapter 2 attains the first research objective using data from the OECD and the World Bank databases. This chapter brings the mediation analysis which focuses on the direct effect as well as the indirect effect of disaggregated aid on per capita GDP. We apply a fixed effect (FE) methods for data analysis and used 25 years of data over the period of 1992 -2016, and the sample comprises 30 developing countries. Chapter 3 attains the second research objective which discusses, how fiscal decisions in Sri Lanka are affected by the

presence of foreign aid. Chapter 4 achieves the third research objective using provincial and district level secondary data in Sri Lanka. The purpose of this chapter is to assess the achieved level of intended outcomes of the first express way in Sri Lanka, focusing on the contributions of the regional gross domestic product, unemployment, industrial sector value addition, and Small and Medium Enterprises (SME)s. The fixed effect estimation was based on a difference-in-difference framework. Chapter 5 concludes the findings from three core chapters. Based on the findings, this chapter discusses sustainable policy implications for the aid growth paradigm particularly for Sri Lanka.

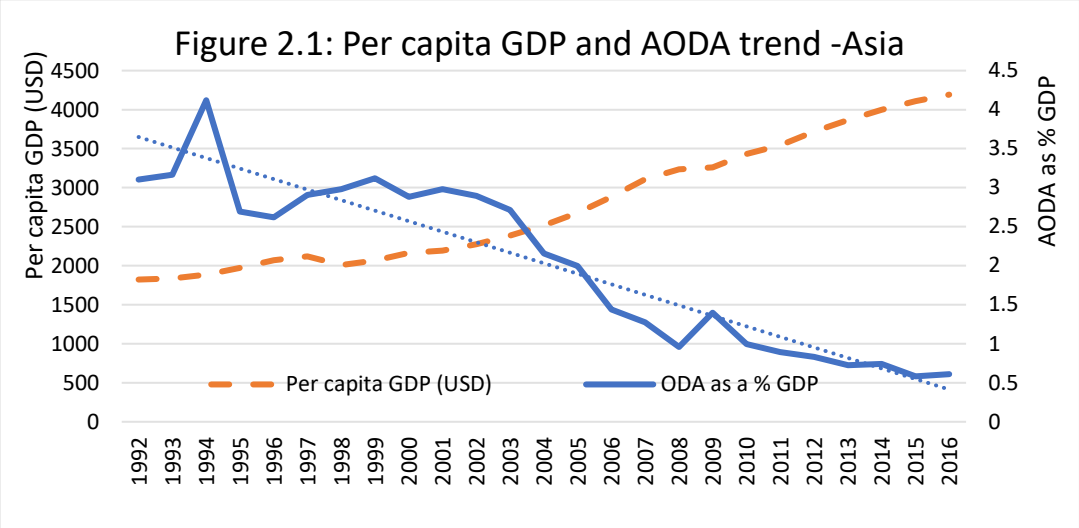
Chapter 2

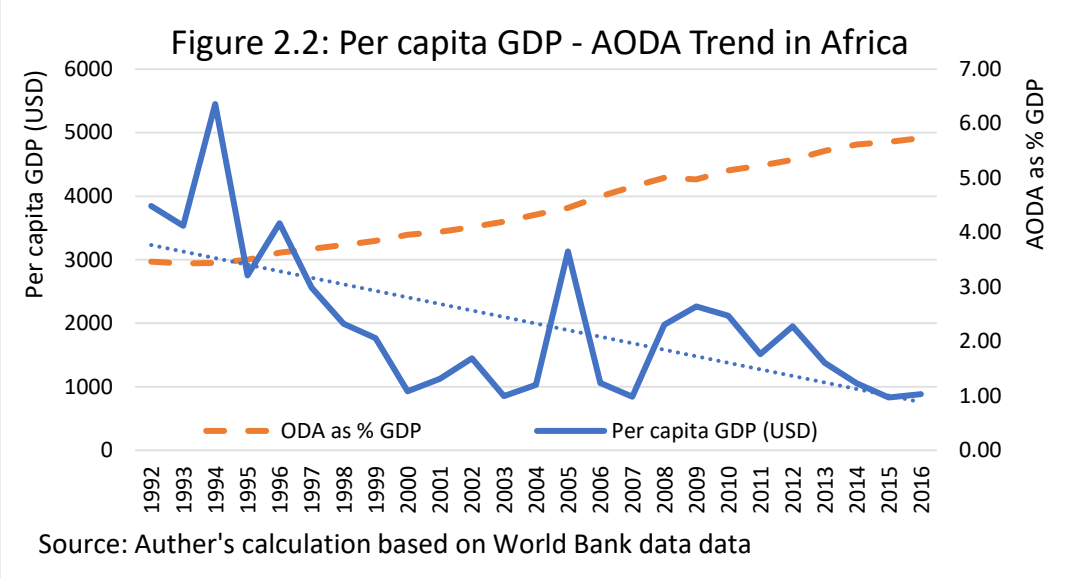
Does Foreign Aid Work Well in Developing Countries? A Mediating Effect Approaches

2.1. Introduction

Not surprisingly, much of the literature which considered the aid-growth nexus reveals the contradictory nature of research findings. Accordingly, McGillivray *et al.* (2005), divided the literature of aid-growth nexus into three major camps: aid work; aid does not work; aid work but it depends. However, Chenery *et.al* (1962) and Chenery *et.al* (1966) introduced the dual-gap model which includes domestic resource gap and foreign resource gap. Bacha (1990) and Taylor (1990) discussed about the fiscal gap as a part of resource gap which badly affect to enhance the utilization capacity. Therefore, more scholars argue that foreign aid can supplement the domestic savings, foreign exchange and public revenues and in turn can meet the economic growth. Accordingly, the significant volumes of foreign aid are directed with the purpose of not only filling the macro-economic gaps but also closing the gaps over time in developing countries. Figures 2.1 to 2.5 graphically illustrate the trends in aggregated official development assistance as a percentage of gross domestic product (AODA) and Per capita gross domestic product of selected groups of countries. It gives an ambiguous insight in two different dimensions. On one hand, it gives a picture that foreign aid increases the recipient countries' ability to mobilize their own resources and achieving self-sustained growth targets as expected in gap model predictions. On the other hand, figure 2.4 and 2.5 clearly emphasize the scenarios of high aid-low growth and low aid- high growth. Figure 2.6 indicate that poorest African countries disburse more foreign aid than Asia and Latin America. Latin America is the lowest aid utilizer. Does it mean that foreign aid work well in developing countries?

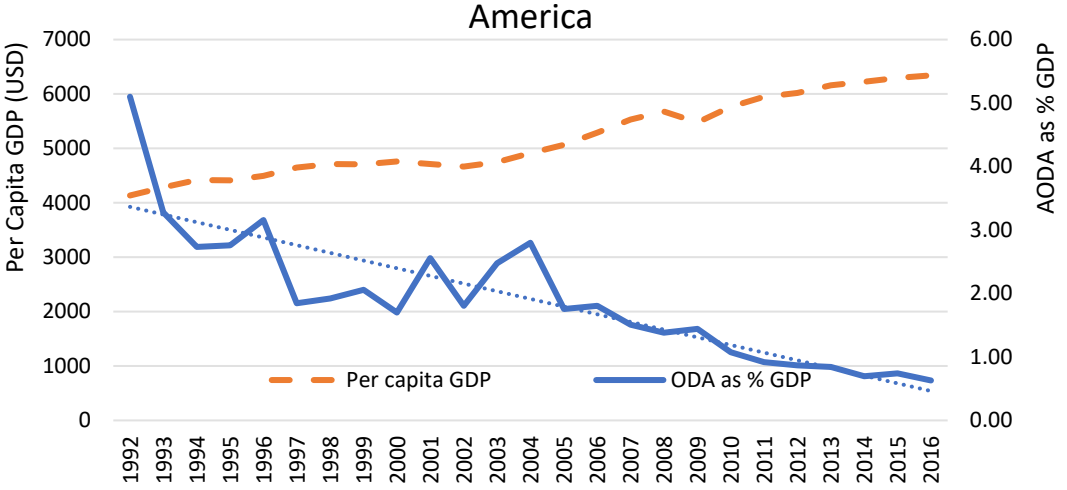
The influential paper done by Addison *et.al* (2017), pointed out that "Even if the serious data and econometric difficulties are addressed, which is not always the case, cross country analysis can only suggest a pattern or tendency that holds on average" (page.991). Nonetheless, before his influential paper, Gomanee *et.al* (2005) similarly, criticized Burnside *et.al* (2000) and pointed out that such type of studies does not take into account the mechanism by which aid impacts on growth. Such traditional works just include aid variable as an explanatory variable in the growth regression. Zhou *et al*. (2018) mentioned that merely establishing the existence of a causal effect between variables without identifying causal mechanisms that explain such effects is not important.





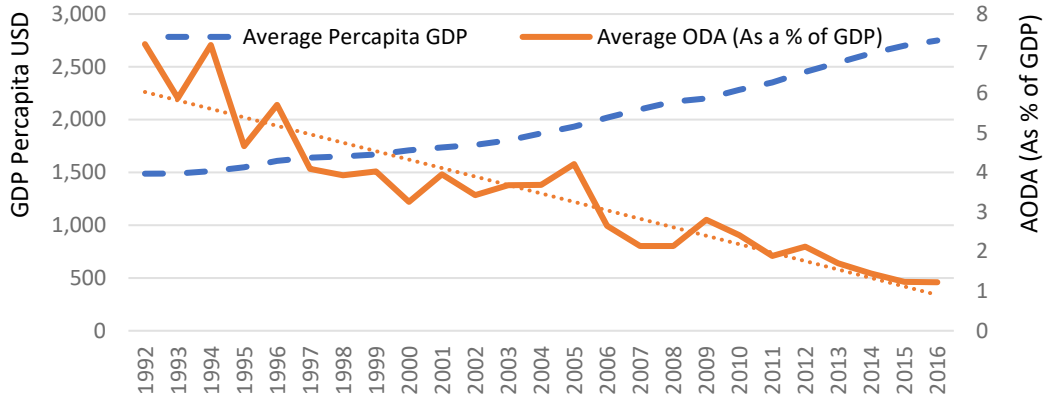
Source: Auther's calculation based on World Bank data data

Figure 2.3: Per capita GDPn and AODA trend in Latin America



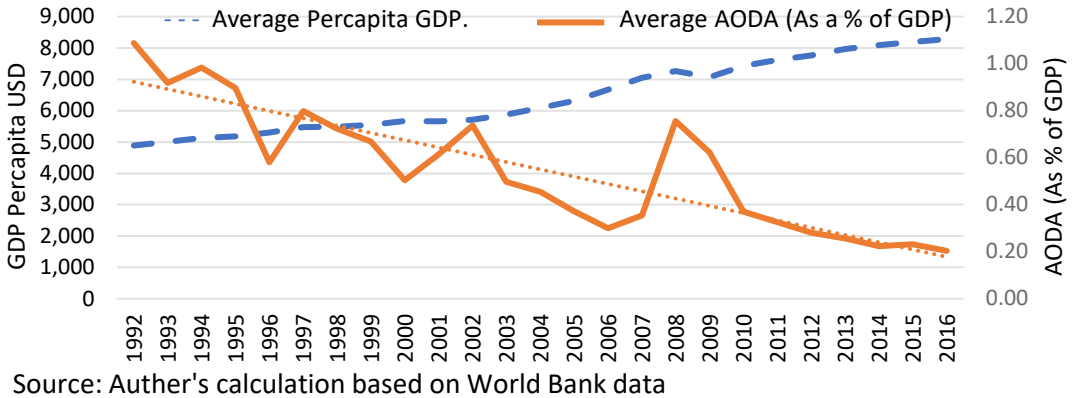
Source: Auther's calculation based on World Bank data data

Figure 2.4: Per capita GDP and AODA trends in LMI countries

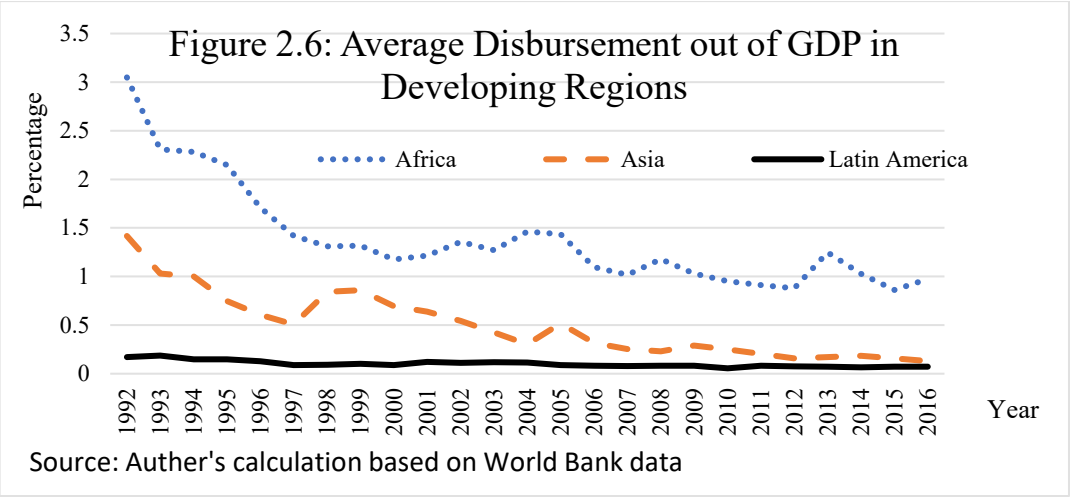


Source: Auther's calculation based on World Bank data

Figure 2.5 : Per capita GDP and AODA trends in UMI countries



Source: Auther's calculation based on World Bank data



Another aspect of this discussion is that even if the volumes of literature reveal the contradictory nature of research findings on aid effectiveness, such studies are based on reduced form specifications which omitted investment that it leads to potential omitted variable bias. If one includes both, aid and investment, there is double counting and the coefficients are biased. The solution depicts in an empirical study that aid operates via transmission mechanisms, such as investment or government consumption, instead of the specifications that recognize the presence of a direct effect.

The purpose of this chapter is to measure not only the total effect of multilateral and bilateral ODA, but also the indirect effect transmitted via mediators such as investment, public consumption and import within a comparison of LMI and UMI countries as well as Asia, Africa and Latin America. It permits us to see the causation of the association between per capita GDP and disaggregated ODA. This study took the path of mediating effect approach which employed by Gomanee *et.al* (2005) and similarly use the residual with regression (RWR) method for this analysis. As a result, double counting and omitted variable problems concerning mediators are avoided. The fixed-effect estimation procedure is employed to address the heterogeneity problem of geographical and socio-economic differences in our samples.

Gomanee *et.al* (2005) yields the results by forcing the regression line of supplementary equations to pass through the origin and allows to yield an incorrect causal path from aid to growth. But the present study includes an intercept for the bivariate supplementary regression and permits to get the direction of causal path itself. They restricted their sample to 25 sub Saharan African (SSA) countries. By the way, we compare the aid effectiveness between two different country groups in terms of

income disparities and three different country groups in terms of geographical disparities. By ignoring heterogeneity problems in SSA countries, they employed the robust estimation procedure in the sample of over the period of 1970–97. However, the fixed effect estimation procedure over the period of 1992-2016 is used in this study. Gomanee *et.al* (2005) just focus on the ODA and grant. This work takes into account the disaggregated ODA- bilateral ODA (BiODA) and multilateral ODA (MulODA)- to capture the heterogeneous character of categorical aid.

What does this paper add to the voluminous literature on aid effectiveness? First, most papers in the literature examine aid effectiveness in a typically narrowly defined setting. We attempt to examine the aid-growth relationship under a variety of settings, using one common framework. Secondly, in contrast to the traditional approach of aid-growth nexus, this study unveils the hidden part of association of foreign aid and shed a light on causation of the association between aid – growth. Gomanee et.al (2005) avoided the intercept from supplementary regression and forces the regression line to pass through the origin and allows to yield an incorrect direction from aid to growth. Nonetheless, we corrected this small but influential problem in empirical front. Third and most interesting grabbing contribution of this work is the novel interpretation for the negativeness of aid-growth association. We found evidence that foreign aid is no longer effective -in deed ineffective- when aid mediated through the causal path of investment. It implies that the rate of return on private capital is reduced or is treated unfavourably by aid. As a result, the outcome (per capita GDP) decreases. Shaomeng *et.al* (2019) re-examined the work done by Doller *et.al* (2000) with extended data up to 2013 and reveals that aid is not conditional on good policies. Gomanee *et. al* (2005) conclude that aid can be effective even if policies are bad. By complying but beyond them, our findings lead to the conclusion that the aid ineffectiveness is not conditional on policies. But policies that affect private investment are conditional on aid effectiveness that depends on the aid management approach. The study reaches to this novel interpretation for the negativeness of aid growth association through the different type of comparisons in one work as we mentioned earlier.

Rest of the chapter is organized as follows. Section 2.2 denote for the literature review. Section 2.3 present the research concept which focus on the mediating effect mechanism in aid-growth nexus. Section 2.4 focuses on the data and the econometric methods we used in this paper. Section 2.5 presents the discussion of the empirical

results with respect to the aid effectiveness, and the section 2.6 contains concluding remarks.

2.2. Literature Review

The literature emphasizes the requirement for foreign aid in three dimensions. Chenery *et.al* (1962) and Chenery *et.al* (1966) elaborated the conceptual foundation for the context of the well-known two-gap model of aid, which consist with the Harrod–Dorma growth tradition. It assumes that there is an excess supply of labour, and that growth is constrained only by the availability of capital, which is determined by the level of savings and the productivity of capital. In this scenario, poor countries continuously remain in poverty because of a lack of savings. Indeed, developing countries that are suffering from insufficient investment turn to foreign aid as a means of filling the resource gap. In addition, they pointed out the foreign resource gap, which means the trade gap is a constraint of economic performance in developing countries. Accordingly, foreign aid provides a potential solution for insufficient foreign exchange that is required to purchase foreign capital goods and intermediate goods for investment.

Bacha (1990) and Taylor (1990) recognized that governments of developing countries do not have the required sources of domestic revenue to meet the desired level of utilization capacity. Further, they argue that foreign aid can supplement the insufficient revenue of the recipient's government with the purpose of enhancing utilization capacities. Accordingly, these ideas advocate for a positive aid-growth relationship on the grounds of Harrod-Domar's growth tradition. By estimating a Panel VAR model, Matthijs *et.al* (2015) pointed out that foreign aid has a long-run positive effect of aid on income. It has been comprehensively proved by the meta-analysis conducted by Tseday *et.al* (2013). As McGillivray *et al.* (2005) explained, this would increase investment and, in turn, growth. Eventually this growth could become self-sustaining, and the need for aid would disappear. Papanek (1973), Dowling *et.al* (1982), Gupta *et.al* (1983), Levy (1988), and Sachs *et al.* (2004) are some defenders of these streams of thought. This might be one reason to increase growth while declines ODA in group of countries as it consistent with the argument of gap model predictions (See figures 2.1-2.5).

However, the literature reveals the contradictory nature of research findings on aid effectiveness. Voivodas (1973), Mosley (1980), and Boone (1996) found that there

is no impact of aid on economic growth. Griffin (1970) and Griffin *et.al* (1970) pointed out the general tendency that the greater the capital inflows from abroad are, the lower the rate of growth in the recipient country. Among a number of interacting reasons for this phenomenon, particular attention was paid to the observation that aid leads to lower domestic savings. This idea contested the assertion of gap models that foreign aid leads to a one-to-one increase in savings, and a part of foreign aid will be allocated to consumption rather than savings/investment. Weisskopf (1972) and Broone (1996) confirmed this concept again. Mosley. *et al.* (1987) discussed the micro-macro paradox. The paradox is that the micro-level performance of development projects shows good performance, whilst those of the macro evidence are ambiguous or negative. These authors offered some explanations, such as aid fungibility within the public sector and backwash effects from aid-financed activities that adversely affect economic performance. Swaroop *et al.* (2000) and Easterly (2006) pointed out that foreign aid is being used for unproductive activities. These projects tend to generate a low or negative rate of return and produce little spill over into other sectors. Yiew, T. H.,*et.al* (2018), also found that ODA has a negative direct effect on GDP. Bulir *et.a*l (2003) showed that aid volatility, especially in aid-dependent countries, undermines the effectiveness of aid. Volatile aid causes economic uncertainty, which leads to poor economic performance. Lensink *et.al* (2000) showed that while the aid uncertainty variable has a negative impact on growth, aid has a positive effect. This finding confirms the hypothesis that aid in itself contributes to higher growth but that the effectiveness of aid is reduced when aid flows are more volatile. Mallik (2008) carried out a cointegration analysis and reported that a negative long run effect of aid as a percentage of GDP on per-capita real GDP for most of African countries in their sample. McGillivray (2005) traced five main alternative views with respect to the negative association of the aid-growth nexus: aid has decreasing returns, volatile aid flows cause uncertainty, external and climatic conditions, political conditions, and institutional quality.

Another trend in the aid effectiveness literature emphasizes that aid is effective but depends on recipient's policies. Guillaumont *et.al* (2001) argued that aid effectiveness depends on exogenous environmental factors such as the terms of trade trend, export instability, corruption, institutional quality and climatic shocks. Burnside *et.al* (2000) showed that aid has a positive impact on real GDP per capita growth, but only when the government of a country carries out 'good' fiscal, monetary and trade

policies. Collier *et.al* (2001) and Collier *et.al* (2002) reported results consistent with those of Burnside *et.al* (2000). Rajan *et. al* (2005) conclude that no evidence that aid works better in better policy or geographical environments. In addition, Shaomeng *et.al* (2019) re-examined the work done by Doller *et.al* (2000) with extended data up to 2013 and reveals that aid is not conditional on good policies. However, Dalgaard *et.al* (2001), Hansen *et.al* (2001), Lensink *et.al* (2001), Jensen *et.al* (2003), Islam (2002), and Ram (2004) failed to find that the interaction term between aid and policy measure is statistically significant in a different context. Dalgaard *et.al* (2004) also elaborated that the impact of foreign aid on long-run productivity depends on policies, structural characteristics such as climate-related circumstances, and the size of the aid flow. Kathavate *et.al* (2012) suggest that strong institutional quality cause to mitigate the bad effect of aid volatility.

By the way, Heller (1975) and followers such as Gang *et.al* (1991), Franco *et al.* (1998), Mavrotas, (2002) and Simon *et.al* (2010) addressed the issue of "fungibility" or the ability of recipient governments to direct aid to uses other than those intended by donors. Mavrotas (2002) found project aid to be more fungible than program aid in regard to the replacement of government funding. In general, official aid goes to the recipient government's budget and is reshuffled into the budget, and the resources are reallocated as per the unintended pattern of donors (probably corruption and /or unproductive infrastructure). Then, if the aid stimulates tax reduction policy or diverts aid resources to public consumption in the recipient country, it negatively affects or does not affect economic growth. The fundamental argument is that the nature of aid management affect to policy distortions that influence to private investment. In turn decline the economic growth. However, though we use a different approach and it is not directly comparable to those of fiscal response model, theoretical insight of our work is more consistent with theirs.

2.3 Mediating Effect of Aid on Growth

Many studies use interaction effect as well as mediation effect to unveil the pathways underlying the effect of an intervention on a particular outcome variable. As Judith *et.al* (2017) mentioned, in statistics, a mediation model seeks to identify and explain the mechanism or process that underlies an observed relationship between an independent variable and a dependent variable via the inclusion of a third

hypothetical variable, known as a mediator variable. Paola *et.al* (2009) examined one specific link between remittances and growth, specifically the one working through financial markets. They tested a hypothesis that whether the level of financial depth in the recipient country affects the impact of remittances on growth. For that, they interacted the remittances variable with an indicator of financial depth. They defined the negative coefficient as the remittances are more effective in boosting growth where there is a shallower financial system. In other words, a negative interaction provides evidence of substitutability between remittances and financial instruments. On the other hand, a positive interaction would imply that the growth effects of remittances are enhanced in deeper financial systems, supporting complementarity of remittances and other financial flows. Mediation implies a causal sequence among three variables; independent variable causes the mediator, and the mediator causes the dependent variable. For example, foreign aid increases the domestic investment, and it increases the economic growth. An interaction means that the effect of X on Y depends on the level of a third variable. No causal sequence is implied by interaction. For example, foreign aid may be successful for good policies but not for bad policies.

Gomanee *et.al* (2005) correctly disclosed the dilemma of the aid-growth nexus. In general, the domestic resource gap is directly financed by foreign aid. But as an argument, by citing Hansen *et.al* (2001), they stated that the implicit growth theory will have investment, not aid, Burnside *et.al* (2000) argued that aid adds to investment, whereas policy determines the productivity of investment, and they therefore include an 'aid-policy' interaction term but exclude investment. Similarly, Roodman (2004) did not include investment in any of the regressions. The core argument for this is that "empirical growth studies are based on reduced form specifications and aid-growth regressions typically omit investment" in contrast to the implicit growth theory because foreign aid supplements the saving and finances the domestic resource gap (saving – investment). Accordingly, 'aid is intended to affect growth via its effect on investment. However, not all aid is intended for investment, and not all investment is financed by aid' Gomanne *et.al* (2005). The issue with this concept is that if one adopts the approach of omitting investment, there is potential omitted variable bias—any effect of investment on growth is attributed to the other variables (especially aid). If one includes aid and investment, there is double counting (as some aid is used for investment), and the coefficients are biased. Nonetheless, investment financed by aid contributes to the economic growth. The conceptual underpinning of this dilemma is

that investment works as a mediator of the aid-growth interrelationship. In other words, the effect of aid on growth is transmitted via investment.

In addition to investment, imports and public consumption expenditure also work as mediators of the aid-growth interrelationship. The gap model argument is further useful in identifying these mediating effects of aid on growth. The foreign resource gap (export – import) is also (at least) financed by foreign aid, which is directed to fill the requirements of import investment/intermediate goods and technology. Heller (1975) type studies based on fiscal response paradigm are demonstrated by Gang *et.al*. (1991), Franco *et al.* (1998), Mavrotas (2002), and Simon *et.al* (2010), and showed that fiscal policy is a significant determinant of the effects of aid. Official development assistance is issued to the recipient government, and the government reshuffles it into the budget. The budget diverts foreign aid not only to donor-intended investments and socio-economic consumption but also to civil public consumption spending in addition to tax reduction efforts. Such behavioral changes could affect the expansion of the fiscal gap (public revenue – public expenditure), which badly affects the domestic resource gap. In contrast, donor-intended socio-economic consumption such as education and health does not have an impact in the short term, and we would expect some of the aid to go to civil consumption spending, which does not have any impact on growth. It implicitly reduces the effectiveness of foreign aid. Accordingly, foreign aid affects economic growth via imports and public consumption. In other words, imports and public consumption work as mediators of the aid-growth association due to the effect of aid on growth transmitted via those variables. Therefore, investment, imports and public consumption are considered as potential mediators (X).

