

**Foreign Aid Effectiveness:
What Type of Spending Matters for What Outcome**

BY

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THESIS

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This thesis is dedicated to my parents, Tsendmaa and Batbold, who taught me that the most important investment in yourself is an education, my husband, Dino, who has been truly supportive, and my children, Emmanuele, Adriana, and Ariana, who gave me the strength, motivation and frequent quality check on my work.

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LIST OF ABBREVIATIONS

CRS	Creditor Reporting System from OECD, DAC
DAC	OECD, Development Assistance Committee (DAC)
FE	Fixed Effects
GDP	Gross Domestic Product
GMM	Generalized Method of Moments
ODA	Net Official Development Assistance
OECD	Organization of Economic Cooperation and Development
OLS	Ordinary Least Squares
OOF	Net Other Official Flows
PRI	Net Total Private Flows
PWT	Penn World Table
WDI	World Development Indicators
WGI	World Governance Indicators

SUMMARY

The effectiveness of foreign aid measured by Official Development Assistance has been a controversial issue since 1960s. In this thesis, I disaggregated the components of the total net ODA, focusing on foreign aid for the health, education, economic infrastructure and production sector, and government and civil society using data from 110 countries between 1995 and 2014. Furthermore, I disaggregate health, education, economic and government aid data into grants and net loans allowing the effect of each component to differ.

I find that an annual health grant of one percent of GDP decreases infant mortality by over 3% and increases life expectancy by approximately 2% over the five years but found no significant effect of health loan on health outcomes. This may be due to the reason that about 85% of the average health aid (averaged over 1995-2014 for all countries in the sample) is health grant and the remaining 15% is health loan. However, the positive effect of health aid on life expectancy does not imply a positive relationship of health aid and GDP per capita since I find that 1% increase in life expectancy is associated with approximately 0.9% increase in population considering the general equilibrium approach. Moreover, the average health aid is considerably large compare to their governments' average public health expenditure (including borrowings and grants from international source) for some countries in South of Sahara region, raising a concern for aid dependency.

The results for education outcome suggest that an annual education grant of one percent of GDP is associated with 7% increase in years of schooling over the five years but found no significant effect of education loan on education outcome. However, I find negative relationship of economic aid and investment while positive relationship of aid for government, civil society and rule of law is detected.

1. INTRODUCTION

Official Development Assistance flows are intended to help the less-developed countries. Temple (2010) notes that the goals of aid have varied over time and summarizes the main focus of aid: productivity and infrastructure in the 1960s; agriculture and basic needs in the 1970s; macroeconomic reform and growth in the 1980s; poverty alleviation, governance and investment climate in the 1990s; and Millennium Development Goals, governance and health in the 2000s; and Sustainable Development Goals in the 2010s. OECD, DAC (2014) reports that the net Official Development Assistance (ODA) flows from DAC member countries were USD 137.2 billion. But, after five decades of foreign aid to reduce poverty and promote growth, World Bank (2016) reports that in 2012, an estimated 900 million people were living on less than \$1.90 a day, mostly concentrated in Sub-Saharan Africa and South Asia.

According to Temple (2010), while most people agree on the goals, there are different views on whether we have knowledge and means to achieve them. Thus, the question is: does aid work? Cohen (2006) provides an example and suggests that even well-intentioned actions have consequences that are difficult to predict. The French colonialists used DDT to combat malaria and typhoid, and built a road to address the region's isolation in a mountain village of Algeria under colonial rule. But, the unintended results were: population explosion, more intensive farming, and deterioration in the land needed to support the villagers' livestock. Due to these consequences, some people were in poverty, others were rich and inequality increased. Since these effects are irreversible, whether aid is the right solution remains questionable. On the contrary, Sachs (2005) provides a number of successful aid examples: "the eradication of smallpox, the drive to eradicate polio, the control of African river blindness, the targeted science of the Green Revolution in agriculture, the estimated 12 million lives that were saved by

UNICEF's The Campaign for Child Survival in the 1980s". These examples show that there are cases where aid served its purpose. Therefore, whether foreign aid works as it was intended is still in controversy.

A number of studies in the literature analyze the direct effect of foreign aid on growth. However, the endogeneity problem of aid and growth is widely known when Ordinary Least Squares (OLS) is used on cross-sectional data since the negative shocks to growth may induce more aid inflows indicating reverse causality. Another approach emphasizes the possibility that foreign aid may affect economic growth through indirect channels which may not be captured directly such as investment, human capital and other indicators. However, most of the earlier studies use total net official development assistance as an aid variable, but not all aid are given for the same purpose. Thus, recent studies have started using available disaggregated sector level aid data to estimate the aid effectiveness.

The goal of this thesis is to contribute to the empirical side of foreign aid effectiveness in a comprehensive manner. The main research questions are: 1) Does aid help the recipient countries in terms of contributing to the decrease in infant mortality, increase in life expectancy, increase in years of schooling, increase in investment to GDP ratio and improvement of the rule of law? 2) Does the effect of aid differ considering total aid vs sector specific aid? 3) Does the effect of aid differ considering grant vs loan? To answer these questions, the relationships of foreign aid and each of the variables: infant mortality, life expectancy, years of schooling, investment and rule of law are estimated individually using the aid disbursement for each sector. Moreover, grant and net loan are considered separately for each sector aid rather than using the sum which imposes the restriction of grant and net loan having same effect. The endogeneity problem also can arise when estimating the effect of aid on these other variables. While number

of studies use instrumental variable approach to address the endogeneity issue, potential problems can arise if instruments are correlated with error term or if the selected instrument is a “weak” instrument. Since the variables are only available annually and not quarterly, there are not sufficient observations to estimate time series models. Therefore, model specification similar to Boone (1996) with additional control variables, OLS and Fixed Effects estimation are used on data for 1995-2014.

I find that an annual health grant of one percent of GDP decreases infant mortality by over 3% and increases life expectancy by approximately 2% over the five years but found no significant effect of health loan on health outcomes. In addition, the results suggest statistically significant relationship of health outcomes and health aid directed toward population policies and reproductive health. The results for education outcome suggest that an annual education grant of one percent of GDP is associated with 7% increase in years of schooling over the five years but found no significant effect of education loan on education outcome. However, Fixed Effects estimation results suggest negative relationship of economic aid and investment to GDP ratio while positive relationship of government aid and rule of law is detected. Chapter 2 provides literature overview, Chapter 3 includes considerations related to institutions and Chapter 4 discusses the model specification. Chapter 5 addresses the data and Chapter 6 shows the main empirical results and findings. Chapter 7 provides policy implications while Chapter 8 concludes the thesis.

2. LITERATURE OVERVIEW

Generally, the studies in the literature have different results suggesting i) aid has positive effect ii) aid has no effect iii) aid has negative effect on the variables of interest. Next, the literature is summarized aid & growth, and aid & other variables.

2.1 Aid and growth

First, there are a number of known theoretical limitations related to the effect of aid on growth. For example, according to Easterly (2003):

The empirical literature on the connections between aid and economic growth has been hampered by the lack of a clear theoretical model by which aid would influence growth and which could pin down the empirical specification of the aid-growth relationship. (p. 30)

Easterly (2003) notes that for many years, the "two-gap" model of Chenery and Strout (1966) was used as the standard model where “the first gap is between the amount of investment necessary to attain a certain rate of growth and the available domestic saving, while the second gap is the one between import requirements for a given level of production and foreign exchange earnings” (p. 30). Easterly (2003) provides the “financing gap approach:

$$(2.1) \quad g = \frac{I/Y}{\mu}$$

$$(2.2) \quad I/Y = A/Y + S/Y$$

where I is required investment, Y is output, g is target GDP growth, A is aid, S is domestic saving and μ is incremental capital-output ratio (ICOR) ranging from 2 to 5. High ICOR indicates poor quality of investment” (p. 31). This approach makes two key assumptions i) stable and linear relationship of investment and growth over the short to medium run ii) aid will finance investment instead of consumption.

However, Easterly (2003) results show that only 6 out of 88 countries indicates positive and significant effect of aid on investment while only 4 countries indicates positive relationship between growth and investment using the “financing gap” model specification. Since only Tunisia passed both tests out of 88 countries in the sample, Easterly (2003) concludes that this model is questionable both theoretically and empirically and “yet no other model of aid and growth has arisen to take its place”.

Also, Temple (2010) notes that “aid transfers have been treated as if dropped from a helicopter, as in Milton Friedman’s thought experiment about an exogenous shock to the money supply” and suggests that “a better model of aid would need to assign stronger roles to the main actors-governments, households, and firms since it will be their decisions and capacities that ultimately determine the effects of aid” (p. 4436). Another problem is that it is never clarified why investment is too low in the first place, which relates to the important criticism suggested by Friedman (1958) and Bauer (1969). Friedman (1958) and Bauer (1969) argue that if the conditions for development are present in a country then the country will grow without foreign aid. This issue is further discussed in detail in Chapter 3. While these theoretical issues are known, a number of empirical studies have been done using various model specifications and different estimation methods.

Second, a brief summary of empirical results in the aid and growth literature is provided. One of the influential papers in the aid literature is Burnside and Dollar (2000). Burnside and Dollar (2000) conclude that “aid has a positive effect on growth in the recipient countries with good fiscal, monetary, and trade policies but has little effect in countries with poor policies”. They formed policy index variable using the budget surplus, inflation and openness values and the estimated coefficients of these variables using OLS and Two-Stage Least Squares. Karras

(2006) finds a positive, permanent and statistically significant effect of aid on growth without conditioning the policy environment. Unlike the cross-sectional approach, Karras (2006) utilizes the time dimension of the data and estimated dynamic time-series model. Karras (2006) concludes that “raising aid by \$20 per person of the recipient country permanently increase the growth rate of real GDP per capita by approximately 0.16% while permanent 1% increase in ODA/GDP permanently increase growth rate by 0.14% to 0.26%”. Rajan and Subramanian (2008) conclude that aid has no effect on growth “after correcting for the possible bias that poorer growth may draw more aid to the recipient countries” using instrumental variable approach. This conclusion holds across time horizons, time periods, cross-section context, panel context and types of aid. Also, Rajan and Subramanian (2008) find no evidence that aid works better in better policy or geographical environments.

2.2 Aid and other variables

Boone (1996) finds that aid does not significantly increase investment, but it does increase the size of government using OLS and Instrumental Variable estimation. Boone (1996) used decade-averaged panel data for period 1971-1990. Hansen and Tarp (2000) provide a survey of 131 empirical analysis that use cross-country regressions and find “a reasonably consistent pattern: i) aid increases aggregate saving, although not by as much as the aid flow, ii) aid increases investment, and iii) aid has positive effect on the growth rate whenever growth is driven by capital accumulation”.

Another approach is that aid can ultimately have positive effect through the immediate humanitarian goals, such as better health and education. For example, Temple (2010) notes that when aid is spent on anti-malaria bed nets, medicines, or cleaner water supplies, it may have

benefits for living standards that are not captured in GDP, or that are reflected in higher productivity only many years later. Boone (1996) finds that ODA/GNP does not benefit the poor as measured by improvements in log difference of life expectancy or log difference of infant mortality using OLS and IV estimation on decade-averaged panel data for period 1971-1990. However, Mishra and Newhouse (2009) find that “health aid has a statistically significant effect on infant mortality: doubling per capita health aid is associated with a 2 percent reduction in the infant mortality rate (increasing per capita health aid by US\$1.60 per year is associated with 1.5 fewer infant deaths per thousand births)” using OLS and GMM estimation. Mishra and Newhouse (2009) notes that while the foreign aid literature is extensive, to their knowledge there were not any macro study on how health aid affects health outcomes and their study is the first one to study the effect of health aid. Moreover, Mishra and Newhouse (2009) find some evidence that health aid was more effective after 1990 and in countries that have better policies and institutions.

Boone (1996) finds no effect of ODA/GNP on log difference of primary schooling (% of eligible age children in primary school). Birchler and Michaelowa (2016) find that increase in education aid has significant contribution to the increase in primary school enrollment, using the education aid disbursements data for 1996-2010, GMM and Fixed Effects estimation. Birchler and Michaelowa (2016) note that the effect of aid for education facilities and training is the most robust. Dreher, Nunnenkamp, and Thiele (2008) find that “higher per capita aid for education significantly increases primary school enrollment while increased domestic government spending on education does not” using Fixed effects, GMM and Two-Stage Least Squares estimation on 100 countries’ data over 1970-2004.

3. INSTITUTIONS, ECONOMIC DEVELOPMENT AND AID

3.1 The fundamental determinant of growth

While this thesis focuses on the effectiveness of foreign aid, the more fundamental question is that why some countries are much poorer than others so that they receive foreign aid to reduce poverty and promote growth?

Acemoglu et al., (2005) argue that while traditional neoclassical growth models “explain differences in income per capita in terms of different paths of factor accumulation” and these models has provided many intuitions and understandings of “mechanics of economic growth” (proximate determinants), they did not provide a fundamental explanation of the deeper causes (fundamental determinants) for economic growth. Following North & Thomas (1973), Acemoglu et al., (2005) suggest that whether a country grows or not, depends on the country’s economic institutions. North and Thomas (1973) states:

Efficient economic organization is the key to growth; the development of an efficient economic organization in Western Europe accounts for the rise of the West. Efficient organization entails the establishment of institutional arrangements and property rights that create an incentive to channel individual economic effort into activities that bring the private rate of return close to the social rate of return. True economic growth implies that the total income of society must increase more rapidly than population. If a society does not grow it is because no incentives are provided for economic initiative. The factors we have listed (innovation, economies of scale, education, capital accumulation, etc.) are not causes of growth; they are growth. Growth will simply not occur unless the existing economic organization is efficient. (p. 1-2)

Acemoglu et al., (2005) provide an empirical evidence showing that the countries with more secure property rights have higher income per capita. But, this evidence could be due the reverse causation or omitted variable. Therefore, Acemoglu et al., (2005) consider North and South Korea split as a "natural experiment" in institutional change since North and South Korea shared exceptionally identical economic, geographic, cultural, linguistic and ethnic characteristics

before the split. Acemoglu et al., (2005) note that the North Korea is better endowed in terms of natural resources, had the largest port on the Sea of Japan and also had advantage in significant industrialization (“large Japanese zaibatsu of Noguchi which accounted for one third of Japanese investment in Korea, was mostly concentrated in North”) compare to South Korea during the colonial period. North and South Korea had approximately the same income per capita at the time of separation. However, by 2014 the level of GDP per capita in North Korea was only \$1,800 while it was \$36,300 in South Korea (CIA World Factbook). While this is only one, extreme case of the difference between a market-oriented economy and a communist one, Acemoglu et al., (2005) conclude that “their very different institutions led to divergent economic outcomes”.

3.2 Acemoglu, Johnson and Robinson’s theory of institutions

Using North & Thomas’s view and a series of historical examples, Acemoglu et al., (2005) proposed the outlines of a theory of institutions focusing on the complex and dynamic relationship of economic institution, political institution and distribution of resources. The outline of their theory including the extension proposed by this thesis is illustrated by Figure 1 in Section 3.7. Acemoglu et al., (2005) state that the economic institutions are endogenous since the different groups in the society will prefer different economic institutions which will lead to different distributions of resources and the group that has more political power at the moment sets the economic institutions which they prefer. Moreover, the political institutions are also endogenous in their framework and there are two components of political power, *de jure* (institutional political power such as democracy, dictatorship or autocracy) and *de facto* political power (a group of individuals who can revolt, use arms and mercenaries, co-opt the military, or

use peaceful protests to express their demand and influence). According to Acemoglu et al., (2005) de jure political power will prefer to “maintain the political institutions that give them political power” and occasionally “de facto political power creates changes in political institutions” if they solve its collective action problem and if they have enough economic resources.

Why the groups with conflicting interests do not agree to set economic institutions which maximizes the aggregate growth? Acemoglu et al., (2005) suggests that this is because there are commitment problems inherent in the use of political power since “different institutions are associated with different distributions of political power, and there is no outside impartial third party with the will and the power to enforce agreements between two parties”.

According to the social conflict view, economic and political institutions are chosen by the groups that have political power at the time and they will choose policies that will maximize their own rents rather than benefiting the whole society. This explains how inefficient institutions can arise and persist. But, without an institution that promotes secure property rights, investors have no incentive to undertake productive investments and the opportunities that would have contributed to economic growth are not taken. Acemoglu et al., (2005) provide detailed discussion of this view and cite the following examples of Haber (2001) and Bates (1981, 1989, 1997) to show that those with political power have a disproportionate effect on economic institutions since “the studies of the development of banking in the United States in the 19th century confirm that a rapid expansion of financial intermediation contributed to the rapid economic growth and industrialization”. Haber (2001) shows that in Mexico political institutions resulted in a very different outcome, where “Mexico had 42 banks, two of which controlled 60 percent of total banking assets, and virtually none of which actually competed with another

bank” while “the United States had roughly 25,000 banks and a highly competitive market structure around 1910”. In Mexico, the central government rationally decided to grant monopoly rights to banks to raise revenue so that they can redistribute rents to their political supporters.

Bates (1981) stressed that Ghana, Nigeria and Zambia’s government controlled marketing boards caused a poor agricultural performance in those countries by purchasing farmers crops at administratively determined low prices and exporting them at world market price so that the government collected funds from the agricultural sector. When the world price of cocoa fell during 1960s, both Ghana and Nigeria’s governments let the producers bear the full burden of the drop of price, resulting a collapse in investment and output of cocoa and other crops.

On the contrary, Bates (1981, 1989, 1997) showed that Kenya and Colombia’s agricultural policy over this period was very different than in Ghana, Nigeria and Zambia due to “who controlled the marketing board”. While farmers were smallholders in Ghana, Nigeria and Zambia, an ethnic group farmers in Kenya had close connection to the ruling political party and were able to secure high prices for themselves. Bates (1997) noted that in Colombia, farmers were favored because two main political parties were competing for their votes.

Acemoglu et al., (2005) conclude that these examples show how “economic institutions are chosen for their distributional consequences” depending on “who has political power”. These inefficient economic institutions tend to persist due to the commitment problems since buying off political elites and persuading them to leave their power is very difficult in practice, even it is guaranteed that “they will not be persecuted subsequently”.

Moreover, the group that has political power at the moment will have no incentive to lose the political power. For example, Killick (1978) concluded that government of Kwame Nkrumah

in Ghana in the 1960s feared “the threat that a wealthy class of Ghanaian businessmen might pose risk to his own political power”, so that his government promoted policies to “limit the size of businesses that Ghanaians could own” by arguing that “the capital investment must be sought from abroad”.

Using their framework, Acemoglu et al., (2005) conclude that good economic institutions are more likely to arise and persist in following cases: if the political institutions are set in a way that political power holders are reviewed or checked regularly; if a relatively broad group of people hold the political power and they have significant investment opportunities; if the rents which the power holders can collect from the rest of the society are limited. Finally, Acemoglu et al., (2005) suggest that an important future task is to construct formal models incorporating and extending this theory of institutions which would provide policy recommendations to improve the institutions and therefore improve the lives of those who are living in poverty.

3.3 Institutions and foreign aid

Closely related to North & Thomas’s view and Acemoglu, Johnson and Robinson’s theory of institutions, Bauer (1969) argues that if “a country cannot develop without foreign aid it is unlikely to develop with it” due to the underlying determinants of development. Furthermore, both Friedman (1958) and Bauer conclude that the foreign aid, specifically economic aid might actually retard economic development rather than promote it.

As Friedman (1958) puts it:

The belief that foreign aid effectively promotes economic development rests in turn on three basic propositions: first, that the key to economic development is the availability of capital; second, that underdeveloped countries are too poor to provide the capital for themselves; third, that centralized and comprehensive economic planning and control by government is an essential requisite for economic development. All three propositions are at best misleading half-truths. (p. 5)

Friedman's first argument is that while an additional capital is necessary for development, how the capital is provided will influence other factors. For example, when the Pharaohs raised massive amount of capital to build the Pyramids, it did not raise the standard of living for the Egyptian mass population. Supporting this argument, Bauer (1969) notes that governments can support specific industries in the economy by building grand monuments or making vast military machines, but such an accomplishment has nothing to do with the improvement of the standard of living. When the capital is formed and used locally, the incentives of the people combined with economic institutions and opportunities will further develop the economy. However, when the resources are given from abroad as aid the resources can be used for economically wasteful projects. Bauer (1969) provides examples, "the establishment of universities based on Western models when there are no employment opportunities for their graduates, the creation of airlines in countries with practically wholly illiterate populations, or the proliferation of steel mills".

The second argument is related to the poverty trap where the "underdeveloped countries are too poor to save and provide capital for themselves". But both Friedman (1958) and Bauer (1969) argue that is not the case since the currently developed countries were once underdeveloped and "many underdeveloped countries in Far East, South East Asia, East and West Africa and Latin America, have advanced without foreign aid". The key issue is the more

use of incentive. Domestic capital will accumulate and foreign capital will be attracted if the property is secure against both private and public seizure in the country. But if there is no secure property rights then the private foreign capital is not attracted and “even locally owned capital is invested abroad”.

Friedman’s third argument is that the centralized program is likely to have negative effect on economic development rather than promote it because of the following explanation. While government has an important role to play in the process of development by providing a stable legal framework, law and order, security to person and property, elementary education, roads, a monetary system, and other important functions, none of these activities call for “detailed control of investment”. Economic development is a process of experimentation since it is difficult to predict what will be the most efficient use of the country’s scarce resources. Investors in private sector have incentive to choose much more carefully since they risk their own resources. Moreover, unsuccessful or inefficient private ventures will have an option to fail. However, once public ventures are established, it is likely to stay even they turn out to be inefficient. Thus, Friedman (1958) concludes that “the foreign aid strengthens the government sector at the expense of the private sector”. Supporting Friedman (1958), Bauer (1969) argues that “foreign aid does not even necessarily increase investment within the recipient countries since it may reduce private investment and even encourage the outflow of capital due to the imposition of extensive controls, such as exchange controls, or a high level of taxation and a balance of payments crises”. The countries receiving foreign aid might also be discouraged to seek funds on market terms (from abroad). In addition, Bauer (1969) states that the governments directly control the lives of consumers and producers by “setting up state monopolies in industry and trade; extensive licensing of industry and commercial activities, as well as of imports and exports

and foreign exchange; and the establishment of many government owned and operated enterprises, including state supported and operated so-called co-operatives”(p. 83). When the state power is extensive, the fight for political power intensifies the resulting political tension. The result is that the energies and activities of citizens are shifted from economic activity to political activity.

Bauer (1969) also notes that these political effects cannot be simply detected from commonly used statistics on the size of the government sector. There can be the case where the government has more control over the economy through many state trading monopolies and extensive licensing while the government expenditure is relatively small. On the other hand, the government may have large expenditure focused on providing the basic services for the citizens rather than being much involved in the economic activity. Bauer (1969) concludes “foreign aid is neither a necessary nor a sufficient condition for advance from poverty” since many governments which are busy attempting to control the economies, neglect even the essential governmental tasks and become “dependent on large-scale foreign aid and gifts of food” with no significant rise in living standard.

Finally, Friedman (1958) argues that foreign aid may have negative political effects if it helps a group with political power to overcome their political crisis during short term and let them keep the political power. Supporters of aid often argue that economic progress is required as a prior condition to freedom and democracy in underdeveloped countries, and that economic aid will contribute to economic progress thereby promoting political freedom.

3.4 **The Theory of Poverty Trap**

Contrary to the criticisms of Friedman (1958) and Bauer (1969), Sachs et al. (2004) supports the positive effect of foreign aid. Sachs et al. (2004) provides the following three cases that would result a poverty trap. First, “when the capital-labor ratio is very low, the marginal productivity of capital is likely to be very low too “because a minimum threshold of capital is needed before a modern production processes can be started”. For example, if a basic infrastructure such as roads, electricity, functioning port and labor force with education and training are not there, then small increase in capital may have minimal effect. However, if the minimum threshold of capital is present then the “marginal productivity of capital may become very high in a low-income country”. Second, when the capital-labor ratio is very low, “the saving rate can become very low or even negative” because the households in poverty are struggling to survive and must consume all of their income and as a consequence do not save. Third, a rapid population growth at low levels of capital-labor ratio can push an economy into a poverty trap. World’s poorest countries have the highest fertility rates since “children are net economic assets from early ages in rural areas” by collecting wood, water, tending animals, other household chores and providing care for the parents when the parents are older. Moreover, mortality of children are high in poor countries and poor families have lack of access to family planning services and contraceptives.

Sachs et al. (2004) concludes that these three factors-capital thresholds, saving traps, and demographic traps-all interact and cause a poverty trap. Therefore, both output per capita and the capital-labor ratio tend to decrease over time if an economy begins with very low capital. So that the poor get poorer by the insufficient capital accumulation combined with high population growth. Sachs et al. (2004) stress that “when an economy has a capital-labor ratio

above a minimum threshold, then economy grows and converge to the higher steady state capital-labor ratio so that the poor countries need a “big push” in public investments to get above the minimum threshold” toward a higher standard of living. However, Sachs et al. (2004) also acknowledge the importance of good governance and states that “well-governed” countries “should be offered a substantial increase in ODA to achieve the Millennium Development Goals” while the scale of aid should be limited to countries with poor governance.