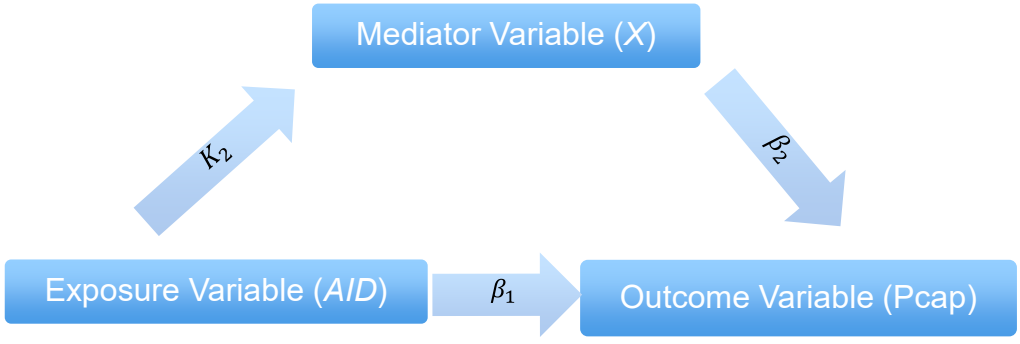


Figure 2.7. Path diagram of a relatively simple mediation model.

Steps which follow Baron *et.al* (1986) precisely explain the mediation analysis which illustrate in Figure 2.7. It is one approach to a causal inference mechanism that attempts to decompose the total effect into the direct effect and the indirect (mediated) effect. The part of the exposure effect that is not mediated by a given set of potential mediators is called the direct effect. In our case, the exposure variable is aid, and the outcome variable is per capita GDP [β_1Path]. The indirect effect, which goes through a mediator variable (K_2 and $\beta_2$path), explains the part of the exposure effect that is mediated by a given set of potential mediators into the outcome variable. Then the total effect of this decomposition is given by $\beta_1 + K_2\beta_2$ [See equation 3].

Conversely, the traditional empirical approach to the aid-growth nexus fails to recognize explicitly that aid has an indirect effect that operates via mediating mechanisms such as investment, government spending and imports. Therefore we, in this analysis, use mediation effect approach instead of interaction effect approach.

2.4. Methodology

Based on the above justification for the mediation effect of foreign aid on growth, this study selects the statistical mediation analysis approach to unveils the hidden part of association of foreign aid and shed a light on causation of the association between aid – growth. Accordingly, the sample comprises with 30 countries divided two parts as LMI and UMI country groups and same set of countries divided three parts according to the geographical disparities. The sample selection list is the OECD-DAC list of ODA recipients, which effective for reporting on 2020 flows. (See Table 1)[2]

[2] According to the definition given in the report, LMI country is defined as a country that was in the per capita GNI $1 006 - $3955 income category in 2016, and a UMI country is defined as a country that was in the per-capita GNI $3956 - $12235 income category in 2016The country classification is effective until 2020. Some of the countries may shift between these categories over the period of 1992-2016.

Table 2.1: Sample Country List

	Asia	Africa	Latin America
LMI Countries(15)	India, Sri Lanka, Pakistan, Indonesia, Philippine, Vietnam, Mongolia	Congo, Morocco, Egypt, Tunisia, Cote d'ivoire	Guatemala, Nicaragua, Bolivia,
UMI Countries (15)	Thailand, Malesia, Azerbaijan	Algeria, Mauritius, Botswana, South Africa	Peru, Mexico, Brazil, Costarica, Jamaica, Argentina, Paraguay Dominican Republic
	10	9	11

(Source:http://www.oecd.org/dac/financing-sustainable-development/development-finance-standards/DAC-List-of-ODA-Recipients-for-reporting-2020-flows.pdf)

Based on the above sub samples, we proceed the two-step empirical solution, similar to Gomanee *et.al* (2005), that was introduced by Pagon (1984) to capture the effect of aid on growth, accounting for the effect of aid on mediating variables (investment, imports and government consumption spending). Accordingly, the model is developed based on the specification of the panel estimation, which is represented in the following equation:

$$ln\_Pcap_{it} = \beta_0 + \beta_1 AID_{it} + \beta_2 X_{jit} + + \beta_z Z_{kit} + u_{it} \quad (1)$$

Where ln_Pcap is the dependent variable that denotes the logarithm of per capita GDP. AID is replaced by disaggregated aid measures:

MulODA- Multilateral official development assistance as a percentage of GDP

BiODA - Bilateral official development assistance as percentage of GDP

Subscript *j* of vector X denotes the mediating variables:

ln_ Inv – logarithm of total domestic investment,

ln_Gcon – logarithm of government consumption

ln_Imp – logarithm of imports

Subscript *k* of vector Z denotes the other covariates:

$MulODA^2$ / $BiODA^2$ – Squared term of disaggregated aid measures

ln_credit - *logarithm of credit to private sector by banks*

Infl – Inflation rate

EXCHA- Exchange rate

DEM – Democracy Index

Crises97/98 – Global economic crisis dummies 1997/1998

Crises08/09 – Global economic crisis dummies 2008/2009

Subscript i denotes the country and subscript t denotes the time

u - Disturbance term

As discussed in the above chapter, we use domestic investment (*ln_Inv*), government consumption (*ln_Gcon*) and imports (*ln_Imp*) as mediators. In general, log natural transformation helps to secure normality and homoscedasticity. Investment is considered to be a factor of capital accumulation in the growth model and it consist with public and private investment. Government consumption includes civil administration consumption and socio-economic consumption, which causes improvement in human resource capital. We assume that some part of imports is also directly financed by foreign aid and it play a mediating role in the equation. By emphasizing the centrality of aid disaggregation, we employ multilateral official development assistance (*MulODA*) and bilateral official development assistance (*BiODA*) as exposure variables. OECD data are used for aid measures. The vector of other covariates (*Z*) is comprised of some other influential variables. We investigate the existence of diminishing returns from aid by adding a quadratic aid term to the growth model. This can be described as a limited absorptive capacity for countries to take up large inflows of foreign aid and a problem of Dutch disease effects. Lensink *et.al* (2001), Hansen *et.al* (2001), Dalgaard *et.al* (2004), and Gomanee *et al.* (2003) found evidence for a negative effect of aid on growth after a certain threshold level. We included the log form of credit to private sector by banks (*ln_credit*) that reflect the financial market behaviour (Financial deepening). On the other hand, to capture the exchange rate market and the trade policy, we employ exchange rate (*EXCHA*). Further, we insert inflation (*Infl*) as a policy indicator. Brempong *et.al* (1999) found that political instability has a direct negative effect on growth and an indirect effect by discouraging investment. Guillaumont *et al*. (1999) found that primary instabilities in SSA reduce growth by distorting economic policy: the rate of investment is volatile; hence, the growth rate is lowered. We also hope to identify some of these effects in the estimation. Therefore, we include an indicator of the political features of sampled countries (*DEM*) based on the survey data published by Freedom House (www.freedomhouse.org). The democracy index takes values between 1 and 3 corresponding to freedom, partial freedom, and no freedom, respectively. To capture

the effect of the economic crises of 1997/1998 and 2007/2008, we use two dummy variables (*Crises97/98* and *Crises08/09*). Estimation is carried out with a panel of 25 years of annual data from 1992 to 2016. All variables measured in financial values represent constant (2010) USD values. To convert the nominal values into constant values, nominal values were deflated (Deflator = Nominal GDP/Constant GDP*100). Unless otherwise stated, the source for all variables is the World Bank database.

However, it is supposed that not all aid is intended for direct investment, and not all investment is financed by aid. In other words, investment, government consumption and imports are partially financed by aid. Therefore, in the above equation, which includes aid and investment together, there is a double-counting problem, and the coefficients are biased. With regard to eradicating the double-counting problem, if one adopts the approach of omitting investment (or government consumption/imports), there is potential omitted variable bias — any effect of such a variable on growth is attributed to the other variables (especially aid variable) — as such variables are not entirely financed by aid.

To solve the dilemma raised in the standard aid-growth specifications as discussed above, we elaborate our basic equation (1) to incorporate the effect of aid on per capita *GDP* via mediating variables. Accordingly, we employ the regression with residual approach by generating regressors from the residuals of a supplementary equation. Pagan (1984) presented a fairly complete treatment of the econometric problems arising when generated variables appear in a regression equation. Gomanee *et.al* (2005) employed the same two-step procedure, which can be derived from the asymptotically efficient estimates and the correct values for the standard errors.

In the first step, we regress the following bivariate regression:

$$X_{jit} = K_1 + K_2 AID_{it} + U_{it} \qquad (2)$$

Where, subscript *j* represents *ln_Inv, ln_Gcon,* and *ln_Imp* in the vector of X; K_1 is the intercept; and U_{it} represents the residual of the specification. Equation (2) estimates the relationship between *AID* and the mediator (X) such that K_2 gives a measure of the strength of the link that exists between them. The expression $[X_{jit} - (K_1 + K_2 AID_{it})]$ represents that part of X that is explained by factors other than *AID,* which is called the residual (U_{it}). We generate the residual series as a variable that represents the part of X that is explained by factors other than *AID* by estimating supplementary equation (2).

In the second step, supplementary equation (2) is substituted into the initial regression (1), and then the mediating variable is replaced by the residual-generated variable that was generated in the first step. This transformation alters only the estimated coefficient on the *AID* variable. This is demonstrated by substituting equation (2) in equation (1) as follows:

$$\boldsymbol{ln\_Pcap_{it} = \beta_0 + (\beta_1+\beta_2 K_2)AID_{it} + \beta_2 U_{it} + \beta_z Z_{kit} + u_{it}} \qquad (3)$$

In the fixed-effect estimation, the expression $\beta_2 K_2$ should be dropped from the equation, as it is time invariant. Then, we regress basic equation (3) with the generated residual series. This reveals that OLS gives us the correct and efficient estimates of variance and coefficient values. Hence, the use of residuals does not invalidate the inferences made, and the coefficient estimates are efficient (Gomanee *et.al* (2005)). Effects of aid on growth should take place overtime. Hence, the part of *X* that is explained by factors other than AID_{it-1} is illustrated by the expression $[X_{jit} - (K_1+K_2 AID_{i(t-1)})]$ is used to consider only the estimates on lagged aid.

Bivariate supplementary equations are regressed with an intercept that explains the data in its own right. However, Gomanee *et.al* (2005) did not use an intercept for bivariate supplementary equations, and a regression without an intercept suggests that the regression line should run through the origin. If the regression is forced through the origin, then it is assumed that the data are observed accordingly. However, in the case of the bivariate regressions proposed for the model, the data are not observed accordingly, which implies a restriction on the coefficient, often positive, and this might create an incorrect causal path from aid to growth. The residual-generated regressors which constructed with intercept explain the part of the mediating variables (investment/government consumption/imports) that is not attributed to *AID* using residuals from each bivariate regression. Those residual-generated variables capture the mediating effect of foreign aid.

In cases where the mediating variable (X_j) has a positive effect on per capita *GDP* and in which *AID* variable has a positive effect on the mediating variable (X_j), it provides a larger positive coefficient on aid. If the mediating variable has a negative effect on per capita *GDP,* and *AID* variable is a positive determinant of the mediating variable or vice versa, the coefficient on *AID* variable is reduced. If it denotes that *AID*

variable is not a determinant of the mediator, there is no effect, and the method is not used.

Country fixed effect estimation procedure is employed to estimate all specification discussed above and particularly concern global economic crises happen in 1997/1998 and 2008/2009 instead of using time fixed effect. Further, standard errors are clustered at the country level to ensure no serial correlation.

2.5. Analyzing Estimation Results and Discussion

As a preliminary work, summary statistics of the above variables are presented in appendix table A1 and A2 in Appendix A. It provides an image that three regions [Asia, Africa and Latin America] are consuming quit similar level of ODA. Descriptive statistics provides an image that LMI countries are consuming higher level of ODA than UMI countries. However, LMI countries can be categorized as 'high aid-low growth' group that experiencing high aid volatility. By the way, all of them can be identified as *BiODA* dominant nations.

Further, it is tested the influence of mediating variables on the outcome variable by excluding aid measures from the specification (See Table B1 in appendix B). The results prove that government consumption has a significant positive association with per capita GDP, while import has an insignificant effect in Asia, Africa and Latin America. By the way, investment does not have any association with per capita GDP for Asia and Africa. In comparison of income disparity country groups, investment and government consumption have a significant positive association with per capita GDP while import has an insignificant effect for both group of countries. It provides insight that there is no mediating path through mediators which have insignificant associations. But we did not drop those cases as a mediating mechanism by considering the possibility that it has a significant effect on outcome variable under different specification. The results related to the indirect effect mediated through such mediators should be treated with some caution given the statistical insignificance of the reported coefficient of imports which implies that nothing to mediate through import in the given specification.

According to our assumption that investment, public consumption and import are considered as potential mediators (X), we constructed residual-generated regressors that represent the part of the mediating variable that is not attributed to the *AID* variables by using residuals from the Aid - mediator bivariate regressions. The same

process was applied not only for the current Aid but also for lag Aid. The estimation results from those supplementary regressions are reported in tables C1 and C2 in appendix C. If Aid and mediator have no relationship, the mediator is just a third variable that may or may not be associated with outcome variable. A mediation makes sense only if there is an association. The residual-generated regressors constructed for each case that have statistically significant coefficients of the aid variable are represented by *Inv_res, Gcon_res*, and *Imp_res*. According to the estimation results, coefficient of *BiODA(-1)* on *ln_Inv* in case of UMI countries and both *MulODA and MulODA(-1)* on *ln_Inv* in LMI countries are statistically insignificant. On the other hand, coefficient of *MulODA* and *MulODA(-1)* on *ln_Inv* and both multilateral and bilateral ODA on government consumption in addition to *MulODA* on *ln_Imp* in case of African countries are statistically insignificant. Therefore, those cases are excluded from our discussion due to the fact that the *AID* variable is not a determinant of the investment as a mediator.

Before the discussion of mediating effects, the estimation results from the equation (1) with and without mediating variables has to be discussed. [See model 1 and 2 for current effect and model 6 for lag effect in tables D1-D10 in the appendix D]. As a whole, *BiODA* in Asian countries and both type of aid in Latin American countries have negatively significant association with outcome variable, *ln_Pcap*. However, AID coefficient given in Model 1, which is omitted mediators, is never significantly different from zero in any of the samples in African countries and *MulODA* in Asian countries and LMI countries. As Baron *et.al* (1986) suggested that there is nothing to mediate through mediator due to absence of association between Aid and outcome. It is assumed that those coefficients reflect the omitted variable biasness. In contrast, Shrout *et.al* (2002) mention that even if there is no any association among them, that should not be a constraint to move forward, if we have a good theoretical background about their relationship. However, if a mediation effect exists, the effect of Aid on per capita GDP will disappear (or at least weaken), when mediator variables are included in the regression. The point is that the effect of Aid completely disappears by suggesting, that the mediator variables fully mediates the effect of Aid on Per capita GDP (*full mediation*). The current effect of *MulODA* in LMI countries and lag effect of *MulODA* in UMI countries on Per capita GDP still exists and suggest that mediator partially mediates the effect of AID on Per capita GDP (*partial mediation*).

However, the results given in model 1 , 2 and 6 are highly consistent with those of previous works that gives enlightenment on contradictory nature of research findings on aid effectiveness. Gomanee *et.al* (2005) found diminishing return of aid inflow similar to our findings on multilateral aid in LMI countries. However, there is no evidence to prove that aid has diminishing returns after the threshold level in rest of the cases.

2.5.1 Comparison of Geographical Regions

By correcting the identification problem, we regress equation (3) accounting for the effect of Aid on the mediating variables with the residual-generated regressors such as *Inv_res, Gcon_res*, and *Imp_res* instead of *ln_Inv, ln_Gcon*, and *ln_Imp* itself, step by step. The estimation results for current effect are reported as model 3, 4, and 5 respectively in corresponding tables. Similarly, lag effects are reported as model 7, 8, and 9 in same tables in appendix D. By the way, the goal of mediation analysis is to obtain the indirect effect which induce each mediator. Therefore, we manually derive indirect effects of Aid through each mediator based on regression estimations that are shown in corresponding tables and present them in table 2.2 as a summary.

Estimation result found evidence that both type of ODA has negative indirect effect which mediated through investment in Asia and Latin America. Accordingly, a one percent increase of *BiODA* reduces per capita GDP by around 0.014 percent due to the mediating effect of investment in Asia and by 0.022 percent in Latin America. There is no any indirect lag effect of bilateral ODA in Asia while Latin America has a similar lag effect that mediate through investment. On the other hand, *MulODA* induce quite similar indirect effect through investment in Asia and Latin America not only in the current effect but also in the lag effect. As a whole, both current and lag effect of total ODA (*BiODA+MulODA*) induce -0.102 percent indirect effect through investment in Asian countries. Similarly, it is around -0.129 percent in Latin American countries. Gomanee *et. al* (2005) reported 0.6 percent positive effect in case of SSA countries. (Note that they did not use an intercept for bivariate supplementary equations, which implies a restriction on coefficients, often positive, that might create an incorrect causal path from aid to growth).

TABLE 2.2: SUMMARY OF THE ESTIMATION RESULTS OF MEDIATION ANALYSIS

Aid type	Asia					Latin America					Africa			
	Direct effect (β_1)	Indirect effect via mediators (β_2K_2)		Total effect ($\beta_1+\sum_{i=1}^{3}\beta_{2i}K_{2i}$)	Contribution of each mediator	Direct effect (β_1)	Indirect effect via mediators (β_2K_2)		Total effect ($\beta_1+\sum_{i=1}^{3}\beta_{2i}K_{2i}$)	Contribution of each mediator	Direct effect (β_1)	Indirect effect via mediators (β_2K_2)		Total effect ($\beta_1+\sum_{i=1}^{3}\beta_{2i}K_{2i}$)
BiODA	-0.07**	Inv	-0.014	-0.085***	13.20%	0.001	Inv	-0.022	-0.022***	78.5%	0.001	Inv		0.001
		Gcon	-0.021	-0.1066***	19.66%		Gcon	-0.006	-0.028***	21.4%		Gcon	-	0.0006
		Imp	-0.0002	-0.1068***	0.18%		Imp	-0.000	-0.028***	0.000		Imp		
BiOD(-1)	-0.031	Inv	-	-0.039	-	-0.000	Inv	-0.022	-0.022***	70.9%	0.004	Inv		0.004
		Gcon	-0.063	-0.063***	101.6%		Gcon	-0.010	-0.032***	32.2%		Gcon	-	0.003
		Imp	0.001	-0.062**	1.6%		Imp	0.001	-0.031***	3.22%		Imp		
MulODA	-0.10**	Inv	-0.04	-0.14***	21.8%	0.012	Inv	-0.038	-0.038***	76%	-0.0007	Inv		
		Gcon	-0.04	-0.181***	21.8%		Gcon	-0.016	-0.054***	32%		Gcon	-0.009	-0.011
		Imp	-0.002	-0.183***	0.001%		Imp	0.004	-0.050***	8%		Imp		
MulODA	-0.03	Inv	-0.048	-0.048**	44.44	-0.007*	Inv	-0.047	-0.054***	69.1%	0.015	Inv		-
		Gcon	-0.058	-0.106***	0.53.7%		Gcon	-0.017	-0.071***	25%		Gcon	-	-
		Imp	-0.002	-0.108***	0.001%		Imp	0.003	-0.068***	4.41%		Imp		
Total	-0.171		-0.288	-0.459		-0.007								

Significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Now, the discussion turns towards the effect of AID that is mediated through government consumption. It is clear that *MulODA* induces greater negative influence rather than *BiODA* through the government consumption in Asia and Latin. On the other hand, government consumption induces greater negative effect than investment when both type of ODA mediates through those mediators. But in contrast, aid which mediate through investment is really unfavourable than aid which mediate through government consumption in Latin American countries. In total, both type of ODA indirectly induces 0.182 percent negative effect through government consumption in Asian countries while Latin American countries induces less than one third (-0.049 percent) of negative effect.

Then, we turn towards the mediation effect of imports. It transpires that both *BiODA* and *MulODA* have negative indirect effect transmitted via import on per capita GDP in Asian countries while Latin American countries experiencing positive effect through import.

By the way, one interesting grabbing point is that African countries do not have any direct or indirect effect for both type of aid measures.

In the final analysis, per capita GDP is reduced in total by 0.0.459 percent in Asian countries while it is reduced by 0.185 percent in Latin American countries. The total indirect effect is around -0.288 percent in Asian countries and around -0.178 percent in Latin American countries. It suggests that Asian countries induce greater negative total and indirect effect than Latin American countries. According to the evidence, the most harmful mediating mechanism is the government consumption. By showing the effect of heterogeneous nature of foreign aid, *MulODA* induces greater negative effect in each groups of countries

2.5.2 Comparison of Country Groups with Income Disparities

After analysing the direct relationships, then the discussion moves towards the indirect effect induced by each mediator. For that end, we regress equation (3) accounting for the effect of Aid on the mediating variables with the residual-generated regressors. The estimation results of *BiODA* and *MulODA* for LMI countries are reported in Tables D7 and D8 in the appendix D, respectively. Table D9 and D10 in the appendix D reports estimation results of UMI countries. By correcting the identification problem, we extend our estimation step by step by replacing *Inv_res, Gcon_res*, and *Imp_res* instead of *ln_Inv, ln_Gcon*, and *ln_Imp* itself, and the

estimation results are reported as model 3, 4, and 5 respectively in corresponding tables. Similarly, lag effects are reported as model 7, 8, and 9 in same tables. By the way, the goal of mediation analysis is to obtain the indirect effect which induce each mediator. Therefore, we manually derive indirect effects of Aid through each mediator based on regression estimations that are shown in corresponding tables and present them in table 2.3 as a summary.

TABLE 2.3: SUMMARY OF THE ESTIMATION RESULTS OF MEDIATION ANALYSIS

Aid type	LMI Countries					UMI Countries				
	Direct effect (β_1)	Indirect effect through mediators (β_2K_2)		Total effect ($\beta_1+\sum_{i=1}^{3}\beta_{2i}K_{2i}$)	Contribution of each mediator	Direct effect (β_1)	Indirect effect through mediators (β_2K_2)		Total effect ($\beta_1+\sum_{i=1}^{3}\beta_{2i}K_{2i}$)	Contribution of each mediator
BiODA	-0.012	Inv	-0.022	-0.022**	78.75%	-0.018	Inv	-	-0.038	-
		Gcon	-0.005	-0.027***	17.85%		Gcon	-0.088	-0.088**	93.61%
		Imp	-0.001	-0.028***	3.57%		Imp	-0.006	-0.094**	6.3%
BODA(-1)	-0.002	Inv	-0.010	-0.010**	62.5%	-0.013	Inv	-	-	-
		Gcon	-0.005	-0.015***	31.25%		Gcon	-0.060	-0.060***	92.30%
		Imp	-0.001	-0.016***	6.25%		Imp	-0.005	-0.065***	7.69%
MulODA	-0.048**	Inv	-	-0.048**	-	-0.116	Inv	-	-0.164	-
		Gcon	-0.007	-0.055**	12.06%		Gcon	-0.236	-0.236**	94.4%
		Imp	-0.003	-0.058**	5.17%		Imp	-0.014	-0.250***	0.056%
MulODA(-1)	-0.013	Inv	-	-	-	-0.079**	Inv	-0.038	-0.117***	18.18%
		Gcon	-0.020	-0.020**	95%.23		Gcon	-0.082	-0.199***	39.23%
		Imp	-0.001	-0.021**	4.76%		Imp	-0.010	-0.209***	4.78%
Total	-0.048		-0.075	-0.123		-0.079		-0.539	-0.618	

Significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Estimation result found evidence that *BiODA* has no either positive or negative indirect effect which mediated through investment in UMI countries. But in contrast, the indirect effect of *BiODA*, accounting for the investment, are negative and statistically significant in LMI countries. Accordingly, a one percent increase of *BiODA* reduces per capita GDP by around 0.022 percent due to the mediating effect of investment. The indirect effect of *BiODA(-1)*, accounting for the effect of *BiODA(1)* on investment, show that the lag effect of *BiODA* on per capita GDP is less than the current effect by half. On the other hand, *MulODA* has no indirect effect through investment, not only in the LMI countries but also in the UMI countries except *MulODA(-1)* in UMI countries. The indirect effect, which merely induced by lag of *MulODA*, accounting for the mediation path of investment, is about -0.038 percent. As a whole, both current and lag effect of total ODA (*BiODA+MulODA*) induce -0.032 percent indirect effect through investment in LMI countries. Gomanee *et. al* (2005) reported 0.6 percent positive effect in case of SSA countries. (Note that they did not use an intercept for bivariate supplementary equations, which implies a restriction on coefficients, often positive, that might create an incorrect causal path from aid to growth).

Now, the discussion turns towards the effect of AID that is mediated through government consumption. It is observed that *BiODA* and *MulODA* that mediate through government consumption has a negative effect in both group of countries. It is clear that *MulODA* induces greater negative influence rather than *BiODA* through the government consumption in both group of countries. On the other hand, UMI are badly affected by mediation effect through government consumption compared to LMI countries. In total, both type of ODA indirectly induces 0.037 percent negative effect in LMI countries while UMI countries induces -0.46 percent.

Then, we turn towards the mediation effect of imports. It transpires that both *BiODA* and *MulODA* has negative indirect effect transmitted via import on per capita GDP in LMI countries and UMI countries. The results related to the indirect effect mediated through import should be treated with some caution given the statistical insignificance of the reported coefficient of imports which implies that nothing to mediate through import in the given specification. According to the estimation results, foreign aid that transmit its effect through imports reduces per capitata GDP in UMI countries rather than LMI countries.