3.5 Sub-Saharan Africa

Because many countries in Sub-Saharan Africa received highest foreign aid relative to their GDP and have remained being the poorest region for decades, it lets many people question the effectiveness of aid. Therefore, this section covers Sachs’s et al. (2004) view, Acemoglu and Robinson’s (2010) view and the examples provided by the authors about the reasons why the countries in Sub-Saharan Africa remains poor.

According to Sachs et al. (2004), Sub-Saharan Africa’s development crisis is unique since Sub-Saharan countries grew more slowly than other developing countries during the 1980-2000 period sample after controlling for the initial income and the quality of governance. Their explanation is that, even the countries with good governance in tropical Africa are “stuck in a poverty trap due a very high transport costs and small market size, low-productivity agriculture, very high disease burden, adverse geopolitics and very slow diffusion of technology from abroad”.

Sachs et al. (2004) explains that the countries in Sub-Saharan Africa have small markets and a little access to global trade so that the economies grow slower than the other developing countries with large markets and better access to global trade due to low transportation costs.

Moreover, Africa has the lowest share of irrigated cropland due to few rivers in addition to the erratic rainfall and high temperature which all contribute to the low productivity in agriculture. Besides the highest HIV prevalence rate, Africa is exposed to large number of endemic tropical diseases such as malaria and the disease burden is contributing to the decrease in productivity and foreign investment. Technological advances also have been delayed in Africa in the areas of agriculture and health contributing to the poverty trap. Sachs et al. (2004) concludes that the substantial population growth in rural areas caused the size of the average household farm to plummet and also led to massive environmental degradation. While they agree that the poor governance complicated the situation, they believe that the poor governance was a symptom rather than a cause.

Acemoglu and Robinson (2010) on the other hand argue that African nations are poor today because of bad institutions including insecure property rights, markets that are not functioning well, “citizens that do not have incentives to save and invest, and weak states and political systems that do not have incentive to provide public goods”. They also note that initial historical absolutist and patrimonial institutions interacted with a series of shocks such as the slave trade, colonialism with the result that after independence there were a set of institutions that were worse than the ones they had during colonization. Acemoglu and Robinson (2010) conclude that these institutions are the root cause of economic decline and the poverty today in Africa and provide the following examples. Sierra Leone was incorporated into The British Empire in 1896 and a railway to the south was initially designed by British to rule Sierra Leone. After the independence of Sierra Leone in 1961, the railway became the core of the country’s most valuable exports such as cocoa, coffee and diamonds. When Siaka Stevens took power in 1967, he pulled up the railway line and sold off the track and rolling stock to make the change

irreversible so that he held onto power while the most vibrant sectors of Sierra Leone's economy was damaged drastically. While the British created the marketing boards to tax farmers, post-colonial governments did the same at even higher rates. It is noted that barely any public service or goods were provided in next four decades causing the roads and schools to disintegrate, and the economy to deteriorate. In Mobutu's Zaire and Amin's Uganda, political leaders over-valued the exchange rate to create an artificially scarce resource which then used to distribute rents to political elites in addition to severe insecurity of property rights. As a counter example, Acemoglu and Robinson (2010) mention case of where Botswana experienced a rapid economic growth after the independence due to good institutions providing public goods and secure and efficient property rights in addition to the wealth created due to diamonds.

3.6 Donors' incentives

This section provides a brief summary about the donors' perspective. Indeed, Cross-sectional regression results show that countries with lower initial income per capita receive more aid. Intuitively, if a country is experiencing rapid economic growth and if it is achieving higher standard of living then the country does not need foreign aid. Instead, that country is likely to attract more private foreign investment and more trade opportunities.

However, there are few other considerations besides the general belief that aid is given to poor countries for only humanitarian reasons. Boone (1996) cites the studies by Maizels and Nissanke (1984), McKinlay and Little (1977), McKinlay and Little (1978, 1979), Mosley (1985), Frey and Schneider (1986) and Trumbull and Wall (1994) which conclude that aid flows are primarily based on the donor's political, strategic and welfare interests rather than the recipient countries' needs.

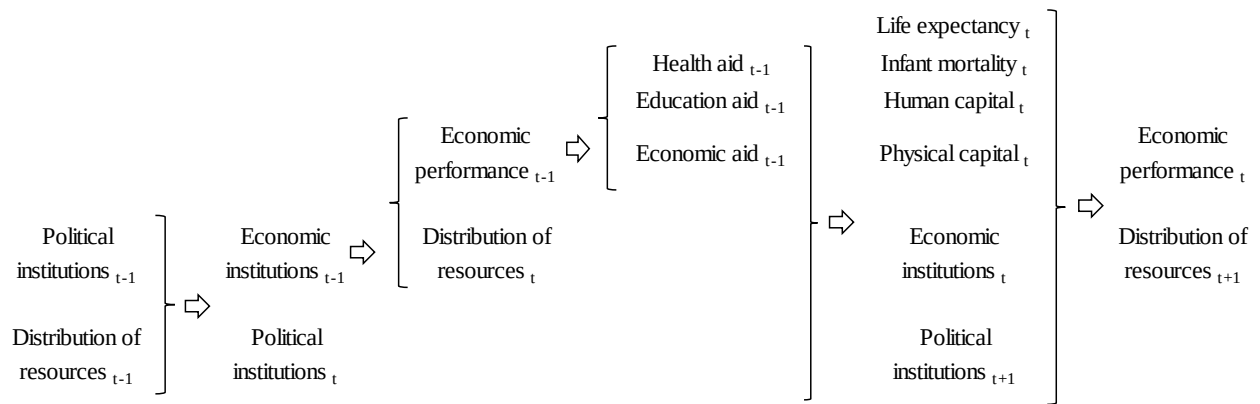
Temple (2010) notes that the “aid has often been tied to the purchase of goods and services from the donor country” such as technical assistance (purchasing services of external consultants), export promotion, much of the food aid (purchased from the farmers of the donor). However, Temple (2010) argue that purchasing advice from overseas consultants, or purchasing food from the donors’ farmers “diverts aid budgets back to the citizens of rich countries” rather than allowing the recipient country to purchase goods and services at world price so that it reduces the effectiveness of aid. While I acknowledge these views and these considerations may reduce the estimated effect of aid, I do not include further analysis related to this issue due to the availability of data.

3.7 Framework of aid and other variables

Acemoglu (2010) stresses the importance of general equilibrium analysis of political economy considerations in development economics since analyses using partial equilibrium estimates ignores “responses from both sources and will not give the appropriate answer to counterfactual exercises”. For example, Behrman and Rosenzweig (2004), Schultz (2002), and Straus and Thomas (1998) cited by Acemoglu (2010) show that “healthier individuals are more productive”. However, we should not conclude that increase in the life expectancy of the working age population would lead to increase in aggregate productivity based on this result of microeconomic literature. According to Acemoglu(2010), the reason why is that “life expectancy would also increase population and may result decrease in labor productivity and cause a reduction in income per capita due to diminishing returns to capital and land”(p. 8). Thus, the policy implications can be very different once the general equilibrium effects are considered. While economic theory provides some guidance in assessing the importance of

general equilibrium effects, I am not aware of any existence of a theory of aid that outlines the dynamic and complex relationship of health aid, education aid, economic aid, health outcomes, human and physical capital accumulation, institutions and economic development. Thus, I attempt to extend Acemoglu, Johnson and Robinson's theory of institutions (in Section 3.2) including aid variables in Figure 1.

Figure 1. Framework of aid and other variables



Note: In this framework, I attempt to extend Acemoglu, Johnson and Robinson's theory of institutions by including foreign aid variables. For Acemoglu, Johnson and Robinson's theory of institutions, see Daren Acemoglu, Simon Johnson and James A. Robinson (2005) "Institutions as a Fundamental Cause of Long-Run Growth", in Philippe Aghion and Steven Durlauf eds. *The Handbook of Economic Growth*, Amsterdam:North-Holland.

A number of difficulties arise related to the attempt to correctly estimate the effect of aid as outlined in this framework. First of all, these factors impacting development are mostly verbal and lack complete model with mathematical details. Second, some of the variables (political institution, economic institution, distribution of resource) are very difficult to correctly measure. Third, even if I use proxy variables there are not sufficient period of data available since some of

the variables take relatively longer time to change. Finally, the exact functional relationships are not known and all variables are endogenous. Acknowledging the dynamic relationship of political institution, distribution of resource, economic institution and economic performance outlined by Acemoglu et al., (2005), I focus on estimating the possible links of aid and other variables using partial equilibrium approach while I accept the possibility of biased estimates. Moreover, I did not obtain any empirical evidence of the relationship of foreign aid and political institutions due to data availability and model specification issues while I acknowledge the effect that foreign aid may have on political institutions.

4. MODEL SPECIFICATION

While the theoretical issues related to aid are discussed in Chapter 2 and Chapter 3, there are number of empirical specifications that are used to estimate the effect of aid. I use model specification similar to Boone (1996) including additional control variables to estimate the effect of health aid, education aid, economic aid and government aid. OLS and Fixed Effects estimations are used. In general, using pooled OLS for panel data is problematic since pooled OLS omit unobserved individual heterogeneity. Wooldridge (2010) notes that “Fixed Effects is useful for policy analysis and program evaluation. A policy variable can be systematically related to the persistent component in the error term. It is for this reason that, Fixed Effects is often superior to pooled OLS or Random Effects for applications where participation in a program is determined by preprogram attributes that also affect the dependent variable” (p. 315). While the disadvantage of Fixed Effects is that the coefficients on the time-invariant variables cannot be estimated, the aid variables in this thesis vary over time within countries. Thus, I consider Fixed Effects results as the main results.

First, the main empirical model for the health outcome is:

$$(4.1) \quad \Delta \log X_{it} = \alpha_0 + \alpha_1 \log X_{i,t-1} + \beta G_{it}^{health} + \delta L_{it}^{health} + \gamma Z_{it} + v_t + \varepsilon_{it}$$

where X is infant mortality or life expectancy, G^{health} is (health grant)/GDP, L^{health} is (health loan)/GDP, Z is a vector of control variables and v is a time dummy variable. Since β is the coefficient of G^{health} , it can be interpreted as a percent change in X due to annual health grant of one percent of GDP. Similarly, δ can be interpreted as a percent change in X due to annual health loan of one percent of GDP. Initial $\log(X)$ and the other control variables in Z are included in the model specification to capture the recipient country's initial condition. Moreover, I include

improved water source to capture the environmental influence. Main empirical model for education outcome is:

$$(4.2) \quad \Delta \log S_{it} = \alpha_0 + \alpha_1 \log S_{i,t-1} + \beta G_{it}^{education} + \delta L_{it}^{education} + \gamma Z_{it} + v_t + \varepsilon_{it}$$

where S is years of schooling for population over 15, $G^{education}$ is (education grant)/GDP, $L^{education}$ is (education loan)/GDP. Z includes a set of control variables capturing country's initial economic status and initial urban population as a percent of total population. Main empirical model for investment is:

$$(4.3) \quad I_{it} = \alpha_0 + \beta G_{it}^{economic} + \delta L_{it}^{economic} + \gamma Z_{it} + v_t + \varepsilon_{it}$$

where I is (capital formation)/GDP, $G^{economic}$ is (economic grant)/GDP, $L^{economic}$ is (economic loan)/GDP. Z includes control variables capturing country's initial economic status, initial price level of capital formation, magnitude of the deviation of price level of capital formation from the sample mean following Barro (1991) and initial rule of law. Finally, the main empirical model for rule of law is:

$$(4.4) \quad \Delta R_{it} = \alpha_0 + \alpha_1 R_{i,t-1} + \beta G_{it}^{government} + \delta L_{it}^{government} + \gamma Z_{it} + v_t + \varepsilon_{it}$$

where R is rule of law, $G^{government}$ is (government grant)/GDP, $L^{government}$ is (government loan)/GDP and Z includes control variables.

The main contributions of the empirical models (4.1), (4.2), (4.3) and (4.4) are: i) the part of ODA for each relevant sector is considered to estimate the effect of aid for that sector rather than using only the total official aid measured by ODA/GDP as in many other papers in the literature ii) the effect of ODA grant and the effect of ODA net loan are allowed to differ for each sector while most papers in the literature use an aid variable that is a sum of ODA grant and ODA net loan imposing restriction of grant and loan having same effect. An additional

specification is estimated to test whether the estimated coefficient of each sector aid differ if OOF net loan and private flows from Bill & Melinda Gates foundation for that sector is included.

Moreover, sector aid data is further disaggregated by its purpose instead of disaggregation by grant and loan. Other specifications using these disaggregated sector aid by purpose are estimated to allow the effect of each sector aid components to differ. For example, health grant and loan includes aid for health (CRS code 120 in Table XXXVII, Appendix C), aid for population policy and reproductive health (CRS code 130 in Table XXXVII, Appendix C), and aid for water and sanitation (CRS code 140 in Table XXXVII, Appendix C). Education aid is disaggregated into level unspecified education aid (CRS code 111 in Table XXXVII, Appendix C), basic education aid (CRS code 112 in Table XXXVII, Appendix C), secondary education aid (CRS code 113 in Table XXXVII, Appendix C) and post-secondary education aid (CRS code 114 in Table XXXVII, Appendix C). Economic aid includes economic infrastructure and services aid (CRS code 200 in Table XXXVII, Appendix C) and production sector aid (CRS code 300 in Table XXXVII, Appendix C). Note that each of these components include both grant and loan to avoid too many missing observations.

5. DATA

The data set covers 110 countries for the period 1995-2014 and were obtained from the Penn World Table 9.0 (PWT), World Development Indicators (WDI), World Governance Indicators (WGI), OECD, Development Assistance Committee (DAC), and Barro-Lee Educational Attainment Dataset. The detailed descriptions of the source of the data sets are provided in Cited Literature. The variables and their descriptions are included in Table I. Table II shows the definitions of the aid variables which are obtained from the OECD, DAC Directives and Glossary of Key Terms & Concepts.

Both public health expenditure as % of government expenditure and government final consumption expenditure (% of GDP) are obtained from WDI. The variable definition in WDI provides that “Public health expenditure consists of recurrent and capital spending from government (central and local) budgets, external borrowings and grants (including donations from international agencies and nongovernmental organizations), and social (or compulsory) health insurance funds”. In addition, both expenditure on education as % of total government expenditure and government final consumption expenditure (% of GDP) are obtained from WDI. WDI provides that “Expenditure on education consists of total general (local, regional and central) government expenditure on education (current, capital, and transfers). It includes expenditure funded by transfers from international sources to government”.

While Net ODA data is available starting from 1960s, OECD, DAC do not recommend to use sector aid disbursement before 2002 and sector aid commitment before 1995 since not all donors reported the sector level commitment and disbursement data in earlier years. OECD, DAC suggests that starting from 2007, disbursement data has coverage ratio above 90%. Due to this issue, the recent studies use sector level aid data for the time period after 1995.

TABLE I. DESCRIPTIONS AND THE SOURCES OF THE VARIABLES

Variable	Description	Source
Initial ln(GDP per capita)	$= \ln \left(\frac{\text{Initial Real GDP at chained PPPs 2011 US\$}}{\text{Population}} \right)$	Penn World Table 9.0 (PWT)
Growth of real GDP per capita	$= \frac{(\text{Real GDP per capita})_t - (\text{Real GDP per capita})_{t-1}}{(\text{Real GDP per capita})_{t-1}}$	PWT
Population	Population	PWT
Trade/GDP	= (Share of merchandise exports at current PPPs + Share of merchandise imports at current PPPs)	PWT
INV/GDP	Share of gross capital formation at current PPPs	PWT
Ppi	Initial Price level of capital formation	PWT
Ppidev	Magnitude of the deviation of ppi from the sample mean	PWT
Life expectancy	Life expectancy at birth, total (years)	WDI
Infant mortality	Mortality rate, infant (per 1,000 live births)	WDI
DPT	Immunization, DPT (% of children ages 12-23 months) (Diphtheria, Pertussis, and Tetanus)	WDI
HIV	Prevalence of HIV, total (% of population ages 15-49)	WDI
Water	Improved water source (% of population with access)	WDI
Urban population	Urban population (% of total)	WDI
Years of schooling	Years of schooling of the population above age 25.	Barro Lee
Rule of Law	Rule of law captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. It ranges between -2.5 to 2.5, with higher values corresponding to better governance.	WGI
Health expenditure	Health expenditure, public (% of GDP) = Health expenditure, public (% of government expenditure) * General government final consumption expenditure (% of GDP)	WDI
Education expenditure	Education expenditure (% of GDP) = Expenditure on education as % of total government expenditure (%) * General government final consumption expenditure (% of GDP)	WDI
Regions	Dummy variable for the regions: South of Sahara, Middle East & North of Sahara, Asia & Pacific, America, and Europe.	OECD, DAC
Time	Time dummy variables for the relevant periods	

TABLE II. OECD, DAC DEFINITIONS OF AID FLOWS

Name	Definition
Net Flow	Net flows equal total new flows (gross disbursements) minus amounts received (e.g. repayments of principal, offsetting entries for debt relief, repatriation of capital, and occasionally recoveries on grants or grant-like flows).
ODA	Net Official Development Assistance. Official Development Assistance (ODA) is the flows of official financing administered with the promotion of the economic development and welfare of developing countries as the main objective, and which are concessional in character with a grant element of at least 25% (using a fixed 10% rate of discount). Lending by export credit agencies—with the pure purpose of export promotion—is excluded. Non-concessional loans are those provided at, or near to, market terms. Concessional loans are those provided at softer terms. The grant element is defined as the difference between the face value of the loan and the discounted future debt service payments to be made by the borrower.
Grant	Grants are transfers in cash or in kind for which no legal debt is incurred by the recipient.
Loan	Loans are transfers in cash or in kind for which the recipient incurs legal debt.
OOF	Net Other Official Flows are related to the transactions by the official sector with Recipients which do not meet the conditions for eligibility as ODA or Official Aid, either because they are not primarily aimed at development, or because they have a Grant Element of less than 25%.
PRI	Private flows (PRI) consist of flows at market terms financed out of private sector resources (i.e. changes in holdings of private long term assets held by residents of the reporting country) and private grants (i.e. grants by non-government organizations, net of subsidies received from the official sector).
Aid commitment	The face value of the activity at the date a grant or loan agreement is signed with the recipient.
Aid disbursement	A disbursement is the placement of resources at the disposal of a recipient country or agency, or in the case of internal development related expenditures, the outlay of funds by the official sector. It can take several years to disburse a commitment.

Mishra and Newhouse (2009) use health aid commitment per capita as an aid variable while Birchler and Michaelowa (2016) used education aid disbursement per capita as an education aid variable. I use health (CRS purpose code 120, 130 and 140 in Table XXXVII, Appendix C), education (CRS purpose code 110 in Table XXXVII, Appendix C), economic infrastructure (CRS purpose code 200 and 300 in Table XXXVII, Appendix C), and government (CRS purpose code 150 in Table XXXVII, Appendix C) sector aid data which were obtained from OECD, DAC CRS database. The total and sector aid variables are defined in following equations using aid flows from all donors (multilateral and bilateral donors). Note that (5.5) adds aid flows associated with OOF and Bill & Melinda Gates foundation because there would be many missing variables if I try to include a separate variable.

$$(5.1) \quad ODA/GDP_{it} = \left(\frac{Net\ ODA_{it}}{GDP_{it}} \right)$$

$$(5.2) \quad ODA\ sector\ grant_{it} = \left(\frac{ODA\ Grant\ disbursement\ for\ the\ sector_{it}}{GDP_{it}} \right)$$

$$(5.3) \quad ODA\ sector\ loan_{it} = (ODA\ Loan\ disbursement\ for\ the\ sector_{it} - ODA\ Loan\ repayment\ of\ principal\ for\ the\ sector_{it}) / GDP_{it}$$

$$(5.4) \quad ODA\ sector\ grant\ and\ loan_{it} = ODA\ sector\ grant_{it} + ODA\ sector\ loan_{it}$$

$$(5.5) \quad \begin{aligned} ALL\ sector\ grant\ and\ loan_{it} \\ = ODA\ sector\ grant\ and\ loan_{it} + OOF\ sector\ grant\ and\ loan_{it} \\ + Bill\ \&\ Melinda\ Gates\ Foundation\ sector\ grant\ and\ loan_{it} \end{aligned}$$

There are following differences of the sector aid data in this thesis compare to other studies: i) grant and loan disbursements are considered separately ii) net loan disbursement is considered in sector loan rather than gross loan disbursement or commitment iii) while Mishra and Newhouse (2009) included only health aid with CRS purpose code 120, I added aid disbursements associated with population policies and reproductive health; water and sanitation in health aid since these are related to health outcomes such as life expectancy and infant mortality.

Finally, the economic sector aid included economic infrastructure and services and production sectors aid. Figure 2 shows ODA/GDP averaged over recipients by the region for each year. Indeed, South of Sahara receives the highest aid relative to its GDP. Table III includes correlation coefficients of grant and loan for each sector. Table IV provides summary statistics of the main variables.

Figure 2. ODA/GDP from all donors using OECD and World Bank data.

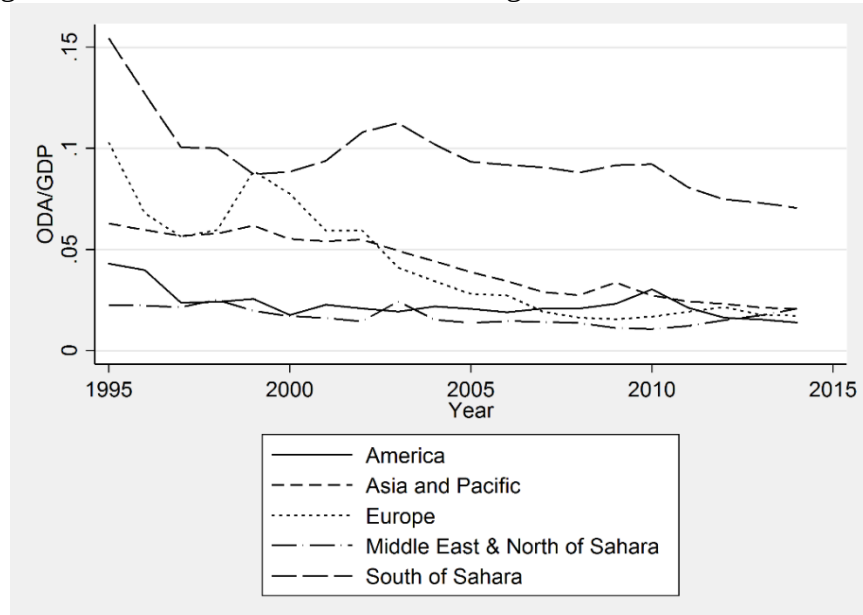


TABLE III. CORRELATION OF GRANT AND LOAN

	Relevant net loan	Obs
Health grant	0.4289	1,851
Education grant	0.3589	1,495
Economic grant	0.3126	2,032
Government grant	0.2501	1,311

TABLE IV. DESCRIPTIVE STATISTICS OF MAIN VARIABLES

Variable	Obs	Mean	Std. Dev.	Min	Max
ODA/GDP	110	0.05487	0.05821	0.00031	0.22990
Log difference of infant mortality	110	-0.64596	0.32002	-1.44238	0.32424
Infant mortality in 1995	110	58.53455	36.91975	8.70000	153.00000
Infant mortality in 2014	110	31.84909	22.72109	3.80000	98.80000
Log difference of life expectancy	106	0.10259	0.10028	-0.14269	0.70573
Life expectancy in 1995	106	61.62736	9.86276	31.60000	76.60000
Life expectancy in 2014	108	67.94537	8.04537	48.90000	81.50000
(ALL health grant and loan)/GDP	107	0.00657	0.00802	-0.00004	0.03745
(ODA health grant and loan)/GDP	107	0.00649	0.00802	0.00001	0.03716
(ODA health grant)/GDP	107	0.00550	0.00715	0.00001	0.03328
(ODA health loan)/GDP	107	0.00099	0.00128	-0.00035	0.00558
(ODA Health-Health grant and loan)/GDP	107	0.00262	0.00338	0.00000	0.01424
(ODA Health-Population-Policy grant and loan)/GDP	107	0.00201	0.00335	0.00000	0.01693
(ODA Health-Water-Sanitation grant and loan)/GDP	107	0.00186	0.00216	-0.00012	0.00988
INV/GDP	110	0.20307	0.07303	0.05699	0.42723
(ALL economic grant and loan)/GDP	110	0.00853	0.00904	-0.00085	0.03692
(ODA economic grant and loan)/GDP	110	0.00805	0.00873	-0.00090	0.03455
(ODA economic grant)/GDP	110	0.00551	0.00633	0.00001	0.02375
(ODA economic loan)/GDP	110	0.00254	0.00363	-0.00158	0.02020
(ODA Economic-Infrastructure grant and loan)/GDP	110	0.00498	0.00587	-0.00159	0.02791
(ODA Economic-Production-Sectors grant and loan)/GDP	110	0.00307	0.00345	-0.00033	0.01272
Difference of rule of law	110	0.05718	0.48480	-1.20000	1.81000
Rule of law in 1996	110	-0.47736	0.73730	-2.02000	1.05000
Rule of law in 2014	110	-0.42018	0.60262	-1.89000	1.42000
(ALL government grant and loan)/GDP	107	0.00412	0.00532	-0.00070	0.03023
(ODA government grant and loan)/GDP	107	0.00401	0.00536	0.00001	0.03023
(ODA government grant)/GDP	107	0.00324	0.00456	0.00001	0.02714
(ODA government loan)/GDP	107	0.00076	0.00119	-0.00066	0.00616
Log difference of years of schooling (over 15)	81	0.25690	0.16776	-0.01574	0.78911
Years of schooling in 1995 (over 15)	81	5.75832	2.42189	0.92881	10.46501
Years of schooling in 2010 (over 15)	81	7.12574	2.41280	1.87676	11.32652
(ALL education grant and loan)/GDP	108	0.00328	0.00404	-0.00010	0.02100
(ODA education grant and loan)/GDP	108	0.00326	0.00404	-0.00009	0.02101
(ODA education grant)/GDP	108	0.00267	0.00338	0.00002	0.01839
(ODA education loan)/GDP	108	0.00059	0.00090	-0.00037	0.00359
(ODA Education-Level-Unspecified grant and loan)/GDP	108	0.00084	0.00114	-0.00010	0.00518
(ODA Education-Basic grant and loan)/GDP	108	0.00107	0.00147	0.00000	0.00609
(ODA Education-Secondary grant and loan)/GDP	108	0.00032	0.00048	-0.00003	0.00289
(ODA Education-Post-Secondary grant and loan)/GDP	108	0.00104	0.00183	0.00001	0.01240

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

Next, some general issues with aid variables are provided. First issue is the nominal vs real share. PWT provides real share of INV/GDP and Trade/GDP using approximated relative price level of each categories. In general, Hsieh and Klenow (2007) find that “real investment share is lower in poor countries than in rich countries because the price of investment is relatively high in poor countries”. Deaton (1995) notes that “because labor is relatively cheap in poor countries, the relative price of non-tradeables to tradeables rises with economic development, so that, services and government tend to be relatively cheap, and investment relatively expensive in poorer countries”. Alcalá and Ciccone (2004) find that “real share of trade is less relative to the nominal share due to relatively high prices of exports and imports”. However, there is a limitation when I try to convert nominal share of aid/GDP to real share since there is no available price level data for aid. Kraay and Raddatz (2007) notes that “Aid dollars can be used to buy goods and services in rich countries (for example, advanced equipment, or consultant services) or in the poor aid recipient (for example on locally produced building materials). We are not aware of estimates of the division of aid along these lines”. If I use the price level of GDP to convert, then real share equals the nominal share. Thus, I use nominal share of aid. In addition, Deaton (1995) states that there are a number of important issues in international national data such as index number problems, measurement error and aggregation problem. Since these data measurement issues can have significant influence on the results of any empirical study using these variables, I attempted to identify and exclude some outliers based on the population data discrepancies between PWT and WDI. The real GDP per capita showed difference ranging from -21.8% to 12.8% depending only on which source of population data to use. Therefore, I excluded Cyprus, Equatorial Guinea, Republic of Moldova, Maldives and Sudan from the dataset to reduce measurement error.

6. EMPIRICAL ANALYSIS

This chapter provides the main empirical results of the health aid and health outcomes, education aid and education outcomes, economic aid and investment, and government aid and rule of law in addition to other empirical findings.

6.1 The determinants of aid

This section provides an empirical evidence for the link of the framework proposed in Chapter 3 where the economic performance determines the foreign aid flow. Following Boone (1996) specification, the results in Table V shows that the estimated coefficients of $\ln(\text{initial GDP per capita})$ are statistically significant and negative. These results confirm that the more aid is given to the countries with low level of economic performance.

However, Boone (1996) specification included dummy variables: friend of US, friend of OPEC, and friend of France capturing the political interests of the donors and the estimated coefficients of these variables were statistically significant. I do not include these dummy variables in the study due to data availability. Other findings include that the countries with lower level of life expectancy received more aid, countries with lower years of schooling received more education aid and the countries with higher level of rule of law received more economic aid.

TABLE V. OLS ESTIMATION FOR THE DETERMINANTS OF FOREIGN AID, PANEL DATA WITH 5 YEAR AVERAGES

	Dependent variables:				
	ODA/GDP	(ODA education grant and loan)/GDP	(ODA health grant and loan)/GDP	(ODA economic grant and loan)/GDP	(ODA government grant and loan)/GDP
Initial ln(GDP_per_capita)	-0.051*** (0.004)	-0.002*** (0.000)	-0.007*** (0.001)	-0.009*** (0.001)	-0.005*** (0.000)
Initial ln(population)	-0.008*** (0.001)	-0.000*** (0.000)	-0.001*** (0.000)	-0.002*** (0.000)	-0.001*** (0.000)
America	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Asia and Pacific	-0.006 (0.006)	0.000 (0.000)	-0.001 (0.001)	0.003*** (0.001)	-0.001 (0.001)
Europe	0.019*** (0.005)	0.001** (0.000)	0.000 (0.001)	0.004*** (0.001)	0.003*** (0.001)
Middle East & North of Sahara	-0.007 (0.007)	0.000 (0.000)	0.000 (0.001)	-0.000 (0.001)	-0.001 (0.001)
South of Sahara	-0.018 (0.010)	0.001* (0.000)	0.005*** (0.001)	0.001 (0.001)	-0.000 (0.001)
Initial ln(years of schooling)	-0.006 (0.007)	-0.001** (0.001)			
Initial ln(life expectancy)	-0.121** (0.043)		0.004 (0.005)		
Initial ln(infant mortality)	-0.009 (0.007)		-0.001 (0.001)		
Initial rule of law	0.008 (0.004)			0.003*** (0.001)	-0.000 (0.000)
INV/GDP	0.016 (0.029)			0.011* (0.005)	
Constant	1.043*** (0.193)	0.019*** (0.002)	0.046 (0.025)	0.078*** (0.005)	0.039*** (0.004)
Observations	324	320	420	439	427
R-squared	0.690	0.572	0.556	0.511	0.465
rss	0.397	0.002	0.018	0.023	0.010

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

6.2 Health aid and health outcomes

First, Figure 3 shows that the health grant is higher than the health loan considering the average of all recipients for each year. Summary statistics in Table IV indicates that the mean of (ODA health grant)/GDP is 0.55%, while the mean of (ODA health loan)/GDP is 0.1%.

Disaggregated health aid in Figure 4 shows that aid for health and population policy on average have increased much higher than aid for water and sanitation while Figure 5 indicates that the countries in South of Sahara on average received the highest health aid compare to other regions.

Figure 3. Health grant and loan
using OECD and World Bank data.

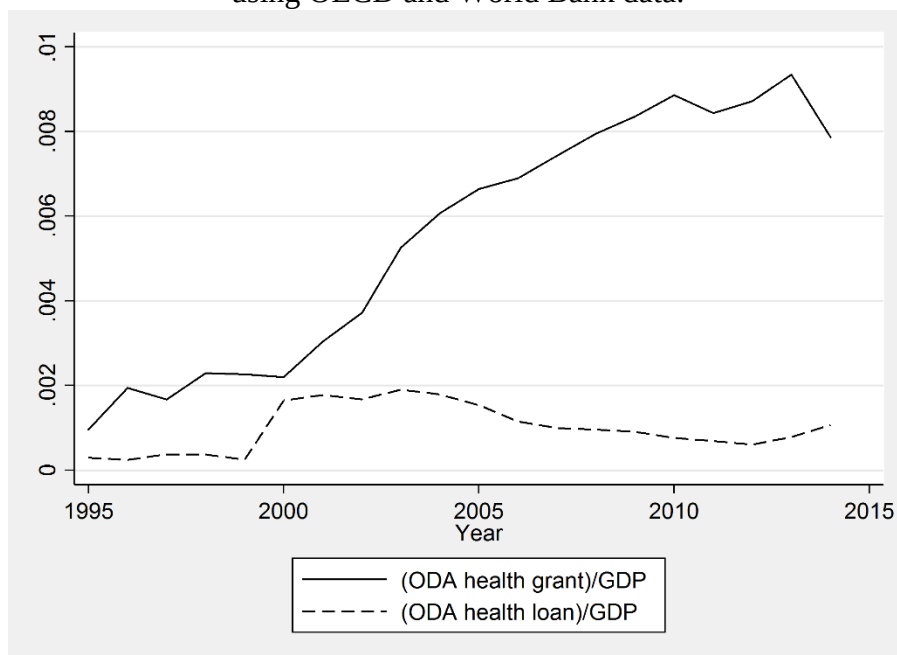


Figure 4. Health aid by purpose
using OECD and World Bank data.

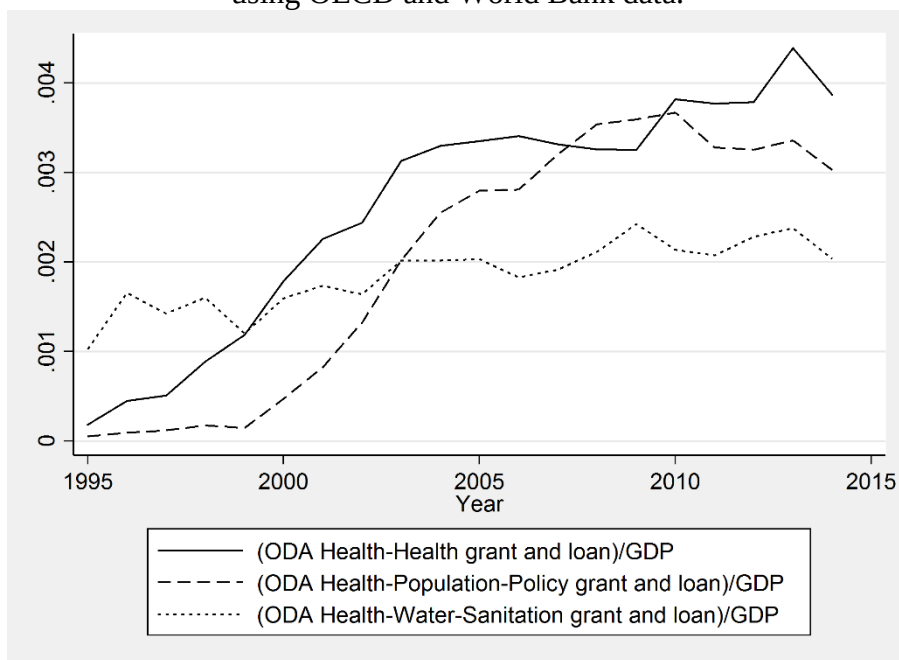
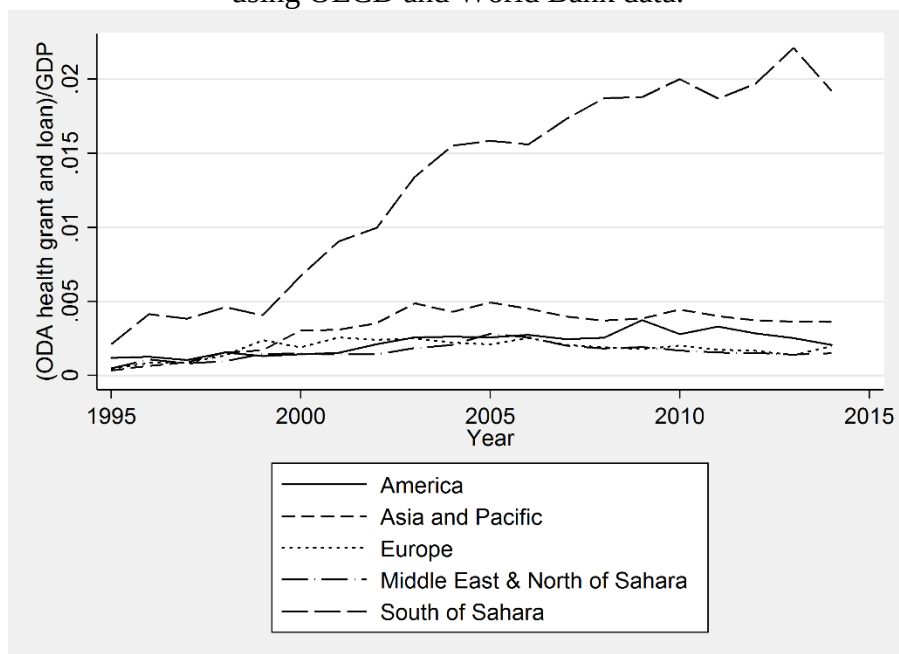


Figure 5. Health aid by region
using OECD and World Bank data.



OLS results for the log difference of infant mortality is provided in Table VI and Fixed Effects results are included in Table VII. Column (1) of Table VII suggest that the coefficient of ODA/GDP is statistically insignificant while the coefficients of (ALL health grant and loan)/GDP are much higher, negative and statistically significant for both OLS and Fixed Effects in column (2). Recall that the (ALL health grant and loan)/GDP includes the sector level aid flow of OOF and Bill & Melinda Gates Foundation in addition to (ODA health grant and loan)/GDP.

The coefficients of (ODA health grant and loan)/GDP in column (3) of Table VI and Table VII are also statistically significant, negative and very close the estimated coefficients of (ALL health grant and loan)/GDP. Moreover, OLS and Fixed Effects results in column (5) indicate that only (ODA health grant)/GDP is associated with the decrease in infant mortality. Both OLS and Fixed Effects results indicate that annual health grants of 1% of GDP decreases infant mortality by over 3% over the five years. The coefficient of (ODA health loan)/GDP is statistically insignificant and this may be due to the reason that on average most of the health aid was given as a grant rather than loan as shown in summary statistics.

Moreover, when aid for health, population policy and water and sanitation are considered separately rather than assuming each has same effect, the health aid toward population policy and reproductive health is associated with decrease in infant mortality. Finally, when education, economic and government aid variables are included in the final specifications to test whether these aid also have effect on health outcomes and no significant relationship detected. Table VI OLS results suggest that higher rate of initial DPT immunization are related to decrease in infant mortality.

TABLE VI. OLS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY,
PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.017 (0.015)	-0.020 (0.015)	-0.020 (0.015)	-0.020 (0.015)	-0.022 (0.015)	-0.020 (0.015)
Initial ln(GDP_per_capita)	-0.001 (0.010)	-0.009 (0.011)	-0.010 (0.011)	-0.010 (0.011)	-0.006 (0.011)	-0.011 (0.011)
Trade/GDP	-0.009 (0.021)	0.003 (0.020)	0.003 (0.020)	0.004 (0.020)	0.006 (0.018)	0.003 (0.020)
Initial ln(population)	-0.009* (0.004)	-0.003 (0.004)	-0.003 (0.004)	-0.003 (0.004)	-0.000 (0.004)	-0.004 (0.004)
Initial DPT immunization	-0.102** (0.033)	-0.096** (0.032)	-0.096** (0.032)	-0.096** (0.032)	-0.103** (0.032)	-0.100** (0.033)
Initial HIV	0.029 (0.114)	0.160 (0.117)	0.163 (0.117)	0.171 (0.125)	0.358** (0.130)	0.128 (0.126)
Initial water	0.039 (0.053)	0.078 (0.055)	0.079 (0.055)	0.080 (0.055)	0.076 (0.053)	0.088 (0.059)
ODA/GDP	-0.469*** (0.129)					
PRI/GDP	-0.001 (0.060)					
(ALL health grant and loan)/GDP		-3.116*** (0.760)				
(ODA health grant and loan)/GDP			-3.215*** (0.748)			-2.754** (1.016)
(ODA health grant)/GDP				-3.284*** (0.833)		
(ODA health loan)/GDP				-2.516 (2.600)		
(ODA Health-Health grant and loan)/GDP					0.796 (2.111)	
(ODA Health-Population-Policy grant and loan)/GDP					-8.525*** (1.934)	
(ODA Health-Water-Sanitation grant and loan)/GDP					1.297 (2.303)	
(ODA education grant and loan)/GDP						-2.702 (1.634)
(ODA economic grant and loan)/GDP						0.539 (0.772)
(ODA government grant and loan)/GDP						-0.357 (0.896)
Constant	0.050 (0.128)	0.045 (0.127)	0.052 (0.126)	0.053 (0.126)	0.022 (0.125)	0.054 (0.125)
Observations	339	331	331	331	331	331
R-squared	0.293	0.309	0.311	0.312	0.351	0.321
rss	1.612	1.514	1.509	1.509	1.423	1.489

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

TABLE VII. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.233*** (0.052)	-0.253*** (0.050)	-0.254*** (0.050)	-0.255*** (0.050)	-0.258*** (0.042)	-0.254*** (0.052)
Initial ln(GDP_per_capita)	-0.023 (0.021)	-0.039 (0.021)	-0.040 (0.020)	-0.041 (0.020)	-0.039 (0.020)	-0.040 (0.021)
Trade/GDP	-0.051 (0.055)	-0.037 (0.052)	-0.036 (0.052)	-0.036 (0.052)	-0.024 (0.051)	-0.040 (0.054)
Initial ln(population)	0.032 (0.107)	0.137 (0.096)	0.143 (0.095)	0.146 (0.097)	0.162 (0.091)	0.142 (0.097)
Initial DPT immunization	-0.017 (0.050)	-0.028 (0.047)	-0.028 (0.047)	-0.028 (0.047)	-0.048 (0.047)	-0.028 (0.047)
Initial HIV	-0.115 (0.430)	-0.067 (0.448)	-0.068 (0.451)	-0.063 (0.451)	-0.075 (0.389)	-0.072 (0.450)
Initial water	-0.356 (0.206)	-0.323 (0.190)	-0.323 (0.189)	-0.325 (0.191)	-0.302 (0.170)	-0.322 (0.191)
ODA/GDP	-0.125 (0.206)					
PRI/GDP	-0.078 (0.118)					
(ALL health grant and loan)/GDP		-2.977** (0.954)				
(ODA health grant and loan)/GDP			-3.161** (0.952)			-2.970** (1.062)
(ODA health grant)/GDP				-3.204** (1.003)		
(ODA health loan)/GDP				-2.671 (2.086)		
(ODA Health-Health grant and loan)/GDP					0.290 (2.147)	
(ODA Health-Population-Policy grant and loan)/GDP					-8.100*** (1.953)	
(ODA Health-Water-Sanitation grant and loan)/GDP					1.349 (2.811)	
(ODA education grant and loan)/GDP						-1.155 (2.169)
(ODA economic grant and loan)/GDP						0.056 (0.894)
(ODA government grant and loan)/GDP						-0.120 (1.175)
Constant	1.233*** (0.324)	1.175*** (0.277)	1.174*** (0.276)	1.176*** (0.275)	1.127*** (0.267)	1.182*** (0.279)
Observations	339	331	331	331	331	331
R-squared	0.280	0.341	0.346	0.346	0.386	0.348
rss	0.764	0.684	0.679	0.679	0.637	0.677

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

While Table VI and Table VII includes results using panel data with 5 year averages, OLS and fixed effects results using data with 20 year averages, 10 year averages and annual data are provided in Table XIX, Table XX, Table XXI, Table XXII and Table XXIII, Appendix B. Intuitively, the estimated coefficient is the smallest for annual data and increases as the time period gets longer. Only education aid for the 20 years data shows association with the decrease in infant mortality.

The main result showing that the health aid is associated with decrease in infant mortality, supports Mishra and Newhouse (2009) finding of statistically significant health aid effect on infant mortality. However, the result does not support Boone (1996) findings since Boone (1996) finds no effect of total ODA/GNP on log difference of infant mortality using decade-averaged data 1971-1980, 1981-1990. In addition to the difference of using health aid vs total aid, it may also be due to the different period of data since Mishra and Newhouse (2009) find that the effect of health aid on infant mortality strengthened after 1990 which may “reflect changes in mechanism of aid delivery towards system-wide and government led intervention in health, rather than small and isolated projects typical of the early 1970s”.

Table VIII and Table IX provide OLS and Fixed Effects results for log difference of life expectancy. OLS results suggest that the ODA/GDP is positively related to log difference of life expectancy, but the estimated coefficients are much lower than the ones estimated for health aid sector aid variables. The coefficients of (ALL health grant and loan)/GDP are much higher than the coefficients of ODA/GDP, positive and statistically significant for both OLS and Fixed Effects. The coefficients of (ODA health grant and loan)/GDP are also statistically significant, positive and very close the estimated coefficients of (ALL health grant and loan)/GDP.

TABLE VIII. OLS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY,
PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.224** (0.084)	-0.257** (0.096)	-0.256** (0.096)	-0.256** (0.096)	-0.255** (0.095)	-0.268** (0.100)
Initial ln(GDP_per_capita)	0.003 (0.006)	0.007 (0.005)	0.008 (0.005)	0.008 (0.005)	0.005 (0.005)	0.006 (0.005)
Trade/GDP	0.005 (0.007)	0.002 (0.007)	0.002 (0.007)	0.002 (0.007)	-0.001 (0.007)	-0.004 (0.007)
Initial ln(population)	0.003* (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	-0.001 (0.001)	-0.001 (0.002)
Initial DPT immunization	0.041 (0.023)	0.044 (0.030)	0.044 (0.030)	0.044 (0.030)	0.048 (0.030)	0.055 (0.031)
Initial HIV	-0.229* (0.114)	-0.311* (0.126)	-0.311* (0.126)	-0.315* (0.129)	-0.411** (0.134)	-0.363** (0.137)
Initial water	0.036 (0.026)	0.025 (0.027)	0.025 (0.027)	0.024 (0.026)	0.027 (0.026)	0.013 (0.027)
ODA/GDP	0.172** (0.056)					
PRI/GDP	0.035 (0.025)					
(ALL health grant and loan)/GDP		1.158*** (0.320)				
(ODA health grant and loan)/GDP			1.165*** (0.320)			1.790*** (0.457)
(ODA health grant)/GDP				1.206*** (0.339)		
(ODA health loan)/GDP				0.750 (0.945)		
(ODA Health-Health grant and loan)/GDP					-1.459 (1.098)	
(ODA Health-Population-Policy grant and loan)/GDP					4.032*** (1.040)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-0.475 (0.659)	
(ODA education grant and loan)/GDP						0.791 (0.593)
(ODA economic grant and loan)/GDP						-0.850* (0.330)
(ODA government grant and loan)/GDP						-0.819 (0.554)
Constant	0.846** (0.294)	0.969** (0.358)	0.968** (0.359)	0.967** (0.358)	0.987** (0.357)	1.033** (0.377)
Observations	339	331	331	331	331	331
R-squared	0.357	0.372	0.371	0.371	0.418	0.400
rss	0.312	0.304	0.305	0.305	0.282	0.291

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

TABLE IX. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF LIFE
EXPECTANCY, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.560*** (0.076)	-0.654*** (0.084)	-0.654*** (0.086)	-0.659*** (0.085)	-0.688*** (0.094)	-0.651*** (0.076)
Initial ln(GDP_per_capita)	-0.014 (0.011)	0.000 (0.008)	0.001 (0.008)	0.002 (0.008)	0.001 (0.008)	-0.003 (0.008)
Trade/GDP	0.031 (0.021)	0.032 (0.018)	0.032 (0.018)	0.032 (0.018)	0.023 (0.013)	0.019 (0.016)
Initial ln(population)	0.107*** (0.028)	0.075** (0.027)	0.073** (0.027)	0.068* (0.028)	0.073** (0.025)	0.069* (0.027)
Initial DPT immunization	-0.023 (0.021)	-0.011 (0.023)	-0.011 (0.023)	-0.012 (0.023)	0.006 (0.022)	0.000 (0.020)
Initial HIV	-0.482 (0.330)	-0.617* (0.277)	-0.615* (0.278)	-0.630* (0.272)	-0.666** (0.222)	-0.682** (0.254)
Initial water	0.066 (0.076)	0.059 (0.064)	0.058 (0.064)	0.063 (0.063)	0.047 (0.062)	0.053 (0.057)
ODA/GDP	-0.013 (0.087)					
PRI/GDP	-0.029 (0.031)					
(ALL health grant and loan)/GDP		1.763*** (0.395)				
(ODA health grant and loan)/GDP			1.816*** (0.416)			2.660*** (0.463)
(ODA health grant)/GDP				1.936*** (0.500)		
(ODA health loan)/GDP				0.536 (1.048)		
(ODA Health-Health grant and loan)/GDP					-1.078 (0.979)	
(ODA Health-Population-Policy grant and loan)/GDP					5.582*** (1.299)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-0.889 (0.977)	
(ODA education grant and loan)/GDP						-0.189 (0.445)
(ODA economic grant and loan)/GDP						-1.110*** (0.249)
(ODA government grant and loan)/GDP						-0.939* (0.470)
Constant	2.156*** (0.337)	2.484*** (0.359)	2.486*** (0.363)	2.506*** (0.361)	2.633*** (0.366)	2.518*** (0.315)
Observations	339	331	331	331	331	331
R-squared	0.535	0.615	0.616	0.619	0.688	0.661
rss	0.144	0.119	0.119	0.118	0.097	0.105

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

Moreover, OLS and Fixed Effects results indicate that only (ODA health grant)/GDP is associated with the increase in life expectancy. For example, the OLS results indicates that annual health grants of 1% of GDP increases life expectancy by over 1% over the five years while the Fixed Effects results indicates that annual health grants of 1% of GDP increases life expectancy by approximately 2% over the five years . The coefficient of (ODA health loan)/GDP is statistically insignificant and this may be due to the reason that on average most of the health aid was given as a grant rather than loan in summary statistics. This main result does not support either Mishra and Newhouse (2009) or Boone (1996) since Mishra and Newhouse (2009) found close to zero and statistically insignificant coefficient of health aid on life expectancy while Boone (1996) found no effect of ODA/GNP on life expectancy.