In the final analysis, per capita GDP is reduced in total by 0.61 percent in UMI countries while it is reduced by 0.12 percent in LMI countries. The total indirect effect is around -0.54 percent in UMI countries and around -0.07 percent in LMI countries. It suggests that the countries which enjoying good policies and less aid induce higher negative influence. According to the evidence, the most harmful mediating mechanism is the government consumption and it is around -0.46 percent, in case of UMI countries. But in LMI countries, investment and government consumption generate quite similar negative influence on per capita GDP. That is about -0.032 and -0.037 percent respectively. Particularly, the mediation path of *BiODA* through investment is more harmful rather than the mediation path through government consumption in LMI. By showing the effect of heterogeneous nature of foreign aid, *BiODA* induces greater negative effect in LMI countries while multilateral aid induces such effect in UMI countries.

However, we do not take into account the reverse causality in this work. As a result, our one-way interpretations of the effect of foreign aid on economic growth should be viewed with scepticism due to the possibility of a consequence of simultaneity bias. Because the increases in per capita GDP might reduce foreign aid. If so, it possibly may lead to a conclusion of the existence of the stylized cross-country fact that as countries grow richer, they rely less on foreign aid.

2.6 Discussion and Conclusion

Even if the ODA decreases over the period of time, GDP indicates a growing trend in each groups of country sample. Simultaneously, the descriptive statistics which relate to the LMI and UMI countries support for the scenarios of high aid -low growth and low aid – high growth. It might imply that Aid would supplement savings and thereby increase investment and, in turn, growth. Eventually, this growth can become self-sustaining, and the need for aid will disappear as per the gap model predictions. in this context, the present paper tries to measure not only the total effect of multilateral and bilateral ODA, but also the indirect effect transmitted via mediators such as investment, public consumption and import within a comparison of different groups of countries that have a different policy scenario.

The negative sign of indirect effect is justified through government consumption by analysing the behaviour of the causal path [Aid on government consumption and

government consumption on Per capita GDP]. The negative sign of reported coefficients (K_2) related to Aid – *ln_Gcon* bivariate regressions (see Appendix C) seems to suggest that foreign aid tend to pull fund out of government consumption to support public investment finance by Aid as counterpart fund and / or to reduce consumption to overcome emerging fiscal policy distortions in contrast to the fungibility literature. Because, if recipient government disburse ODA, it is needed to scarify *Gcon* and/or turn towards domestic borrowings to fulfil the requirement of counterpart domestic resources. By employing fiscal response model, Mavrotas (2002) confirmed that project aid tends to pull fund out of public consumption in India and Kenya. Meanwhile, the positive coefficient of *ln_Gcon* in the growth model suggests that those countries are enjoying a commodity boom through government consumption and /or the recipient governments tend to spend on productive socio-economic consumption that has a positively influence on per capita GDP. Accordingly, those two regression estimations imply that when ODA is increased, the *Gcon* is reduced and thereby per capita GDP is reduced.

The prominent question is, why foreign aid, mediated especially via investment, induce a negative effect in developing countries. Simply, the evidence from the regressions that denotes the causal path, [aid on investment and investment on per capita GDP] elaborate that foreign aid has a negative association on domestic investment and investment itself has positive association on per capita GDP. Even if we expect that foreign aid should increase investment, in contrast, the domestic investment decline while increase the foreign aid. It implies that private investment is shrinking. (foreign aid increases the public investment). Accordingly, the negative effect of current and lagged Aid mediated via investment implies that the rate of return on private capital is reduced or is treated unfavourably by Aid. As a result, the outcome (GDP) decrease. In that sense, foreign aid causes a decline in domestic savings instead of supplementing such savings. It indirectly implies that foreign aid badly influences to the policies that affect to private investment. This is occurred not only in the LMI countries, but also in the UMI that are experiencing relatively good macroeconomic policies. Accordingly, we argue that aid ineffectiveness is not conditional on policies, but policies are conditional on aid effectiveness. More simply, aid effectiveness is depending on aid administration and management process.

On the other hand, debt servicing is a critical problem for aid recipients in general due to the unfavourable response of investment to Aid, which leads to decrease the

outcome. As such economic asymmetries, donors are discouraged due to the debt risk and tends to reduce ODA, and they turn to a more conditional framework. As a result, the proportion of net Aid, that recipients receive, decreases, as it is directed to settle the capital repayment. As we discuss above, when the proportion of ODA declines, on the one hand, recipient governments tend to borrow from domestic and international financial markets, and on the other hand, recipient governments reshuffle them by favouring unproductive civil administration consumption, such as interest payments, rather than donor-intended socio-economic consumption. Such policy measures lead to policy distortions in the macroeconomy that leads to unfavourable treatment for private capital. Another possibility is the crowding-out effect of private investment by aid-financed public investment. Herzer et al. (2012) estimated the effect of aid on investment in developing countries by using panel cointegration and causality techniques and enlightened our finding regarding aid ineffectiveness, which is mediated by investment in developing countries. This result suggests that private investment must be considered a key determinant of economic growth, and development aid does not exploit its full growth potential.

Rajan *et.al* (2005) argued that there is no evidence that aid works better in better policy. Similarly, Shaomeng *et.al* (2019) re-examined the work done by Doller *et.al* (2000) with extended data up to 2013 and reveals that aid is not conditional on good policies. Gomanee *et. al* (2005) conclude that aid can be effective even if policies are bad. By complying those assessments, we conclude that the aid ineffectiveness is not conditional on policies, rather policies that affect to private investment are conditional on aid effectiveness that depends on the aid administration and management approach.

Chapter 3

How Fiscal Decisions are Affected by Foreign Aid in Sri Lanka

3.1 Introduction

Since 1960, billions of official development assistance (ODA) have been continuously transferred to Sri Lankan development objectives. As a result, Sri Lanka has reached a critical debt crisis. The public debt to GDP ratio increased to 86.8 percent at the end of 2019 from 83.7 percent at the end of 2018, reflecting the impact of higher net borrowing to finance the enlarged budget deficit1[3]. The $ 84 billion worthy economy, which has been downgraded by world-famous all three global rating agencies such as Moody, S&P, and Fitch continuously from 2015 to 2020 and is reached the level of 'substantial risk' by November 2020 and is obliged to pay approximately $ 4.5 billion annually by 2025, has yet to fill its annual trade deficit.

Furthermore, the 'gap model' argument predicts that foreign aid is used not only to temporarily fill macroeconomic gaps but also to close the gaps over time, thereby accelerating and sustaining economic growth without aid. However, the trends of the macroeconomic gaps in Sri Lanka shown in Figure 3.1 illustrate these controversial claims. Clearly, the country is straying from the path created by the gap model predictions, and as a result, the gaps are tremendously expanding instead of closing. Figure 3.2 precisely shows that the fiscal authority is shifting from an investment-oriented policy to a consumption-oriented policy, supporting the criticism that aid is given to the recipient government, reshuffled in the budget and redirected to non-productive activities. Mavrotas (2002) mentioned that any effect of ODA on the macroeconomy depends on fiscal behaviour. Thus, aid does not have a direct effect; instead, aid operates via transmission mechanisms, such as public investment,

[3] Source: Annual Report Central Bank Sri Lanka 2019

government consumption, and tax revenue. The controversy regarding the gap model predictions and fiscal policy directions in Sri Lanka provides the motivation to shed light on how fiscal decisions are affected by foreign aid.

The general form of aid growth specifications ignores the causal path of the aid – growth nexus. Jena (2020) ascertains that a positive relationship exists between aid and the per capita GDP in South Asian countries by including both investment and aid in a panel dynamic OLS approach. Similarly, Sethi (2019) reveals that foreign aid has a negative impact on Sri Lanka by regressing the VAR model including both investment and aid. Burnside *et.al* (2000) argued that foreign aid is added to investment, while policy determines the productivity of investment. Therefore, these authors include an 'aid-policy' interaction term but exclude investment from the empirical specification. Similarly, Roodman (2004) did not include investment in any regressions. However, by citing Hansen *et.al* (2001), Gomanee *et.al* (2005) stated that the implicit growth theory addresses investment rather than aid as an argument and mentioned that not all aid is intended for investment and not all investment is financed by aid. The issue with this concept is that if one omits investment, there is potential omitted variable bias, i.e., any effect of investment on growth is attributed to other variables (especially aid). If one includes both aid and investment, there is double counting. This situation represents a stimulating research gap that we found in the empirical front in the aid-growth literature.

The controversial argument regarding the direct effect approach is that any effect of aid on growth transmits via fiscal decisions affected by the presence of foreign aid. However, the traditional empirical approach to the aid-growth nexus fails to explicitly recognize that aid has an indirect effect that operates via mediating mechanisms, such as public investment, government spending and taxation. Heller (1975) conducted studies based on the fiscal response paradigm to attempt to explicitly recognize how fiscal decisions are affected by foreign assistance and beyond fiscal responses; the impact of aid on growth is indirectly assumed. Some earlier works in the fiscal response literature have considered the effects of aid on fiscal variables in the Sri Lankan scenario; Otim (1996) uses panel data from India, Pakistan and Sri Lanka during the 1977-1990 period; Khan, *et al.* (1992) use a pooled time series and cross-sectional data during the 1955-1976 period from five countries, including Sri Lanka. However, these works discuss the situation occurring three decades ago or earlier.

Another limitation observed in earlier studies is that the data used consist of a few time series observations.

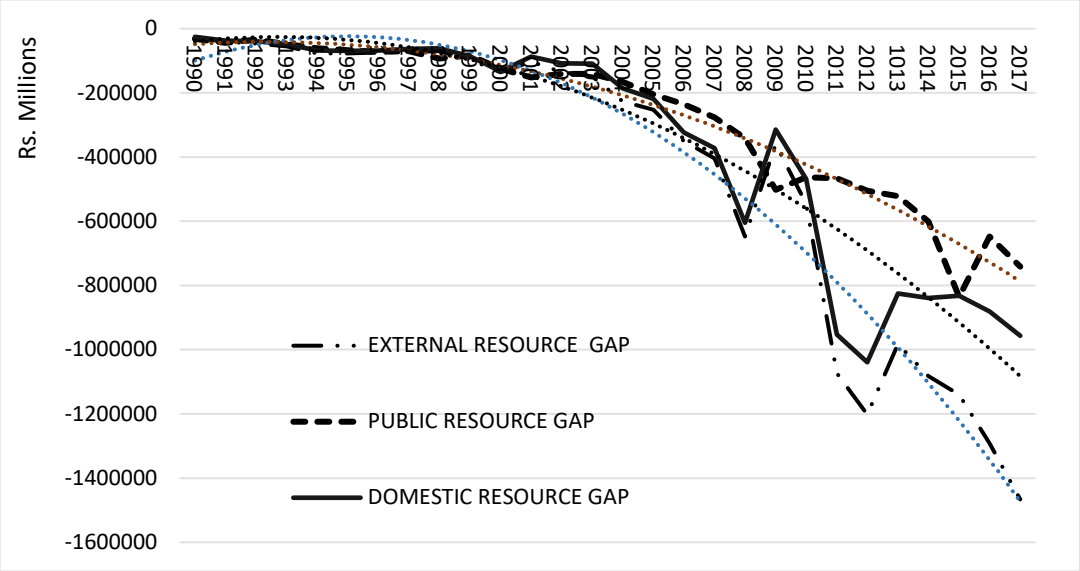


Figure 3.1: Macroeconomic Gaps in Sri Lanka

[Data extracted from the Annual Reports of the Central Bank - 2018, Sri Lanka]

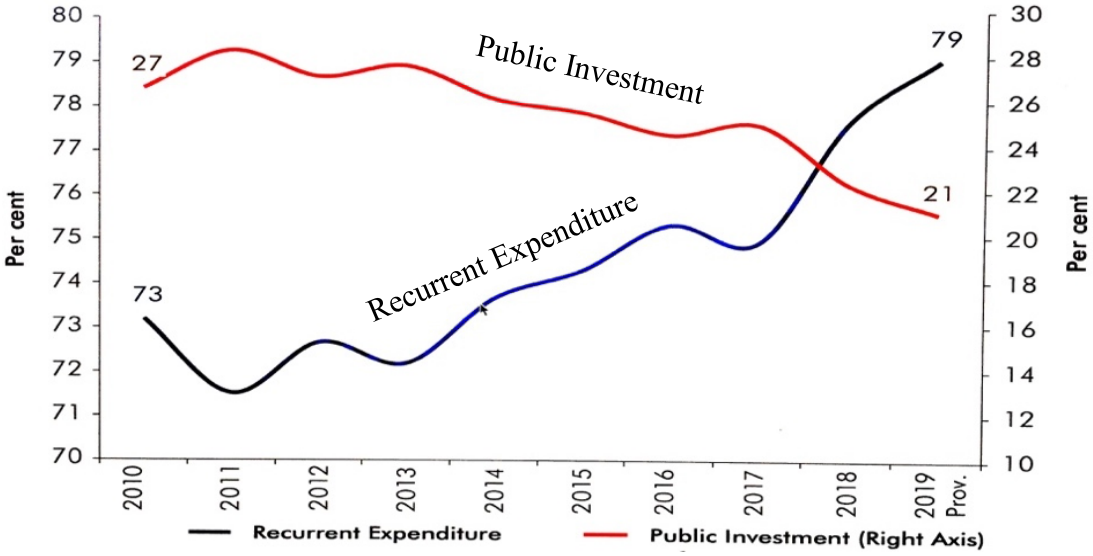


Figure 3.2: Public Investment and Consumption Trends in Sri Lanka

[Source: The Annual Reports of the Central Bank - 2019, Sri Lanka]

The purpose of this paper is to focus on the intended development objectives and how fiscal decisions deviate from those objectives in the presence of foreign aid in Sri Lanka. Therefore, we consider the overall influence of aid on the fiscal sector by regressing the fiscal response model, which maximizes the quadratic loss function of public policymakers, by employing 3SLS. The present paper used consistent time

series data during the 1962–2017 period from a single country (Sri Lanka), leading to more general conclusions necessary for policy purposes.

What does this paper add to the literature on aid effectiveness? In theory, it is expected that foreign aid increases the public investment and thereby increase GDP. But in contrast, we found that Sri Lankan fiscal policymakers substitute tax revenue and increase consumption in the presence of foreign aid. Accordingly, the budget deficit and domestic borrowings are expected to increase. Thereby in the next turn, the authority faces a critical problem due to lack of required domestic resources that need to mobilize public investment. Then, the fiscal authority prioritizes eradicating the pressure on domestic borrowing rather than increasing investment, indicating that investment decreases due to the pressure on domestic borrowing. This work precisely explains the reason for reducing the rate of return on private capital which defends in chapter 2.

The remainder of the chapter is organized as follows. Section 3.2 provides an overview on the related literature. Section 3.3 presents the fiscal response paradigm which elaborate the decision map of public policy maker. Section 3.4 present the discussion of the model development and estimation procedure. Section 3.5 provides a discussion of the estimation results, and in Section 3.6 devoted for the conclusion of the chapter.

3.2 Literature Review

The Harrod-Domar and Solow growth models emphasize physical capital formation as a main driving force of economic performance. These output models depend on the investment rate and productivity. Broadly, these growth models assume that growth is constrained by the availability and productivity of capital. The availability of capital or the level of investment is determined by domestic savings. Any gap between the level of domestic savings and the level of investment required to achieve the target growth rate is described as a savings gap (Rosenstein 1961; Fei, 1965). In such a scenario, we can assume that foreign aid exogenously contributes to increasing the capital stock of the recipient country. Hence, aid allows investments by exceeding the limits set by the domestic savings rate in the recipient country. Pronk (2001) argues that "…economic growth higher than would have been possible given the domestic saving rate would lead to higher income and production

and increase future savings and exports, making aid less necessary to reach a given target in later years" [2001 p. 618].

By quoting Griffin *et al.* (1970), Pronk (2001) shows the controversy regarding the gap model argument. Accordingly, aid may merely substitute for domestic savings and, subsequently, may divert to consumption rather than investment. Particularly, aid may influence the reallocation of a combination of public expenditures with a bias towards public consumption and unproductive investment activities or activities that have a long gestation period. In such a case, aid will not meet the anticipated level of investment and growth. In contrast, the recipient government may divert foreign aid towards capital-intensive technology, which increases the receiving country's subsequent need for capital. Similarly, aid-funded projects may subsequently increase the maintenance and operational cost over the intended return of the project, and as a result, growth will slow rather than accelerate. Pronk (2001) also agrees with Friedman's argument that there is no necessity for aid because "if other conditions for economic development are ripe, capital will be readily available through the market; if not, for instance, because of inadequate policies of the government concerned, capital made available would be likely to be wasted" (2001, p. 8). Thus, a lack of domestic savings reflects a lack of opportunities rather than income.

Bacha (1990) and Taylor (1990) mentioned that as a part of the domestic saving gap, the fiscal gap imposes a limit on public spending and may become a binding constraint. Thus, aid recipients do not have sufficient public revenue sources to meet the intended investment level, which is directly related to capacity utilization as a major aspect of growth. This fiscal gap could be filled by directing foreign aid to the government budget, and as a result, capacity utilization can be increased due to spending on infrastructure and social services. Furthermore, a major criticism is that recipient governments may reallocate aid to non-productive activities or sharply reduce the tax effort. Therefore, the budget deficit may increase in another round. As a result, over time, aid causes government savings to be lower than those possible without aid rather than closing the fiscal gap. Therefore, if the recipient government spends foreign assistance on development purposes at the margin, aid is successful as expected in the gap model predictions. Otherwise, foreign aid is not successful. An influential paper published by Burnside, *et al.* (2000) sheds light on this explanation and concludes that aid only functions well in a good policy environment.

However, the empirical evidence regarding the aid-growth nexus appears rather mixed, and there is no one-to-one relationship. Mavrotas (2002) notes that the traditional specification of the aid-growth nexus fails to clearly identify that aid has an indirect effect on the macro economy through public expenditures. This finding is a supporting concept in the fiscal response literature that focuses on how foreign aid may affect government fiscal behaviour that weakens the anticipated growth effect of aid. Therefore, fiscal response analyses are vital as they shed light on an underpinning area in the aid-growth nexus. The potential negative effects of foreign aid could be viewed within the context of the fungibility literature, which is based on the fiscal response paradigm. However, Binh, *et al.* (1993) criticize the faulty specification of the utility function employed by Heller (1975) and his followers [Gang, *et al.* (1991); Khan *et al.* (1992); Otim, (1996)]. Binh, *et al.* (1993) reveal that the specification of the utility function they employed is not compatible with the concept that deviating from the target is undesirable. Therefore, either underestimating or overestimating the target amounts is a loss to the policymaker, and as a result, such amounts cannot truly be considered targets. To ensure consistency with the above claim, these authors introduced a more consistent specification for the utility function that is well matched with the representation that deviating from the target is undesirable. Movrotas, (2002) follows this specification by using time series data from India and Kenya.

Another problem with the fiscal response model is related to the centrality of the target variables. Empirical works in this field have been blinded regarding how these variables might be formulated. All studies cited above did not use actual target variables due to difficulties in obtaining data regarding optimum targets. In the literature, we observed that the fitted values of a supplementary equation involving endogenous variables are treated as estimates of the targets. This procedure is not free from the problem of using generated regressors in an empirical model (Pagan,1984). Simon, *et al.* (2010) use expenditure appropriations and revenue estimates as target variables. However, such estimations are based on an incremental budgeting procedure performed using a previous period's budget or actual performance as a basis, and the marginal change is based on incremental assumptions regarding the new budget period. In this case, there is no standard formula to determine the applicable marginal changes. Therefore, such appropriations and revenue estimates are also full of weaknesses as they fail to consider changing circumstances. Furthermore, budgetary slack that may be built into the budget is never reviewed, and previously, requirements might have

been overestimated to obtain a budget that is easier to adhere to and, therefore, achieve favourable results. This approach ultimately requires spending or losing the budget. As a result, the national budget may become outdated and no longer relates to the expected productivity of the work being carried out. In contrast, statistically generated targets also consider lag periods similar to the incremental budgeting approach and consider the changing circumstances through demographic, macroeconomic, and other factors. Accordingly, more seriously, statistically generated targets are relatively more acceptable than appropriations and revenue estimates as target variables.

3.3 Fiscal Response Paradigm

Griffin (1970) and Griffin, *et al.* (1970) note the general tendency of more aid and less growth in recipient countries. The authors emphasize the concept of aid fungibility, which is the fraction of foreign aid allocated to unproductive consumption rather than savings and investment, as a prominent interacting reason for this phenomenon. The idea is that aid is first allocated to the recipient government's national budget, and in turn, fiscal decisions regarding taxation and expenditure are affected. This phenomenon, i.e., the so-called fiscal response paradigm in the presence of foreign aid, is illustrated more precisely in Figure 3.3.

Pack, *et al.* (1993) express that the recipient government stands on its own indifference curve, which reflects the choice of preferences for public goods subject to the budget constraint comprising domestic revenues and foreign aid. Accordingly, public policymakers allocate aid to coincide with their own preferences without considering the donor's intention. Suppose that the recipient government spends its total domestic resources on public investment (I_g) and the following two consumption goods: civil administration consumption (G_c) and socioeconomic consumption (G_s), such as health and education. All three goods are normal (non-inferior). The government finances these goods by means of domestically generated resources. BB' represents domestically financed allocation choices and point E_1 represents the preferred resource allocation of the recipient country.

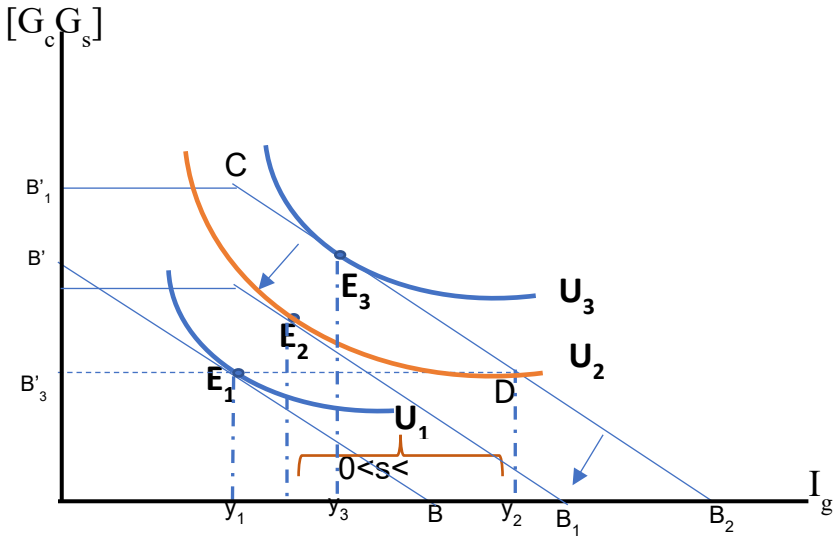


Figure 3.3. Public Consumption and Revenue Responses in the Presence of Foreign Aid

In addition to its own resources, the country receives an amount of y_1 -y_2 of earmarked foreign aid for good I_g. For simplicity, it is assumed that the aid has no impact on the relative prices of the two goods. Then, the post-aid budget constraint is $B_2C\ B'_1$, and y_1- y_3 shows that the aid amount has to be spent on I_g. However, suppose that the recipient government does not divert any of its resources from I_g and spends the earmarked aid on it. In this case, the post-aid consumption combination, point D, is on a higher indifference curve U_2. Therefore, foreign assistance to I_g increases the overall utility in the short run. Point D is an inefficient resource allocation combination that does not satisfy the maximum current utility level of the general public. Therefore, we presume that the two parties, i.e., the donor and the recipient government, do not have identical preferences in the case of aid spending. Therefore, upon receiving aid, the recipient government mixes such aid with domestic resources and changes the pattern of public spending and the pattern of revenue effort in terms of both the level and composition of the government budget. In such situations, while the donor agency would prefer that the aid funds are spent on I_g at the margin, it is unable to monitor the intended pattern of public spending. If the public policymaker can treat a portion of aid ($0<s<1$) as a resource supplement, the government diverts some of its own resources from I_g to G_c and G_s by spending the acquired foreign aid resources on I_g and/or imposing a tax reduction policy. Accordingly, the most efficient new resource allocation equilibrium points are given by points E_2 and E_3, which are located in higher

indifference curves U_2 and U_3, respectively. This outcome shows the intention of policymakers to maximize the utility level of the general public in the short run.

However, beyond the fiscal response model, the impact of aid on growth is indirectly assumed to be that aid funds are spent on Ig at the margin, leading to a higher production possibility and, in turn, much higher economic growth than would have been possible given the domestic resource level. This phenomenon leads to higher income, which increases the motivation for domestic savings and, therefore, reduces the aid requirement to reach a higher indifference curve; thus, the aid is successful.

3.4 Modelling the Aid-Growth Nexus

In this section, we demonstrate the empirical model we employ to identify the influence of foreign aid on the economic growth transmitted via fiscal variables. Thus, we proceed by performing three steps.

First, we follow the public policymaker's utility function developed by Binh, *et. al.* (1993), including bilateral and multilateral aid, by focusing on the heterogeneous character of aid. It is assumed that the policymaker followed a welfare function during time period *t,* which is called the fiscal response model.

$$U = f(I_g,\ G_c,\ G_s, T, B,\ A_1,\ A_2)$$

Table 3.1 provides a description of the variables. Three expenditure categories, i.e., I_g, G_c and G_s, reflect the functional classification in the budget of Sri Lanka. Multilateral and bilateral ODA are viewed as exogenous variables.

We suppose that the fiscal authority maximizes the following quadratic welfare function to obtain the maximum benefit for the general public. Equation (1) shows that the policymaker has a predetermined target level of revenue and expenditure, and any deviation from the defined target levels is considered an undesirable loss to the fiscal authority.

$$U = \propto_0 - (\tfrac{\propto_1}{2})(I_g - I_g^*)^2 - (\tfrac{\propto_2}{2})(T - T^*)^2 - (\tfrac{\propto_3}{2})(G_c - G_c^*)^2 - (\tfrac{\propto_4}{2})(G_s - G_s^*)^2 - (\tfrac{\propto_5}{2})(B - B^*)^2 \quad (1)$$

where the variables with an asterisk (*) represent the target level of each endogenous variable. The target level is the optimal level of each variable that reaches the maximum utility.