When economic and education aid variables are included in the final specifications, economic aid is negatively associated with life expectancy and only education aid for the 20 years data shows association with increase in life expectancy in Table XXIV, Appendix B. Table XXV, Table XXVI, Table XXVII, and Table XXVIII, Appendix B provides OLS and Fixed Effects results using panel data with 10 years averages and annual panel data. The finding of positive and statistically significant coefficient of health aid still holds.

Results indicate that the higher rate of HIV incidence is related to the decrease in life expectancy. Cutler, Deaton and Lleras-Muney (2006) conclude that “in rich countries, most deaths are from cancers and cardiovascular diseases; in poor countries, most deaths are from infectious diseases and higher rate of deaths are among children”.

6.3 Education aid and education outcome

Figure 6 shows that the education grant is higher than the education loan considering the average of all recipients in the sample for each year. Summary statistics in Table IV indicates that the mean of (ODA education grant)/GDP is 0.27%, while the mean of (ODA education loan)/GDP is 0.06%. Figure 7 shows education aid disaggregated by its purpose and Figure 8 indicates that the countries in South of Sahara on average received the highest education aid compare to other regions.

Figure 6. Education grant and loan using OECD and World Bank data.

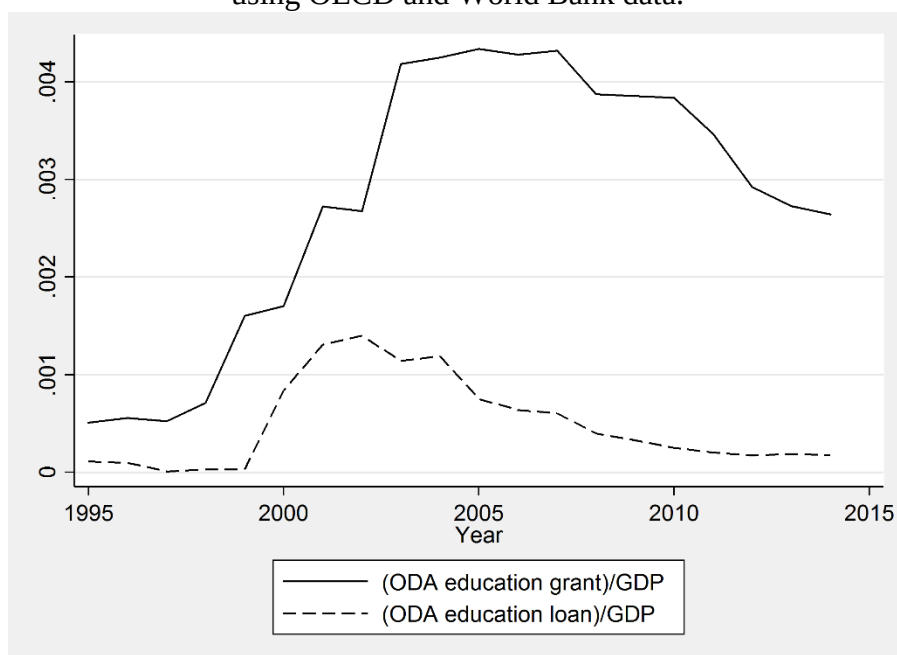


Figure 7. Education aid by purpose
using OECD and World Bank data.

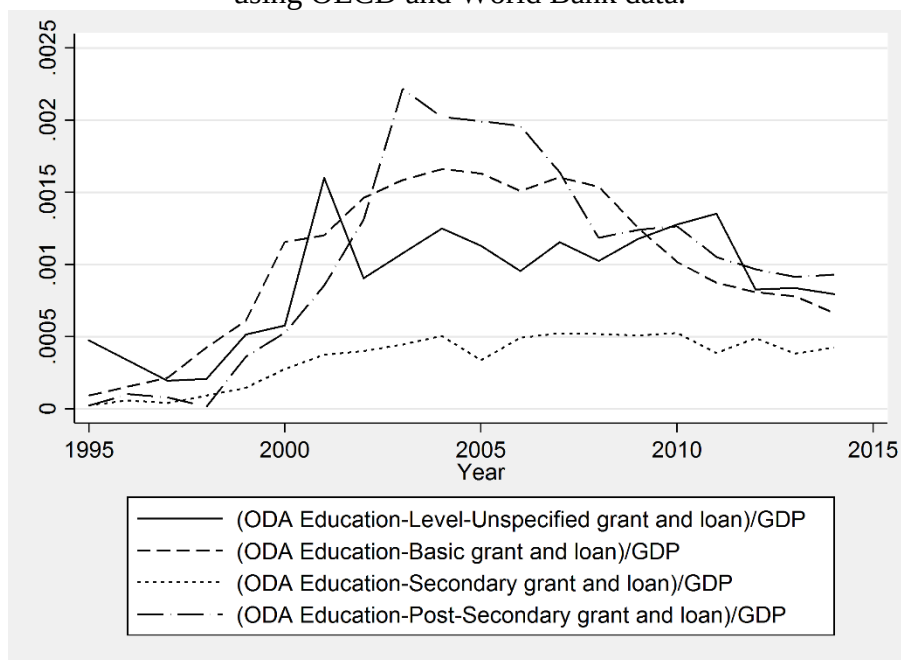


Figure 8. Education aid by region
using OECD and World Bank data.

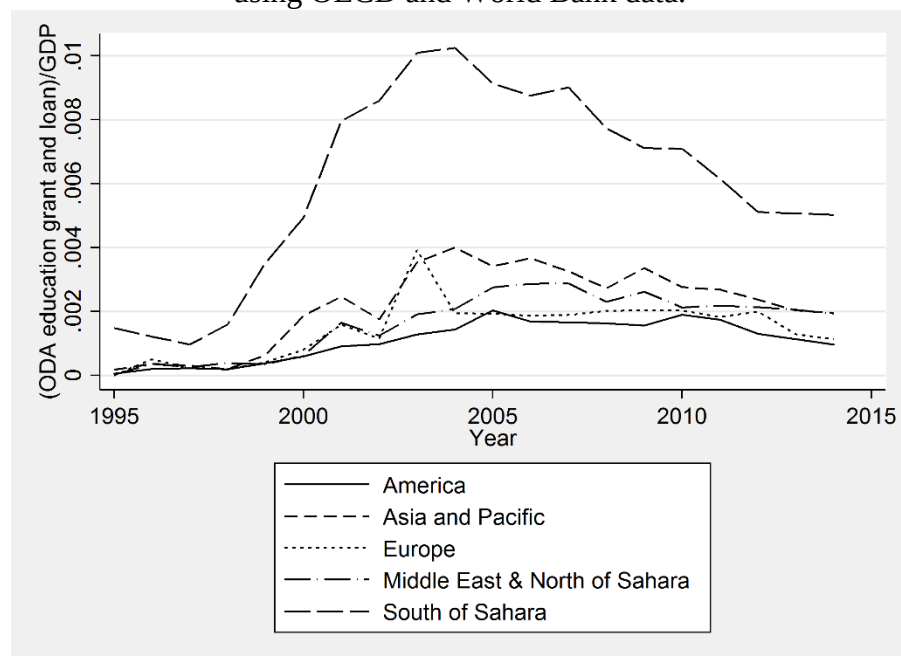


Table X and Table XI provides OLS and Fixed Effects estimation results for the education outcome. Education outcome is log difference of years of schooling and is obtained from Barro-Lee educational attainment data set. OLS results in Table X indicate no significant effect of education aid on education outcome supporting Boone (1996).

However, Fixed Effects results in Table XI suggest positive and significant effect of education aid. An annual education grant of one percent of GDP is associated with 7% increase in years of schooling over the five years but found no significant effect of education loan on education outcome. This result supports Birchler and Michaelowa (2016) since they find that increase in education aid has significant contribution to the increase in primary school enrollment over the last 15 years.

Moreover, when aid for level-unspecified education, basic education, secondary education and post-secondary education are considered separately rather than added together, positive and statistically significant relationship of aid for secondary education and years of schooling is detected. This result may be due to the dependent variable which is years of schooling for population over 15. If I considered primary school enrolment rate as an outcome variable, the results may have been different. In addition, due to data availability only 15 years of data (1995-2010) is used since the latest available data for years of schooling is 2010 and not 2015. Finally, when health, economic and government aid variables are included in the final specifications to test whether these aid also have effect on health outcomes and no significant relationship detected.

TABLE X. OLS ESTIMATION FOR LOG DIFFERENCE OF YEARS OF SCHOOLING,
PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(years of schooling)	-0.106*** (0.027)	-0.102*** (0.027)	-0.102*** (0.027)	-0.102*** (0.027)	-0.106*** (0.027)	-0.104*** (0.028)
Initial ln(GDP_per_capita)	-0.003 (0.017)	0.005 (0.017)	0.005 (0.017)	0.004 (0.018)	0.005 (0.017)	0.003 (0.020)
Trade/GDP	0.020 (0.023)	0.022 (0.024)	0.022 (0.025)	0.022 (0.025)	0.022 (0.025)	0.020 (0.024)
Initial ln(population)	0.007 (0.005)	0.008 (0.005)	0.008 (0.005)	0.008 (0.005)	0.008 (0.005)	0.008 (0.005)
Initial urban population	0.022 (0.043)	0.014 (0.043)	0.014 (0.043)	0.015 (0.043)	0.014 (0.040)	0.035 (0.061)
ODA/GDP	0.024 (0.107)					
PRI/GDP	0.118 (0.131)					
(ALL education grant and loan)/GDP		3.149 (2.487)				
(ODA education grant and loan)/GDP			3.160 (2.505)			2.075 (3.628)
(ODA education grant)/GDP				2.472 (3.392)		
(ODA education loan)/GDP				5.250 (3.924)		
(ODA Education-Level-Unspecified grant and loan)/GDP					-4.571 (5.588)	
(ODA Education-Basic grant and loan)/GDP					4.057 (4.524)	
(ODA Education-Secondary grant and loan)/GDP					25.832 (17.173)	
(ODA Education-Post-Secondary grant and loan)/GDP					3.179 (8.673)	
(ODA health grant and loan)/GDP						0.547 (1.162)
(ODA economic grant and loan)/GDP						0.106 (0.573)
(ODA government grant and loan)/GDP						0.003 (1.090)
Constant	0.242* (0.097)	0.181 (0.093)	0.181 (0.093)	0.184 (0.094)	0.183* (0.093)	0.183 (0.107)
Observations	243	240	240	240	240	237
R-squared	0.298	0.299	0.299	0.300	0.307	0.301
rss	1.444	1.432	1.432	1.431	1.415	1.426

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

TABLE XI. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF YEARS OF SCHOOLING, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(years of schooling)	-0.766*** (0.140)	-0.774*** (0.134)	-0.774*** (0.134)	-0.777*** (0.133)	-0.787*** (0.130)	-0.770*** (0.136)
Initial ln(GDP_per_capita)	-0.022 (0.031)	-0.015 (0.031)	-0.015 (0.031)	-0.014 (0.031)	-0.014 (0.031)	-0.019 (0.032)
Trade/GDP	-0.166 (0.127)	-0.161 (0.126)	-0.159 (0.127)	-0.161 (0.126)	-0.165 (0.125)	-0.167 (0.130)
Initial ln(population)	0.448** (0.139)	0.340** (0.126)	0.341** (0.126)	0.334** (0.125)	0.319* (0.124)	0.306 (0.166)
Initial urban population	-0.144 (0.316)	-0.135 (0.307)	-0.136 (0.307)	-0.125 (0.308)	-0.094 (0.309)	-0.079 (0.319)
ODA/GDP	-0.047 (0.149)					
PRI/GDP	0.099 (0.142)					
(ALL education grant and loan)/GDP		5.672* (2.170)				
(ODA education grant and loan)/GDP			5.627* (2.161)			5.117* (2.375)
(ODA education grant)/GDP				7.204* (3.373)		
(ODA education loan)/GDP				1.271 (5.346)		
(ODA Education-Level-Unspecified grant and loan)/GDP					-10.123 (7.321)	
(ODA Education-Basic grant and loan)/GDP					9.888 (6.687)	
(ODA Education-Secondary grant and loan)/GDP					42.254* (19.445)	
(ODA Education-Post-Secondary grant and loan)/GDP					4.090 (5.541)	
(ODA health grant and loan)/GDP						0.668 (1.971)
(ODA economic grant and loan)/GDP						0.956 (1.078)
(ODA government grant and loan)/GDP						-1.309 (1.536)
Constant	0.600 (0.507)	0.781 (0.498)	0.778 (0.498)	0.787 (0.498)	0.823 (0.498)	0.840 (0.541)
Observations	243	240	240	240	240	237
R-squared	0.433	0.452	0.451	0.454	0.474	0.456
rss	0.741	0.716	0.716	0.713	0.686	0.710

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

6.4 Aid and investment

Figure 9 shows economic grant and loan considering the average of all recipients for each year. Summary statistics in Table IV indicates that the average (ODA economic grant)/GDP is 0.55%, while the average (ODA economic loan)/GDP is 0.25%. Figure 10 shows aid for economic infrastructure and production sector separately. Figure 11 indicates that the countries in South of Sahara on average received the highest economic aid compare to other regions starting 2000.

Figure 9. Economic grant and loan using OECD and World Bank data.

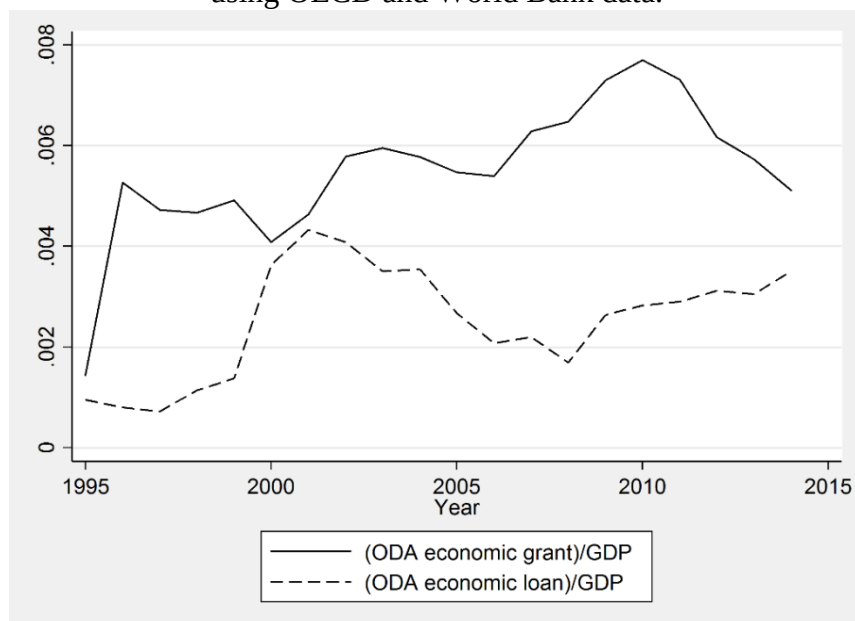


Figure 10. Economic aid by purpose
using OECD and World Bank data.

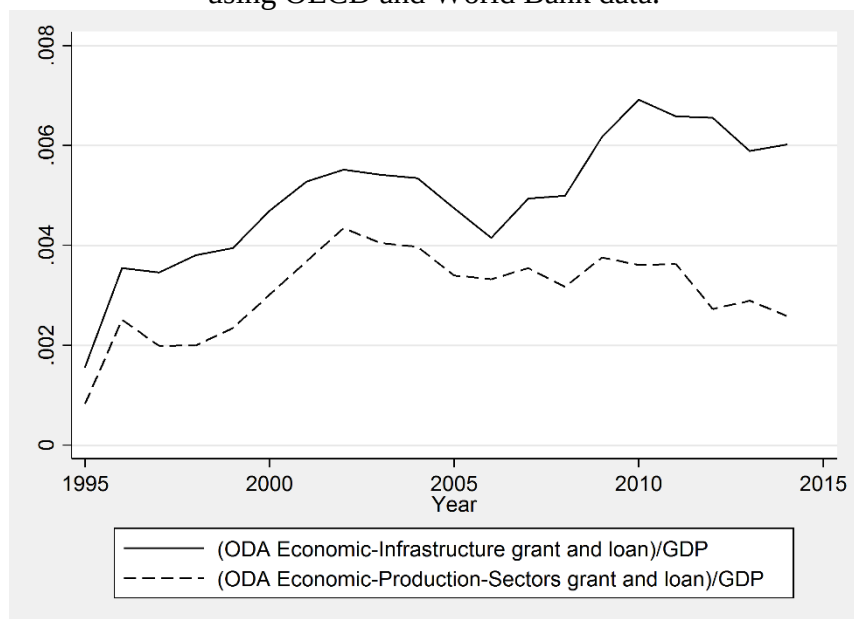


Figure 11. Economic aid by region
using OECD and World Bank data.

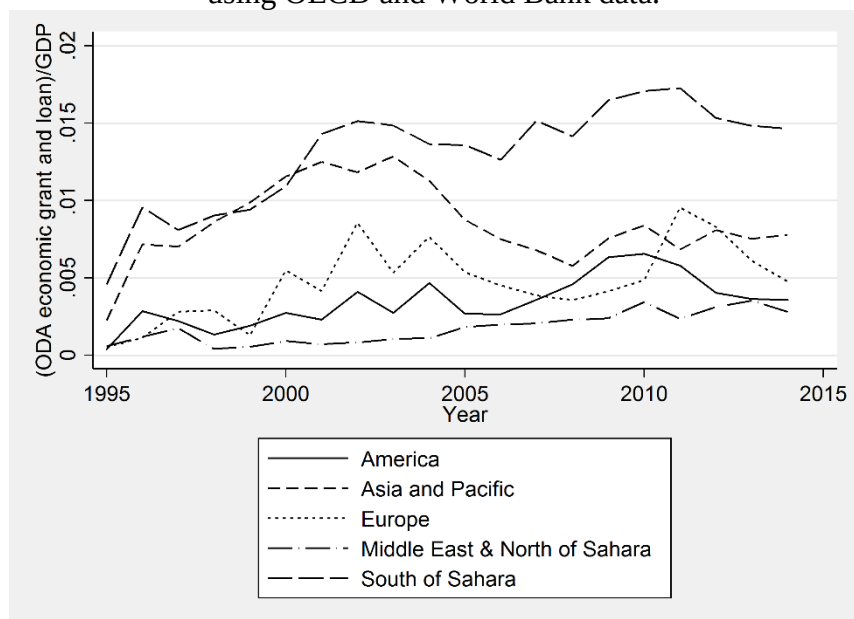


Table XII and Table XIII provide OLS and Fixed Effects estimation results for INV/GDP. OLS estimation results suggest that the relationship of economic aid and INV/GDP is positive and statistically significant indicating that an annual 1% (ODA economic grant and loan)/GDP is related to 1% higher investment to GDP ratio. However, Fixed Effects results in Table XIII suggest no relationship of economic aid (including grant and loan) and investment, but negative relationship of economic grant and investment. Column (4) in Table XIII shows that an annual 1% (ODA economic grant)/GDP is related to 1% lower investment to GDP ratio.

Table XXXI, Appendix B shows Fixed Effects results using panel data with 10 year averages and indicates negative relationship of economic aid and investment while Table XXXIII, Appendix B suggests no relationship of economic aid and investment using annual panel data. OLS results for data with 20 year averages, panel data with 10 year averages and annual data are provided in Table XXIX, Table XXX and Table XXXII in Appendix B.

In general, using pooled OLS for panel data is problematic since pooled OLS omit unobserved individual heterogeneity. Wooldridge (2010) notes that “Fixed Effects is useful for policy analysis and program evaluation. A policy variable can be systematically related to the persistent component in the error term. It is for this reason that, Fixed Effects is often superior to pooled OLS or Random Effects for applications where participation in a program is determined by preprogram attributes that also affect the dependent variable” (p. 315). While the disadvantage of Fixed Effects is that the coefficients on the time-invariant variables cannot be estimated, the aid variables in this thesis vary over time within countries. Thus, I consider Fixed Effects results as the main results which support Boone (1996), Friedman (1958) and Bauer (1969). However, the negative relationship of economic aid and investment can also be due to reverse causality.

TABLE XII. OLS ESTIMATION FOR INV/GDP, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	0.022** (0.007)	0.028*** (0.006)	0.027*** (0.007)	0.025*** (0.006)	0.024*** (0.006)	0.026*** (0.007)
Trade/GDP	0.092*** (0.020)	0.103*** (0.020)	0.100*** (0.020)	0.097*** (0.020)	0.095*** (0.020)	0.103*** (0.021)
Initial ln(population)	0.004 (0.003)	0.006* (0.003)	0.005* (0.003)	0.004 (0.003)	0.005 (0.003)	0.006* (0.003)
ppi (Initial Price level of capital formation)	-0.182*** (0.030)	-0.177*** (0.029)	-0.178*** (0.029)	-0.180*** (0.029)	-0.177*** (0.029)	-0.182*** (0.029)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.111** (0.037)	0.107** (0.037)	0.108** (0.037)	0.112** (0.037)	0.110** (0.037)	0.107** (0.037)
Initial rule of law	0.035*** (0.007)	0.028*** (0.007)	0.029*** (0.007)	0.029*** (0.007)	0.031*** (0.007)	0.026*** (0.007)
ODA/GDP	0.079 (0.101)					
PRI/GDP	-0.098 (0.063)					
(ALL economic grant and loan)/GDP		1.384** (0.494)				
(ODA economic grant and loan)/GDP			1.169* (0.529)			1.636** (0.617)
(ODA economic grant)/GDP				0.372 (0.709)		
(ODA economic loan)/GDP				2.253* (0.912)		
(ODA Economic-Infrastructure grant and loan)/GDP					2.236** (0.820)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-1.417 (1.170)	
(ODA education grant and loan)/GDP						2.418 (1.431)
(ODA health grant and loan)/GDP						-0.169 (0.679)
(ODA government grant and loan)/GDP						-2.664*** (0.658)
Constant	0.044 (0.068)	-0.020 (0.058)	-0.005 (0.060)	0.017 (0.058)	0.023 (0.057)	0.006 (0.062)
Observations	439	439	439	439	439	419
R-squared	0.381	0.391	0.386	0.390	0.394	0.411
rss	2.057	2.023	2.040	2.028	2.014	1.858

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

TABLE XIII. FIXED EFFECTS ESTIMATION FOR INV/GDP, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	-0.019 (0.015)	-0.011 (0.014)	-0.013 (0.014)	-0.014 (0.015)	-0.013 (0.014)	-0.015 (0.015)
Trade/GDP	0.097** (0.031)	0.113*** (0.030)	0.113*** (0.030)	0.113*** (0.030)	0.113*** (0.030)	0.110** (0.035)
Initial ln(population)	0.012 (0.051)	0.025 (0.054)	0.031 (0.055)	0.034 (0.055)	0.030 (0.056)	0.035 (0.062)
ppi (Initial Price level of capital formation)	-0.142*** (0.026)	-0.137*** (0.028)	-0.139*** (0.028)	-0.139*** (0.028)	-0.139*** (0.028)	-0.134*** (0.028)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.077* (0.033)	0.072* (0.034)	0.072* (0.034)	0.073* (0.034)	0.072* (0.034)	0.066 (0.034)
Initial rule of law	0.033** (0.012)	0.034** (0.012)	0.036** (0.012)	0.038** (0.012)	0.036** (0.012)	0.039** (0.013)
ODA/GDP	-0.262** (0.097)					
PRI/GDP	0.080 (0.073)					
(ALL economic grant and loan)/GDP		-0.347 (0.327)				
(ODA economic grant and loan)/GDP			-0.670 (0.362)			-0.495 (0.425)
(ODA economic grant)/GDP				-1.203* (0.465)		
(ODA economic loan)/GDP				0.086 (0.913)		
(ODA Economic-Infrastructure grant and loan)/GDP					-0.696 (0.621)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-0.605 (1.250)	
(ODA education grant and loan)/GDP						-0.316 (0.776)
(ODA health grant and loan)/GDP						0.215 (0.498)
(ODA government grant and loan)/GDP						-0.741 (0.545)
Constant	0.366* (0.183)	0.252 (0.184)	0.264 (0.184)	0.270 (0.183)	0.264 (0.185)	0.268 (0.202)
Observations	439	439	439	439	439	419
R-squared	0.350	0.333	0.337	0.340	0.337	0.330
rss	0.664	0.681	0.677	0.674	0.677	0.636

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

When education aid, health aid and government aid variables are included in the model specification, the coefficients are insignificant in Table XIII. Table XIII shows that initial price level of capital formation is negatively associated with investment to GDP ratio while initial rule of law is positively related to investment to GDP ratio. Recall that rule of law includes the perception of the quality of contract enforcement and property rights. Indeed, the investment would be expected to be higher in countries with more secure property rights and better contract enforcement than in countries with insecure property rights and less contract enforcement.

6.5 Aid and institutions

Figure 12 shows government grant and loan considering the average of all recipients for each year. Grant toward government and civil society, relative to GDP is higher than the government loan relative to GDP. Figure 13 indicates that the countries in South of Sahara on average received the highest government aid (relative to GDP) compare to other regions starting 2000.

Young and Sheehan (2014) conclude that “foreign aid flows are associated with the deterioration of both political and economic institutions” using a panel of up to 116 countries from 1970 to 2010. Related to economic institutions they find that “aid flows are associated with deterioration in a recipient's legal system and property rights, as well as its openness to international trade”. Busse and Groning (2009) also suggest that aid has a negative rather than a positive influence on governance. While both of these studies use instrumental variable approach, I use OLS and Fixed Effects since OLS and Fixed Effects are used for the other empirical results in this thesis. I follow similar model specification as Young and Sheehan (2014), and Busse and Groning (2009).

Figure 12. Government grant and loan using OECD and World Bank data.

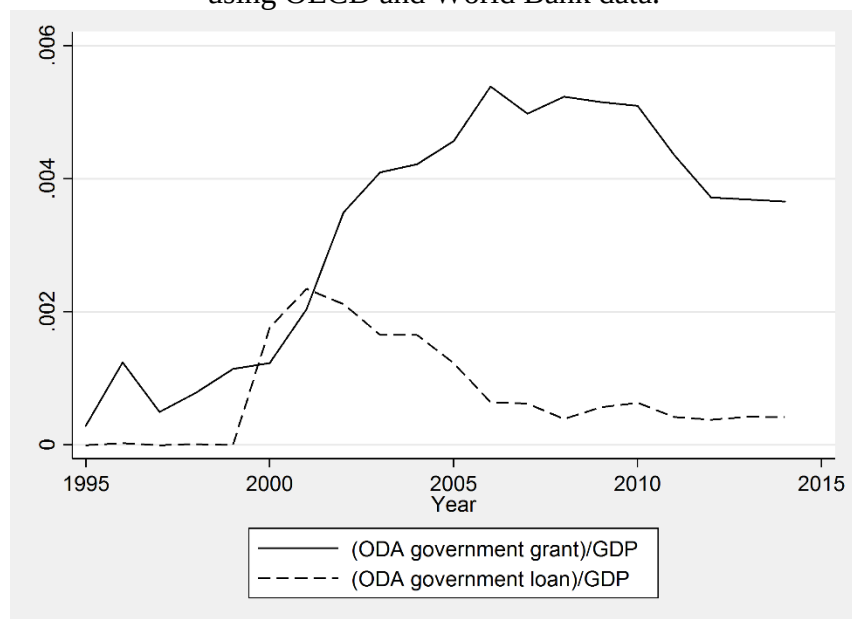
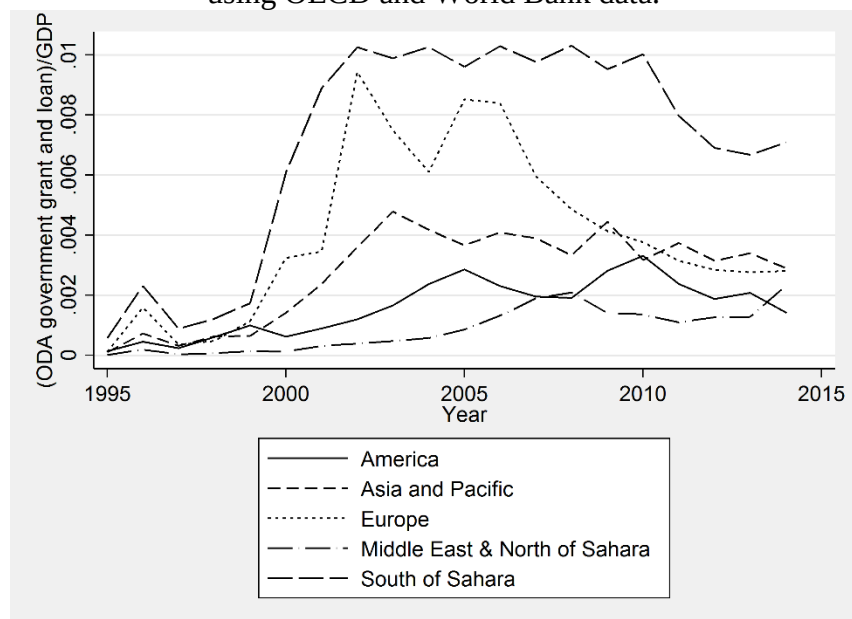


Figure 13. Government aid by region using OECD and World Bank data.



On the contrary, Jones and Tarp (2016) find “a small positive net effect of total aid on political institutions” and that “this aggregate net effect is driven primarily by the positive contribution of more stable inflows of governance aid” by using disaggregated aid data, several measurements of political institutions, long run cross-section and alternative dynamic panel estimators. They use 104 countries data for 1983-2010.

Table XIV and Table XV provide OLS and Fixed Effects estimation results for the difference of rule of law. OLS results in Table XIV show no significant relationship of aid variables and rule of law. The coefficient of ODA/GDP is also insignificant in Column (1), Table XV. However, Fixed Effects results in Table XV suggest positive and statistically significant relationship of government aid and rule of law.

Moreover, column (4) of Table XV shows that government grant is positively associated with rule of law while no significant relationship of government loan and rule of law is detected. Thus, the results support Jones and Tarp (2016) finding and indicate that aid directed toward governance and civil society is associated with improvement in rule of law indicator. When education aid, health aid and economic aid variables are included in the model specification, the coefficients are insignificant.

TABLE XIV. OLS ESTIMATION FOR THE DIFFERENCE OF RULE OF LAW, PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)
Initial rule of law	-0.175*** (0.037)	-0.180*** (0.038)	-0.183*** (0.038)	-0.185*** (0.038)	-0.172*** (0.039)
Growth of real GDP per capita	1.708* (0.812)	1.859* (0.871)	1.844* (0.870)	1.850* (0.865)	1.980* (0.897)
Trade/GDP	0.000 (0.105)	0.014 (0.097)	0.008 (0.097)	0.015 (0.100)	-0.009 (0.108)
Initial ln(population)	-0.005 (0.014)	-0.004 (0.013)	-0.005 (0.013)	-0.006 (0.013)	-0.012 (0.015)
ODA/GDP	0.368 (0.507)				
(ALL government grant and loan)/GDP		6.011 (4.119)			
(ODA government grant and loan)/GDP			4.984 (4.041)		6.187 (5.076)
(ODA government grant)/GDP				3.561 (4.300)	
(ODA government loan)/GDP				15.344 (15.310)	
(ODA education grant and loan)/GDP					0.838 (6.071)
(ODA health grant and loan)/GDP					2.039 (4.322)
(ODA economic grant and loan)/GDP					-3.439 (3.033)
Constant	-0.160 (0.090)	-0.178* (0.075)	-0.173* (0.074)	-0.181* (0.077)	-0.134 (0.084)
Observations	220	214	214	214	210
R-squared	0.247	0.267	0.265	0.266	0.260
rss	17.539	16.279	16.334	16.302	15.844

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

TABLE XV. FIXED EFFECTS ESTIMATION FOR THE DIFFERENCE OF RULE OF LAW,
PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)
Initial rule of law	-0.840*** (0.112)	-0.891*** (0.102)	-0.889*** (0.103)	-0.893*** (0.106)	-0.907*** (0.107)
Growth of real GDP per capita	1.292 (0.690)	1.321* (0.657)	1.307* (0.652)	1.230 (0.679)	1.354* (0.649)
Trade/GDP	0.508* (0.246)	0.380 (0.193)	0.374 (0.195)	0.368 (0.193)	0.296 (0.193)
Initial ln(population)	0.039 (0.344)	-0.124 (0.331)	-0.144 (0.336)	-0.172 (0.360)	-0.260 (0.338)
ODA/GDP	0.293 (0.876)				
(ALL government grant and loan)/GDP		17.481** (5.500)			
(ODA government grant and loan)/GDP			16.586** (5.656)		11.233 (10.741)
(ODA government grant)/GDP				16.593** (5.649)	
(ODA government loan)/GDP				6.786 (22.199)	
(ODA education grant and loan)/GDP					-7.965 (13.804)
(ODA health grant and loan)/GDP					2.491 (5.493)
(ODA economic grant and loan)/GDP					4.520 (4.197)
Constant	-0.715 (0.631)	-0.442 (0.624)	-0.398 (0.632)	-0.333 (0.688)	-0.159 (0.663)
Observations	220	214	214	214	210
R-squared	0.487	0.539	0.536	0.537	0.546
rss	5.245	4.461	4.490	4.483	4.267

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%.
All specifications include time dummy variables.

6.6 Life expectancy and growth

Acemoglu's (2010) approach stating that the importance of general equilibrium considerations rather than only relying on partial equilibrium empirical conclusions is discussed in Section 3.7. Following that discussion, I estimate the relationship of life expectancy and population growth, GDP and GDP per capita using Acemoglu and Johnson (2007) model specification. Acemoglu and Johnson (2007) find that "1 percent increase in life expectancy leads to a 1.7–2 percent increase in population, but life expectancy has a much smaller effect on total GDP" and they do not find any evidence that the large increase in life expectancy raised income per capita using data for 1940-2000. To overcome the potential problems of omitted factors, they use instrumental variable approach. However, their Fixed Effects result also shows that the increase in life expectancy is associated with increase in population.

Table XVI shows the Fixed Effects estimation results for life expectancy and growth. Supporting Acemoglu and Johnson (2007) result, increase in life expectancy is associated with increase in population. The estimated coefficient is smaller than Acemoglu and Johnson (2007) result due shorter period 1995-2014 rather than 1940-1980 or 1960-2000. Moreover, the magnitude of positive relationship of life expectancy and population is higher for population under 14 years old compare to other age groups.

While there is a positive relationship of log of life expectancy and log of GDP, there is no evidence of statistically significant relationship of log of life expectancy and log of GDP per capita or log of life expectancy and log of GDP per working age population. Thus, the positive effect of health aid on life expectancy may lead to increase in population therefore, the effect on GDP per capita is ambiguous depending on which is growing faster population or GDP. Further discussion related to policy implication is included in Chapter 7.

TABLE XVI. FIXED EFFECTS ESTIMATION FOR LIFE EXPECTANCY AND GROWTH

	Dependent variable:						
	Log population	Log population under 14	Log population 15-64	Log population over 65	Log GDP	Log GDP per capita	Log GDP per working age population
Log of life expectancy	0.884*** (0.155)	1.431*** (0.282)	0.687*** (0.129)	0.538*** (0.134)	1.153** (0.429)	0.268 (0.435)	0.465 (0.427)
Year 1995	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)	0.000 (.)
Year 2014	0.238*** (0.024)	-0.035 (0.039)	0.353*** (0.025)	0.440*** (0.028)	0.867*** (0.059)	0.631*** (0.061)	0.515*** (0.060)
Constant	-1.699** (0.637)	-4.912*** (1.158)	-1.468** (0.529)	-3.439*** (0.547)	5.254** (1.769)	6.952*** (1.791)	6.719*** (1.759)
Observations	214	214	214	214	213	213	213
R-squared	0.807	0.314	0.861	0.860	0.792	0.621	0.553
rss	1.466	3.806	1.574	2.130	13.556	13.901	13.508

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. Acemoglu and Johnson's (2007) long-difference specifications with two observations per country, one for the 1995 and one 2014.

6.7 Growth

Table XVII provides OLS results for growth following Solow growth model. The purpose of the Table XVII is to provide a support for the final link of the framework shown in Figure 1 of Chapter 3. The results are estimated using the model specification of Mankiw et al., (1992) in column (1) and column (3) while the rule of law variable is added in the specification of column (2) and column (4). Column (1) and column (2) results support the “conditional convergence” since the estimated coefficient of log of GDP per working age population in 1995 is negative and statistically significant. Table XVII results support the augmented Solow model. The estimated coefficients of $\ln(\text{INV}/\text{GDP})$ and $\ln(\text{years of schooling})$ are positive and statistically significant while the estimated coefficient of $\ln(n+g+\delta)$ is negative in all cases but statistically significant only in column (3). When the rule of law is added, the estimated

coefficient is positive and statistically significant in column (4). However, Acemoglu et al., (2014) suggest that just including institution “on the right-hand side of an OLS regression, is unlikely to provide convincing evidence” since they argue that institution is fundamental determinant so that it has effect on total factor productivity, human capital and physical capital.

While Acemoglu et al., (2014) use instrumental variable approach to obtain their main results, I include OLS result in column (5) to show that the estimated coefficient of rule of law is much higher compare to column (4). Recognizing the extensive literature on growth, I do not include further empirical analysis on this issue.

TABLE XVII. OLS ESTIMATION FOR GROWTH

	Dependent variables:				
	Log difference of GDP per working age population	Log difference of GDP per working age population	Log GDP per working age population 2014	Log GDP per working age population 2014	Log GDP per capita 2014
	(1)	(2)	(3)	(4)	(5)
Log of GDP per working age population 1995	-0.337*** (0.064)	-0.340*** (0.063)			
ln(INV/GDP)	0.582*** (0.134)	0.576*** (0.149)	0.831*** (0.189)	0.656** (0.198)	
ln(n+g+ δ)	-0.342 (0.352)	-0.336 (0.360)	-0.942* (0.430)	-0.739 (0.407)	
ln(years of schooling)	0.354*** (0.101)	0.354*** (0.102)	0.943*** (0.114)	0.885*** (0.109)	
Initial rule of law		0.012 (0.088)		0.254* (0.103)	0.722*** (0.094)
Constant	2.910** (1.001)	2.952** (1.020)	6.504*** (1.198)	6.961*** (1.141)	9.074*** (0.076)
Observations	81	81	81	81	110
R-squared	0.313	0.314	0.639	0.664	0.292
rss	11.124	11.121	22.626	21.094	74.805

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. Mankiw, Romer, Weils's (1992) model specifications are used in the first two columns where n denotes working age population growth and (g+ δ) is assumed to be 0.05. Acemoglu, Gallego, Robinson's (2014) specification including only rule of law is shown in last column.

7. POLICY IMPLICATIONS

This Chapter provides detailed discussion about each sector aid policy implications and also includes related policy suggestions by other authors whose studies are discussed in this thesis. Acemoglu et al., (2005) state that “in a world where political choices are made rationally and are endogenous to the structure of institutions, which are also endogenous, giving policy advice is a conceptually complex issue”. Moreover, Bauer (1969) notes that “it is difficult or even impossible to ascertain confidently what would have happened without aid”.

Thus, I acknowledge the complexity and I attempt to address the key issues related to policy implication of health aid, education aid, economic aid and government aid in general. However, the effect of sector level aid and its policy implications should be taken with caution for each individual country since each country has its own economic and political conditions with various other factors affecting economic performance and human development indicators in a dynamic setting.

7.1 Health aid and humanitarian goals

Table XVIII, Appendix A provides mean of the main variables for each country by region. Table XVIII shows that countries in South of Sahara on average have the lowest GDP per capita, the highest infant mortality and the lowest life expectancy on average. Moreover the region has the highest incidence of tuberculosis and HIV, the lowest rate of DPT immunization and the lowest rate of access to improved water source in 1995 compare to other regions in the sample. During 1995-2014, the countries in South of Sahara received the highest health aid relative to GDP which is around 1% of GDP. While the percentage decrease in infant mortality is not the highest due to high initial infant mortality level, the absolute decrease in infant

mortality indicates that on average 37 fewer infants (per 1,000 live births) died in 2014 compared to 1995 in South of Sahara. This is the highest absolute decrease compared to other regions. Despite the significant decline during 1995-2014, the infant mortality is still the highest for South of Sahara due to the initial high level of infant mortality.

Life expectancy increased by 8 years on average for the countries in South of Sahara, the highest increase relative to other regions. However, the life expectancy in 2014 remains the lowest in 2014 due to low initial life expectancy. There have been improvements in the level of DPT immunization and access to improved water source.

Overall, policy implication of health aid should be carefully considered for specific countries since there are other characteristics such as level of economic and health status of the country, quality of the institutions and ongoing political conflict. In addition, note that there is a problem related to the measurement error of counting people, births, and deaths in less developed countries. Deaton (1995) states that “1990s data on life-expectancy and infant mortality are available for only a half (a quarter) of less developed countries, and two-thirds of African countries have collected no data on life-expectancy since 1970, so that many of the published figures are estimates and projections, not measurements”. However, this problem is beyond the scope of this thesis.

World Bank (2016) reports that “the number of children who die before their fifth birthday fell from 13 million in 1990 to just over 6 million in 2013, implying that 17,000 fewer children die each day compared with 1990 and average life expectancy at birth has risen from 47 years in 1950 to 72 years in 2015”. World Bank (2016) report also notes that “since 2001, the number of people newly infected with HIV has declined by about 33%, the incidence of

tuberculosis fell at an average rate of 1.5 % a year between 2000 and 2013, and deaths from malaria fell by some 26%”.

This thesis concludes that the part of this improvement is due to ODA health aid based on the empirical results from Chapter 6. While I did not study the effect of health aid on HIV prevalence, DPT immunization, incidence of tuberculosis and improved water source, the results suggested that annual health grant of 1 % relative to GDP is associated with approximately 2% increase in life expectancy and over 3% decrease in infant mortality over the five years. Intuitively, vaccinations, medical supplies, fund to build hospitals and any other medical assistance for sure have helped saving lives. Thus, I conclude that health aid did achieve humanitarian goals and should be promoted to achieve these goals.

7.2 Health aid and dependence

However, I suggest that health aid may also have effect on other outcomes. First of all, some governments of the recipients may become dependent on the ODA funds covering the health expenditure and completely neglect to provide basic public health service to their citizens. Figure 14 - Figure 19 show health aid and health expenditure by each region. Health expenditure includes funds from international sources and is derived from WDI data as shown in Chapter 5. While this variable may have measurement error, it is the only available variable indicating the public health expenditure relative to GDP. In regions America, Europe, Middle East & North of Sahara, health aid is relatively small on average compare to the public health expenditure. In Asia & Pacific health aid has increased on average relatively during 2000s, but remained almost same level for the remaining years.

Figure 14. Health aid and health expenditure, America using OECD and World Bank data.

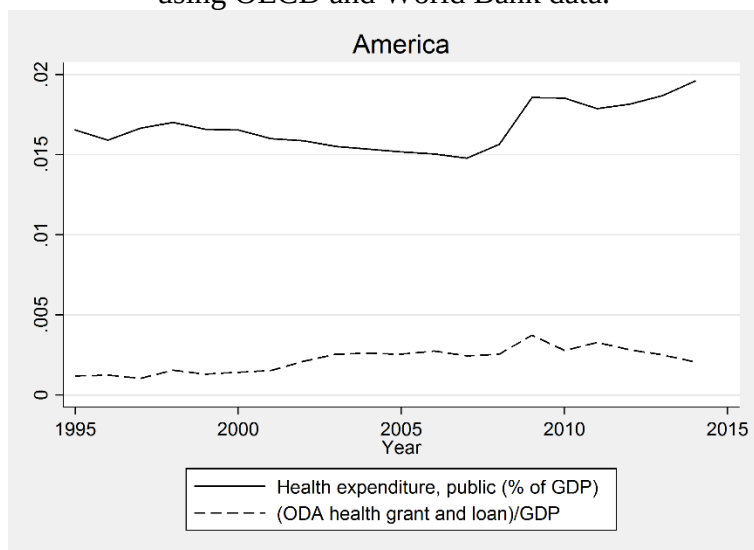


Figure 15. Health aid and health expenditure, Asia and Pacific using OECD and World Bank data.

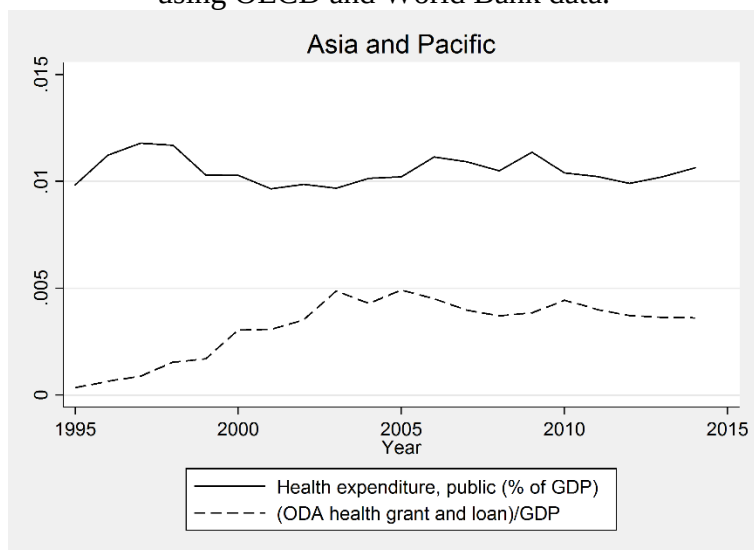


Figure 16. Health aid and health expenditure, Europe using OECD and World Bank data.

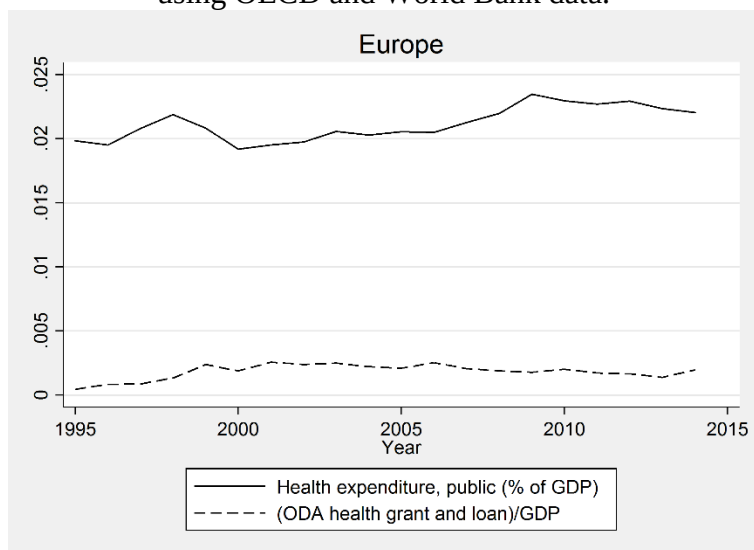
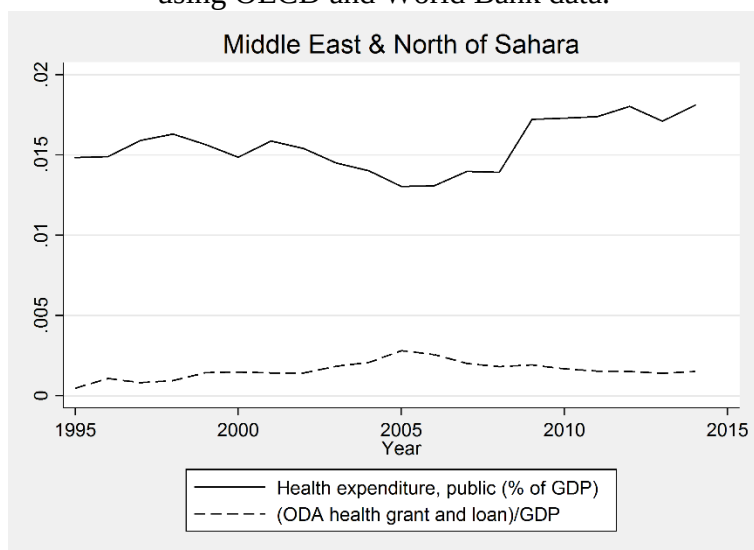


Figure 17. Health aid and health expenditure, Middle East & North Sahara using OECD and World Bank data.