Then, the maximum value of U is $\propto_0$, which is obtained when the actual variables I_g, G_s, G_c, T and B are set equal to their targets. Here, we assume the estimated values of each endogenous variable as the target levels by regressing the following

supplementary equations (2) – (5). In addition, we assume that the targeted domestic borrowing is zero ($B^*=0$)[4].

$$I_g = \rho_a + \rho_1 GDP_{t-1} + \rho_2 Ig_{t-1} + e_1 \quad (2)$$

$$G_c = \rho_b + \rho_1 Gc_{t-1} + \rho_2 T + \rho_3 POP + e_2 \quad (3)$$

$$G_s = \rho_c + \rho_1 Gs_{t-1} + \rho_2 GDP_{t-1} + e_3 \quad (4)$$

$$T = \rho_d + \rho_1 GDP_{t-1} + \rho_2 T_{t-1} + e_4 \quad (5)$$

Table 3.1: Description of variables

Variable	Description of variable*
I_g	Public investment expenditure on social services and economic services in real term (excluding capital expenditures on general public services).
G_c	General public services in real term (including both recurrent and capital expenditures on civil administration, defence and public order and safety).
G_s	Government socio-economic consumption expenditure in real term (including social services, such as education, health, and community services, and welfare and economic services, such as agriculture, irrigation, energy, water supply, transport and communication).
T	Total tax revenue (including direct and indirect taxes) in real term.
B	Public domestic borrowings in real term
A_1	Multilateral ODA in real term (including loan and grant components).
A_2	Bilateral ODA in real term (including loan and grant components).
GDP	Gross domestic product in real term.
POP	Total mid-year population

*All financial values are given in Sri Lankan Rupees.

Table 1 provides a description of the variables. The time subscript *t-1* indicates the period before *t,* and *e* is a disturbance term. We included a one-year lag to capture the previous period's budget or actual performance, which is used to prepare expenditure appropriations and revenue estimates in the incremental budgeting approach, and additionally included demographic and macroeconomic factors to consider the changing circumstances in such scenarios. Then, the budget constraints considered here are given in equations (6) and (7), which indicate the feasible region for decision mapping by public policymakers.

[4] Similar specifications were employed by Gang, *et al.* (1991), Khan, (1992), Otim, (1996), Franco *et al*. (1998) and Mavrotas, (2002).

$$G_s + G_c = p_1T + p_2A_1 + p_3A_2, \quad (6)$$

where $0 \leq p_i \leq 1, i = 1,2,3$ indicates the shares of tax revenue, multilateral ODA and bilateral ODA that are allocated to socioeconomic and general public services. Therefore, public investments can be financed by domestic borrowing (B), and the remainder is financed by tax revenues (T), multilateral ODA (A_1) and bilateral ODA (A_2) as follows:

$$I_g = B + (1 - p_1)T + (1 - p_2)A_1 + (1 - p_3)A_2. \quad (7)$$

Then, we obtain the Lagrangian form in equation (8) as follows:

$$\text{Max L} = \propto_0 - (\tfrac{\propto_1}{2})(I_g - I_g^*)^2 - (\tfrac{\propto_2}{2})(T - T^*)^2 - (\tfrac{\propto_3}{2})(G_c - G_c^*)^2 - (\tfrac{\propto_4}{2})(G_s - G_s^*)^2 - (\tfrac{\propto_5}{2})(B - B^*)^2 + \lambda_1\{I_g - B - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2\} + \lambda_2\{G_s + G_c - p_1T - p_2A_1 - p_3A_2\} \quad (8)$$

From the first-order conditions, we derive the reduced-form equation in equations (9) to (12)[5] as follows:

$$G_s = \beta_1 G_s^* - (1 - \beta_1)G_C^* + (1 - \beta_1)p_1T + (1 - \beta_1)p_2A_1 + (1 - \beta_1)p_3A_2 \quad (9)$$

$$G_c = (1 - \beta_1)G_c^* - \beta_1 G_s^* + \beta_1 p_1 T + \beta_1 p_2 A_1 + \beta_1 p_3 A_2 \quad (10)$$

$$T = \beta_3 p_1 (G_c^* - G_c) + \beta_2 T^* + \beta_4 (1 - p_1)\left[I_g - (1 - p_2)A_1 - (1 - p_3)A_2\right] \quad (11)$$

$$I_g = (1 - \beta_5)\, I_g^* + \beta_5[(1 - p_1)T + (1 - p_2)A_1 + (1 - p_3)A_2] \quad (12)$$

where $\beta_1 = \propto_4/(\propto_4 + \propto_3)$, $\beta_2 = \propto_2/[\propto_2 + \propto_5 (1 - p_1)^2]$, $\beta_3 = \propto_3/[\propto_2 + \propto_5 (1 - p_1)^2]$, $\beta_4 = \propto_5/[\propto_2 + \propto_5 (1 - p_1)^2]$, $\beta_5 = \propto_5/(\propto_1 + \propto_5)$.

Here, β_1 is a parameter reflecting socio-economic consumption compared to total government consumption; this parameter shows the deviation of G_c if G_s deviated from its targets. β_2 reflects the relationship between tax revenues and total public receipt, including domestic public borrowing and shows the deviation of B if T deviated from its targets. β_3 indicates the relationship between general public services and total public receiving and shows the deviation of T if G_c deviated from its targets. β_4 represents the relationship between public borrowing and total public receiving and shows the deviation of T if B deviated from its targets. β_5 implies the association between public borrowings and investments and borrowing, thus showing the deviation of I_g if B deviated from its targets.

[5] See Appendix E for the complete details.

Regarding the estimation method, we regress equations (2) to (5) using OLS as the first step to use regressors as the target variables[6] following the approximating approach according to the previous literature, i.e., Mavrotas, (2002); Gang, *et al.* (1991); Khan, *et al.* (1991); Otim, (1996). Next, the target variables are inserted as independent variables in the simultaneous system of equations (equations (9) to (12)). We separately obtain each theoretical parameter, such as p and β, using the 3SLS method[7]. Here, we used time series data over fifty-five years (1962-2017) from Sri Lanka. All data were converted to real terms by deflating the current values using the GDP deflator based on 2010. The unit of the monetary values of the data is the Sri Lankan rupee. The data sources of all variables are annual reports of the Central Bank of Sri Lanka.

3.5 Results and Interpretations

In this section, we attempt to answer how fiscal decisions are affected by foreign aid. Accordingly, we review the statistical properties of the variables before applying any time series analysis. Table G1 in Appendix G presents the summary statistics during the period from 1962 to 2016. Bilateral aid and multilateral aid vary from 272 to -1.86 and from 72.3 to -0.31, respectively, and the standard deviation provides evidence of aid volatility. Table G2 in Appendix G presents the corelation matrix. The correlation matrix shows that a strong positive relationship exists among the fiscal variables and aid measures we use in the fiscal response model.

The unit root test is a pre-requisite for analysing time series data. Therefore, we apply the ADF unit root test to the 55 years of annual time series data, and Table G3 in Appendix G presents the test statistics at both level and first differences. By discussing the issues of identification, estimation, and statistical inferences of nonstationary time series and simultaneous equation models, Hsiao, *et.al* (1998), argued that non-stationarity does not necessarily call for a different modelling strategy, such as simultaneous equation modelling, and system estimators, such as 3SLS. Given his argument, we estimate the fiscal response model with non-stationary data. However, we also report the estimation results obtained using the first difference stationary data in Table G4 in Appendix Gas further information.

[6] For the approximation, several specifications were applied to each variable, and the results were confirmed using a serial correlation LM test and RAMSE RESET misspecification diagnostic test.
[7] See Appendix F.

The estimation results of equations (2) – (5) used to decide the target variables (I_g^*, G_c^*, G_s^*, and T*) are shown in Table 3.2, which shows that all coefficients of the predetermined variables are positive and statistically significant. Table 3.3 indicates the set of misspecification diagnostics used to properly test the empirical equations.

Using the estimated values of each regression shown in Table 3.2 as target variables of the system of equations, we obtained all parameters of the equation system from equations (9) to (12) by 3SLS as shown in Table 3.4. Additionally, some combinations of each parameter in the model can be interpreted as the theoretical relation among the parameters shown in Table 3.5. p_1 in Table 5 shows that the fraction of tax revenue allocated to public consumption is 1.32, indicating that there is tendency to withdraw funds from investment. The Central Bank's annual report in 2019 shows that the ratio between public consumption and tax revenue is approximately 1.22, indicating that consumption exceeds the total tax revenue by 22 percent. However, p_2 and p_3 in Table 4 suggest that multilateral aid is displaced by approximately 40 percent, while bilateral aid displaces funds from consumption by approximately 24 percent.

Table 3.2. Estimation Results of Equations (2) – (5) Used to Derive the Target Variables

Dependent Variables	Regressions				Summary Statistics
$\mathbf{I_g}$	**18.80***	**+ 0.012GDP_{t-1}*** + 0.726$I_{g_{t-1}}$***			R^2 - 0.885
	[1.79]	**[2.67]**	**[6.63]**		DW - 2.23
$\mathbf{G_c}$	**-121.09*** +**	**0.489$G_{c_{t-1}}$*** + 0.33T*** +9120POP***			R^2 - 0.99
	[-3.43]	**[3.67]**	**[3.88].**	**[3.34]**	DW – 1.99
$\mathbf{G_s}$	**26.78*** +**	**0.636$G_{s_{t-1}}$***. + 0.021GDP_{t-1}***			R^2 - 0.96
	[2.65]	**[4.35]**	**[2.71]**		DW - 1.72
T	**2.4.9** +**	**0.037GDP_{t-1}*** + 0.722T_{t-1}***			R^2 - 0.98
	[2.18]	**[3.82]**	**[8.00]**		DW- 2.01

*Note: t-ratios are reported in square brackets below the coefficients. Significance levels are indicated as ***, ** and *, reflecting the 1 percent, 5 percent and 10 percent levels, respectively.*

Table 3.3. Estimation Results of the Misspecification Diagnostic Tests

	LM Test	Ramsey's RESET Test
I_g	$\chi^2(2)$: 1.56 [0.458] F(2,50) : 0.73 [0.486]	$\chi^2(1)$: 3.03 [0.081] F(1,51) : 2.89 [0.094]
G_C	$\chi^2(2)$: 0.04 [0.979] F(2,49) : 0.01 [0.981]	$\chi^2(1)$: 1.22 [0.268] F(1,50) : 1.12 [0.293]
G_s	$\chi^2(2)$: 2.60 [0.271] F(2,50) : 1.24 [0.296]	$\chi^2(1)$: 2.90 [0.088] F(1,51) : 2.76 [0.102]
T	$\chi^2(2)$: 1.07 [0.585] F(2,50) : 0.49 [0.611]	$\chi^2(1)$: 1.69 [0.193] F(1,51) : 1.59 [0.212]

According to Table 3.5, multilateral aid positively influences both general public services and socioeconomic consumption, such as education, health and welfare, while bilateral aid negatively influences both types of consumption, indicating that public consumption increases in the presence of multilateral aid but not bilateral aid. In addition, both bilateral aid and multilateral aid negatively influence public investment (I_g), indicating that public investment tends to decrease by approximately 26 percent and 13 percent, respectively, in the presence of foreign aid. This negativism is derived from behavioural parameter β_5, which reflects the behavioural pattern between domestic borrowing and public investment.

Table 3.4: 3SLS Estimation Results of the Unknown Parameters in the Structural Equations of the Fiscal Response Model

Parameter	Bilateral and Multilateral Aid	
	Coefficient	*t*-Statistic
p_1	1.320***	37.08
p_2	0.390*	1.69
p_3	-0.239*	-1.62
β_1	0.370***	5.93
β_2	0.947***	41.78
β_3	-0.426**	-2.14
β_4	-1.045***	-2.72
β_5	-0.214***	-3.69
Sample	1962-2017	
Observations	55	
No of Iterations	8	

*Note: Significance levels are indicated as ***, ** and *, reflecting the 1 percent,5 percent and 10 percent levels, respectively*

Table 3.5: Coefficients of the Revenue Variables in the Fiscal Response Model			
Dependent Variables	**Treatment Variables**	**Coefficient**	**Estimated Values**[8]
General public service (G_c)	Bilateral aid (A_1)	$\beta_1 p_3$	-0.08863
Socio-economic consumption (G_s)		$(1-\beta_1)p_3$	-0.15086
Investment (I_g)		$\beta_5(1-p_3)$	-0.26563
Tax (T)		$-(1-p_3)\beta_4(1-p_1)$	-0.41514
General public service (G_c)	Multilateral aid (A_2)	$\beta_1 p_2$	0.14441
Socio-economic consumption (G_s)		$(1-\beta_1)p_2$	0.24581
Investment (I_g)		$\beta_5(1-p_2)$	-0.13068
Tax (T)		$-(1-p_2)\beta_4(1-p_1)$	-0.20423
General public service (G_c)	Tax (T)	$\beta_1 p_1$	0.48863
Socio-economic consumption (G_s)		$(1-\beta_1)p_1$	0.83174
Investment (I_g)		$\beta_5(1-p_1)$	0.06866
Tax (T)	Gap between the target and actual levels of General public service (Gc)	$\beta_3 p_1$	-0.56282

On the revenue side, both bilateral and multilateral aid negatively influence tax revenue. The obtained negative coefficients, i.e., -0.41 and -0.2, suggest that tax revenue might substitute for other revenue sources, such as bilateral and multilateral aid, by respective amounts. Simultaneously, the coefficient of β_2, which is positive, significant and close to one in our case, indicates that actual tax collection is closely associated with the targeted tax level. This finding suggests that if a public policymaker intends to increase tax revenue, the process will eventually achieve the target. However, a negative β_3 is an indication that tax revenue increases if general public services exceed their targets and vice versa. However, the tax revenue is positively associated with investment, socioeconomic consumption and general public services, which sounds natural.

Fiscal decisions affected by foreign aid highly comply with the heterogeneous nature of bilateral and multilateral aid. Bilateral aid is highly strategic and may reflect the commercial interests of the respective donor countries. However, the cost of

[8] These values are derived from the estimation results of the system of equations (9)–(12) given in table 3.4

multilateral aid is less than that of bilateral aid as multilateral agencies provide loans under a relatively lower interest rate. Multilateral aid also has a relatively long gestation period. The grant component is also slightly higher. According to the heterogeneous nature of foreign aid, high-cost bilateral aid is not displaced, and compared to multilateral aid, a higher amount of bilateral aid is allocated to investment.

Our discussion should focus on the intended development objectives and how fiscal decisions deviate from those objectives in the presence of foreign aid. We expect public investment to increase if foreign aid is increased. However, in contrast, public investment decreases, while foreign aid increases. Accordingly, β_5 and $(1-p_i)$ together indicate the association between investment and foreign aid. As a behavioural factor, a negative β_5 suggests that when borrowings increase, public investment decreases. According to the expression given in Equation 11, public investment increases the tax effort. However, simultaneously, foreign aid has a greater negative effect on the tax effort. Thereby in the next turn, the authority faces a critical problem due to dispossess of required domestic resources which need to mobilize public investment. Simply, as we discuss above, Sri Lankan fiscal policymakers substitute tax revenue and increase consumption in the presence of foreign aid in addition to diverting more resources to consumption than tax revenues. Accordingly, the budget deficit and domestic borrowings are expected to increase. Then, the fiscal authority prioritizes eradicating the pressure on domestic borrowing rather than increasing investment, indicating that investment decreases due to the pressure on domestic borrowing, which is reflected in β_5.

The image we elaborate here provides insight suggesting that Sri Lankan public policymaker desire to maximize their utility within the utility function of U_2, which we show in Figure 3.3. This finding suggests that the fiscal authority tends to maximize utility in the short run by sacrificing the long-run utility that is expected to be gained through improved production possibility, which is built by aid-financed investment at the margin.

However, we do not take into account the reverse causality in this work. As a result, our one-way interpretations of the effect of foreign aid on fiscal variables should be viewed with doubt due the possibility of a consequence of simultaneity bias.

3.6 Conclusion

Generally, external monetary sources, such as foreign aid, are expected to close the fiscal gap in developing countries over time. However, in Sri Lanka, the fiscal gaps have tremendously expanded, even though foreign aid has continuously entered the economy throughout the past seven decades. Further, the country is downgraded by world-famous three credit rating agencies such as Moody, S&P, and Fitch continuously from 2015 to 2020 and is reached the level of 'substantial risk' by November 2020. Therefore, Sri Lanka is the most potential country to get feedback on aid effectiveness, which mediates through fiscal decisions affected by foreign aid.

Therefore, this paper attempts to reveal how fiscal decisions are affected by foreign aid in Sri Lanka. We assume that the Sri Lankan government is attempting to allocate resources, such as taxes and aid for public expenditures, to maximize its utility function subject to budget constraints. We also considered the heterogeneous nature of foreign aid, which can assume the form of bilateral and multilateral aid. The government is supposed to adjust the gap between the target level and actual level of each expenditure and revenue source. Regarding our empirical procedures, we estimated the parameters of the simultaneous reduced forms using 3SLS by using time series data from 1962 to 2017.

Present paper focus on the intended development objectives and how fiscal decisions deviate from those objectives in the presence of foreign aid. We expect public investment to increase if foreign aid is increased. But in contrast, we found evidence that public investment decreases while foreign aid increases. It is reflected by negative β_5, which suggests that public investment decreases if borrowings increase. Further, we found that Sri Lankan fiscal policymakers substitute tax revenue and increase consumption in the presence of foreign aid. Accordingly, the budget deficit and domestic borrowings are expected to increase. Thereby in the next turn, the authority faces a critical problem due to the dispossessed of required domestic resources that need to mobilize public investment. Then, the fiscal authority prioritizes eradicating the pressure on domestic borrowing rather than increasing investment, indicating that investment decreases due to the pressure on domestic borrowing, which is reflected in β_5.

Therefore, we conclude that Sri Lankan public policymakers desire to maximize their utility within the utility function of U_2, which we show in Figure 3.3. It suggests that the fiscal authority tends to maximize utility in the short run by sacrificing the

long-run utility that is expected to be gained through improved production possibility, which is built by aid-financed investment at the margin.

Chapter 4

Assessment of the Intended Outcomes of the Newly Built Expressway in Sri Lanka

4.1 Introduction

Despite the controversies among classical thoughts, the requirements of infrastructure for economic growth are emphasized by all schools of thought in economics. Researchers widely accept that improvements in infrastructure can contribute to economic growth and social welfare. The Sri Lankan authorities have thus invested huge amounts of money in road construction, including expressways—a policy decision justified by different points of view. The effectiveness of other infrastructure facilities across different regions also depends on their accessibility. Hence, road construction, which affects the largest proportion of the population, both within and outside of a region, is the most influential carrier of sustainable development. However, the controversial issue pertains to the national priorities regarding infrastructure schedules and the level of effectiveness. Gertler *et.al* (2010) mentioned that the purpose of development projects is to change outcomes and to improve the well-being of community members. More commonly, authorities simply focus on controlling and measuring the resources spent during the course of a project, as well as the performance of said project without assessing whether the project achieved its sustainable outcomes. Accordingly, the crucial public policy question is whether the construction of the first expressway in Sri Lanka achieved its intended outcomes and, in turn, whether it ensured the sustainable development of the affected regions in Sri Lanka?

The expansion of the road network directly generates new markets and expands market opportunities not only for the goods market, but also for the factor market. The outcome of such expansion indirectly influences investment decisions, which then transform into industrial production, household income, and public revenue.

Improvement in the quality and quantity of road networks reduces the travel time and associated costs, which directly influence the goods and factor markets through factor productivity. As pointed out by Inthakesone *et.al* (2016), the urban–rural connection roads provide market access opportunities to rural people and help them to diversify their income sources as they are linked with a greater variety of functional livelihood value chain systems. Guojun *et.al* (2020), provided evidence within a difference-in-difference (DID) framework that poor rural counties grew faster in terms of gross domestic product (GDP) while slowing down the growth in rich rural counties due to the Chinese expressway system when compared to unconnected rural counties.

The purpose of this paper was to assess the impact of the expressway from Katunayaka International Airport, which is located in the western province, to Matara, which is located in southern Sri Lanka at first time. We aimed to identify the causal effect of the expressway with regard to the intended outcomes of the project, such as RGDP, industrial sector value addition, improving unemployment, and benefiting SMEs. The impact assessment was carried out using the DID approach by employing a fixed effect estimation procedure for 14 years of panel data over the 2005–2018 period. Our initial findings can be summarized as follows: The estimation results suggest that the expressway increased the RGDP in the affected regions (i.e., the western and southern provinces) by approximately 421 billion Sri Lankan rupees (7.5% out of total RGDP), and in addition, industrial sector value addition has increased by approximately 160 billion Sri Lankan rupees, which accounts for 38% of the total impact on RGDP. Meanwhile, the unemployment rate was reduced by 1.05% in comparison to the non-affected regions, and the expressway encouraged the development of approximately 285 SMEs in the affected regions.

The rest of the chapter is organized as follows. Section 4.2 is devoted to discussing some of the related literature. Section 4.3 provides an economic overview and background information on the expressway project in Sri Lanka. Section 4.4 outlines the methodology. Section 4.5 describes the data and estimation results. Section 4.6 provides the conclusion and policy implications.

4.2 Literature Review

As Shahidur, *et.al* (2010) mentioned, impact evaluations, as a part of evidence-based policy making, are marked by a shift in focus from the inputs to the

outcomes and results. Even if it is impossible for impact evaluations to capture exactly how infrastructure might affect economic outcomes, there is still important policy relevance in terms of how infrastructure provision influences the outcome variables of interest. It is important for the central government to review the economic viability of future infrastructure projects, as these are particularly sensitive issues for developing countries, which often finance infrastructure projects through foreign aid and domestic borrowings. Donor countries and agencies might also have an interest in the magnitude and significance of the impact of particular infrastructure projects on economic outcomes in developing countries.

The empirical literature provides evidence for a number of empirical approaches that have been used to investigate the socio-economic impacts of infrastructure development. Shahidur *et al*. (2019) mentioned that development projects and program evaluation approaches have evolved greatly over the past two decades toward impact evaluation. The issues of total impact estimation are typically addressed by randomized trial methods or treatment effect methods. The DID method is a convenient technique to use when the randomization of individuals is not feasible. Accordingly, researchers can estimate the effect of a specific intervention by comparing the changes in the outcomes over time between an affected group of the population that is enrolled in a project/program and a non-affected group of the population, under the assumption of a common time path and the availability of pre- and post-treatment data on the outcome variables of interest.

Provocative findings in the field provide both confirmatory and contradictory results. Yoshino, *et.al* (2000*)* conducted an empirical investigation on the productivity effects of infrastructure in Japan, and subsequently in Thailand, by employing a production function approach. They suggested that tertiary industries, such as the telecommunication sector, show greater productivity effects as a result of infrastructure development than do primary and secondary industries. They also revealed that regions with large urban areas appear to experience greater effects from the provision of new infrastructure. In a literature survey conducted by Pereira, *et.al* (2013), they mentioned that the magnitudes of the effects of public investment in infrastructure development tends to be substantially higher for less developed countries.

In particular, Bouasone *et.al* (2019) estimated the impact of irrigation on household sticky rice productivity in Lao People's Democratic Republic by employing

propensity score matching (PSM) and the DID method and suggested that "the average sales value and total production of sticky rice for irrigated households is greater than those for non-irrigated households by around 36% to 38% per season." With greater similarity to our work, Naoyuki, *et.al* (2017), estimated the changes in the growth rate of regional-level economic outcomes in affected regions as a result of the newly built railway connection in the southern part of Uzbekistan based on DID estimation, and their results suggested that the railway line increased the regional gross domestic product in the affected regions by approximately 2%. Wang*, et.al* (2020) found that the introduction of the high-altitude railway connecting Qinghai Province to Tibet increased the GDP per capita by 33%.

Benjamin, (2014) suggested that the Chinese National Trunk Highway System led to a reduction in GDP growth among peripheral counties outside of the network. Guojun *et al*. (2020) showed that the "Chinese expressway system helps poor rural counties grow faster in GDP while slowing down growth in the rich rural counties, compared with the unconnected rural counties" in the framework of the DID method. Wang *et al.* (2020) found that both rail and road transport infrastructure has a significant positive impact on economic growth in Southeast Asia, Central Europe and Eastern Europe. However, there was no significant correlation in other regions. Regional economic growth demonstrated a negative correlation with the development of road infrastructure in South Asia and with rail infrastructure in West Asia and North Africa. Wang *et al.* (2020) employed the spatial econometric technique with cross country data.

4.3 Economic Overview and The Background of the Project

4.3.1. Economic Overview

The economic growth rate continuously declined from 5% to 2.3% over the 2014–2019 period in Sri Lanka. The GDP per capita increased by 3.9% in 2019 in comparison to an increase of 6.7% in 2018. It is estimated at Sri Lankan Rupees (Rs) 688,719 in 2019, compared to Rs. 662,949 in 2018. The industry activities (value-added) grew by 2.7% in 2019 compared to the growth of 1.2% recorded in 2018. Being the second-largest contributor, the industrial sector accounted for 27% of the GDP of the economy. The unemployment rate increased from 4.4% to 4.8% over the 2013–

2019 period. The population density per square kilometre increased from 342 to 346 during 2017- 2018 in Sri Lanka.

The RGDP of the western and southern provinces accounted for 50% of the total GDP in 2015, while the other seven provinces accounted for the remaining 50%. The contribution of the industrial sector to the RGDP was 34.5% in the western province and approximately 18% in the southern province in the same year. The unemployment rate in the western province reduced by 1% in 2018 from 4.1% reported in 2015. However, in the southern province, the unemployment rate only reduced by 0.1% within the same time period. The RGDP per capita in the western province was estimated as 730,083 in 2015, compared to 901,562 Sri Lankan Rs in 2018. In the southern province, it was estimated as 432,493 Sri Lankan Rs in 2015 and 542,893 Sri Lankan Rs in 2018. The number of SMEs increased by 261 between 2013 and 2018, while this increased by 54 in the southern province. (Source of Data: Central Bank Annual Report 2019, Sri Lanka.)