However, Figure 18 shows completely different pattern for South of Sahara compare to other regions. While during 1995 health aid is relatively small on average compare to the public health expenditure, health aid has been increasing significantly on average since then and surpasses the public health expenditure starting 2007 and remains higher than health expenditure until 2014. Using Table XVIII, following countries have higher health aid than health expenditure relative to GDP: Haiti in America, Cambodia and Lao PDR in Asia and Pacific, Burundi, Chad, Congo Dem. Rep., Ethiopia, Gambia, Guinea, Guinea-Bissau, Malawi, Mozambique, Niger, Rwanda, Sierra Leone, Uganda, Zambia, Zimbabwe in South of Sahara.

However, I am not aware of which health aid components are exactly included in the public health expenditure measure while the definition shows that it includes external borrowings and grants (including donations from international agencies and nongovernmental organizations). Recall that aid for health, population policy and water and sanitation are all included in health aid in this study. Since I do not have information about which health related aid expenditures are included in WDI measure, Figure 19 provides health aid excluding aid for water and sanitation. Health aid is still very high and close to public health expenditure in Figure 19.

Thus, substituting the government role of providing basic services to their citizen by foreign aid is not a sustainable policy. Specially, considering Friedman's (1958) view that "foreign aid may help a government in a shaky position to overcome its temporary political crisis therefore having adverse political effects to freedom and democracy".

Figure 18. Health aid and health expenditure, South of Sahara, including aid for water and sanitation (OECD and World Bank data).

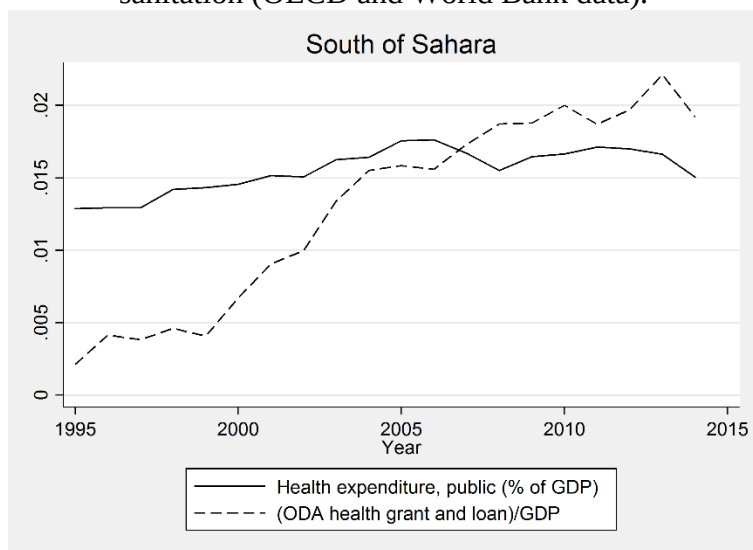
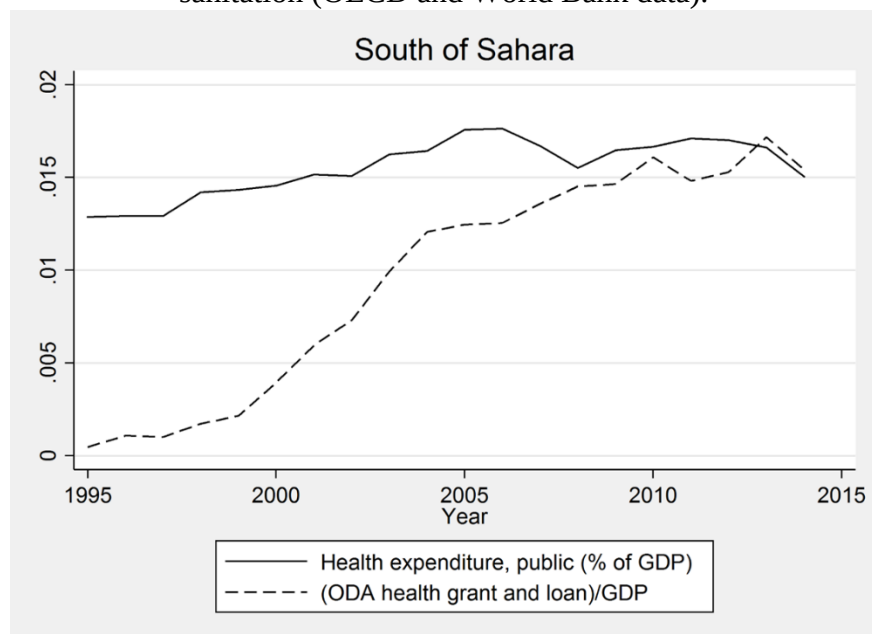


Figure 19. Health aid and health expenditure, South of Sahara, excluding aid for water and sanitation (OECD and World Bank data).



7.3 Health aid and population

Results in Section 6.6 suggest that the increase in life expectancy is associated with increase in population. Related to this issue, Table XVIII shows that countries in South of Sahara on average has the highest percentage increase in population during 1995-2014. For example, Angola, Chad, Gambia, Niger, Rwanda, Uganda all had 80%-104% increase in population comparing population in 1995 and 2014. Sachs et al. (2004) concludes that the rapid population growth has contributed to the poor economic performance of countries in South of Sahara. Indeed, it would be very difficult for any underdeveloped country that is experiencing a rapid population growth to even maintain same GDP per capita level or providing schooling for all the children, especially when percentage of population under 15 is very high (on average 42% in South of Sahara between 1995-2014). Figure 20 shows log population by region and Figure 21 shows percentage of population under 15.

Figure 20. Log population by region using Penn World Table data.

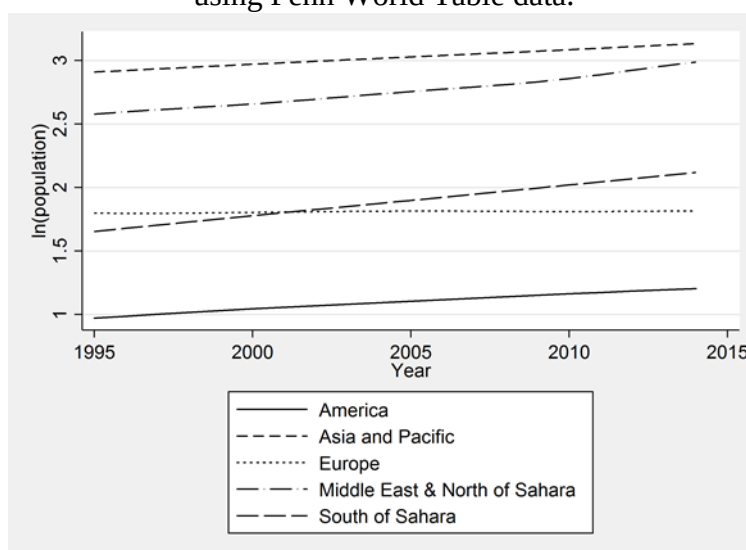


Figure 21. Percentage of population under 15 using Penn World Table and World Bank data.

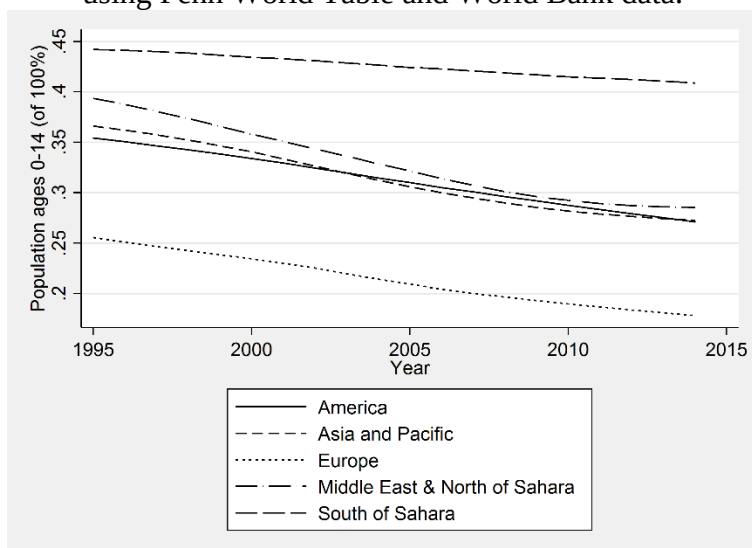
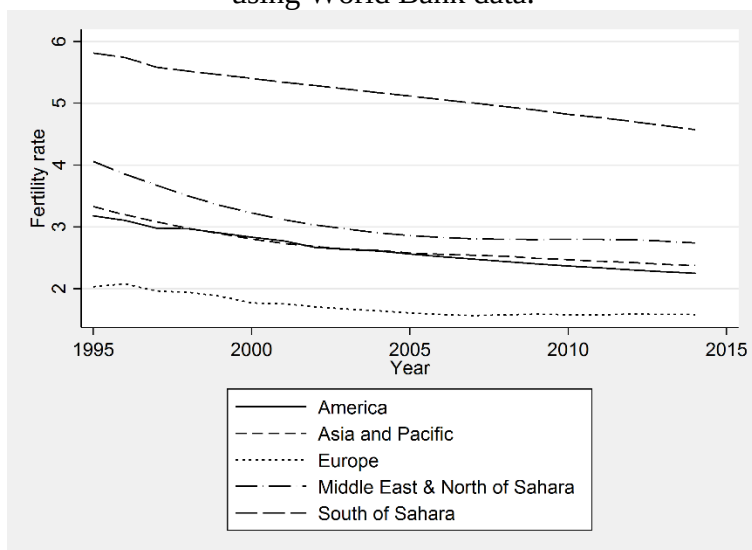


Figure 22. Fertility by region using World Bank data.



While this population explosion can be based on many factors such as high fertility rate, increase in life expectancy, decrease in infant mortality and other factors, I conclude that health aid has contributed it through the part of increase in life expectancy and the part of decrease in infant mortality. Sachs et al. (2004) include a policy package associated with “family planning and reproductive health services, girls’ education, women’s empowerment and employment opportunities for young women aiming to reduce high fertility rates”. I support Sachs et al. (2004) policy package to reduce high fertility rates in South of Sahara and I believe that aid associated with these activities should be prioritized. However, the country’s own government’s attempt to address the country’s problems should be considered too.

7.4 Education aid

World Bank (2016) reports that “between 2000 and 2012, the increase in primary school enrollment in developing countries rose from 83 percent to 90 percent, almost twice as fast as over the preceding 12 years and the number of children not attending school dropped from 102 million to 57 million”. According to Table XVIII, countries in the South of Sahara on average have the lowest 4.27 years of schooling for population over 15. There have been increase in years of schooling in all regions and almost all countries in the sample between 1995 and 2014.

Chapter 6 results indicate that an annual education grant of one percent of GDP is associated with 7% increase in years of schooling over the five years but found no significant effect of education loan on education outcome. Moreover, when aid for level-unspecified education, basic education, secondary education and post-secondary education are considered separately rather than added together, positive and statistically significant relationship of aid for secondary education and years of schooling is detected. This result may be due to the dependent

variable which is years of schooling for population over 15. If I considered primary school enrolment rate as an outcome variable, the results may have been different.

In addition, Birchler and Michaelowa (2016) stress the importance of the quality of the education rather than the quantitative measure. For instance, Malawi, Mozambique and Kenya experienced a substantial increase in school enrolment when their' education systems were not prepared for it, resulting a decline or stagnation in national test scores. Thus, Birchler and Michaelowa (2016) suggest that the countries face significant challenge to raise or even maintain the quality of education during the substantial increase in school enrolment rates.

Education aid on average was the lowest compare to health aid, economic aid and government aid for 1995-2014. While I compare the government expenditure on education and education aid relative to GDP, I do not find similar alarming pattern as in health aid. So far, government expenditure on education is higher than the education aid relative to GDP on average for all countries with available data in the sample. Based on the results, I conclude that education aid is effective and should be promoted to support human capital in developing countries.

7.5 **Economic aid**

Table XVIII also shows that the countries in South of Sahara received the highest average economic aid relative to GDP (1.3%) on average, while they have the lowest INV/GDP (18%) on average. While economic aid relative to GDP is relatively small compare to INV/GDP in most countries in the sample during 1995-2014, Kyrgyz Republic, Tajikistan in Asia and Burundi, Central African Republic, Congo Dem. Rep., Guinea-Bissau, and Sierra Leone in South of

Sahara have very low INV/GDP (10% and below) and received relatively high economic aid (between 10% - 44% relative to INV/GDP) on average.

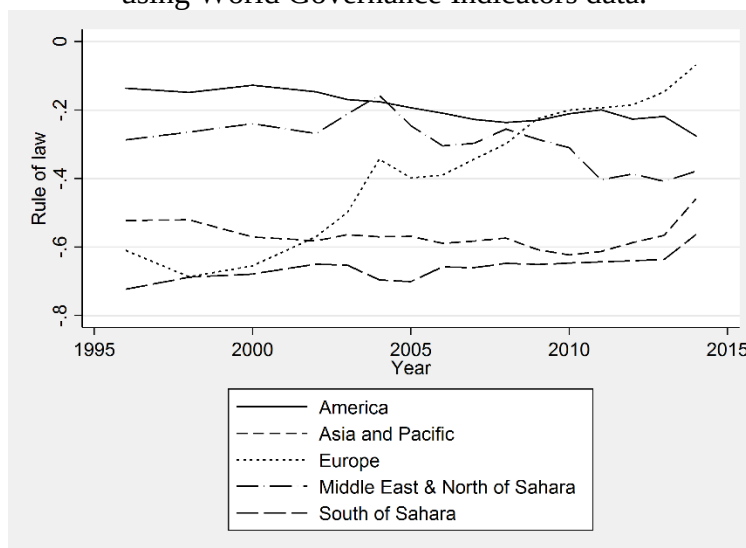
Fixed Effects estimation results of panel data with 5 year averages and 10 year averages suggest that economic aid and investment have negative relationship. This result may be due to reverse causality or due to the view that economic aid may have negative impact on private investment and economic development. Friedman (1958) and Bauer (1969) suggest that “the way additional capital provided matters and the bulk of the capital accumulation and investment decisions should be made by private sectors rather than government controlled projects”.

On the contrary to economic aid, Friedman (1958) suggest that developed countries should help underdeveloped countries by setting example through their foreign trade policy, promoting free trade, minimal government interference with economic activity and a climate favorable to private international investment.

7.6 Aid, institution and other considerations

Figure 23 illustrates rule of law by region over the period of 1995-2014. Countries in South of Sahara on average has the lowest level of rule of law compare to other regions and it shows slight improvement in later years compare to 1995. Countries in Europe in the sample has on average highest improvement in rule of law comparing to other regions, while America and Middle East & North of Sahara on average have decline in rule of law measure. I find positive relationship of aid directed toward governance, civil society and rule of law which is considered as proxy indicator of economic institution in some studies. However, I recognize the complexity of the aid and institution relationship and I did not attempt to explore the effect of aid on political institutions.

Figure 23. Rule of law by region
using World Governance Indicators data.

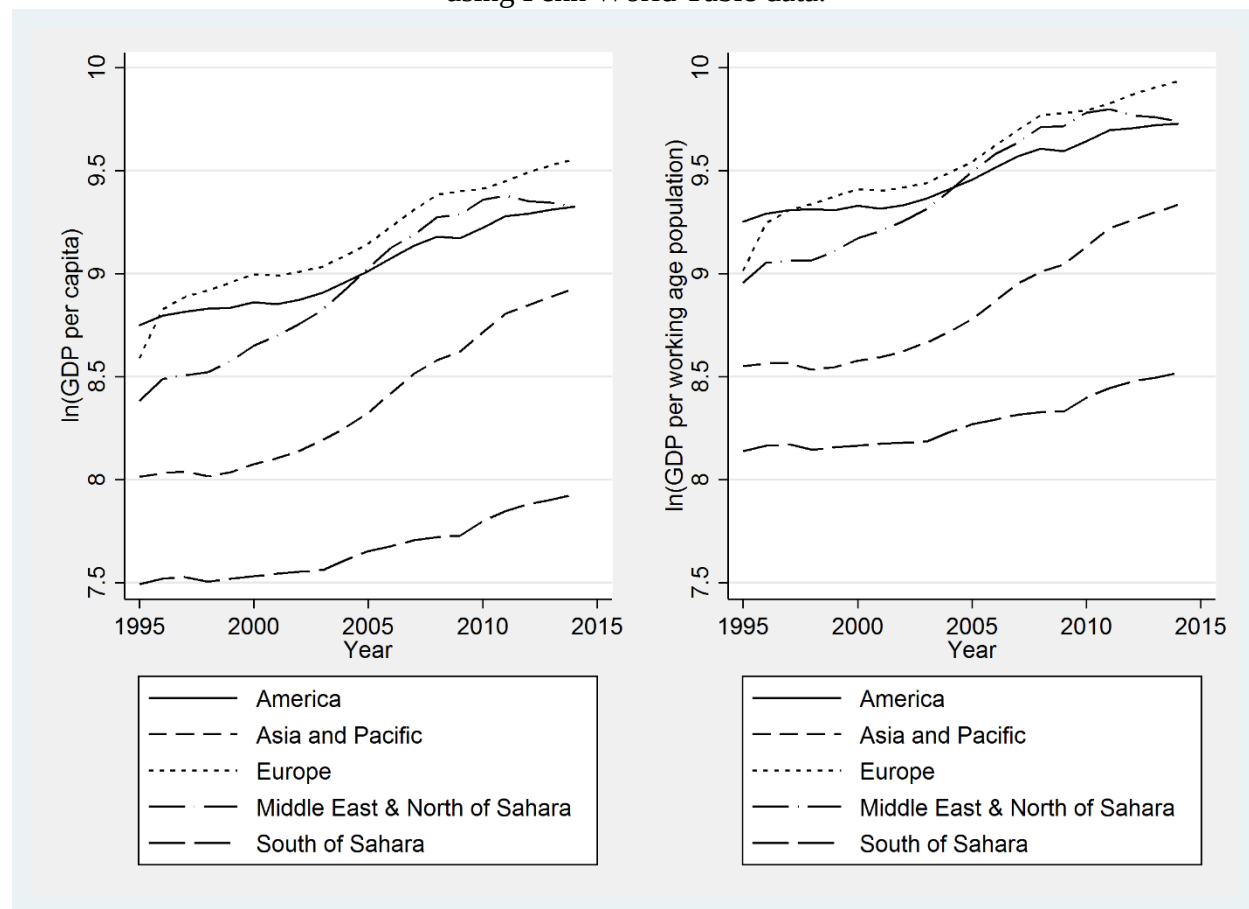


Related to institutions, Bauer (1969) suggests that “foreign aid should be allocated much more selectively to the governments for help in the essential tasks of government while refraining from close control of the economy since such criteria would reduce political tension and also aid could be separated from the commercial interest of the donor countries to be more effective”. Acemoglu (2010) suggest that “the political effects should be considered in development economics since large-scale shocks and policy interventions will create political economy responses from those who see their economic or political rents threatened or from those that see new options to increase these rents”.

Finally, Figure 24 shows log GDP per capita by region. Considering the decades of foreign aid prior to 1995 and the fact that countries in the South of Sahara were the recipients of highest aid to GDP ratio on average, the gap compared to other regions seems to be growing in terms of GDP per capita while countries in the South of Sahara remain the poorest. Due to demographics of the countries in South of Sahara, the gap is narrower for log of GDP per

working age population compare to log of GDP per capita. However, an individual country's statistics would differ.

Figure 24. Log GDP per capita by region
using Penn World Table data.



8. CONCLUSION

The disaggregated data shows promising results compare to the extensive aid literature that use total aid flows as an aid variable. The policy implication of these results is that not all aid has same effect on the variables of interest. I find some evidence of a positive effect of health aid on health outcomes, positive impact of education aid on education outcome and positive relationship of governance aid and rule of law while I find that economic aid is negatively related to investment. Moreover, other considerations such as rapid population increase and recipient country's dependence on foreign aid fund should be considered with caution.

World Bank (2016) reports about a transition from the Millennium to the Sustainable Development Goals starting 2015. While there were progress, there are still challenges achieving the Sustainable Development Goals. World Bank (2016) reports:

Progress fell particularly short for targets related to health (maternal and infant mortality), nutrition (undernourishment and hunger), and sanitation (Kenny and Dykstra 2013). Close to one-fifth of all children under five remain undernourished, and some 860 million people continue to live in slums. Access to primary school education and literacy rates have improved, yet the quality of education remains a concern. Moreover, while the tide has turned on the incidence of major deadly diseases, a high number of preventable deaths persist. Three-fifths of people living with HIV, mostly in developing countries, lack access to antiretroviral drugs. Tuberculosis killed 1.5 million people in 2013, many in the prime of their productive lives. An estimated 198 million cases of malaria were registered in 2013, claiming the lives of about 453,000 children. (p. 8)

In addition, one of the major focus in recent years is a climate change. World Bank (2016) states:

“The cost of environmental degradation—externalities associated with outdoor and indoor air pollution, water pollution, deforestation, carbon emissions, and other environmental hazards—rose 50% during 1990–2010. In 2010, between 11 and 21 percent of all deaths in developing countries were the result of pollution and other environmental risk factors”. These environmental risk factors will decrease the effect of health aid aimed at improving the health of world

population. While Sustainable Development Goals aim to use more integrated approach to development since most of the goals aimed to achieve are interconnected, it will not be easy to overcome the challenges. The availability of more reliable disaggregated aid and other variables data for longer time period in the future will enable further research using time series methods and more findings on this topic.