4.3.2. Background of the Project

The full length of the Sri Lankan road network, including its expressway, is approximately 12,442.6 km (see Table 4.1). The expressway travels from Katunayake (the international airport) to Hambantota (the international airport and harbour) and consists of three phases, namely, the Southern Expressway, the Outer Circular Highway (OCH)—which is located in the Colombo Metropolitan Region—and the Colombo Katunayake expressway (see Figure 4.1). In this work, we focused on the regions that were exposed to the positive effects of the newly built expressway from Katunayake to Matara that initially operated on or before March 2014 (see Table 4.2). The total length of this section is around 181 km, including 19 interchanges (namely, the Katunayake, Ja-Ela, Kerawalapitaya, Peliyagoda, Kadawatha, Kaduwela, Kothalawala, Athurugiriya, Kottawa, Kahathuduwa, Gelanigama, Dodangoda, Welipenna, Kurundugaha, Baddegama. Pinnaduwa, Imaduwa, Kokmaduwa, and Godagama interchanges).

This expressway has a four-lane capacity, and the maximum operating speed is 100 km/h. The expected travel time from Colombo to Matara through the Southern Expressway is 2 h. The Sri Lankan government spent 2534 million USD on the aforementioned section of the expressway, which is approximately 186 km in length. On average, the cost per kilometre was approximately 13.6 million USD (see Table

4.3). After starting the construction of the expressway, the prices of the land and property situated along the expressway rose. These property market dynamics may have affected the social and economic behaviours within and outside of the affected regions as the project spread throughout two provinces—the western province as the commercial hub of the country and the southern province. Table 4.4 indicates the land price movements across the selected areas.

This expressway was constructed as a multipurpose project that included the following objectives: to develop the industries and services in the region; to encourage local and foreign investors to expand the job market; to reduce travel time and traffic congestion; to develop the towns within the interchanges as economic centres; to expand tourism in the region by ensuring fast access to international airports; to develop the ports of Galle and Hambantota; to enhance the values of the land and property in the region; and to reduce carbon emissions. In this work, we attempted to estimate the magnitude of the achievement of particular objectives regarding the economic performance for the regions exposed to the project compared to those that were not.

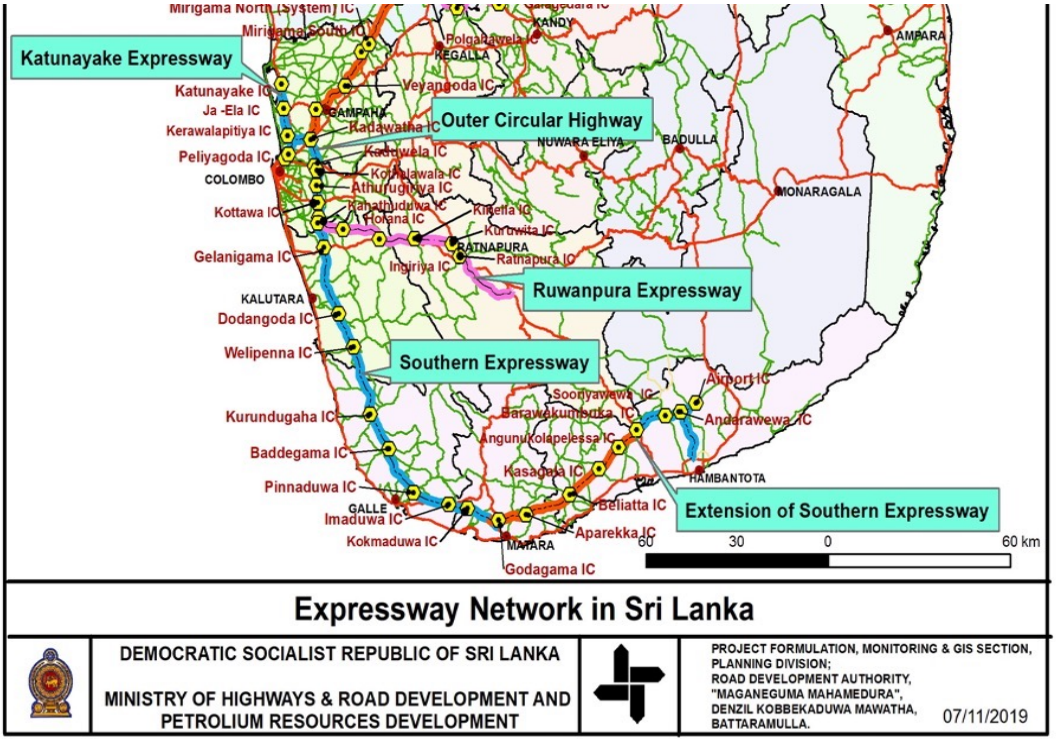


Figure 4.1. The Expressway Network in Sri Lanka

TABLE 4.1. NATIONAL HIGHWAYS IN SRI LANKA.		
Road Class	**Length**	
Class "E" roads		222.000 km
Class "A" roads		4217.420 km
Class “AA” roads	3720.31 km	
Class "AB" roads	466.92 km	
Class "AC" roads	30.190 km	
Class "B" roads		8003.167 km
All national highways ("A," "B,” and "E" class roads)		12,442.587 km

(Source: Road Development Authority.)

TABLE 4.2. PARTS OF THE EXPRESSWAY IN OPERATION IN 2020			
Route Number	**Road Name**	**Length(km)**	**Open to the General Public**
E001	Southern Expressway	**222**	
	Colombo to Galle	95.3	27.11.2011
	Galle to Matara	30.8	15.03.2014
	Matara to Hambantota	96	23.02.2020
E002	Outer Circular Highway (OCH)	**28.867**	15.03.2014
E003	Colombo–Katunayake Expressway	**25.800**	27.10.2013
	Total length of the expressway in operation (Katunayake to Hambantota)	276.667	

(Source: Road development authority)

Table 4.3. The cost of the construction of the expressway in Sri Lanka.						
Expressway	**Phase**	**Donor**	**Construction Period**	**Length (km)**	**Cost (USD Mn)**	**USD Mn/Km**
Southern Expressway	Kottawa to Kurudugaha	Japan	2001–2011	67	463	7
	Kurudugaha to Pinnaduwa	ADB	2000–2011	29	277	9
	Pinnaduwa to Godagama	China	2011–2014	35	152	4
OCH	Kottawa to Kaduwela	Japan	2009–2014	11	212	19
	Kaduwela to Kadawatha	Japan	2012–2015	9	379	43
	Kadawatha to Kerawalapitiy	China	2013–2014	9	666	72
Katunayake Expressway	Colombo to Katunayake	Japan	2009–2013	26	385	15
Total				186	2534	13.6

Source: Professor Amal (2019)

Table 4.4. Land Price Changes in the Cities Along the Expressway			
City	Percentage Increase in Land Price (2015 vs. 2012)	City	Percentage Increase in Land Price (2015 vs. 2012)
Kottawa	81%	Athurugiriya	32%
Pannipitiya	113%	Hokandara	49%
Panadura	124%	Kaduwela	46%
Kalutara	47%	Malabe	47%
Aluthgama	49%	Kadawatha	34%
Ambalangoda	79%	Waliweriya	143%

(Source: Price Waterhouse Coopers: https://www.pwc.com/lk/en/services/deals/real-estate-advisory/publications/The-Nexus-between-Property-and-Road-Development-in-Sri-Lanka.html.)

4.4 Methodology

To estimate the impact of the Expressway Project in terms of the economic dimensions, in particular, we considered variations in the outcome variables affected by the introduction of the project. To accomplish this, we employed the DID approach: Shahidur, et al. (2010) mentioned that this approach essentially compares affected and

non-affected groups in terms of outcome changes over time comparative to the outcomes observed for a preintervention baseline. Accordingly, the data were decomposed into a control group and a treatment group on the basis of geographical location and time, which illustrated the differences between the pre- and post-intervention data. Figure 4.2 provides a graphical illustration of the DID method with the RGDP.

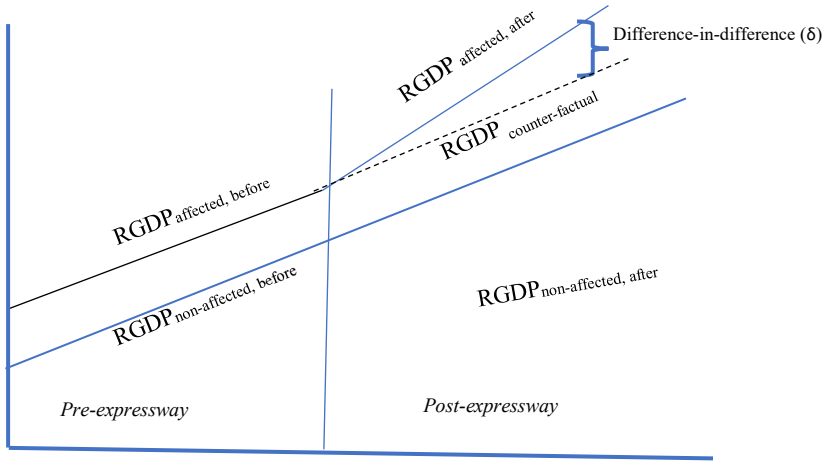


Figure 4.2. Graphical illustration of the DID method with RGDP

First, we estimated the regional effects based on geographical context. Then, we considered the variations in the outcome variable in terms of the timing. Accordingly, a probabilistic expression for the DID coefficient can be illustrated as follows:

$$(E[Yit|i=AR,t\{After\}]-E[Yit|i=AR,t\{before\}])-(E[Yit|i=NAR,t\{after\}]-E[Yit|i=NAR,t\{before\}])=\delta \quad (1)$$

where E represents the population averages, Y is the outcome variable, *i* symbolizes the geographical regions (such as provinces or districts), t denotes the year, AR indicates the affected regions of the expressway, NAR indicates those regions not affected by the expressway, and δ denotes the DID coefficient.

Then, we controlled for time-invariant, region-specific effects and year-specific effects. However, variances in the outcome variables might be driven by other factors, in addition to the provision of the expressway and the aforementioned effects. Not considering these effects might have caused bias in our estimation results. Banerjee, *et.al* (2009) and Ravallion (2009) explained that this is an external validity problem; accordingly, we need to determine the factors behind the cause of variance in each outcome variable. We can reach a less biased estimate of the DID coefficient by controlling for suitable time-varying covariates, and we can define the linear

projection of the variable of interest by incorporating such time-varying covariates into the general form of the specification for the DID estimation framework as follows:

$$Y_{it} = \alpha_i + \gamma_t + X'_{it} * \beta + \delta * Ew\_d_{gt} + \varepsilon_{it} \quad (2)$$

Where Y represents the outcome variable, X denotes the vector of the time-varying covariates, Ew_d_{gt} is the dummy variable that indicates the observation belonging to the affected group after the provision of the expressway, *i* refers to the regions, *g* refers to the groups of regions (1 = affected group and 0 = non-affected group), *t* refers to the treatment before and after the provision of the expressway (t = 0 before and t = 1 after), and α_i considers the heterogeneous factor of individual regions that requires for DID to meet the paroral trend assumption. Assume that the autonomous rate of growth α to be equal in both the affected and non-affected groups. The year-specific effects represented by γ_t and ε_{it} is stand-ins for the error term, which is assumed to be independent over time. The vector of the observed controls (X) as shown in table 55, can be classified according to the outcome variables corresponding to the provincial and district levels.

We used a fixed effects estimator to consider both the time-invariant unobserved characteristics and the year-specific effects. If such factors do not determine the nature of the changes in the control variables, a random effects estimator might be effective. However, this would ignore important information regarding the change in variables over time, when regional heterogeneous characteristics are correlated with time-varying covariates. Thus, we presented both type of estimations subject to the Hausman test for favorable estimation.

The assumption behind the estimation is that the changes in the outcome variables at the regional level in treated regions would be induced only through the expressway being the biggest project implemented in said regions, conditional upon the regions' time-invariant effects, evolving the social and economic characteristics (i.e., year-specific effects) and time-variant factors mentioned in Table 4.5.

We examined the assumption of a regional effect of the provision of the expressway for two different levels, namely, the provincial level and the district level (see Table 4.6). The assessment of the impact of a particular intervention typically requires clear identification of the differences between the affected and non-affected groups. Inappropriate assignment of the observational data among the affected and non-affected groups might result in misperceptions in the assessment process.

TABLE 4.5. THE VECTORS OF THE OBSERVED CONTROLS.						
	Province				District	
	Ind	Unemployment	RGDP	SME_P*	SME_{D2012}**	SME_{D2014}***
Regional population (Pop)	√	√	√	√		√
Regional agricultural contribution in RGDP (Agri)	√					
Marginal industrial value addition per person (M_ind)	√		√	√		
Average daily wage of informal construction sector (Master mason) (Wage rate)	√		√	√		
Goods transport vehicles (Transport)	√					
Number of industries registered under BOI & Ministry of commerce [small and medium enterprises (SMEs)]	√		√			
Departure for foreign employment (f_emp)					√	√
Banking density index (the number of bank branches for 100,000 persons) (Bank_den)	√		√	√	√	√
Population density (Pop_den) per kilometer					√	
Percentage of students that have minimum qualification to apply national universities (Uni_qualified)	√	√	√			
Number of teachers in thousands (Teacher)					√	√
Electricity sales for industries(GW/h) (E_sales_ind)		√				

*SME_p denotes the outcome variable of SMEs related to the provincial level.
**SME_{D2012} denotes the outcome variable of SME related to the district level subject to preintervention year 2012.
***SME_{D2014} denotes the outcome variable of SME related to the district level subject to preintervention year 2014

However, in our case, the expressway was operated section-wise and, as a result, the total length that we considered here was not operated at once. The expressway from Colombo (Kottawa) to Galle (Pinnaduwa) commissioned at the end of 2011. Two sections, i.e., from Colombo to Katunayaka International Airport in the western province and Galle to Matara in the southern province, were commissioned at the beginning of 2014. Although, quite a similar proportion of the length in both provinces

in the affected groups was operated later, we considered the year 2012 as the pre-intervention baseline.

Taking this into account in the case of the district-level comparisons of the impacts on SMEs, we set two effective combinations of treated groups based on different pre-intervention baselines for 2012 [SME_{D2012}] and 2014 [SME_{D2014}]. Pereira, *et.al* (2013) pointed out that infrastructure provisions induce different impacts on various economic sectors. Our scope of analysis covered the industrial sector value addition, Regional gross domestic product, number of SMEs, and unemployment rate so as to reveal the labour market effectiveness of the project. To measure the effectiveness of attracting private investment as an objective of the project, we considered the impact of the project on SMEs not only at the provincial level, but also at the district level.

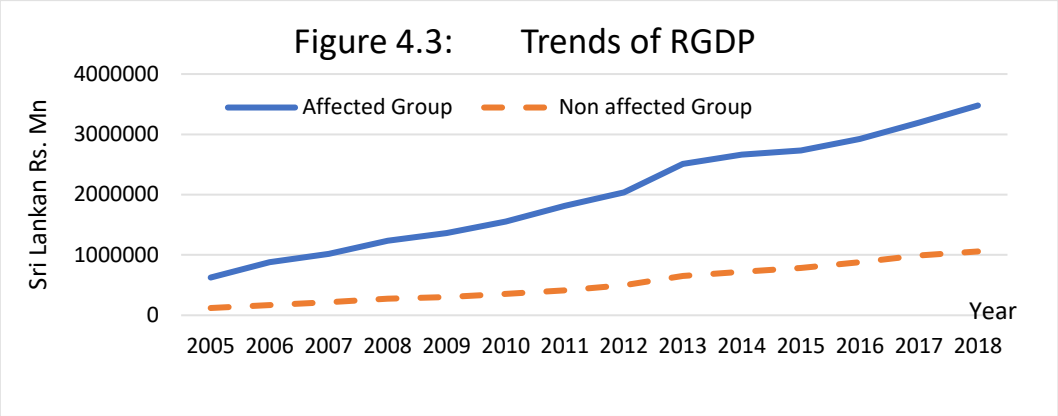
TABLE 4.6. AFFECTED AND NON-AFFECTED REGIONS.

Non-Affected Regions	**Affected Regions**	Pre-Intervention Baseline Year
Provincial Level	Provincial Level	
Eastern province	Western province	2012
Central province	Southern province	2012
North western province		
North central province		
Sabaragamuwa province		
Uva province		
Northern province		
District Level	District Level	
Batticaloa–Ampara	Colombo–Kaluthara–Galle	2012
Nuwaraeliya–Matale–Kandy	Gampaha–Matara	2014
Kurunegala–Putthalama		
Anuradapura–Polonnaruwa		
Kegalle–Rathnapura		
Monaragala–Badulla		
Vavniya		
Hambantota		

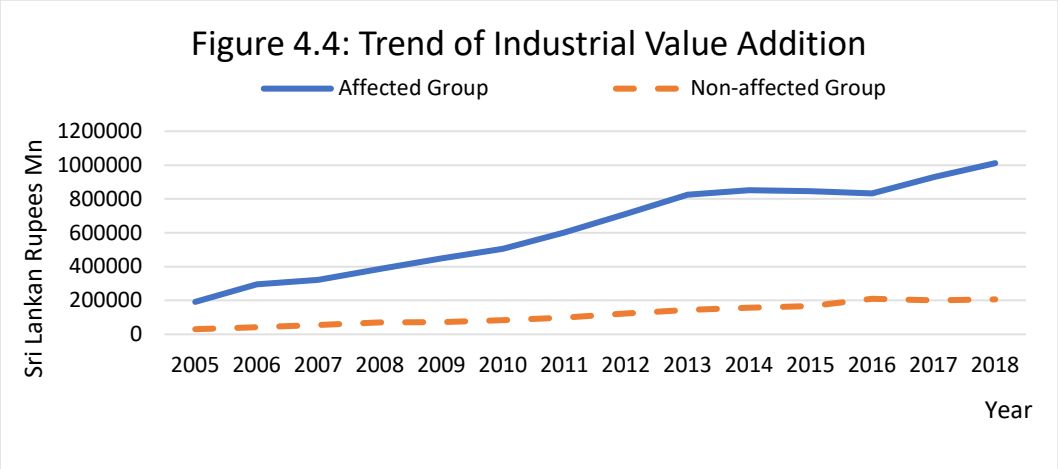
4.5 Estimation Results

4.5.1. Data

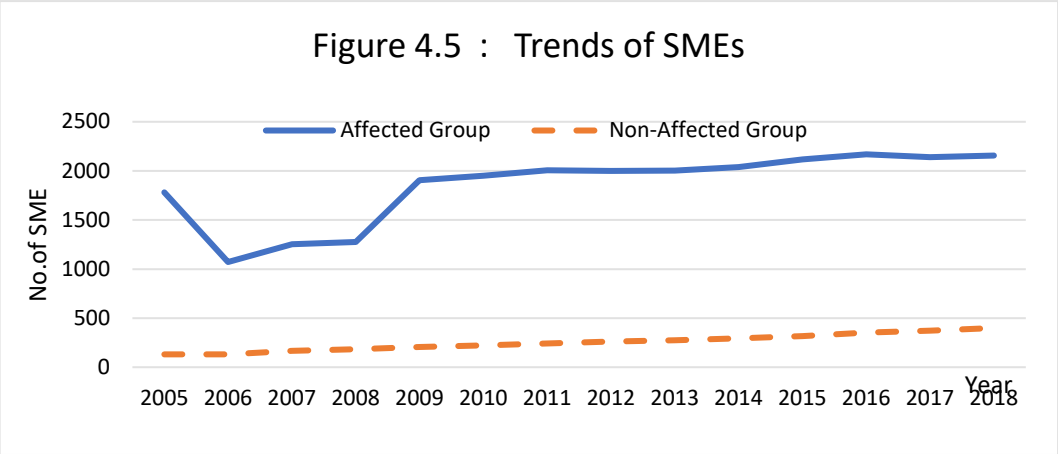
All estimations in this work were dependent on an exclusive panel data set containing information regarding the socio-economic characteristics of the regions in Sri Lanka. This was collected from annual statistic bulletins called the "Economic and Social Statistics of Sri Lanka" issued by the Central Bank of Sri Lanka, and from its annual reports from 2006 to 2019. The data set comprised 14 years of data over the period of 2005–2018, including all provinces and 20 out of the 25 districts, as shown in Table 6. Descriptive statistics for all outcome variables are provided in Table 4.7. Time trends of those variables with respect to the affected and non-affected groups are shown in Figures 4.3–4.6.



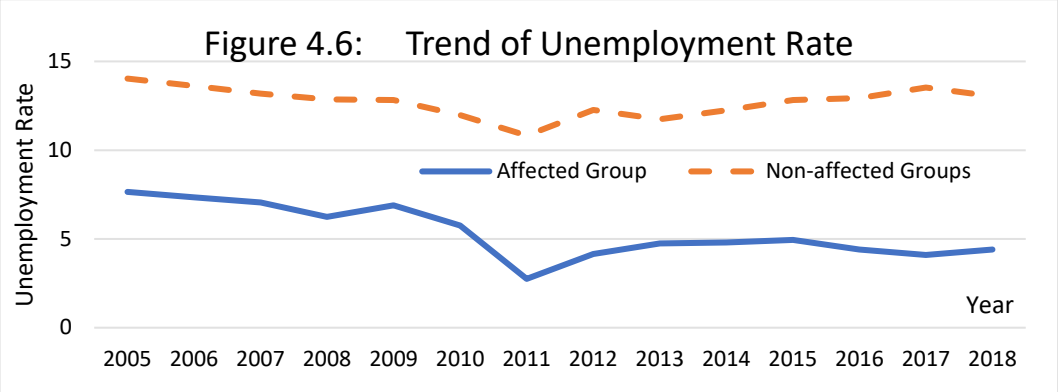
Source: Economic and Social Statistics of Sri Lanka and Sri Dayanath



Source: Economic and Social Statistics of Sri Lanka and Sri Dayanath



Source: Economic and Social Statistics of Sri Lanka and Sri Dayanath



Source: Economic and Social Statistics of Sri Lanka and Sri Dayanath

4.5.2. Estimation Results

We estimated Equation (2) using different outcome variables to assess the achievement of the objectives set by the expressway project mentioned above. Accordingly, the DID coefficient was estimated for the variable of interest by employing the fixed effect estimation procedure, and the results are reported in Table 4.8. The interaction term EW_d_{gt} focuses on the comparison of the path for the counter-factual scenario without the provision of infrastructure to the actual performance of the regions after launching the sections of new expressway from Katunayaka to Matara. We preceded the estimation by employing not only the fixed effect, but also the random effect estimation procedures (see Table H1 in Appendix H). However, the Hausman test strongly rejected the random effect estimations.

Table 4.8 indicates that the RGDP for the affected regions was greater than for the non-affected regions, i.e., by approximately 420,784 million Sri Lankan Rs per annum. This is about 7.5% out of the total average RGDP of the affected regions from 2012 to 2018**.** The year-specific effects in the estimation results might suggest that the general business climate in the transition economy, especially after a civil war which ended in 2009, might have significant relevance for the economic performance of regions. Data for the labour force and total investments, which are considered key variables of the growth model, were not available and, thus, were not used as the explanatory variables in the specification.

The other explanatory variables in our expanded specification explained 81% of the variance for RGDP and played a significant role with respect to the DID coefficient. SMEs and the banking density, with statistically significant positive coefficients, shed a light on the RGDP as proxies of private investment patterns. On the other hand, we used the marginal industrial product of a unit of population (M_ind) to capture the dynamics of industrial output in relation to population. This suggested that more labour inputs are required to maximize the regional industrial output. The wage rate—the average daily wage of the informal construction sector (Master Masons) as a leading wage rate of the informal sector—was positive and significantly influenced the RGDP. This might attract labour from the unproductive agricultural sector to the productive industrial sector and, in turn, increase the RGDP. We controlled for the minimum qualifications for applying to universities (Uni_qualified) to explain the variation of the RGDP due to the quality of human capital in the regions. However, the statistically significant coefficient of population (pop) and the positive but statistically insignificant coefficient of Uni_qualified can be interpreted as the size of the human resource pool (a proxy of the labour force) as a matter of the economic performance, and not the quality of it in the current situation of regional economies.

Table 4. 8 indicates that the industrial value addition for the affected regions was greater than that for the non-affected regions, i.e., by approximately 160,432 million Sri Lankan Rs per annum. This is approximately 38% of the total impact on the RGDP due to commissioning the expressway. The national-level contribution of the industrial sector to the GDP in 2015 was around 27%. Similarly, the contributions of the industrial sectors of the western and southern provinces to the RGDP in the same year were approximately 34.5% and 18%, respectively. These figures shed a light on our estimations. The significant and negative coefficient of agricultural output (Agri) on

industrial value addition indicates that the agricultural sector attracted human and physical capital from the industrial sector likely during the agricultural seasons in the year. Among other control variables, goods transportation vehicles (Transport) played a significant role in determining the industrial output. The population (Pop) was used as a proxy of the labour workforce for the industrial value addition. Moreover, SMEs were highly significant and positively associated with industries, which suggests that they contribute to the industrial value addition.

We obtained influential statistical evidence for the objective of minimizing the unemployment rate in the affected regions. According to Table 4.8, the DID coefficient for the unemployment rate was approximately –1.05, which implies that the unemployment rate decreased by 1.05% due to the development of the expressway from Katunayake to Matara. This estimation results were justified by the reduction of the unemployment rate in the western province in 2018 in comparison to 2015: The rate reduced by 1% in the western province and by 0.1% in the southern province. The coefficient on electricity sales for industrial sector (E_sale_ind), which was employed as a proxy of industrialization or automation in the industrial sector, became positive and significant. This might suggest that the automation process caused job opportunities to diminish slightly in those regions.

We tested the level of achievement of another objective, that is, attracting private investment toward the regions by employing SMEs as the outcome variable. We performed this estimation on regional-level data, as well as on district-level data (see Table 4.8). However, for eradicating inappropriate assignments of the observational data among the affected and non-affected groups, we conducted two estimations based on different pre-intervention years.

For the district-level estimation in case of SMEs, we considered Colombo, Kalutara, and Galle as the affected regions, which were commissioned by the end of 2011. As a result, we dropped the Gampaha district (in the western province) and Matara district (in the southern province) from the estimation. However, we considered the impact of the express way in these two districts, which were commissioned in 2014. Similarly, the Colombo, Kalutara, and Galle districts, which were commissioned in the end of 2011, were dropped from the estimation. The results are shown in Table 4.8. Accordingly, the coefficient we obtained for the DID interaction term was 285 for the case of the provinces, which included five districts over a seven-year affected period. The impact of the express way in Colombo, Kalutara,

and Galle (Table 4.8) was approximately 76 SMEs for the seven-year affected period. The impact of the express way regarding Gampaha and Matara as the affected regions reported 35 SMEs in the case of the two districts over a four-year affected period. Three estimations were performed by augmenting the baseline specification with slightly different covariates and obtaining consistent coefficients for the DID interaction term.

TABLE 4.7. Summary Statistics for The Outcome Variables (2005–2018).

	No. of Observation	Mean	Standard Deviation	Maximum	Minimum
Provincial Level					
Affected Group					
Industries	28	625623	563927	1786090	41680
SMEs	28	1847.5	1671.25	4004	177
Unemployment	28	5.37	2.09	9.5	1.3
RGDP	28	2003072	1613508	5525674	187116
Non-Affected groups					
Industries	98	133934	103493	482416	3986
SMEs	98	117.08	104.51	350	4
Unemployment	98	4.83	1.50	8.2	2.2
RGDP	98	531590	380394	1700270	63063
District Level					
Affected groups					
SMEs	70	783.28	886	2578	50
Non-affected groups					
SMEs	210	55.83	49.77	201	0

Then we conducted a placebo test by setting 2008 as a fake preintervention year. We estimate the DID, for the time period which before commissioning the road. (2005-2012). We found evidence that even if the road is not commissioned, the impact of the industrial sector for the affected regions was greater than that for the non-affected regions. So, we can conclude that the road has precisely contributed only for the RGDP and Un_emp in affected regions.

TABLE 4.8. FIXED EFFECT DIFFERENCE-IN-DIFFERENCE ESTIMATION OUTPUT.						
	Province				**District**	
	RGDP	**Ind**	**Un_emp**	**SME_P**	**SME_{D2012}**	**SME_{D2014}**
EW_$Dg_{(2012-2018)}$	420,784***(4.79)	160,432 *** (4.03)	–1.05 * (–1.69)	285 *** (3.52)	76 *** (9.65)	
EW_$Dg_{(2014-2018)}$						35.1*** (5.62)
Time_d	194,396***(2.90)	64702 ** (2.19)	–0.09 (–0.34)	77.70 (0.23)	12.04 *** (3.02)	7.44*** (3.03)
Pop_den					0.083 * (1.74)	
Pop	2.50 *** (4.90)	1.22 *** (6.17)	–0.00001***(–4.79)	0.002 *** (6.15)		0.0003***(10.83)
Agri		–2.49 *** (–412)				
Wage rate	190 ** (1.88)	76.38 (1.38)		–0.28 ***(–3.00)		
SME	684 *** (7.00)	232.46 *** (5.70)				
Bank_den	2843 * (1.77)	798.60 (1.14)		2.61* (1.74)	0.162 (0.40)	–0.07 (–0.31)
Uni_qualified	2789 (0.89)	–183.23 (–0.13)	–0.19 (–0.95)			
Teacher					0.003 * (1.83)	
Transport		1.74 * (1.66)				–0.001 (–1.25)
F_emp					0.001 (1.58)	0.0001 (1.14)
E_sale_ind			0.003 * (2.30)			
M_ind	15671.7 **(2.11)			5.30 (0.73)		
Constant	–5850476***(-5.35)	–2683963**(6.23)	28.58 *** (6.47)	-5349.6*** (–5.79)	105.8 *** (3.22)	–171.2 (–6.43)
R^2	0.81	0.78	0.0078	0.87	0.86	0.68
Groups	9	9	9	9	18	17
Observations	125	126	126	12	252	238

Note: The *t* ratios are in parentheses; significance levels are indicated as ***, **, and * for the 1%, 5%, and 10% levels, respectively.

Table 4.9. Fixed Effect Difference-in-Difference Estimation Output (2005–2012).				
Treated -Western and Southern pro				
	RGDP	Un_emp	Ind	SME
EW_D$_{(2008-2012)}$	61310 (1.26)	0.493 (0.62)	75680***(2.61)	355** (1.98)
Time_d	8561 (0.16)	-0.836**(2.12)	11022 (0.33)	123.5 (0.62)
Pop	9063*** [3.93]	-000008**(-1.97)	0.80***(4.40)	0.003*** (2.96)
Agri			0.249 (0.35)	
Wage rate	227.6** [1.95]		-5.25 (-0.07)	-0.49 (-1.15)
SME	230.6 *** [3.67]		48.82**(2.18)	
Bank_den	1454.6 [0.86]		1293.7 (1.39)	6.60 (1.28)
Uni_qualified	-1094.8 [-0.22]	0.017 (0.28)	145 (0.06)	
Transport			-0.038(-0.07)	
E_sale_ind		-0.007*(-1.86)		
M_ind	-4216.3 [-0.52]			10.83 (0.37)
Constant	-3644183*** [3.22]	25.66***(2.45)	-1785417***-.90	-7369.8*** (-2.98)
R^2	0.93	0.42	0.82	0.47
Groups	9	9	9	9
Observations	54	63	63	54

*Note: Significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively. t-ratio are within brackets.*

4.6 Conclusion

For the first time, we examined the impact of the first expressway in Sri Lanka within the DID framework. This was an effort to assess whether the construction of the expressway achieved the intended outcomes and, in turn, provided sustainable development in the affected regions, especially through the contributions of the industrial sector as a sustainable growth engine. Our fixed effect estimation results based on 14 years of panel data over the 2005–2018 period indicated several impact assessments for provincial- and district-level outcome variables.

We found that the industrial value addition for the western and southern provinces was greater than that for other seven provinces due to the expressway, i.e. it approximately account for 38% of the total impact on the RGDP. RGDP in affected regions was enlarged by around 7.5% out of the total average RGDP of the affected regions. We obtained influential statistical evidence for the objective of minimizing the unemployment rate in the affected regions by approximately 1.05% per annum. These indicators are quite natural and provide evidence for the sustainability of economic growth. Our empirical results further reveal that the provision of the expressway induced 285 SMEs in the affected provinces, while there was an increase of 74 SMEs in the Colombo, Kalutara, and Galle districts, and 35 SMEs in the Gampaha and Matara districts under different pre-intervention years.

Chapter 5

Conclusion and Policy Implications

Conclusion: Development, as a matter of centrality of political economy, has been strongly discussed in global development dialogue for more than 100 years. Supplemental economic theories are more optimistic, relating to the contribution of foreign aid towards the development process. But, on the empirical front, volumes of studies on aid effectiveness have often ended up with a negative or inconclusive conclusion. Those conclusions are still unclear due to the ignorance of the causal path in between aid and growth. Indeed, any effect of foreign aid on economic growth depends on the effects of foreign aid transmitted through some mediators such as investment, public consumption, tax revenue, public investment and etc. But volumes of literature mainly take into account the direct effect and ignore the requirement of analysing the hidden factors behind the aid-growth nexus. On the basis of this impression, this study aims to examine whether foreign aid meets the intended development objectives, while it operates via indirect mechanisms.

Chapter two investigates not only the total effect but also the indirect effect of disaggregated aid on per capita GDP by comparing low middle income (LMI) and upper middle income (UMI) countries, in addition to the regional comparison. We employed a statistical mediation approach with the residual with regression method on fixed effect estimation procedure. It gives insight that the UMI countries, which are experiencing good policies, are suffering from greater negative indirect effects, rather than LMI countries. The evidence proves that foreign aid is no longer effective -indeed ineffective- when aid mediated through investment while investment itself has a positive effect on per capita GDP.

The third chapter turns to an individual country study that tries to analyse how fiscal decisions have deviated from the intended development objectives in the presence of foreign aid in Sri Lanka. Sri Lanka is a country that is downgraded by world-famous three credit rating agencies such as Moody, S&P, and Fitch continuously from 2015 to 2020 and is reached the level of 'substantial risk' by November 2020. We consider the overall influence of aid on the fiscal sector by regressing the fiscal response model by employing 3SLS. We found that public consumption increases while fiscal policymaker substitutes tax revenue in the presence of foreign aid. Accordingly, it is expected that the budget deficit and domestic borrowings will increase. The meaning is that the public saving is reduced than it would have been without aid. In that context, we found evidence that the fiscal authority tends to decrease public investment due to eradicating the pressure on domestic borrowing.

Then we move to assess whether foreign aid works well at the micro-level by using a causal approach. Accordingly, chapter 4 tries to assess whether the achieved level of intended outcomes of the first express way in Sri Lanka. Causal evidence, which derives from the fixed effect estimation based on the difference-in-difference framework, supports that RGDP for the affected regions has enlarged by around 7.5% out of the total average RGDP. The unemployment rate is declined by 1.05% due to the induced impact of the express way.

Findings, derived from the above three empirical studies, shed a light on rigorous consistent conclusions. Fourth chapter advocate for the supplemental economic theories, that emphasize the foreign aid work well. Even If foreign aid works well at the micro-level, chapter three support that aid does not work at the macro level since Sri Lankan public policymakers' desires to maximize their utility in the short run by sacrificing the long-run utility that is expected to be gained through improved production possibility, which is built by aid-financed investment at the margin. This means, when foreign aid mediates through fiscal policies, it leads to some sort of fiscal policy asymmetries like increase consumption, substitute the tax revenue. As a result, budget deficit and domestic borrowings increase by imposing an unfavourable policy environment for private investment. Consistently, chapter two provides evidence that foreign aid is no longer effective -indeed ineffective- when aid mediated through investment while investment itself has a positive effect on per capita GDP. Simply, the evidence from the regressions that denote the causal path, [aid on investment and

investment on per capita GDP] elaborates that foreign aid has a negative association with domestic investment and investment itself has a positive association on per capita GDP. Even if we expect that foreign aid should increase investment, in contrast, the domestic investment decline while increasing foreign aid. It implies that private investment is shrinking. (foreign aid, indeed, increases the public investment). Accordingly, the negative effect of aid mediated via investment implies that the rate of return on private capital is reduced or is treated unfavourably by Aid. The chapter three precisely contribute to explain the reason for reducing the rate of return on private capital as well as the public capital. As a result, the outcome (GDP) decreases. In that sense, foreign aid causes a decline in domestic savings instead of supplementing such savings. It implies that foreign aid badly influences the policies that affect private investment.

Rajan *et.al* (2005) argued that there is no evidence that aid works better in better policy. Similarly, Shaomeng *et.al* (2019) re-examined the work done by Doller *et.al* (2000) with extended data up to 2013 and reveals that aid is not conditional on good policies. Gomanee *et. al* (2005) conclude that aid can be effective even if policies are bad. Based on the above discussion and complying but beyond the conclusion raised by previous studies, we conclude that the aid ineffectiveness is not conditional on policies, rather policies that affect private investment are conditional on aid effectiveness that depends on the aid administration and management approach.

Policy implications: According to the empirical findings, we can see that there is a micro-macro paradox. Even if some particular projects are successful on the ground, the aid management and administration process badly influence at the macro level. Therefore, reliance on foreign aid does not offer a better solution for sustainable growth given the prevailing fiscal behaviour. As a midterm policy approach, we emphasize the requirement of a gradual growth perspective that ensures more bearable, stable, and sustainable economic achievements, instead of getting rapid growth through isolated mega projects that take a long time for mobilizing income-generating activities and domestic resources. Because such ‘big push’ efforts may cause to increase the cost of private investment and reduce the competitiveness and in turn reduce the production. Accordingly, the recipient governments should divert foreign aid to the manufacturing sector through financial support schemes for private entrepreneurs and to key initiatives of private-public joint ventures instead of over-

investing in infrastructure. Such an intervention favourably affects to reduce the counterpart domestic resource requirement for public investment finance by foreign aid and thereby reduce demand for domestic borrowings that unfavourably affect the private investment.

Further, we emphasize the requirement of mobilizing domestic resources rather than depending excessively on domestic borrowings for aid-financed public investment. Thus, fiscal authorities should improve their domestic revenues by expanding the tax base and should not substitute tax revenue with foreign aid. Furthermore, expenditures on general public services need to be reduced.

On the institutional side, we emphasize the requirement of recognizing national investment priorities and effectively enabling the fiscal responsibility act (2003) while strengthening good governance practices.

Appendix A

Table A1: Summary Statistics of the Key Variables in case of Regional Disparities

		Asia					Latin America					Africa				
Variable		**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**	**Obs**	**Mean**	**Std. Dev.**	**Min**	**Max**
ln_pcap	overall	N = 250	7.654	0.733	6.167	9.309	N = 275	8.360	0.650	6.969	9.386	N =225	8.105	0.548	7.038	9.192
	between	n = 10		0.688	6.843	8.957	n = 11		0.659	7.244	9.174	n = 9		0.548	7.168	8.771
	within	T = 25		0.331	6.808	8.400	T = 25		0.162	7.940	8.810	T = 25		0.178	7.660	8.551
BiODA	overall	N = 250	1.469	2.495	-0.635	13.802	N = 275	1.409	3.124	-0.246	26.448	N =225	1.472	2.686	-0.304	22.080
	between	n = 10		2.147	0.047	7.242	n = 11		2.556	0.024	8.117	n = 9		1.502	0.233	4.514
	within	T =25		1.436	-4.079	8.028	T = 25		1.949	-5.478	19.740	T = 25		2.280	-2.693	19.038
MulODA	overall	N =250	0.563	0.904	-0.267	5.043	N = 275	0.505	0.984	-0.003	7.693	N =225	0.597	1.003	-0.211	8.370
	between	n = 10		0.627	0.007	1.870	n = 11		0.902	0.006	2.862	n = 9		0.589	0.076	1.875
	within	T = 25		0.679	-0.994	3.735	T = 25		0.476	-1.033	5.336	T = 25		0.834	-1.490	7.750
ln_Inv	overall	N =250	24.13	1.550	20.214	27.353	N = 275	23.264	1.762	20.564	26.983	N =225	22.944	1.336	20.884	25.322
	between	n = 10		1.545	21.275	26.566	n = 11		1.815	21.366	26.532	n = 9		1.359	21.336	24.772
	within	T = 25		0.494	22.772	25.307	T = 25		0.314	22.420	24.010	T = 25		0.367	22.108	23.985
ln_Gcon	overall	N = 250	23.23	1.491	19.735	26.383	N = 275	22.723	1.886	19.714	26.864	N =225	22.571	1.334	20.181	25.197
	between	n = 10		1.490	20.462	25.404	n = 11		1.924	20.525	26.535	n = 9		1.375	20.781	24.809
	within	T =25		0.467	20.254	24.208	T = 25		0.420	20.912	23.744	T = 25		0.304	21.960	23.249
ln_Imp	overall	N =250	24.54	1.404	20.871	27.090	N = 275	23.642	1.412	20.956	26.922	N =225	23.435	1.092	20.858	25.649
	between	n = 10		1.388	21.854	25.989	n = 11		1.428	21.975	26.275	n = 9		1.075	22.223	25.109
	within	T =25		0.480	23.153	25.644	T = 25		0.366	22.622	24.372	T = 25		0.401	21.919	24.430
ln_credit	overall	N =250	24.38	2.120	18.546	27.836	N = 275	23.484	1.829	20.374	28.149	N =225	22.894	1.843	19.150	26.378
	between	n = 10		2.040	20.812	26.674	n = 11		1.845	21.227	27.415	n = 9		1.840	20.228	26.028
	within	T = 25		0.856	21.445	26.732	T =25		0.488	22.045	24.679	T = 25		0.613	21.582	24.652
EXCHA	overall	N =250	2529	5293.3	0.010	21935.0	N = 275	419.2	1252.8	0.002	6424.3	N =225	131.5	220.3	0.884	733.0
	between	n =10		5306.0	0.804	15847.7	n = 11		1220.5	1.875	4083.4	n = 9		227.0	1.334	530.2
	within	T=25		1606.0	-3501	8616.8	T = 25		458.6	-2164	2760.1	T = 25		50.5	-134.0	334.4
Infl	overall	N=250	21.78	130.2	-10.6	1662.22	N = 275	27.35	178.98	-1.17	2075.9	N =225	5.95	5.468	-3.935	42.43
	between	n =10		39.6	2.7	132.163	n = 11		59.53	6.094	206.7	n = 9		2.28	2.29	8.63
	within	T=25		124.6	-121	1551.84	T = 25		169.70	-176.2	1896.5	T = 25		5.025	-3.509	42.865

Table A2: Summary Statistics of the Key variables										
			Lower Middle-Income Countries				Upper Middle-income Countries			
Variable		Observations	Mean	Std. Dev.	Min	Max	Mean	Std. Dev.	Min	Max
ln_pcap	overall	N = 375	7.495	0.461	6.167	8.360	8.602	0.445	7.119	9.386
	between	n = 15		0.410	6.843	8.106		0.390	7.965	9.174
	within	T = 25		0.235	6.815	8.156		0.236	7.755	9.348
BiODA	overall	N = 375	2.560	3.578	-0.102	26.448	0.335	0.576	-0.635	6.224
	between	n = 15		2.483	0.162	8.117		0.317	0.024	1.077
	within	T = 25		2.652	-4.327	20.892		0.488	-0.505	5.482
MulODA	overall	N = 375	0.908	1.191	-0.242	8.370	0.195	0.431	-0.267	4.058
	between	n = 15		0.829	0.042	2.862		0.275	0.006	1.009
	within	T = 25		0.880	-1.178	8.061		0.339	-1.080	3.245
ln_Inv	overall	N = 375	23.240	1.618	20.214	27.353	23.672	1.650	20.962	26.983
	between	n = 15		1.609	21.275	26.566		1.666	21.336	26.532
	within	T = 25		0.439	21.882	24.417		0.352	22.354	24.634
ln_Gcon	overall	N = 375	22.555	1.458	19.714	26.383	23.136	1.735	20.181	26.864
	between	n = 15		1.445	20.462	25.404		1.746	20.781	26.535
	within	T = 25		0.414	19.580	23.534		0.398	21.326	24.157
ln_Imp	overall	N = 375	23.695	1.350	20.858	27.090	24.065	1.432	21.575	26.922
	between	n = 15		1.311	21.854	25.989		1.431	22.223	26.275
	within	T = 25		0.464	22.179	24.796		0.365	23.020	25.023
ln_credit	overall	N = 375	23.295	1.944	19.030	27.836	23.915	2.054	18.546	28.149
	between	n = 15		1.881	20.228	26.674		2.015	21.397	27.415
	within	T = 25		0.683	21.201	25.118		0.648	20.982	26.269
EXCHA	overall	N = 375	1757.490	4457.95	0.88	21935.00	315.12	1086.25	0.00	6424.34
	between	n = 15		4404.50	1.33	15847.70		1046.98	0.80	4083.40
	within	T = 25		1310.98	-4273.48	7844.79		392.56	-2268.02	2656.06
infl	overall	N = 375	8.451	17.754	-3.935	268.151	29.706	185.449	-10.630	2075.887
	between	n = 15		6.759	2.294	31.477		58.536	2.703	206.741
	within	T = 25		16.506	-22.982	245.125		176.592	-173.836	1898.852

Appendix B

Table B1:	**Fixed Effect Estimation Results of Mediators on Per capita GDP [Without AID variable]**				
	UMI countries	LMI countries	Asia	L America	Africa
ln_INV	0.113* [1.89]	0.148* [1.89]	0.073 [0.86]	0.32*** [16.9]	-0.01 [-0.20]
ln_GCON	0.188*** [4.94]	0.100** [2.14]	0.20** [2.83]	0.10*** [3.89]	0.28** [2.84]
ln_IMPO	0.036 [0.49]	0.023 [0.39]	-0.005 [-0.07]	-0.02 [-0.45]	0.04 [0.88]
ln_credit	0.165*** [3.35]	0.142*** [4.62]	0.22*** [4.07]	0.04*** [3.43]	0.10* [2.17]
EXCHA	-0.00002** [-2.58]	0.00002*** [4.62]	0.00001 [1.35]	-0.000003 [-1.12]	0.0004 [1.14]
Infl	-0.0001** [-1.98]	-0.0002 [-0.76]	-0.0001*** [-3.18]	-0.00005*** [-4.05]	-0.0001 [-0.05]
DEM	0.030 [1.31]	-0.001 [-0.04]	0.035 [1.21]	-0.21 [-0.85]	-0.011 [-0.34]
CRISIS97/98	-0.027* [-2.02]	-0.032 [-1.53]	-0.073** [-2.67]	-0.018 [-1.44]	-0.02 [-1.10]
CRISIS08/09	0.012 [0.74]	0.011 [0.64]	0.026 [1.28]	-0.005 [-0.63]	0.03 [1.57]
C	-3.329*** [-3.78]	-2.131 [-1.66]	-4.23*** [-3.09]	-2.07*** [-3.15]	-1.76 [-1.01]
Within R^2	0.88	0.84	0.92	0.91	0.82
No.of countries	15	15	10	11	9
Observation	375	375	250	275	225

Note: Standard Errors has been clustered at country level to ensure no serial correlation.

t- ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

Table C1: Fixed Effect Estimation Results for Bivariate Supplementary Regressions in case of Regional Disparities							
		ln_inv	ln_gcon	ln_imp	ln_inv	ln_Gcon	ln_imp
Asia [Obs: 250/240]	Mul ODA	-0.31***[-3]	-0.22**[-2.37]	-0.24***[-3.21]			
	Mul ODA(-1)				-0.25**[-2.64]	-0.23**[-2.26]	-0.20**[-2.74]
	C	24.30***[420]	23.35[447]	24.68***[575]]	24.30***[427]	23.39***[392]	24.68***[569]
	Within R^2	0.17	0.1	0.11	0.13	0.14	0.09
Latin America [Obs: 275/264]	Mul ODA	-0.16***[-2.99]	-0.13**[-2.76]	-0.17**[-2.64]			
	Mul ODA(-1)				-0.15***[-3.24]	-0.12**[-2.52]	-0.16**[-2.64]
	C	23.34***[853]	22.79***[916]	23.72***[726]	23.36***[931]	22.81***[933]	23.75***[722]
	Within R^2	0.06	0.02	0.04	0.06	0.02	0.05
Africa [Obs: 225/216]	Mul ODA	-0.005[-0.32]	-0.03***[-2.94]	-0.02*[-1.86]			
	Mul ODA(-1)				0.003[0.1]	-0.026[-1.49]	-0.02[-1.24]
	C	22.94***[2193]	22.58***[3582]	23.45***[2832]	22.95***[1022]	22.59***[2118]	23.47***[1673]
	Within R^2						
Asia [Obs: 250/540]	BiODA	-0.17***[-4.68]	-0.12**[-2.58]	-0.12***[-3.06]			
	BiODA(-1)				-0.15***[-5.4]	-0.12***[-3.04]	-0.12***[-3.5]
	C	24.38***[449]	23.41***[329]	24.72***[405]	24.38***[561]	23.44***[385]	24.75***[477]
	Within R^2	0.25	0.14	0.14	0.21	0.21	0.14
Latin America [Obs: 275/264]	BiODA	-0.07***[-3.88]	-0.06***[-2.91]	-0.07***[-3.44]			
	BiODA(-1)				-0.073***[-3.97]	-0.07***[-3.61]	-0.08***[-3.78]
	C	23.37***[851]	22.81***[730]	23.75***[728]	23.38***[868]	22.85***[798]	23.78***[766]
	Within R^2	0.22	0.08	0.18	0.21	0.12	0.19
Africa [Obs: 225/216]	BiODA	-0.02***[-3.06]	-0.02[-1.56]	-0.02**[-2.58]			
	BiODA(-1)				-0.02**[-2.39]	-0.021[-1.73]	-0.021**[-2.22]
	C	22.98***[1781]	22.60***[1171]	23.46***[1786]	22.99***[1618]	22.61***[1995]	23.49***[1591]
	Within R^2	0.02	0.007	0.01	0.02	0.02	0.01

Note: Standard Errors has been clustered at country level to ensure no serial correlation. t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table C2: Fixed Effect Estimation Results for Bivariate Supplementary Regressions in case of Income disparities

		ln_INV	ln_GCON	ln_IMP	ln_INV	ln_GCON	ln_IMP
UMI Countries [Obs:375/360]	MulODA	-0.3879***[-7.46]	-0.3595***[-6.51]	-0.3236***[-6.31]			
	MulODA(-1)				-0.2829***[-5.94]	-0.3589***[-4.22]	-0.2522***[-5.47]
	C	23.75***[2337.05]	23.206***[2151]	24.128***[2409.7]	23.725***[2543.9]	23.207***[1393.4]	24.115***[2671.6]
	Within R^2	0.14	0.09	0.09	0.07	0.09	0.05
LMI Countries [Obs:375/360]	MulODA	-0.101[-1.52]	-0.0798**[-2.36]	-0.0993**[-2.21]			
	MulODA(-1)				-0.0690[-1.19]	-0.0694**[-2.09]	-0.0790**[-2.13]
	C	23.332***[385.95]	22.627***[737.3]	23.7849***[582.1]	23.308***[439.91]	22.62***[749.94]	23.771***[704.82]
	Within R^2	0.04	0.02	0.03	0.01	0.02	0.02
UMI Countries [Obs:375/360]	BiODA	-0.1554*[-1.91]	-0.2748**[-2.11]	-0.1862**[-2.06]			
	BiODA(-1)				-0.861[-1.49]	-0.2319**[-2.08]	-0.1325*[-1.89]
	C	23.73***[867.69]	23.228***[531.85]	24.127***[795.18]	23.69***[1222.05]	23.215***[618.8]	24.110***[1023.2]
	Within R^2	0.04	0.11	0.06	0.01	0.08	0.03
LMI Countries [Obs:375/360]	BiODA	-0.0702***[-3.25]	-0.0497***[-3.39]	-0.0602***[-3.66]			
	BiODA(-1)				-0.0554***[-3.30]	-0.0489***[-3.68]	-0.0493***[-3.10]
	C	23.420***[423.37]	22.68***[603.83]	23.84***[565.20]	23.388***[543.03]	22.684***	23.826***[583.53]
	Within R^2	0.18	0.10	0.11	0.11	0.09	0.08