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APPENDICES

APPENDIX A

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	GDP per capita 1995	GDP per capita 2014	ODA/ GDP	Life expec- tancy 1995	Life expec- tancy 2014	Infant morta- lity 1995	Infant morta- lity 2014	Popu- lation (mil) 1995	Popu- lation (mil) 2014	Health expenditure (% of GDP)	Health grant & loan (% of GDP)
America	7,371	12,990	0.0228	70	74	30	17	16	20	0.01662	0.00221
Antigua and Barbuda	13,234	21,002	0.0082	72	76	18	6	0	0	0.02401	0.00001
Argentina	11,978	20,222	0.0004	73	76	21	12	35	43	0.02073	0.00006
Barbados	19,365	14,220	0.0021	72	76	14	12	0	0	0.01625	
Belize	7,470	8,393	0.0213	70	70	25	15	0	0	0.01464	0.00119
Bolivia	2,849	6,013	0.0641	58	68	72	32	8	11	0.01551	0.00575
Brazil	8,535	14,871	0.0003	68	74	40	14	163	206	0.01191	0.00003
Chile	11,191	21,581	0.0009	75	82	11	7	14	18	0.01596	0.00005
Colombia	7,629	12,599	0.0035	69	74	25	14	37	48	0.03208	0.00016
Costa Rica	8,805	14,186	0.0011	77	79	13	9	4	5	0.03636	0.00023
Dominica	8,355	10,188	0.0639			14	20	0	0	0.01719	0.00236
Dominican Republic	5,936	12,511	0.0039	70	74	39	26	8	10	0.01014	0.00085
Ecuador	4,941	10,968	0.0050	71	76	35	19	11	16	0.00880	0.00058
El Salvador	1,667	7,843	0.0142	67	73	36	15	6	6	0.01490	0.00144
Grenada	5,742	11,155	0.0321	69	73	15	11	0	0	0.01544	0.00095
Guatemala	4,238	6,851	0.0114	65	72	49	25	10	16	0.01291	0.00151
Haiti	1,238	1,562	0.1354	56	63	88	54	8	11	0.01263	0.01690
Honduras	3,126	4,424	0.0601	69	73	37	18	6	8	0.02036	0.00579
Jamaica	5,394	7,449	0.0055	72	76	22	14	2	3	0.00938	0.00090
Mexico	9,840	15,853	0.0003	73	77	29	12	94	125	0.01233	0.00004
Nicaragua	3,079	4,453	0.1146	67	75	41	19	5	6	0.01449	0.01021
Panama	7,221	19,702	0.0015	74	78	24	15	3	4	0.01887	0.00050
Paraguay	3,996	8,284	0.0073	69	73	32	18	5	7	0.01353	0.00100
Peru	4,652	10,993	0.0054	68	75	43	14	24	31	0.01564	0.00095
St. Kitts and Nevis	12,152	23,324	0.0194			19	9	0	0	0.01111	
St. Lucia	7,624	10,067	0.0263	71	75	17	13	0	0	0.01683	0.00258
St. Vincent and the Grenadines	6,756	9,616	0.0358	71	73	19	17	0	0	0.01878	0.00130
Suriname	5,530	15,655	0.0378	68	71	35	20	0	1	0.02922	0.00420
Trinidad and Tobago	9,688	31,196	0.0013	68	70	26	19	1	1	0.01058	
Uruguay	11,516	20,396	0.0013	74	77	18	9	3	3	0.01944	0.00006
Venezuela	7,372	14,134	0.0004	71	74	22	13	22	31	0.00851	0.00002

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX A (continued)

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	INV/ GDP	Economic grant & loan (% of GDP)	Rule of law 1996	Rule of law 2014	Government grant & loan (% of GDP)	Years of school 1995	Years of school 2010	Education expenditure (% of GDP)	Education grant & loan (% of GDP)
America	0.2115	0.00343	-0.14	-0.28	0.00160	6.97	8.28	0.02063	0.00099
Antigua and Barbuda	0.2836	0.00341	1.01	-0.19				0.02055	0.00056
Argentina	0.1771	0.00004	0.03	-0.90	0.00002	8.64	9.51	0.02074	0.00006
Barbados	0.1682	0.00031	0.96	1.06		8.88	9.45	0.02400	
Belize	0.1462	0.00323	0.01	-0.74	0.00077	9.40	11.29	0.02604	0.00036
Bolivia	0.1358	0.00930	-0.31	-1.08	0.00530	7.83	8.25	0.02931	0.00382
Brazil	0.2108	0.00004	-0.33	-0.08	0.00002	5.58	7.89	0.02255	0.00003
Chile	0.2494	0.00027	1.05	1.42	0.00004	8.78	9.78	0.01852	0.00009
Colombia	0.1994	0.00032	-0.89	-0.34	0.00049	6.47	8.95	0.02452	0.00017
Costa Rica	0.1849	0.00035	0.52	0.51	0.00011	7.42	7.97	0.02913	0.00020
Dominica	0.1443	0.01830	0.78	0.47	0.00178			0.03126	0.00057
Dominican Republic	0.2518	0.00072	-0.50	-0.38	0.00035	6.31	7.85	0.00994	0.00041
Ecuador	0.2331	0.00075	-0.51	-1.06	0.00033	7.10	7.60	0.00820	0.00037
El Salvador	0.1229	0.00258	-0.90	-0.51	0.00127	5.42	7.77	0.01551	0.00062
Grenada	0.2739	0.00506	0.33	-0.16	0.00114			0.01264	0.00213
Guatemala	0.1377	0.00076	-1.17	-0.99	0.00175	3.80	4.57	0.01881	0.00069
Haiti	0.2558	0.01338	-1.67	-1.19	0.01349	3.92	5.11		0.00421
Honduras	0.2294	0.00695	-0.94	-0.97	0.00395	5.26	6.19		0.00260
Jamaica	0.2173	0.00116	-0.44	-0.31	0.00055	8.18	9.87	0.02432	0.00030
Mexico	0.2111	0.00005	-0.77	-0.45	0.00006	7.20	8.79	0.02213	0.00003
Nicaragua	0.2025	0.01476	-0.59	-0.68	0.00722	5.02	6.61	0.01235	0.00523
Panama	0.2475	-0.00004	-0.27	-0.09	0.00016	8.43	9.27	0.02387	0.00029
Paraguay	0.1494	0.00042	-0.79	-0.68	0.00102	6.25	7.57	0.01923	0.00067
Peru	0.2240	0.00072	-0.65	-0.55	0.00038	7.88	8.88	0.01643	0.00032
St. Kitts and Nevis	0.2916	0.00174	0.77	0.09	0.00031			0.01718	
St. Lucia	0.2183	0.00632	0.77	0.52	0.00062			0.02994	0.00109
St. Vincent and the Grenadines	0.2134	0.00692	0.77	0.52	0.00143			0.03757	0.00170
Suriname	0.3730	0.00508	-0.37	-0.16	0.00222				0.00092
Trinidad and Tobago	0.1708	-0.00006	0.44	-0.13	0.00002	9.00	10.63	0.01501	0.00005
Uruguay	0.2074	0.00016	0.45	0.67	0.00009	7.57	8.17	0.01004	0.00015
Venezuela	0.2137	0.00001	-0.88	-1.89	0.00003	5.86	8.41	0.01730	0.00005

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX A (continued)

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	GDP per capita 1995	GDP per capita 2014	ODA/ GDP	Life expect- tancy 1995	Life expect- tancy 2014	Infant morta- lity 1995	Infant morta- lity 2014	Popu- lation (mil) 1995	Popu- lation (mil) 2014	Health expenditure (% of GDP)	Health grant & loan (% of GDP)
Asia and Pacific	3,619	9,333	0.0419	65	71	56	26	124	155	0.01048	0.00322
Armenia	2,671	8,586	0.0745	69	75	34	13	3	3	0.00878	0.00405
Azerbaijan	2,301	15,887	0.0210	65	71	75	29	8	10	0.00568	0.00092
Bangladesh	1,461	2,885	0.0196	62	72	81	32	118	159	0.00399	0.00247
Bhutan	3,211	6,880	0.1190	56	70	75	28	1	1	0.02445	0.00597
Cambodia	1,172	2,995	0.0877	55	68	88	26	11	15	0.00519	0.01194
China	3,439	12,473	0.0011	70	76	38	10	1,228	1,369	0.01588	0.00012
Fiji	6,126	7,909	0.0205	67	70	22	19	1	1	0.01533	0.00261
Georgia	2,514	9,362	0.0621	70	75	38	11	5	4	0.00814	0.00362
India	1,580	5,224	0.0024	60	68	78	39	961	1,295	0.00497	0.00057
Indonesia	4,378	9,707	0.0049	65	69	51	24	198	254	0.00409	0.00056
Kazakhstan	5,967	23,450	0.0047	65	72	45	14	16	17	0.01203	0.00032
Kyrgyz Republic	2,967	3,359	0.1121	66	70	51	20	5	6	0.02197	0.00738
Lao PDR	1,575	5,544	0.1189	56	66	97	52	5	7	0.00472	0.00903
Malaysia	11,655	23,158	0.0004	72	75	12	6	21	30	0.00681	0.00028
Mongolia	2,553	11,526	0.1095	61	70	62	20	2	3	0.01217	0.00557
Nepal	1,242	2,173	0.0630	59	70	77	31	21	28	0.01056	0.00711
Pakistan	2,637	4,646	0.0152	62	66	97	67	123	185	0.00415	0.00146
Philippines	4,364	6,659	0.0052	66	68	34	23	70	99	0.00859	0.00047
Sri Lanka	3,825	10,342	0.0215	69	75	17	9	18	21	0.00824	0.00163
Tajikistan	2,088	2,747	0.0894	62	70	93	40	6	8	0.00737	0.00610
Thailand	7,988	13,967	0.0013	70	74	24	11	59	68	0.02413	0.00020
Turkmenistan	5,674	20,953	0.0063	63	66	72	45	4	5	0.01294	0.00029
Uzbekistan	3,814	8,195	0.0097	66	68	57	35	23	29	0.01600	0.00141
Vietnam	1,644	5,353	0.0346	72	76	31	18	75	92	0.00536	0.00314
Europe	6,352	14,699	0.0420	71	76	22	8	13	16	0.02155	0.00183
Albania	4,316	10,664	0.0537	72	78	29	13	3	3	0.00870	0.00457
Bosnia and Herzegovina	1,873	10,028	0.1175	72	76	12	5	4	4	0.02724	0.00278
Croatia	10,751	21,675	0.0030	72	77	9	4	5	4	0.02669	0.00006
Macedonia	6,963	13,151	0.0348	72	75	22	5	2	2	0.02659	0.00246
Serbia	3,843	13,441	0.0411	76	76	17	6	8	7	0.02643	0.00103
Turkey	10,367	19,236	0.0016	67	75	43	12	59	78	0.01368	0.00008
Middle East & North of Sahara	5,278	13,570	0.0169	68	74	40	18	24	33	0.01527	0.00159
Algeria	6,973	12,812	0.0033	68	75	36	22	29	39	0.01392	0.00009
Egypt	3,733	9,909	0.0147	67	71	49	21	62	90	0.00722	0.00091
Iran	5,019	15,547	0.0008	68	75	36	14	60	78	0.01311	0.00002
Jordan	3,708	10,456	0.0551	71	74	26	16	4	7	0.03302	0.00646
Lebanon	5,243	13,999	0.0184	72	79	22	7	3	6	0.01521	0.00104
Morocco	4,615	7,163	0.0137	67	74	52	25	27	34	0.00995	0.00141
Oman	10,307	38,527	0.0054	70	77	21	10	2	4	0.01386	0.00003
Tunisia	7,239	10,365	0.0119	71	74	36	13	9	11	0.02133	0.00114
Yemen	661	3,355	0.0290	59	64	80	35	15	26	0.00982	0.00324

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX A (continued)

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	INV/ GDP	Economic grant & loan (% of GDP)	Rule of law 1996	Rule of law 2014	Government grant & loan (% of GDP)	Years of school 1995	Years of school 2010	Education expenditure (% of GDP)	Education grant & loan (% of GDP)
Asia and Pacific	0.2133	0.00849	-0.52	-0.46	0.00273	6.59	8.05	0.01754	0.00212
Armenia	0.1432	0.01265	-0.49	-0.32	0.00487	10.43	10.73	0.01489	0.00204
Azerbaijan	0.1943	0.00374	-1.16	-0.61	0.00113			0.01428	0.00035
Bangladesh	0.2194	0.00344	-0.96	-0.72	0.00105	3.68	5.91	0.00886	0.00161
Bhutan	0.4094	0.02845	0.05	0.35	0.00678			0.03429	0.00968
Cambodia	0.1625	0.01422	-1.14	-0.93	0.00928	3.27	4.72	0.00564	0.00396
China	0.3542	0.00036	-0.43	-0.33	0.00002	6.79	7.95	0.02023	0.00012
Fiji	0.1963	0.00244	0.21	-0.54	0.00206	10.11	9.96	0.03222	0.00282
Georgia	0.1472	0.01241	-1.45	0.20	0.00723			0.01647	0.00239
India	0.2657	0.00066	0.26	-0.09	0.00012	4.12	6.24	0.01560	0.00033
Indonesia	0.2494	0.00066	-0.37	-0.35	0.00037	4.62	7.61	0.01228	0.00050
Kazakhstan	0.1700	0.00115	-1.19	-0.55	0.00017	9.34	11.33	0.01377	0.00011
Kyrgyz Republic	0.1035	0.01684	-0.76	-0.94	0.00716	8.93	10.71	0.02850	0.00195
Lao PDR	0.2556	0.02613	-0.98	-0.71	0.00568	3.92	5.02	0.01088	0.00567
Malaysia	0.3065	-0.00052	0.61	0.64	0.00002	8.39	10.44	0.02403	0.00016
Mongolia	0.2773	0.02885	-0.04	-0.35	0.00382	7.84	9.20	0.02218	0.00697
Nepal	0.2452	0.01150	-0.19	-0.68	0.00489	2.65	4.23	0.01935	0.00462
Pakistan	0.1261	0.00290	-0.67	-0.78	0.00130	3.36	5.02	0.01208	0.00107
Philippines	0.1909	0.00169	-0.01	-0.33	0.00036	7.56	8.43	0.01507	0.00040
Sri Lanka	0.1920	0.00603	0.17	-0.15	0.00143	9.35	10.06	0.01299	0.00126
Tajikistan	0.0603	0.01363	-1.69	-0.96	0.00565	10.47	10.30	0.01392	0.00171
Thailand	0.2778	0.00116	0.54	-0.15	0.00004	5.50	7.99	0.02815	0.00014
Turkmenistan	0.2606	0.00032	-1.36	-1.33	0.00019				0.00012
Uzbekistan	0.0730	0.00267	-1.09	-1.08	0.00043				0.00090
Vietnam	0.2395	0.01244	-0.40	-0.31	0.00139	4.85	7.15	0.01019	0.00192
Europe	0.2013	0.00474	-0.61	-0.07	0.00403	7.58	9.42	0.01507	0.00137
Albania	0.2272	0.00833	-0.93	-0.37	0.00451	8.22	9.93	0.01098	0.00332
Bosnia and Herzegovina	0.1914	0.00870	-0.26	-0.20	0.00867				0.00207
Croatia	0.2400	0.00025	-0.61	0.31	0.00052	9.08	11.30	0.01647	0.00022
Macedonia	0.1833	0.00452	-0.41	-0.03	0.00472			0.01797	0.00148
Serbia	0.1785	0.00603	-1.28	-0.16	0.00562			0.02085	0.00096
Turkey	0.1873	0.00062	-0.17	0.04	0.00013	5.44	7.05	0.00908	0.00017
Middle East & North of Sahara	0.2383	0.00175	-0.29	-0.38	0.00086	4.94	6.92	0.02788	0.00149
Algeria	0.3026	0.00022	-1.19	-0.73	0.00008	5.41	6.68	0.01505	0.00085
Egypt	0.1204	0.00292	0.05	-0.60	0.00024	5.12	7.15	0.01498	0.00066
Iran	0.2597	0.00013	-0.85	-1.03	0.00001	6.35	8.88	0.02544	0.00014
Jordan	0.2265	0.00365	0.28	0.48	0.00250	7.58	9.59	0.04059	0.00309
Lebanon	0.2982	0.00083	-0.25	-0.76	0.00173			0.01071	0.00193
Morocco	0.2967	0.00397	0.24	-0.05	0.00052	3.40	4.96	0.03627	0.00267
Oman	0.2886	0.00007	0.69	0.58				0.02273	-0.00009
Tunisia	0.2156	0.00281	-0.20	-0.13	0.00047	5.07	7.48	0.04287	0.00223
Yemen	0.1369	0.00113	-1.35	-1.17	0.00134	1.67	3.68	0.04225	0.00192

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX A (continued)

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	GDP per capita 1995	GDP per capita 2014	ODA/ GDP	Life expect- tancy 1995	Life expect- tancy 2014	Infant morta- lity 1995	Infant morta- lity 2014	Popu- lation (mil) 1995	Popu- lation (mil) 2014	Health expenditure (% of GDP)	Health grant & loan (% of GDP)
South of Sahara	2,857	4,548	0.0961	52	60	90	53	13	21	0.01546	0.01297
Angola	2,284	7,968	0.0269	42	52	133	99	13	24	0.01190	0.00181
Benin	1,136	1,922	0.0871	55	60	97	66	6	11	0.01537	0.01358
Botswana	7,068	16,175	0.0136	56	64	49	36	2	2	0.01815	0.00470
Burkina Faso	881	1,565	0.1280	49	59	101	62	10	18	0.02739	0.01719
Burundi	655	772	0.2299	49	57	103	56	6	11	0.02083	0.02951
Cabo Verde	2,429	6,290	0.1668	68	73	44	21	0	1	0.01771	0.01091
Cameroon	2,086	2,682	0.0441	53	56	93	59	14	23	0.00660	0.00276
Central African Republic	1,008	594	0.1190	47	51	115	94	3	5	0.01276	0.01245
Chad	1,336	2,013	0.0815	47	52	111	87	7	14	0.00641	0.00833
Comoros	1,856	1,460	0.1130	59	63	77	57	0	1	0.01407	0.01300
Congo, Dem. Rep.	781	1,217	0.1193	49	59	115	77	42	75	0.00646	0.01172
Congo, Rep.	1,343	4,426	0.0522	52	62	69	34	3	5	0.00843	0.00165
Cote d'Ivoire	2,406	3,352	0.0456	50	52	104	69	14	22	0.01081	0.00362
Djibouti	2,600	3,200	0.1345	57	62	86	56	1	1	0.03133	0.01682
Ethiopia	631	1,323	0.1153	49	64	106	43	57	97	0.01592	0.01613
Gabon	8,702	14,161	0.0075	61	64	58	37	1	2	0.00867	0.00064
Gambia	1,644	1,544	0.0985	54	60	71	49	1	2	0.01149	0.02046
Ghana	2,029	3,570	0.0799	58	61	72	44	17	27	0.01476	0.01090
Guinea	1,986	1,429	0.0727	52	59	122	63	8	12	0.00532	0.00965
Guinea-Bissau		1,251	0.2287	51	55	122	62	1	2	0.00786	0.02186
Kenya	2,094	2,769	0.0431	55	62	72	37	27	45	0.01334	0.01076
Lesotho	1,424	2,409	0.0873	57	50	77	71	2	2	0.03190	0.02493
Malawi	1,053	949	0.1832	44	63	122	45	10	17	0.01850	0.03716
Mali	938	1,434	0.1162	48	58	125	76	10	17	0.01633	0.01389
Mauritania	2,059	3,409	0.1277	59	63	76	66	2	4	0.01463	0.01109
Mauritius	12,417	17,942	0.0082	70	74	19	12	1	1	0.01285	0.00063
Mozambique	423	1,137	0.2065	46	55	143	59	16	27	0.02253	0.02794
Namibia	4,870	10,911	0.0312	60	65	48	33	2	2	0.03137	0.00730
Niger	771	852	0.1315	47	62	120	58	9	19	0.01437	0.01635
Nigeria	414	5,501	0.0120	46	53	123	72	108	177	0.00599	0.00204
Rwanda	618	1,565	0.2067	32	64	130	33	6	11	0.01646	0.03209
Senegal	1,743	2,247	0.0886	57	66	71	42	9	15	0.01234	0.01216
Seychelles	16,414	25,822	0.0269		73	13	12	0	0	0.02776	0.00093
Sierra Leone	1,822	1,419	0.1978	36	51	153	90	4	6	0.01406	0.01936
South Africa	8,223	12,128	0.0032	61	57	48	34	41	54	0.02608	0.00091
Swaziland	7,696	8,029	0.0197	56	49	69	46	1	1	0.02058	0.00685
Tanzania	869	2,213	0.1071	49	65	96	36	29	50	0.02119	0.01610
Togo	1,109	1,384	0.0735	55	60	84	54	4	7	0.00961	0.00794
Uganda	1,025	1,839	0.1151	44	59	101	39	20	38	0.01565	0.02266
Zambia	997	3,726	0.1348	42	60	108	45	9	16	0.00353	0.01829
Zimbabwe	4,439	1,869	0.0573	50	58	60	48	12	15	0.01238	0.01489

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX A (continued)

TABLE XVIII. DESCRIPTIVE STATISTICS
USING WDI, PWT, WGI, BARRO-LEE AND OECD, DAC DATA

Region/Country	INV/ GDP	Economic grant & loan (% of GDP)	Rule of law 1996	Rule of law 2014	Government grant & loan (% of GDP)	Years of school 1995	Years of school 2010	Education expenditure (% of GDP)	Education grant & loan (% of GDP)
South of Sahara	0.1834	0.01303	-0.72	-0.56	0.00701	4.27	5.42	0.02862	0.00616
Angola	0.3723	0.00168	-1.63	-1.10	0.00111			0.01781	0.00098
Benin	0.1802	0.01798	-0.19	-0.55	0.00608	2.61	4.43	0.02325	0.00561
Botswana	0.3325	0.00127	0.50	0.63	0.00038	8.24	9.55	0.04665	0.00095
Burkina Faso	0.2068	0.01991	-1.03	-0.54	0.00862			0.04023	0.00933
Burundi	0.0909	0.02435	-1.72	-0.93	0.02976	2.18	3.35	0.02814	0.00831
Cabo Verde	0.4272	0.03455	0.77	0.59	0.00612			0.03098	0.01753
Cameroon	0.1345	0.00543	-1.47	-0.88	0.00117	5.00	6.15	0.01903	0.00380
Central African Republic	0.0928	0.02238	-1.50	-1.73	0.00980	2.99	3.76	0.01038	0.00312
Chad	0.1411	0.01065	-1.16	-1.11	0.00459			0.00819	0.00376
Comoros	0.1154	0.01278	-1.05	-0.94	0.00973			0.03290	0.01654
Congo, Dem. Rep.	0.1073	0.01000	-1.93	-1.43	0.01093				0.00225
Congo, Rep.	0.2150	0.00055	-1.33	-1.08	0.00115	5.62	5.94	0.01895	0.00245
Cote d'Ivoire	0.0848	0.00312	-0.82	-0.61	0.00214	3.30	4.65	0.02983	0.00152
Djibouti	0.2123	0.01328	-0.96	-0.85	0.00508			0.06913	0.02101
Ethiopia	0.1533	0.01963	-0.91	-0.42	0.00629				0.00554
Gabon	0.2042	0.00092	-0.62	-0.50	0.00025	6.25	8.39	0.01373	0.00221
Gambia	0.1530	0.02317	0.10	-0.63	0.00639	2.45	3.77	0.00867	0.00643
Ghana	0.1916	0.01649	-0.34	0.02	0.00638	5.89	7.00	0.02534	0.00460
Guinea	0.1127	0.00866	-1.51	-1.37	0.00508			0.01045	0.00765
Guinea-Bissau	0.0570	0.02542	-2.02	-1.35	0.01625			0.01804	0.01181
Kenya	0.1273	0.00754	-1.04	-0.44	0.00234	5.26	6.14	0.04103	0.00184
Lesotho	0.1926	0.01195	0.00	-0.23	0.00696	5.66	5.85	0.09468	0.00641
Malawi	0.1423	0.02255	-0.45	-0.30	0.01043	3.06	4.81	0.01560	0.01153
Mali	0.1427	0.02171	-0.53	-0.65	0.00860	1.01	1.97	0.02507	0.01038
Mauritania	0.2389	0.02377	-0.39	-0.82	0.00628	3.12	4.53	0.02491	0.00921
Mauritius	0.2313	-0.00090	0.86	0.90	0.00023	6.83	8.86	0.01943	0.00153
Mozambique	0.1977	0.02918	-0.85	-0.83	0.01574	0.93	1.93	0.03095	0.01051
Namibia	0.2508	0.00532	0.20	0.14	0.00137	6.05	6.17	0.04999	0.00257
Niger	0.2009	0.01488	-1.00	-0.69	0.00927	1.23	1.88	0.02463	0.00739
Nigeria	0.0988	0.00057	-1.26	-1.09	0.00054				0.00034
Rwanda	0.1272	0.02173	-1.73	0.08	0.01800	2.66	4.36	0.02990	0.01084
Senegal	0.1883	0.01596	-0.23	-0.11	0.00471	2.20	2.74	0.02403	0.00874
Seychelles	0.3462	0.00380	0.75	0.10	0.00029			0.03923	0.00079
Sierra Leone	0.1038	0.02248	-1.48	-0.93	0.03023	2.46	4.23	0.02006	0.00481
South Africa	0.1801	0.00024	-0.01	0.17	0.00027	8.29	9.69	0.03650	0.00026
Swaziland	0.1766	0.00230	-0.53	-0.27	0.00091	5.00	5.06	0.03197	0.00086
Tanzania	0.2364	0.01680	-0.26	-0.41	0.00766	4.38	5.81	0.02880	0.00584
Togo	0.1159	0.00627	-0.76	-0.87	0.00527	4.31	5.49	0.02293	0.00528
Uganda	0.1964	0.01697	-0.64	-0.39	0.01008	3.97	5.70	0.01878	0.00946
Zambia	0.2608	0.01432	-0.65	-0.26	0.00526	6.01	7.32		0.00717
Zimbabwe	0.1806	0.00456	-0.82	-1.43	0.00568	6.70	7.61		0.00133

Note: While ODA/GDP, health, economic, government aid variables are averaged over 1995-2014 for each country, education aid variables are averaged over 1995-2010 since the latest education outcome variable is available for 2010.

APPENDIX BTABLE XIX. OLS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY,
DATA WITH 20 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.134 (0.090)	-0.134 (0.090)	-0.135 (0.090)	-0.128 (0.090)	-0.124 (0.091)	-0.131 (0.088)
Initial ln(GDP_per_capita)	-0.006 (0.066)	0.002 (0.060)	0.001 (0.060)	-0.001 (0.060)	0.007 (0.060)	0.023 (0.060)
Trade/GDP	0.026 (0.119)	0.050 (0.135)	0.052 (0.136)	0.067 (0.139)	0.044 (0.113)	0.098 (0.121)
Initial ln(population)	-0.036 (0.021)	-0.016 (0.021)	-0.016 (0.021)	-0.014 (0.021)	-0.007 (0.023)	-0.018 (0.023)
Initial DPT immunization	-0.709*** (0.187)	-0.690*** (0.185)	-0.692*** (0.185)	-0.720*** (0.196)	-0.671** (0.206)	-0.935*** (0.211)
Initial HIV	0.685 (0.680)	1.051 (0.677)	1.056 (0.673)	1.386 (0.766)	1.836* (0.920)	0.557 (0.743)
Initial water	0.445 (0.295)	0.479 (0.298)	0.482 (0.298)	0.531 (0.277)	0.493 (0.282)	0.710* (0.291)
ODA/GDP	-1.691* (0.706)					
PRI/GDP	0.000 (0.836)					
(ALL health grant and loan)/GDP		-8.954 (5.269)				
(ODA health grant and loan)/GDP			-9.009 (5.368)			6.171 (10.537)
(ODA health grant)/GDP				-12.065 (7.545)		
(ODA health loan)/GDP				16.998 (33.579)		
(ODA Health-Health grant and loan)/GDP					-8.527 (22.772)	
(ODA Health-Population-Policy grant and loan)/GDP					-25.892 (21.412)	
(ODA Health-Water-Sanitation grant and loan)/GDP					19.731 (24.917)	
(ODA education grant and loan)/GDP						-38.009** (12.306)
(ODA economic grant and loan)/GDP						14.113 (7.584)
(ODA government grant and loan)/GDP						-18.241 (15.453)
Constant	0.192 (0.777)	-0.014 (0.787)	-0.007 (0.788)	-0.049 (0.796)	-0.151 (0.805)	-0.212 (0.779)
Observations	84	82	82	82	82	82
R-squared	0.504	0.479	0.479	0.486	0.505	0.534
rss	3.339	3.311	3.309	3.265	3.142	2.959

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables.