Note: Standard Errors has been clustered at country level to ensure no serial correlation.
T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table D1: ASIA Fixed Effect Estimation Results of Bilateral ODA on Per capita GDP									
	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
BiODA	-0.092*** [-4.27]	-0.071** [-2.38]	-0.08***[-3.25]	-0.1066*** [-4.64]	-0.1068*** [-4.15]				
BiODA(-1)						-0.031 [-1.42]	-0.039 [-1.75]	-0.063*** [3.21]	-0.062*** [-3.26]
ln_Inv		0.077[1.16]				0.002*[1.93]			
ln_Gcon		0.171**[2.66]	0.171**[2.66]			0.072[0.87]	0.072[0.87]		
ln_Imp		0.001[0.01]	0.001[0.01]	0.001[0.01]		0.244***[4.02]	0.244***[4.0]	0.244***[4.0]	
Inv_res			0.077[1.16]	0.077[1.16]	0.077[1.16]		0.002*[1.93]	0.002*[1.93]	0.002*[1.93]
Gcon_res				0.171**[2.66]	0.171**[2.66]			0.072[0.87]	0.072[0.87]
Imp_res					0.001[0.01]				0.244***[4.0]
BiODA^2	0.007***[5.77]	0.005***[2.9]	0.005***[2.91]	0.005***[2.91]	0.005***[2.91]	-0.009[-0.14]	-0.009[-0.14]	-0.009[-0.14]	-0.009[-0.14]
ln_credit	0.321***[10.5]	0.216***[4.9]	0.216***[4.99]	0.216***[4.99]	0.216***[4.99]	0.214***[4.67]	0.214***[4.6]	0.214***[4.6]	0.214***[4.6]
EXCHA	0.00001[0.67]	0.000008[0.8]	0.000008[0.84]	0.000008[0.84]	0.000008[0.84]	0.000006[0.85]	0.000006[0.8]	0.000006[0.8]	0.000006[0.8]
Infl	-0.0001*** [-3.15]	-0.0002*** [-3.49]	-0.0002*** [-3.49]	-0.0002*** [-3.49]	-0.0002*** [-3.49]	-0.0002*** [-4.35]	-0.0002*** [-4.35]	-0.0002*** [-4.35]	-0.0002*** [-4.35]
DEM	-0.006[-0.13]	0.029[1.08]	0.029[1.08]	0.029[1.08]	0.029[1.08]	0.023[0.98]	0.023[0.98]	0.023[0.98]	0.023[0.98]
CRISIS97/98	-0.103**[-2.82]	-0.082*** [-3.3]	-0.082***[-3.3]	-0.082***[-3.3]	-0.082***[-3.3]	-0.079**[-2.33]	-0.079** [-2.33]	-0.079** [-2.33]	-0.079** [-2.33]
CRISIS08/09	0.034[0.14]	0.021[1.1]	0.021[1.1]	0.021[1.1]	0.021[1.1]	0.012[0.59]	0.012[0.59]	0.012[0.59]	0.012[0.59]
C	-0.115[-0.16]	-3.50[-2.71]	-1.622[-1.11]	2.392[1.37]	2.422**[2.31]	-4.798[-2.89]	-3.030[-1.57]	2.683*[1.94]	2.452**[2.23]
Within R^2	0.89	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
No. of coun:	10	10	10	10	10	10	10	10	10
Observation	250	250	250	250	250	240	240	240	240

Note: Standard Errors has been clustered at country level to ensure no serial correlation.
t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table D2: ASIA Fixed Effect Estimation Results of Multilateral ODA on Per capita GDP									
	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
MulODA	-0.052 [-0.93]	-0.107** [-2.46]	-0.138** [-5.39]	-0.181*** [-6.22]	-0.183*** [-5.37]				
MulODA(-1)						-0.033[-1.28]	-0.048**[2.22]	-0.106***[6.17]	-0.108***[4.85]
ln_Inv	0.018**[2.38]	0.021***[3.59]				0.001[0.44]			
ln_Gcon		0.095[1.35]	0.095[1.35]			0.064[0.73]	0.064[0.73]		
ln_Imp		0.195**[2.81]	0.195**[2.81]	0.195**[2.81]		0.282***[5.16]	0.282***[5.16]	0.282***[5.16]	
Inv_res			0.021***[3.59]	0.021***[3.59]	0.021***[3.59]		0.001[0.44]	0.001[0.44]	0.001[0.44]
Gcon_res				0.095[1.35]	0.095[1.35]			0.064[0.73]	0.064[0.73]
Imp_res					0.195**[2.81]				0.282***[5.16]
MulODA²		0.010[0.12]	0.010[0.12]	0.010[0.12]	0.010[0.12]	0.012[0.17]	0.012[0.17]	0.012[0.17]	0.012[0.17]
ln_credit	0.338***[9.13]	0.187***[4]	0.187***[4]	0.187***[4]	0.187***[4]	0.179***[4.5]	0.179***[4.5]	0.179***[4.5]	0.179***[4.5]
EXCHA	0.00001[0.95]	0.00001*[1.77]	0.00001*[1.77]	0.00001*[1.77]	0.00001*[1.77]	0.00001[1.68]	0.00001[1.68]	0.00001[1.68]	0.00001[1.68]
Infl	-0.0001*** [-5.33]	-0.0001*** [-3.91]	-0.0001*** [-3.91]	-0.0001*** [-3.91]	-0.0001*** [-3.91]	-0.0002 [-4.43]	-0.0002 [-4.43]	-0.0002 [-4.43]	-0.0002 [-4.43]
DEM	-0.0003[-0.01]	0.040[1.68]	0.040[1.68]	0.040[1.68]	0.040[1.68]	0.031[1.53]	0.031[1.53]	0.031[1.53]	0.031[1.53]
CRISIS97/98	-0.105** [-2.69]	-0.079*** [-3.35]	-0.079*** [-3.35]	-0.079*** [-3.35]	-0.079*** [-3.35]	-0.059** [-2.16]	-0.059** [-2.16]	-0.059** [-2.16]	-0.059** [-2.16]
CRISIS08/09	-0.044[1.75]	0.027[1.43]	0.027[1.43]	0.027[1.43]	0.027[1.43]	0.013[0.63]	0.013[0.63]	0.013[0.63]	0.013[0.63]
C	-0.630[-0.68]	-4.08***[-3.07]	-1.770[-1.26]	2.799[1.59]	3.050**[2.69]	-5.17**[-3.14]	-3.61*[-2.03]	2.970**[2.39]	3.271***[3.39]
Within R²	0.89	0.93	0.93	0.93	0.93	0.93	0.93	0.93	0.93
No.of count:	10	10	10	10	10	10	10	10	10
Observations	250	250	250	250	250	240	240	240	240

Note: Standard Errors has been clustered at country level to ensure no serial correlation. T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table D3:	LATIN AMERICA Fixed Effect Estimation Results of Bilateral ODA on Per capita GDP								
	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
BiODA	-0.037* [-2.12]	0.001 [0.21]	-0.022*** [-.3.39]	-0.028*** [-5.12]	-0.028*** [5.12]				
BiODA(-1)						-0.0001 [-0.07]	-0.022*** [-8.59]	-0.032*** [-12.42]	-0.031*** [-13.08]
ln_Inv	0.001[0.11]	-0.00003[-0.16]				0.0002**[2.68]			
ln_Gcon		0.323***[15.61]	0.323***[15.61]			0.309***[12.78]	0.309***[12.78]		
ln_Imp		0.108***[3.79]	0.108***[3.79]	0.108***[3.79]		0.135***[4.08]	0.135***[4.08]	0.135***[4.08]	
Inv_res			-0.00003[-0.16]	-0.00003[-0.16]	-0.00003[-0.16]		0.0002**[2.68]	0.0002**[2.68]	0.0002**[2.68]
Gcon_res				0.323***[15.6]	0.323***[15.6]			0.309***[12.78]	0.309***[12.78]
Imp_res					0.108***[3.79]				0.135***[4.08]
BiODA²		-0.017[-0.38]	-0.017[-0.38]	-0.017[-0.38]	-0.017[-0.38]	-0.014[-0.31]	-0.014[-0.31]	-0.014[-0.31]	-0.014[-0.31]
ln_credit	0.224***[7.36]	0.041***[3.47]	0.041***[3.47]	0.041***[3.47]	0.041***[3.47]	0.031*[2]	0.031*[2]	0.031*[2]	0.031*[2]
EXCHA	-0.000009** [-2.15]	-0.000003 [-1.14]	-0.000003 [-1.14]	-0.000003 [-1.14]	-0.000003 [-1.14]	-0.000001 [-0.66]	-0.000001 [-0.66]	-0.000001 [-0.66]	-0.000001 [-0.66]
Infl	-0.0001*** [-20.9]	-0.00005*** [-3.71]	-0.00005*** [-3.71]	-0.00005*** [-3.71]	-0.00005*** [-3.71]	-0.00004** [-2.49]	-0.00004** [-2.49]	-0.00004** [-2.49]	-0.00004** [-2.49]
DEM	-0.073**[-1.71]	-0.020[-0.79]	-0.020[-0.79]	-0.020[-0.79]	-0.020[-0.79]	-0.019[-0.76]	-0.019[-0.76]	-0.019[-0.76]	-0.019[-0.76]
CRISIS97/98	-0.038**[-2.15]	-0.017[-1.47]	-0.017[-1.47]	-0.017[-1.47]	-0.017[-1.47]	-0.010[-0.99]	-0.010[-0.99]	-0.010[-0.99]	-0.010[-0.99]
CRISIS08/09	0.019[1.05]	-0.005[-0.61]	-0.005[-0.61]	-0.005[-0.61]	-0.005[-0.61]	-0.006[-0.79]	-0.006[-0.79]	-0.006[-0.79]	-0.006[-0.79]
C	3.23***[4.56]	-2.156**[-2.42]	5.407***[6.01]	7.467***[27.9]	7.467***[27.9]	-2.297**[-2.46]	4.93***[4.38]	8.036***[8.09]	7.700***[21.52]
Within R^2	0.72	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
No.of count:	11	11	11	11	11	11	11	11	11
Observation	275	275	275	275	275	264	264	264	264

Note: Standard Errors has been clustered at country level to ensure no serial correlation.

T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

Table D4:	LATIN AMERICA Fixed Effect Estimation Results of Multilateral ODA on Per capita GDP								
	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
MulODA	-0.087*[1.87]	0.0126 [1.22]	-0.038***[4.0]	-0.054***[5.61]	-0.050***[4.65]				
MulODA(-1)						-0.007[-2.38]	-0.054***[10]	-0.071***[13.7]	-0.068***[14.2]
ln_Inv	0.006[1.31]	-0.002*[-2.03]				0.0001[0.14]			
ln_Gcon		0.318***[17.8]	0.318***[17.8]			0.297***[11.6]	0.297***[11.62]		
ln_Imp		0.112***[3.91]	0.112***[3.91]	0.112***[3.91]		0.140***[3.8]	0.140***[3.84]	0.140***[3.84]	
Inv_res			-0.002*[-2.03]	-0.002*[-2.03]	-0.002*[-2.03]		0.0001[0.14]	0.0001[0.14]	0.0001[0.14]
Gcon_res				0.318***[17.82]	0.318***[17.8]			0.297***[11.62]	0.297***[11.6]
Imp_res					0.112***[3.91]				0.140***[3.84]
MulODA²		-0.018[-0.43]	-0.018[-0.43]	-0.018[-0.43]	-0.018[-0.43]	-0.020[-0.44]	-0.020[-0.44]	-0.020[-0.44]	-0.020[-0.44]
ln_credit	0.250***[8.4]	0.040***[3.25]	0.040***[3.25]	0.040***[3.25]	0.040***[3.25]	0.032*[1.86]	0.032*[1.86]	0.032*[1.86]	0.032*[1.86]
EXCHA	-0.000005 [-1.10]	-0.000003 [-1.24]	-0.000003 [-1.24]	-0.000003 [-1.24]	-0.000003 [-1.24]	-0.000002 [-0.68]	-0.000002 [-0.68]	-0.000002 [-0.68]	-0.000002 [-0.68]
Infl	-0.0001*** [-20.82]	-0.00005*** [-3.98]	-0.00005*** [-3.98]	-0.00005*** [-3.98]	-0.00005*** [-3.98]	-0.00004** [-2.48]	-0.00004** [-2.48]	-0.00004** [-2.48]	-0.00004** [-2.48]
DEM	-0.061[-1.18]	-0.021[-0.81]	-0.021[-0.81]	-0.021[-0.81]	-0.021[-0.81]	-0.023[-0.91]	-0.023[-0.91]	-0.023[-0.91]	-0.023[-0.91]
CRISIS97/98	-0.032[-1.74]	-0.018[-1.45]	-0.018[-1.45]	-0.018[-1.45]	-0.018[-1.45]	-0.011[-1.13]	-0.011[-1.13]	-0.011[-1.13]	-0.011[-1.13]
CRISIS08/09	0.014[0.85]	-0.005[-0.66]	-0.005[-0.66]	-0.005[-0.66]	-0.005[-0.66]	-0.007[-0.96]	-0.007[-0.96]	-0.007[-0.96]	-0.007[-0.96]
C	2.167***[3.7]	-2.07***[-2.91]	5.366***[6.58]	7.920***[7.93]	7.481***[26.69]	-2.008**[2.4]	4.946***[4.33]	8.154***[8.26]	7.676***[19.3]
Within R²	0.69	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
No.of count:	11	11	11	11	11	11	11	11	11
Observations	275	275	275	275	275	264	264	264	264

Note: Standard Errors has been clustered at country level to ensure no serial correlation.
T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively

Table D5: AFRICA Fixed Effect Estimation Results of Bilateral ODA on Per capita GDP							
	Current Effect				Lag Effect		
	Model 1	Model 2	Model 3	Model 5	Model 6	Model 7	Model 9
BiODA	-0.16[-1.28]	0.001[0.19]	0.001[0.21]	0.0006*[0.94]			
BiODA(-1)					0.004[1.49]	0.004[1.42]	0.0029[0.7]
ln_Inv	0.001*[1.83]	0.0002[0.69]			0.0003***[3.29]		
ln_Gcon		-0.006[-0.12]	-0.006[-0.12]	-0.006[-0.12]	-0.006[-0.13]	-0.006[-0.13]	-0.006[-0.13]
ln_Imp		0.297**[2.73]	0.297**[2.73]		0.282**[0.039]	0.282**[2.46]	
Inv_res			0.0002[0.69]	0.0002[0.69]		0.0003***[3.29]	0.0003***[3.29]
Imp_res				0.297**[2.73]			0.282**[2.46]
BiODA²		0.040[0.7]	0.040[0.7]	0.040[0.7]	0.066[1.02]	0.066[1.02]	0.066[1.02]
ln_credit	0.235***[4.93]	0.106*[2.15]	0.106*[2.15]	0.106*[2.15]	0.0973*[2.1]	0.097*[2.1]	0.097*[2.1]
EXCHA	0.0001[0.89]	0.0004[1.18]	0.0004[1.18]	0.0004[1.18]	0.0005216[1.13]	0.0005[1.13]	0.0005[1.13]
Infl	-0.0002[-0.08]	-0.0005[-0.23]	-0.0005[-0.23]	-0.0005[-0.23]	-0.001[-0.5]	-0.001[-0.5]	-0.001[-0.5]
DEM	-0.029[0.75]	-0.004[-0.16]	-0.004[-0.16]	-0.004[-0.16]	-0.004[-0.13]	-0.004[-0.13]	-0.004[-0.13]
CRISIS97/98	-0.023[-0.74]	-0.029[-1.07]	-0.029[-1.07]	-0.029[-1.07]	-0.033[-1.12]	-0.033[-1.12]	-0.033[-1.12]
CRISIS08/09	0.049[1.61]	0.038[1.55]	0.038[1.55]	0.038[1.55]	0.037[1.4]	0.037[1.4]	0.037[1.4]
C	2.75**[2.34]	-1.88[-1.01]	-2.04[-1.06]	-1.102[-0.46]	-1.95[-1.06]	-2.11[-1.07]	-0.553[-0.21]
Within R^2	0.72	0.82	0.82	0.82	0.82	0.82	0.82
No.of countries	9	9	9	9	9	9	9
Observations	225	225	225	225	216	216	216

Note: Standard Errors has been clustered at country level to ensure no serial correlation.

t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Models 4 and 8 are excluded from the table due to the fact that the BiODA(-1) is not a determinant of the Gcon as a mediator.

Table D6: AFRICA **Fixed Effect Estimation Results of Multilateral ODA on Per capita GDP**				
	Current Effect			
	Model 1	Model 2	Model 4	Model 5
MulODA	-0.004[-0.21]	-0.0007[-0.04]	-0.009[-0.58]	-0.011[-0.62]
ln_Inv	0.0009[0.41]	0.001[0.74]	0.001[0.74]	0.001[0.74]
ln_Gcon		-0.015[0.79]		
ln_Imp		0.290**[2.74]	0.290**[2.74]	
Gcon_res			-0.015[0.79]	-0.015[0.79]
Imp_res				0.290**[2.74]
$MulODA^2$		0.053[0.88]	0.053[0.88]	0.053[0.88]
ln_credit	0.234***[4.65]	0.102**[2.21]	0.102**[2.21]	0.102**[2.21]
EXCHA	0.0002[1.47]	0.0004[1.05]	0.0004[1.05]	0.0004[1.05]
Infl	-0.001[-0.30]	-0.001[-0.55]	-0.001[-0.55]	-0.001[-0.55]
DEM	-0.030[-0.80]	-0.012[-0.37]	-0.012[-0.37]	-0.012[-0.37]
CRISIS97/98	-0.028[-0.77]	-0.029[-1.17]	-0.029[-1.17]	-0.029[-1.17]
CRISIS08/09	0.047[1.52]	0.039[1.74]	0.039[1.74]	0.039[1.74]
C	2.76**[2.22]	-1.726[-0.96]	4.829***[3.52]	6.076***[4.36]
Within R^2	0.71	0.82	0.82	0.82
No.of countries	9	9	9	9
Observations	225	225	225	225

Note: Standard Errors has been clustered at country level to ensure no serial correlation. T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 percent levels, respectively.
Models 3, 6, 7, 8, and 9 are excluded from the table due to the fact that the MulODA is not a determinant of the related mediators

Table D7: LOWER-MIDDLE-INCOME COUNTRIES
Fixed Effect Estimation Results of Bilateral ODA on Per capita GDP

	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
BiODA	-0.025**[-2.36]	-0.012 [-1.16]	-0.022**[-2.38]	-0.027*** [-2.85]	-0.028*** [-3.63]				
BiODA(-1)						-0.002 [-0.69]	-0.010** [-2.53]	-0.015*** [-3.12]	-0.016*** [-4.33]
$BiODA^2$	0.001[1.2]	0.001 [1.09]	0.001[1.09]	0.001[1.09]	0.001[1.09]	0.00002 [0.25]	0.00002 [0.25]	0.00002 [0.25]	0.00002 [0.25]
ln_Inv		0.14*[1.68]				0.147*[1.79]			
ln_Gcon		0.094*[1.98]	0.094*[1.98]			0.098**[2.06]	0.098**[2.06]		
ln_Imp		0.025[0.41]	0.025[0.41]	0.025[0.41]		0.025[0.42]	0.025[0.42]	0.025[0.42]	
Inv_res			0.14[1.68]	0.14[1.68]	0.14[1.68]		0.147*[1.79]	0.147*[1.79]	0.147*[1.79]
Gcon_res				0.094*[1.98]	0.094*[1.98]			0.098**[2.06]	0.098**[2.06]
Imp_res					0.025[0.41]				0.025[0.42]
ln_credit	0.254***[7.42]	0.141***[3.39]	0.141***[3.39]	0.141***[3.39]	0.141***[3.39]	0.141[***[3.21]	0.141[***[3.21]	0.141[***[3.21]	0.141[***[3.21]
EXCHA	0.00002*** [3.26]	0.000002*** [4.3]	0.000002*** [4.3]	0.000002*** [4.3]	0.000002*** [4.3]	0.00002*** [4.45]	0.00002*** [4.45]	0.00002*** [4.45]	0.00002*** [4.45]
Infl	-0.0002[-0.89]	-0.0002[-0.75]	-0.0002[-0.75]	-0.0002[-0.75]	-0.0002[-0.75]	-0.0003[-0.91]	-0.0003[-0.91]	-0.0003[-0.91]	-0.0003[-0.91]
DEM	-0.036[-0.96]	-0.007[-0.26]	-0.007[-0.26]	-0.007[-0.26]	-0.007[-0.26]	-0.002[-0.08]	-0.002[-0.08]	-0.002[-0.08]	-0.002[-0.08]
CRISIS97/98	-0.0524**[-2.1]	-0.032[-1.55]	-0.032[-1.55]	-0.032[-1.55]	-0.032[-1.55]	-0.031[-1.5]	-0.031[-1.5]	-0.031[-1.5]	-0.031[-1.5]
CRISIS08/09	0.034*[1.91]	-0.5895 [-1.86]	-0.5895 [-1.86]	-0.5895 [-1.86]	-0.5895 [-1.86]	0.010[0.6]	0.010[0.6]	0.010[0.6]	0.010[0.6]
C	1.648**[2.07]	-1.75[-1.18]	1.52[1.18]	3.64**[2.2]	4.23***[4.41]	-2.052[-1.46]	1.388[1.11]	3.62**[2.2]	4.21***[4.13]
Within R^2	0.80	0.83	0.83	0.83	0.83	0.84	0.84	0.84	0.84
No.ofcountrie	15	15	15	15	15	15	15	15	15
Observations	375	375	375	375	375	360	360	360	360

Note: Standard Errors has been clustered at country level to ensure no serial correlation.
t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Table D8: LOWER-MIDDLE-INCOME COUNTRIES Fixed Effect Estimation Results of Multilateral ODA on Per capita GDP							
	Current Effect				Lag Effect		
	Model 1	Model 2	Model 4	Model 5	Model 6	Model 8	Model 9
MulODA	-0.0374**[2.29]	-0.0476**[2.08]	-0.055**[-2.55]	-0.058**[-2.5]			
MulODA(-1)					-0.013[-1.38]	-0.020**[-2.42]	-0.021**[-2.54]
$MulODA^2$	0.0039*[1.82]]	-0.005*[1.83]	-0.005*[1.83]	-0.005*[1.83]	-0.001[-0.8]	-0.001[-0.8]	-0.001[-0.8]
ln_Inv		0.15*[1.98]	0.15*[1.98]	0.15*[1.98]	0.153*[2.05]	0.153*[2.05]	0.153*[2.05]
ln_Gcon		0.099**[2.11]			0.099**[2.12]		
ln_Imp		0.029[0.49]	0.029[0.49]		0.023[0.38]	0.023[0.38]	
Gcon_res			0.099**[2.11]	0.099**[2.11]		0.099**[2.12]	0.099**[2.12]
Imp_res				0.029[0.49]			0.023[0.38]
ln_credit	0.265***[7.7]	0.131***[3.33]	0.131***[3.33]	0.131***[3.33]	0.137***[3.3]	0.137***[3.27]	0.137***[3.27]
EXCHA	0.00002*** [3.12]	0.00002*** [4.68]	0.00002*** [4.68]	0.00002*** [4.68]	0.00002*** [4.59]	0.00002*** [4.59]	0.00002*** [4.59]
Infl	0.0002[-0.7]	-0.0001[-0.44]	-0.0001[-0.44]	-0.0001[-0.44]	-0.0002[0.79]	-0.0002[0.79]	-0.0002[0.79]
DEM	-0.0299[-0.77]	-0.007[-0.26]	-0.007[-0.26]	-0.007[-0.26]	-0.004[-016]	-0.004[-016]	-0.004[-016]
CRISIS97/98	-0.0543*[-1.86]	-0.030[-1.34]	-0.030[-1.34]	-0.030[-1.34]	-0.031[-1.44]	-0.031[-1.44]	-0.031[-1.44]
CRISIS08/09	0.031*[1.81]	0.007[0.47]	0.007[0.47]	0.007[0.47]	0.006[0.4]	0.006[0.4]	0.006[0.4]
C	1.36[1.68]	-1.95[-1.54]	0.278[0.21]	0.978[0.59]	-2.028[-1.56]	0.213[0.16]	0.751 [0.47]
Within R^2	0.79	0.83	0.83	0.83	0.83	0.83	0.83
No.of countries	15	15	15	15	15	15	15
Observation	375	375	375	375	360	360	360

Note:Note: Standard Errors has been clustered at country level to ensure no serial correlation. T ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively. Model 3 and 7 are excluded from the table due to the fact that the AID variable is not a determinant of the investment as a mediator.

Table D9: UPPER-MIDDLE-INCOME COUNTRIES Fixed Effect Estimation Results of Bilateral ODA on Per capita GDP								
	Current Effect					Lag Effect		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 8	Model 9
BiODA	-0.0632[-1.21]	-0.0187[-0.51]	-0.0371[-0.97]	-0.0875**[-2.27]	-0.0939**[-2.62]			
BiODA(-1)						-0.0127[-0.69]	-0.0606***[3.16]	-0.0651***[3.60]
BiODA²	0.008[0.94]	0.0012[0.21]	0.0012[0.21]	0.0012[0.21]	0.0012[0.21]	-0.0013[-1.39]	-0.0013[-1.39]	-0.0013[-1.39]
ln_Inv		0.1183*[1.93]				0.1158*[1.86]	0.1158*[1.86]	0.1158*[1.86]
ln_Gcon		0.183***[4.99]	0.183***[4.99]			0.206***[7.56]		
ln_Imp		0.0347[0.46]	0.0347[0.46]	0.0347[0.46]		0.0342[0.47]	0.0342[0.47]	
Inv_res			0.1183*[1.93]	0.1183*[1.93]	0.1183*[1.93]			
Gcon_res				0.183***[4.99]	0.183***[4.99]		0.206***[7.56]	0.206***[7.56]
Imp_res					0.0347[0.46]			0.0342[0.47]
ln_credit	0.3022***[10.9]	0.1627***[3.37]	0.1627***[3.37]	0.1627***[3.37]	0.1627***[3.37]	0.1550***[3.20]	0.1550***[3.20]	0.1550***[3.20]
EXCHA	-0.00002**[1.98]	-00002**[-2.50]	-00002**[-2.50]	-00002**[-2.50]	-00002**[-2.50]	-0.00002***[2.83]	-0.00002***[2.83]	-0.00002***[2.83]
Infl	-0.0001***[17.9]	-0.0001*[-1.97]	-0.0001*[-1.97]	-0.0001*[-1.97]	-0.0001*[-1.97]	-0.0001*[-1.74]	-0.0001*[-1.74]	-0.0001*[-1.74]
DEM	-0.001[-0.04]	0.0299[1.33]	0.0299[1.33]	0.0299[1.33]	0.0299[1.33]	-0.0326[1.52]	-0.0326[1.52]	-0.0326[1.52]
CRISIS97/98	-0.047*[-1.8]	-0.0295*[-1.94]	-0.0295*[-1.94]	-0.0295*[-1.94]	-0.0295*[-1.94]	-0.0279[-1.70]	-0.0279[-1.70]	-0.0279[-1.70]
CRISIS08/09	0.035*[2.02]	0.0151[0.86]	0.0151[0.86]	0.0151[0.86]	0.0151[0.86]	0.0156[0.87]	0.0156[0.87]	0.0156[0.87]
C	1.406**[2.07]	-3.192***[-3.54]	-0.3845[-0.25]	3.869***[3.15]	4.706***[4.01]	-3.484***[-3.86]	1.308[1.17]	2.134[1.11]
Within R²	0.81	0.88	0.88	0.88	0.88	0.89	0.89	0.89
No.of countries	15	15	15	15	15	15	15	15
Observations	375	375	375	375	375	360	360	360

Note: Standard Errors has been clustered at country level to ensure no serial correlation.
t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.
Model 7 is excluded from the table due to the fact that the Lag bilateral ODA is not a determinant of the investment as a mediator.

Table D10: UPPER-MIDDLE-INCOME COUNTRIES Fixed Effect Estimation Results of Multilateral ODA on Per capita GDP									
	Current Effect					Lag Effect			
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7	Model 8	Model 9
MulODA	-0.073[-0.92]	-0.1159[-1.24]	-0.1643[-1.53]	-0.236**[-2.16]	-0.250***[2.64]				
MulODA(-1)						-0.0793**[2.58]	-0.1173***[2.66]	-0.199***[4.60]	-0.208***[5.79]
$MulODA^2$	0.014[0.75]	0.0083[0.33]	0.0083[0.33]	0.0083[0.33]	0.0083[0.33]	-0.0162*[-1.90]	-0.0162*[-1.90]	-0.0162*[-1.90]	-0.0162*[-1.90]
ln_Inv		0.1248**[2.10]				0.1344*[2.04]	0.1344*[2.04]		
ln_Gcon		0.2005***[5.3]	0.2005***[5.3]			0.2287***[8.68]	0.2287***[8.68]	0.2287***[8.68]	
ln_Imp		0.0426[0.57]	0.0426[0.57]	0.0426[0.57]		0.0382[0.50]	0.0382[0.50]	0.0382[0.50]	0.0382[0.50]
Inv_res			0.1248**[2.1]	0.1248**[2.10]	0.1248**[2.10]		-0.0162*[-1.90]	-0.0162*[-1.90]	-0.0162*[-1.90]
Gcon_res				0.200***[5.28]	0.200***[5.28]			0.1344*[2.04]	0.1344*[2.04]
Imp_res					0.0426[0.57]				0.2287***[8.6]
ln_credit	0.3044***[9.38]	0.1269***[3.05]	0.1269***[3.05]	0.1269***[3.05]	0.1269***[3.05]	0.1070**[2.56]	0.1070**[2.56]	0.1070**[2.56]	0.1070**[2.56]
EXCHA	-0.00001 [-1.42]	-0.00002** [-2.46]	-0.00002** [-2.46]	-0.00002** [-2.46]	-0.00002** [-2.46]	-0.00002*** [-2.81]	-0.00002*** [-2.81]	-0.00002*** [-2.81]	-0.00002*** [-2.81]
Infl	-0.0001***[11.2]	-0.00007[-1.67]	-0.00007[1.6]	-0.00007[-1.67]	-0.00007[-1.67]	-0.00008[-1.29]	-0.00008[-1.29]	-0.00008[-1.29]	-0.00008[-1.29]
DEM	0.004[0.09]	0.023[1.11]	0.023[1.11]	0.023[1.11]	0.023[1.11]	0.0219[1.15]	0.0219[1.15]	0.0219[1.15]	0.0219[1.15]
CRISIS97/98	-0.040[-1.36]	-0.014[-1.07]	-0.014[-1.07]	-0.014[-1.07]	-0.014[-1.07]	-0.007[-0.65]	-0.007[-0.65]	-0.007[-0.65]	-0.007[-0.65]
CRISIS08/09	0.0389**[2.14]	0.0239[1.26]	0.0239[1.26]	0.0239[1.26]	0.0239[1.26]	0.0175[-3.71]	0.0175[-3.71]	0.0175[-3.71]	0.0175[-3.71]
C	1.34[1.69]	-3.064***[3.35]	-0.0982[-0.06]	4.55***[2.88]	5.585***[5.52]	-3.36***[-3.71]	-0.170[-0.09]	5.137***[3.09]	6.059***[5.96]
Within R^2	0.81	0.89	0.89	0.89	0.89	0.90	0.90	0.90	0.90
No.of countries	15	15	15	15	15	15	15	15	15
Observations	375	375	375	375	375	360	360	360	360

Note: Standard Errors has been clustered at country level to ensure no serial correlation.

t ratios are in parentheses; significance levels are indicated as ***, ** and * for the 1 per cent, 5 per cent and 10 per cent levels, respectively.

Appendix E

In this appendix, we show the derivative process of the fiscal response model we used in chapter 3 in detail. We assume that the public policy maker maximizes the following quadratic utility function to obtain a maximum benefit for the general public.

$$U = \propto_0 - (\frac{\propto_1}{2})(I_g - I_g^*)^2 - (\frac{\propto_2}{2})(T - T^*)^2 - (\frac{\propto_3}{2})(G_c - G_c^*)^2 - (\frac{\propto_4}{2})(G_s - G_s^*)^2 - (\frac{\propto_5}{2})(B - B^*)^2 \quad \text{A1}$$

where I_g represents public investment expenditure for development purposes; T stands for tax revenues; B represents public borrowing from domestic sources; G_c is for general public services; G_s is socioeconomic expenditure; A_1 denotes bilateral foreign aid and A_2 represents multilateral foreign aid; $\propto \geq 0$; and '*' represents the target level for each variable we have just defined. We maximize the above utility function (A1) subject to the budget constraints given in equations (2) and (3) faced by the public policy maker. Accordingly, the policy maker's feasible region of decision mapping is based upon the following institutional constraints.

$$I_g = B + (1 - p_1)T + (1 - p_2)A_1 + (1 - p_3)A_2 \quad \text{(A2)}$$

$$G_s + G_c = p_1T + p_2A_1 + p_3A_2 \quad \text{(A3)}$$

where $(1 - p_1)$ = the fraction of tax revenues directed to government investment

$(1 - p_2)$ = the fraction of bilateral aid directed to government investment

$(1 - p_3)$ = the fraction of multilateral aid directed to government investment

Then, we form the following Lagrangian by maximizing the utility function (A1) of the public policy maker subject to the budget constraints (A2) and (A3).

$$\text{Max L} = \propto_0 - (\frac{\propto_1}{2})(I_g - I_g^*)^2 - (\frac{\propto_2}{2})(T - T^*)^2 - (\frac{\propto_3}{2})(G_c - G_c^*)^2 - (\frac{\propto_4}{2})(G_s - G_s^*)^2 - (\frac{\propto_5}{2})(B - B^*)^2 + \lambda_1\{I_g - B - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2\} + \lambda_2\{G_s + G_c - p_1T - p_2A_1 - p_3A_2\} \quad \text{(A4)}$$

The Lagrangian multiplier yields the following first-order conditions (FOC):

$$\partial L/\partial I_g = -\propto_1 (I_g - I_g^*) + \lambda_1 = 0 \quad \text{(A5)}$$

$$\partial L/\partial G_c = -\propto_3 (G_C - G_C^*) + \lambda_2 = 0 \quad \text{(A6)}$$

$$\partial L/\partial G_s = -\propto_4 (G_s - G_s^*) + \lambda_2 = 0 \quad \text{(A7)}$$

$$\partial L/\partial T = -\propto_2 (T - T^*) - \lambda_1(1 - p_1) - \lambda_2 p_1 = 0 \quad \text{(A8)}$$

$$\partial L/_{\partial B} = -\propto_5 (B - B^*) - \lambda_1 = 0 \quad \text{(A9)}$$

$$\partial L/_{\partial \lambda_1} = I_g - B - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2 = 0 \quad \text{(A10)}$$

$$\partial L/_{\partial \lambda_2} = G_s + G_c - p_1 T - p_2 A_1 - p_3 A_2 = 0 \quad \text{(A11)}$$

Then, by solving equations (A5) – (A11), we derived the following set of structural equations.

The derivation of G_s

From (A7), we obtain

$-\propto_4 (G_s - G_s^*) + \lambda_2 = 0$

$-\propto_4 G_s + \propto_4 G_s^* + \lambda_2 = 0$

$\propto_4 G_s = \propto_4 G_s^* + \lambda_2$

Then, λ_2 can be derived from (A6)

$-\propto_3 (G_C - G_C^*) + \lambda_2 = 0 \lambda_2 = \propto_3 (G_C - G_C^*)$

We obtain Gc from equation (A11).

$G_s + G_c - p_1 T - p_2 A_1 - p_3 A_2 = 0$

$G_c = p_1 T + p_2 A_1 + p_3 A_2 - G_s$

Substituting the previous equation, we obtain

$\propto_4 G_s = \propto_4 G_s^* + \lambda_2$

$\propto_4 G_s = \propto_4 G_s^* + \propto_3 (G_C - G_C^*)$

$\propto_4 G_s = \propto_4 G_s^* + \propto_3 (p_1 T + p_2 A_1 + p_3 A_2 - G_s) - \propto_3 G_C^*$

$\propto_4 G_s = \propto_4 G_s^* + \propto_3 (p_1 T + p_2 A_1 + p_3 A_2) - \propto_3 G_s - \propto_3 G_C^*$

$\propto_4 G_s + \propto_3 G_s = \propto_4 G_s^* + \propto_3 (p_1 T + p_2 A_1 + p_3 A_2) - \propto_3 G_C^*$

$$G_s = \frac{\propto_4}{\propto_4 + \propto_3} G_s^* - \frac{1 - \propto_4}{\propto_4 + \propto_3} G_C^* + \frac{1 - \propto_4}{\propto_4 + \propto_3} p_1 T + \frac{1 - \propto_4}{\propto_4 + \propto_3} p_2 A_1 + \frac{1 - \propto_4}{\propto_4 + \propto_3} p_3 A_2 \quad \text{(A12)}$$

The derivation of G_c

From (A6), we obtain

$-\propto_3 (G_c - G_c^*) + \lambda_2 = 0$

$-\propto_3 G_c + \propto_3 G_c^* + \lambda_2 = 0$

$\propto_3 G_c = \propto_3 G_c^* + \lambda_2$

λ_2 can be derived from (A7) $\quad -\propto_4 (G_s - G_s^*) + \lambda_2 = 0$

$\lambda_2 = \propto_4 (G_s - G_s^*)$

We obtain Gs from equation (A11).

$G_s = p_1T + p_2A_1 + p_3A_2 - G_c$

Substituting the previous equation, we obtain

$\propto_3 G_c = \propto_3 G_c^* + \lambda_2$

$\propto_3 G_c = \propto_3 G_c^* + \propto_4 (G_s - G_s^*)$

$\propto_3 G_c = \propto_3 G_c^* + \propto_4 (p_1T + p_2A_1 + p_3A_2 - G_c) - \propto_4 G_s^*$

$\propto_3 G_c = \propto_3 G_c^* + \propto_4 (p_1T + p_2A_1 + p_3A_2) - \propto_4 G_c - \propto_4 G_s^*$

$\propto_3 G_c + \propto_4 G_c = \propto_3 G_c^* + \propto_4 (p_1T + p_2A_1 + p_3A_2) - \propto_4 G_s^*$

$G_c = \frac{1-\propto_4}{\propto_4+\propto_3} G_c^* - \frac{\propto_4}{\propto_4+\propto_3} G_s^* + \frac{\propto_4}{\propto_4+\propto_3} p_1T + \frac{\propto_4}{\propto_4+\propto_3} p_2A_1 + \frac{\propto_4}{\propto_4+\propto_3} p_3A_2$ (A13)

The derivation of *T* from (A8) yields

$-\propto_2 (T - T^*) - \lambda_1(1 - p_1) - \lambda_2 p_1 = 0$

λ_2 can be derived from (A6)

$\lambda_2 = \propto_3 (G_c - G_c^*)$

λ_1 can be derived from (A9) *under the assumption of B* = 0,*

$-\propto_5 (B - B^*) - \lambda_1 = 0$

$\lambda_1 = -\propto_5 B$

B can be derived from (A10)

$I_g - B - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2 = 0$

$B = I_g - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2$

Then, we can rewrite equation (A8) as follows:

$-\propto_2 (T - T^*) - \{-\propto_5 [I_g - (1 - p_1)T - (1 - p_2)A_1 - (1 - p_3)A_2]\}(1 - p_1)$
$-\propto_3 (G_c - G_c^*)p_1 = 0$

$-\propto_2 T + \propto_2 T^* - \propto_5 (1 - p_1)^2 T + \propto_5 [I_g - (1 - p_2)A_1 - (1 - p_3)A_2](1 - p_1)$
$- p_1[\propto_3 (G_c - G_c^*)] = 0$

$\propto_2 T + \propto_5 (1 - p_1)^2 T = \propto_2 T^* + \propto_5 \left[I_g - (1 - p_2) - (1 - p_3)A_2\right](1 -$
$p_1) + \propto_3 p_1(G_c^* - G_c)$

$T = \frac{\propto_3 p_1(G_c^* - G_c)}{\propto_2 + \propto_5 (1-p_1)^2} + \frac{\propto_2 T^*}{\propto_2 + \propto_5 (1-p_1)^2} + \frac{\propto_5 (1-p_1)[I_g - (1-p_2)A_1 - (1-p_3)A_2]}{\propto_2 + \propto_5 (1-p_1)^2}$ (A14)

The derivation of I_g

From (A5), we obtain

$-\propto_1 \left(I_g - I_g^*\right) + \lambda_1 = 0$

$\propto_1 I_g = \propto_1 I_g^* + \lambda_1$

λ_1 can be derived from (A9) under the assumption of B* = 0:

$\lambda_1 = -\propto_5 B$

B can be derived from (A10)

$I_g - B - (1-p_1)T - (1-p_2)A_1 - (1-p_3)A_2 = 0$

$B = I_g - (1-p_1)T - (1-p_2)A_1 - (1-p_3)A_2$

Substituting equation (A5) and then rewriting, we have

$\propto_1 I_g = \propto_1 I_g^* - \propto_5 [I_g - (1-p_1)T - (1-p_2)A_1 - (1-p_3)A_2]$

$\propto_1 I_g = \propto_1 I_g^* - \propto_5 I_g + \propto_5 [(1-p_1)T + (1-p_2)A_1 + (1-p_3)A_2]$

$\propto_1 I_g + \propto_5 I_g = \propto_1 I_g^* + \propto_5 [(1-p_1)T + (1-p_2)A_1 + (1-p_3)A_2]$

$I_g = 1 - \frac{\propto_5}{\propto_1+\propto_5} I_g^* + \frac{\propto_5}{\propto_1+\propto_5}[(1-p_1)T + (1-p_2)A_1 + (1-p_3)A_2]$ (A15)

We let

$\beta_1 = \propto_4/(\propto_4+\propto_3)$ $\beta_2 = \propto_2/[\propto_2+\propto_5 (1-p_1)^2]$

$\beta_3 = \propto_3/[\propto_2+\propto_5 (1-p_1)^2]$ $\beta_4 = \propto_5/[\propto_2+\propto_5 (1-p_1)^2]$

$\beta_5 = \propto_5/(\propto_1+\propto_5)$

We simplify the above structural equations as follows:

$G_s = \beta_1 G_s^* - (1-\beta_1)G_C^* + (1-\beta_1)p_1 T + (1-\beta_1)p_2 A_1 + (1-\beta_1)p_3 A_2$ (A16)

$G_c = (1-\beta_1)G_c^* - \beta_1 G_s^* + \beta_1 p_1 T + \beta_1 p_2 A_1 + \beta_1 p_3 A_2$ (A17)

$T = \beta_3 p_1 (G_c^* - G_c) + \beta_2 T^* + \beta_4 (1-p_1)\left[I_g - (1-p_2)A_1 - (1-p_3)A_2\right]$ (A18)

$I_g = (1-\beta_5) I_g^* + \beta_5 [(1-p_1)T + (1-p_2)A_1 + (1-p_3)A_2]$ (A19)

Appendix F

Here, we describe the 3SLS estimation procedure that we employed in the fiscal response model. If endogenous variables appear in the system of equations, it is necessary to combine the instrumental variable method of 2SLS with the SUR estimation procedure to obtain the best efficiency by taking into account the endogeneity problem and correlation of error between various equations.

Consider a general linear model containing G jointly dependent endogenous variables with K predetermined variables, where the i^{th} equation is

$$y_i = Y_i \beta_i + X_i \gamma_i + \mu_i \quad \text{(B1)}$$

where y_i is an n x1 vector of sample observations on the dependent variable in the i^{th} equation, Y_i is an n xg matrix of observations on the other endogenous variables in the equation, and X_i is an n x k matrix of predetermined variables included in the i^{th} equation. μ_i is an n x 1 vector of disturbances satisfying E(μ_i)= 0, Cov(X_i/μ_i) = 0, Cov(Y_i/μ_i) $\neq$ 0 and E($\mu_i \mu_j'$) = σ_{ii}I

Then, find the instrumental variable called P_i that are correlated with Y_i and derive the linear-form equations for all g endogenous variables.

$$Y_i = \pi_0 + Z_i \pi_i + e_i \quad \text{(B2)}$$

where Z_i = [P_i, X_i], E (e_i)= 0, Cov (P_i/μ_i) = 0,

Estimate fitted values [$\hat{Y}_i$] of each endogenous variable by using the OLS estimator

$$\hat{\pi}_i = [(Z'Z)^{-1}Z'XY_i] \quad \text{(B3)}$$

$$\hat{Y}_i = Z[(Z'Z)^{-1}Z'Y_i] \quad \text{(B4)}$$

Use the fitted values [$\hat{Y}_i$] and place them on endogenous regressions of the structural equation.

$$y_i = \hat{Y}_i\beta_i + X_i \gamma_i + \mu_i \quad \text{(B5)}$$

Say simply $y_i = \hat{Z}_i\delta_i + \mu_i$ (B6)

where $\hat{Z}_i$ = [$\hat{Y}_i, X_i$], $\delta_i = \begin{pmatrix}\beta_i \\ \gamma_i\end{pmatrix}$

Estimate the δ_i of structural equations by using OLS

The $\hat{\delta}_{2SLS} = [(\hat{Z}_i'\hat{Z}_i)^{-1}\hat{Z}_i y_i]$ (B7)

$$\hat{y}_i = \hat{Z}[(\hat{Z}_i'\hat{Z}_i)^{-1}\hat{Z}_i y_i] \quad \text{(B8)}$$

However, the limited-information method focuses on a single equation. Hence, simultaneous correlations between various equations' error terms are ignored. Therefore, we obtain the residual vector of the 2SLS estimator of δ_i

$$\hat{\mu}_i = \hat{y}_i - Z_i\hat{\delta}_i \qquad (i= 1\ldots.g) \qquad (B9)$$

Estimate the system of equations jointly in the SUR model using the GSL estimator. A collection of the full system of *G* structural equations together is given as follows:

$$\begin{bmatrix}\hat{y}_1\\ \hat{y}_2\\ \\ \hat{y}_g\end{bmatrix} = \begin{bmatrix}\hat{Z}_1 & \cdots & 0\\ & & \\ \vdots & \ddots & \vdots\\ 0 & \cdots & \hat{Z}_G\end{bmatrix}\begin{bmatrix}\delta_1\\ \delta_2\\ \\ \delta_g\end{bmatrix}+\begin{bmatrix}\hat{\mu}_1\\ \hat{\mu}_2\\ \\ \hat{\mu}_g\end{bmatrix} \qquad (B10)$$

Or more compactly,

$$\hat{y}_i = \hat{Z}_i\delta_i + \hat{\mu}_i \qquad (B11)$$

The variance matrix for the vector $\hat{\mu}$ is

$$E(\hat{\mu}\hat{\mu}') = \begin{bmatrix}\sigma_{11}I & \cdots & \sigma_{1G}I\\ & & \\ \vdots & \ddots & \vdots\\ \sigma_{G1}I & \cdots & \sigma_{GG}I\end{bmatrix} = \sum \otimes I \qquad (B12)$$

[Our basic assumptions are as follows: each structural equation has a homoscedastic non-auto correlated error term; **the disturbances in different structural equations may be contemporaneously correlated. That is, the error terms from the i^{th} and j^{th}equations are correlated.** Accordingly, if all var=0, the error terms from the i^{th} and j^{th}equations are not correlated. Therefore, there is no need for stage 3].

Provided that at least some of the σ_{ii} are nonzero, then the SUR model provides a natural candidate for the 3SLS estimator:

$$\delta_{3SLS} = [\hat{Z}'(\sum \otimes I)^{-1}\hat{Z}]^{-1}\hat{Z}(\sum \otimes I)^{-1})\hat{y} \qquad (B13)$$

Appendix G

Table G1 : Summery Statistics									
	A1	A2	Ig	Gs	Gc	T	B	GDP	POP
Mean	25.84	65.61	169.84	209.47	295.45	384.41	129.37	2858.4	16900000
Median	28.04	52.52	159.49	170.04	247.40	343.32	100.04	1820	16825000
Maximum	72.31	272.00	437.59	582.56	812.89	1110.7	468.11	10084.6	22200000
Minimum	-0.32	-1.86	30.34	77.20	42.49	100.84	16.08	500.5	10400000
Std. Dev.	18.78	64.37	110.67	124.49	213.35	255.25	104.22	2551.8	3654690
Obs:	55	55	55	55	55	55	55	55	55

Table G2: Corelation matrix									
	A1	A2	Ig	Gs	Gc	T	B	GDP	POP
A1	1								
A2	0.4124	1							
Ig	0.5386	0.8681	1						
Gs	0.53	0.8022	0.8465	1					
Gc	0.6084	0.7671	0.8625	0.965	1				
T	0.5707	0.8221	0.8786	0.9835	0.9843	1			
B	0.4346	0.4939	0.7254	0.828	0.8583	0.8105	1		
GDP	0.4854	0.8325	0.8733	0.967	0.9605	0.9816	0.7864	1	
POP	0.7274	0.6068	0.7776	0.8549	0.9249	0.8747	0.8402	0.8162	1

Table G3: ADF Test Results for Existence of Unitroot						
	I(0)				I(1)	
	Without trend		With trend		Without trend	
A1	-2.868	0.0493			-10.297	0.000
A2	-1.798	0.3815	-3.255	0.74	-11.922	0.000
Ig	-0.722	0.8409	-2.346	0.408	-9.581	0.000
Gs	0.841	0.9923	-1.415	0.856	-6.956	0.000
Gc	1.94	0.9986	-1.122	0.925	-7.718	0.000
T	2.891	1.00	0.462	0.9968	-6.740	0.000
B	-2.600	0.093	-5.922	0.000	-11.86	0.000
GDP	8.721	1.00	3.693	1.000	-3.566	0.000
pop	-1.65	0.457	-0.824	0.9636	-7.14	0.000

Table G4: 3SLS estimation results based on 1st difference data		
Parameter	Coefficient	t-Statistic
p1	1.02***	7.419398
p2	0.53**	2.061185
p3	0.45***	6.299744
b1	0.58***	10.27861
b2	0.49***	3.638205
b3	-0.74***	-3.432102
b4	-4.20*	-0.147722
b5	-0.75**	-2.053144
observations	55	
no of iterations	16	

TABLE H1. RANDOM EFFECT DIFFERENCE-IN-DIFFERENCE ESTIMATION OUTPUT (2005–2018).						
	RGDP	**Ind**	**Unemp: rate**	**SME$_P$**	**SME$_{D\ 2012}$**	**SME$_{D\ 2014}$**
Time_d	87,753 (1.27)	22,585 (0.69)	–0.48 *(–1.78)	–143 (–1.21)	7.58 * (1.62)	8.77 *** (3.45)
EW_d	–321,018 ***(–3.86)	–130,675***(–3.36)	2.39 ***(2.37)	–354 *** (–2.50)	131.4 * (1.67)	217.4 ***(4.09)
EW_D$_{g(2012–2018)}$	574,939 *** (6.20)	218148***(4.73)	–0.77 (–1.21)	444 *** (2.85)	85 *** (8.94)	
EW_D$_{g(2014–2018)}$						35.1*** (5.26)
Pop_den					0.49***(14.7)	
Pop	0.18 *** (4.41)	0.05 * (1.77)	–0.000(–0.52)	0.0007***(20.05)		0.0003***(12.3)
Agri		–0.64(–1.17)				
Wage rate	563 *** (7.69)	162.3 *** (3.46)		0.15 (1.26)		
SME	608 *** (11.52)	209.7 *** (6.25)				
Bank_den	–962 (–0.91)	–718 (–1.34)		4.75 *** (2.65)	1.05 ** (0.21)	–0.155 (–59)
Uni_qualified	2575 (0.80)	1194.6 (0.76)	–0.04 **(1.91)			
Teacher					0.0031*(1.65)	–0.002 **(1.52)
F_emp					0.001* (1.84)	0.0001 (1.09)
E_sale_ind			-0.00093(0.76)			
M_ind	14,946 *(1.80)			15.59 (1.07)		
Transport		1.10 (0.74)				
Constant	–751,668**(–3.37)	–203,392 ** (–1.93)	8.22 ***(5.12)	–1464 *** (–9.30)	–146***(4.2)	–181.6 ***(6.86)
R^2	0.96	0.92	0.0.23	0.87	0.94	0.76
Groups	9	9	9	9	18	17
Obs:	125	126	126	12	252	238

The *z* ratios are in parentheses; significance levels are indicated as ***, **, and * for the 1%, 5%, and 10% levels, respectively.

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