APPENDIX B (continued)

TABLE XX. OLS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY,
PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.060 (0.042)	-0.060 (0.041)	-0.060 (0.041)	-0.060 (0.041)	-0.063 (0.041)	-0.058 (0.041)
Initial ln(GDP_per_capita)	-0.013 (0.030)	-0.020 (0.034)	-0.021 (0.034)	-0.021 (0.034)	-0.010 (0.034)	-0.021 (0.034)
Trade/GDP	-0.017 (0.064)	0.008 (0.059)	0.009 (0.059)	0.009 (0.060)	0.017 (0.056)	0.026 (0.062)
Initial ln(population)	-0.018 (0.012)	-0.006 (0.011)	-0.006 (0.011)	-0.006 (0.011)	-0.000 (0.011)	-0.004 (0.011)
Initial DPT immunization	-0.240* (0.093)	-0.231* (0.091)	-0.231* (0.091)	-0.231* (0.095)	-0.255** (0.093)	-0.260* (0.100)
Initial HIV	0.039 (0.341)	0.288 (0.368)	0.291 (0.367)	0.285 (0.382)	0.672 (0.407)	0.320 (0.404)
Initial water	0.082 (0.157)	0.142 (0.160)	0.143 (0.159)	0.142 (0.162)	0.145 (0.157)	0.193 (0.179)
ODA/GDP	-0.954** (0.339)					
PRI/GDP	-0.032 (0.271)					
(ALL health grant and loan)/GDP		-5.750** (1.977)				
(ODA health grant and loan)/GDP			-5.844** (1.970)			-6.001 (3.119)
(ODA health grant)/GDP				-5.806** (2.153)		
(ODA health loan)/GDP				-6.503 (10.006)		
(ODA Health-Health grant and loan)/GDP					2.306 (6.827)	
(ODA Health-Population-Policy grant and loan)/GDP					-15.613* (6.005)	
(ODA Health-Water-Sanitation grant and loan)/GDP					3.123 (5.270)	
(ODA education grant and loan)/GDP						-5.839 (4.563)
(ODA economic grant and loan)/GDP						3.532 (2.556)
(ODA government grant and loan)/GDP						-1.194 (3.821)
Constant	0.239 (0.354)	0.159 (0.366)	0.167 (0.365)	0.169 (0.365)	0.079 (0.368)	0.129 (0.358)
Observations	169	165	165	165	165	165
R-squared	0.302	0.304	0.305	0.305	0.334	0.316
rss	3.150	2.976	2.974	2.974	2.848	2.927

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXI. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY, PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.652*** (0.105)	-0.652*** (0.109)	-0.655*** (0.108)	-0.662*** (0.111)	-0.639*** (0.091)	-0.624*** (0.100)
Initial ln(GDP_per_capita)	-0.045 (0.041)	-0.078 (0.044)	-0.080 (0.044)	-0.085 (0.045)	-0.076 (0.042)	-0.071 (0.043)
Trade/GDP	-0.025 (0.134)	-0.013 (0.130)	-0.011 (0.129)	-0.022 (0.129)	-0.002 (0.123)	0.024 (0.136)
Initial ln(population)	0.293 (0.263)	0.483* (0.223)	0.495* (0.221)	0.517* (0.231)	0.535* (0.221)	0.484* (0.233)
Initial DPT immunization	0.005 (0.114)	-0.033 (0.110)	-0.033 (0.110)	-0.035 (0.112)	-0.100 (0.114)	-0.074 (0.114)
Initial HIV	-0.408 (0.662)	-0.163 (0.759)	-0.163 (0.754)	-0.165 (0.742)	-0.326 (0.639)	-0.119 (0.854)
Initial water	-0.861* (0.374)	-0.892* (0.351)	-0.891* (0.350)	-0.893* (0.352)	-0.782* (0.318)	-0.861* (0.346)
ODA/GDP	0.404 (0.463)					
PRI/GDP	0.016 (0.860)					
(ALL health grant and loan)/GDP		-5.028* (2.063)				
(ODA health grant and loan)/GDP			-5.329* (2.091)			-7.153* (3.441)
(ODA health grant)/GDP				-5.436* (2.096)		
(ODA health loan)/GDP				3.010 (11.658)		
(ODA Health-Health grant and loan)/GDP					1.651 (5.653)	
(ODA Health-Population-Policy grant and loan)/GDP					-15.869** (5.130)	
(ODA Health-Water-Sanitation grant and loan)/GDP					11.438 (8.266)	
(ODA education grant and loan)/GDP						5.590 (13.212)
(ODA economic grant and loan)/GDP						2.663 (2.384)
(ODA government grant and loan)/GDP						-0.582 (7.397)
Constant	2.633*** (0.600)	2.537*** (0.587)	2.530*** (0.587)	2.553*** (0.583)	2.295*** (0.544)	2.339*** (0.582)
Observations	169	165	165	165	165	165
R-squared	0.496	0.525	0.529	0.532	0.584	0.547
rss	0.762	0.689	0.683	0.679	0.604	0.657

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX B (continued)

TABLE XXII. OLS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY,
ANNUAL PANEL DATA

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.001 (0.003)	-0.000 (0.003)
Initial ln(GDP_per_capita)	0.003 (0.002)	-0.002 (0.001)	-0.002 (0.001)	-0.002 (0.002)	-0.002 (0.001)	-0.002 (0.002)
Trade/GDP	0.003 (0.004)	0.003 (0.003)	0.004 (0.003)	0.004 (0.003)	0.003 (0.003)	0.004 (0.004)
Initial ln(population)	-0.001 (0.001)	-0.001 (0.000)	-0.001 (0.000)	-0.001 (0.000)	-0.000 (0.000)	-0.001 (0.001)
Initial DPT immunization	-0.033*** (0.007)	-0.028*** (0.005)	-0.028*** (0.005)	-0.028*** (0.005)	-0.028*** (0.005)	-0.029*** (0.006)
Initial HIV	0.018 (0.021)	0.041* (0.017)	0.042* (0.017)	0.047** (0.017)	0.069*** (0.020)	0.045* (0.023)
Initial water	0.017** (0.007)	0.022** (0.007)	0.022** (0.007)	0.022** (0.007)	0.022** (0.007)	0.024*** (0.007)
ODA/GDP	-0.042 (0.060)					
PRI/GDP	0.009 (0.008)					
(ALL health grant and loan)/GDP		-0.628*** (0.152)				
(ODA health grant and loan)/GDP			-0.655*** (0.153)			-0.705*** (0.148)
(ODA health grant)/GDP				-0.705*** (0.174)		
(ODA health loan)/GDP				-0.234 (0.236)		
(ODA Health-Health grant and loan)/GDP					-0.392 (0.411)	
(ODA Health-Population-Policy grant and loan)/GDP					-1.374** (0.527)	
(ODA Health-Water-Sanitation grant and loan)/GDP					0.209 (0.242)	
(ODA education grant and loan)/GDP						-0.247 (0.249)
(ODA economic grant and loan)/GDP						0.151 (0.118)
(ODA government grant and loan)/GDP						0.084 (0.194)
Constant	-0.031 (0.028)	-0.003 (0.018)	-0.001 (0.018)	0.001 (0.018)	0.001 (0.018)	-0.006 (0.020)
Observations	1600	1571	1571	1571	1571	1571
R-squared	0.161	0.182	0.184	0.185	0.197	0.186
rss	0.940	0.894	0.892	0.891	0.878	0.889

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXIII. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF INFANT MORTALITY, ANNUAL PANEL DATA

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(infant mortality)	-0.050*	-0.053**	-0.053**	-0.054**	-0.055***	-0.053**
	(0.020)	(0.017)	(0.017)	(0.017)	(0.016)	(0.017)
Initial ln(GDP_per_capita)	-0.003	-0.008	-0.008	-0.009	-0.009	-0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Trade/GDP	-0.004	-0.005	-0.005	-0.005	-0.005	-0.004
	(0.010)	(0.010)	(0.009)	(0.010)	(0.009)	(0.010)
Initial ln(population)	0.008	0.024	0.025	0.029	0.032	0.025
	(0.026)	(0.023)	(0.023)	(0.024)	(0.023)	(0.025)
Initial DPT immunization	-0.007	-0.007	-0.007	-0.007	-0.009	-0.009
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
Initial HIV	0.018	-0.002	-0.003	0.002	-0.023	0.003
	(0.145)	(0.133)	(0.133)	(0.133)	(0.125)	(0.134)
Initial water	-0.095	-0.098	-0.098	-0.100	-0.093	-0.097
	(0.056)	(0.055)	(0.055)	(0.056)	(0.053)	(0.055)
ODA/GDP	0.027					
	(0.070)					
PRI/GDP	0.002					
	(0.011)					
(ALL health grant and loan)/GDP		-0.616***				
		(0.178)				
(ODA health grant and loan)/GDP			-0.658***			-0.743**
			(0.178)			(0.228)
(ODA health grant)/GDP				-0.720***		
				(0.204)		
(ODA health loan)/GDP				-0.163		
				(0.226)		
(ODA Health-Health grant and loan)/GDP					-0.447	
					(0.721)	
(ODA Health-Population-Policy grant and loan)/GDP					-1.403*	
					(0.590)	
(ODA Health-Water-Sanitation grant and loan)/GDP					0.137	
					(0.306)	
(ODA education grant and loan)/GDP						0.023
						(0.366)
(ODA economic grant and loan)/GDP						0.111
						(0.080)
(ODA government grant and loan)/GDP						0.161
						(0.292)
Constant	0.252**	0.277**	0.277**	0.279**	0.274**	0.268**
	(0.077)	(0.088)	(0.088)	(0.088)	(0.085)	(0.084)
Observations	1600	1571	1571	1571	1571	1571
R-squared	0.097	0.123	0.125	0.127	0.136	0.127
rss	0.690	0.665	0.664	0.662	0.655	0.662

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXIV. OLS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY,
DATA WITH 20 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.821*** (0.128)	-0.849*** (0.146)	-0.851*** (0.146)	-0.906*** (0.173)	-0.841*** (0.143)	-0.905*** (0.129)
Initial ln(GDP_per_capita)	0.019 (0.020)	0.018 (0.020)	0.018 (0.020)	0.019 (0.020)	0.018 (0.019)	0.014 (0.017)
Trade/GDP	-0.014 (0.037)	-0.021 (0.043)	-0.022 (0.044)	-0.015 (0.041)	-0.017 (0.036)	-0.028 (0.038)
Initial ln(population)	0.008 (0.007)	0.002 (0.006)	0.002 (0.006)	0.002 (0.006)	0.002 (0.007)	0.005 (0.007)
Initial DPT immunization	0.182*** (0.050)	0.189*** (0.054)	0.191*** (0.054)	0.186** (0.054)	0.187*** (0.051)	0.244*** (0.065)
Initial HIV	-0.501 (0.256)	-0.656* (0.289)	-0.656* (0.288)	-0.548 (0.281)	-0.601 (0.339)	-0.444 (0.263)
Initial water	0.001 (0.103)	-0.003 (0.109)	-0.003 (0.108)	0.020 (0.106)	-0.004 (0.112)	-0.034 (0.123)
ODA/GDP	0.469* (0.232)					
PRI/GDP	0.299 (0.208)					
(ALL health grant and loan)/GDP		2.044 (1.961)				
(ODA health grant and loan)/GDP			1.965 (2.037)			-2.726 (4.265)
(ODA health grant)/GDP				0.371 (2.722)		
(ODA health loan)/GDP				12.799 (8.694)		
(ODA Health-Health grant and loan)/GDP					4.724 (8.395)	
(ODA Health-Population-Policy grant and loan)/GDP					0.530 (6.536)	
(ODA Health-Water-Sanitation grant and loan)/GDP					0.054 (9.262)	
(ODA education grant and loan)/GDP						13.076** (4.802)
(ODA economic grant and loan)/GDP						-2.073 (2.235)
(ODA government grant and loan)/GDP						1.466 (4.266)
Constant	3.204*** (0.470)	3.358*** (0.552)	3.370*** (0.557)	3.574*** (0.657)	3.329*** (0.552)	3.609*** (0.489)
Observations	84	82	82	82	82	82
R-squared	0.742	0.725	0.725	0.733	0.726	0.768
rss	0.236	0.249	0.249	0.242	0.248	0.210

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables.

APPENDIX B (continued)

TABLE XXV. OLS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY,
PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.541*** (0.127)	-0.584*** (0.150)	-0.585*** (0.150)	-0.589*** (0.152)	-0.570*** (0.149)	-0.601*** (0.148)
Initial ln(GDP_per_capita)	0.008 (0.013)	0.019 (0.014)	0.019 (0.014)	0.019 (0.014)	0.012 (0.014)	0.016 (0.013)
Trade/GDP	0.011 (0.019)	0.008 (0.020)	0.007 (0.020)	0.008 (0.019)	0.001 (0.018)	-0.007 (0.020)
Initial ln(population)	0.005 (0.003)	0.002 (0.003)	0.002 (0.003)	0.002 (0.003)	-0.000 (0.003)	-0.001 (0.003)
Initial DPT immunization	0.080 (0.042)	0.080 (0.048)	0.081 (0.048)	0.078 (0.049)	0.090 (0.050)	0.099 (0.050)
Initial HIV	-0.457 (0.245)	-0.623* (0.263)	-0.622* (0.263)	-0.601* (0.264)	-0.787** (0.275)	-0.710** (0.271)
Initial water	0.077 (0.063)	0.058 (0.064)	0.057 (0.064)	0.062 (0.063)	0.057 (0.062)	0.035 (0.072)
ODA/GDP	0.324* (0.124)					
PRI/GDP	0.153 (0.115)					
(ALL health grant and loan)/GDP		2.493** (0.876)				
(ODA health grant and loan)/GDP			2.452** (0.855)			3.826** (1.391)
(ODA health grant)/GDP				2.288** (0.827)		
(ODA health loan)/GDP				5.289 (3.800)		
(ODA Health-Health grant and loan)/GDP					-2.392 (2.996)	
(ODA Health-Population-Policy grant and loan)/GDP					7.178** (2.711)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-0.118 (2.098)	
(ODA education grant and loan)/GDP						2.817 (2.308)
(ODA economic grant and loan)/GDP						-1.619 (1.068)
(ODA government grant and loan)/GDP						-2.660 (1.439)
Constant	2.080*** (0.456)	2.212*** (0.553)	2.217*** (0.552)	2.225*** (0.558)	2.215*** (0.550)	2.330*** (0.547)
Observations	169	165	165	165	165	165
R-squared	0.490	0.511	0.509	0.511	0.536	0.538
rss	0.476	0.454	0.457	0.455	0.431	0.430

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXVI. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY, PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-1.059*** (0.145)	-1.158*** (0.095)	-1.161*** (0.095)	-1.173*** (0.096)	-1.204*** (0.065)	-1.130*** (0.093)
Initial ln(GDP_per_capita)	-0.022 (0.017)	0.002 (0.011)	0.003 (0.011)	0.007 (0.011)	0.011 (0.010)	-0.005 (0.012)
Trade/GDP	0.082 (0.047)	0.072 (0.038)	0.072 (0.039)	0.080* (0.037)	0.083* (0.035)	0.041 (0.032)
Initial ln(population)	0.268*** (0.063)	0.165** (0.049)	0.162** (0.050)	0.154** (0.049)	0.125** (0.041)	0.144** (0.050)
Initial DPT immunization	-0.118* (0.049)	-0.084* (0.037)	-0.084* (0.037)	-0.082* (0.037)	-0.050 (0.034)	-0.053 (0.031)
Initial HIV	-0.177 (0.423)	-0.495 (0.353)	-0.489 (0.350)	-0.495 (0.343)	-0.430 (0.252)	-0.578 (0.380)
Initial water	0.100 (0.131)	0.106 (0.087)	0.106 (0.087)	0.107 (0.087)	0.030 (0.083)	0.078 (0.077)
ODA/GDP	-0.123 (0.209)					
PRI/GDP	-0.133 (0.167)					
(ALL health grant and loan)/GDP		3.478*** (0.843)				
(ODA health grant and loan)/GDP			3.567*** (0.857)			5.260*** (1.225)
(ODA health grant)/GDP				3.653*** (0.931)		
(ODA health loan)/GDP				-1.548 (5.643)		
(ODA Health-Health grant and loan)/GDP					2.291 (1.989)	
(ODA Health-Population-Policy grant and loan)/GDP					9.298*** (1.737)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-10.219*** (2.623)	
(ODA education grant and loan)/GDP						-1.814 (3.208)
(ODA economic grant and loan)/GDP						-1.917** (0.697)
(ODA government grant and loan)/GDP						-1.605 (1.810)
Constant	3.964*** (0.606)	4.345*** (0.425)	4.358*** (0.423)	4.399*** (0.430)	4.599*** (0.299)	4.356*** (0.413)
Observations	169	165	165	165	165	165
R-squared	0.776	0.846	0.846	0.849	0.905	0.874
rss	0.114	0.078	0.078	0.077	0.048	0.064

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX B (continued)

TABLE XXVII. OLS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY,
ANNUAL PANEL DATA

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.038*** (0.011)	-0.043*** (0.012)	-0.043*** (0.012)	-0.043*** (0.012)	-0.045*** (0.012)	-0.044*** (0.012)
Initial ln(GDP_per_capita)	-0.000 (0.001)	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)
Trade/GDP	0.001 (0.001)	0.001 (0.001)	0.001 (0.001)	0.000 (0.001)	0.000 (0.001)	-0.001 (0.001)
Initial ln(population)	0.001*** (0.000)	0.000* (0.000)	0.000* (0.000)	0.000* (0.000)	0.000 (0.000)	0.000 (0.000)
Initial DPT immunization	0.010*** (0.003)	0.009** (0.004)	0.009** (0.004)	0.009** (0.004)	0.010** (0.004)	0.012** (0.004)
Initial HIV	-0.050*** (0.014)	-0.064*** (0.015)	-0.065*** (0.015)	-0.067*** (0.015)	-0.089*** (0.016)	-0.073*** (0.016)
Initial water	0.005 (0.003)	0.003 (0.003)	0.003 (0.003)	0.003 (0.003)	0.004 (0.003)	0.001 (0.003)
ODA/GDP	0.032*** (0.007)					
PRI/GDP	0.005* (0.003)					
(ALL health grant and loan)/GDP		0.249*** (0.038)				
(ODA health grant and loan)/GDP			0.254*** (0.038)			0.345*** (0.051)
(ODA health grant)/GDP				0.274*** (0.041)		
(ODA health loan)/GDP				0.080 (0.080)		
(ODA Health-Health grant and loan)/GDP					-0.267* (0.111)	
(ODA Health-Population-Policy grant and loan)/GDP					0.901*** (0.102)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-0.101 (0.069)	
(ODA education grant and loan)/GDP						0.027 (0.056)
(ODA economic grant and loan)/GDP						-0.161*** (0.034)
(ODA government grant and loan)/GDP						-0.066 (0.056)
Constant	0.152*** (0.039)	0.169*** (0.044)	0.168*** (0.044)	0.169*** (0.044)	0.178*** (0.044)	0.174*** (0.047)
Observations	1600	1571	1571	1571	1571	1571
R-squared	0.258	0.274	0.274	0.276	0.326	0.292
rss	0.111	0.108	0.108	0.108	0.100	0.105

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXVIII. FIXED EFFECTS ESTIMATION FOR LOG DIFFERENCE OF LIFE EXPECTANCY, ANNUAL PANEL DATA

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(life expectancy)	-0.121** (0.037)	-0.141*** (0.039)	-0.141*** (0.039)	-0.143*** (0.039)	-0.157*** (0.038)	-0.143*** (0.037)
Initial ln(GDP_per_capita)	-0.005 (0.003)	-0.003 (0.003)	-0.003 (0.003)	-0.002 (0.003)	-0.002 (0.003)	-0.004 (0.003)
Trade/GDP	0.005 (0.004)	0.005 (0.004)	0.005 (0.004)	0.005 (0.004)	0.004 (0.003)	0.003 (0.003)
Initial ln(population)	0.013 (0.008)	0.009 (0.009)	0.009 (0.009)	0.008 (0.009)	0.011 (0.008)	0.009 (0.008)
Initial DPT immunization	-0.001 (0.006)	-0.001 (0.006)	-0.001 (0.006)	-0.001 (0.006)	0.002 (0.006)	0.002 (0.005)
Initial HIV	-0.219 (0.120)	-0.241* (0.099)	-0.240* (0.099)	-0.245* (0.097)	-0.251** (0.079)	-0.250** (0.090)
Initial water	0.019 (0.022)	0.017 (0.021)	0.017 (0.021)	0.018 (0.021)	0.016 (0.019)	0.015 (0.019)
ODA/GDP	0.005 (0.010)					
PRI/GDP	-0.000 (0.002)					
(ALL health grant and loan)/GDP		0.295** (0.098)				
(ODA health grant and loan)/GDP			0.304** (0.108)			0.431*** (0.072)
(ODA health grant)/GDP				0.340** (0.116)		
(ODA health loan)/GDP				0.040 (0.173)		
(ODA Health-Health grant and loan)/GDP					-0.281 (0.156)	
(ODA Health-Population-Policy grant and loan)/GDP					1.103*** (0.289)	
(ODA Health-Water-Sanitation grant and loan)/GDP					-0.013 (0.154)	
(ODA education grant and loan)/GDP						-0.154 (0.092)
(ODA economic grant and loan)/GDP						-0.182*** (0.042)
(ODA government grant and loan)/GDP						-0.148 (0.078)
Constant	0.501*** (0.146)	0.575*** (0.151)	0.575*** (0.151)	0.584*** (0.151)	0.633*** (0.146)	0.588*** (0.141)
Observations	1600	1571	1571	1571	1571	1571
R-squared	0.335	0.382	0.382	0.387	0.452	0.423
rss	0.065	0.061	0.061	0.060	0.054	0.057

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX B (continued)

TABLE XXIX. OLS ESTIMATION FOR INV/GDP, DATA WITH 20 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(GDP_per_capita)	0.011 (0.011)	0.020 (0.010)	0.018 (0.011)	0.016 (0.011)	0.016 (0.011)	0.016 (0.010)
Trade/GDP	0.069 (0.038)	0.106** (0.038)	0.099* (0.038)	0.091* (0.037)	0.088* (0.039)	0.102** (0.038)
Initial ln(population)	0.004 (0.005)	0.010* (0.005)	0.009 (0.005)	0.006 (0.005)	0.006 (0.005)	0.010 (0.005)
ppi (Initial Price level of capital formation)	-0.128*** (0.036)	-0.126*** (0.032)	-0.127*** (0.033)	-0.133*** (0.033)	-0.123*** (0.032)	-0.127*** (0.032)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.123** (0.042)	0.115** (0.038)	0.117** (0.038)	0.124** (0.038)	0.116** (0.037)	0.113** (0.037)
Initial rule of law	0.046*** (0.011)	0.036*** (0.010)	0.037*** (0.010)	0.036*** (0.010)	0.040*** (0.010)	0.031** (0.011)
ODA/GDP	0.125 (0.207)					
PRI/GDP	-0.213 (0.192)					
(ALL economic grant and loan)/GDP		2.613* (1.262)				
(ODA economic grant and loan)/GDP			2.311 (1.415)			3.308 (1.686)
(ODA economic grant)/GDP				0.635 (1.783)		
(ODA economic loan)/GDP				4.644 (2.758)		
(ODA Economic-Infrastructure grant and loan)/GDP					5.822** (2.076)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-5.115 (2.803)	
(ODA education grant and loan)/GDP						3.378 (3.636)
(ODA health grant and loan)/GDP						-1.485 (1.793)
(ODA government grant and loan)/GDP						-3.118 (1.624)
Constant	0.138 (0.105)	0.017 (0.100)	0.040 (0.107)	0.070 (0.104)	0.080 (0.105)	0.060 (0.098)
Observations	109	109	109	109	109	104
R-squared	0.374	0.399	0.388	0.401	0.436	0.431
rss	0.350	0.336	0.342	0.335	0.316	0.305

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables.

APPENDIX B (continued)

TABLE XXX. OLS ESTIMATION FOR INV/GDP, PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	0.025** (0.010)	0.029*** (0.008)	0.027** (0.009)	0.024** (0.008)	0.023** (0.008)	0.026** (0.009)
Trade/GDP	0.075** (0.028)	0.092** (0.028)	0.087** (0.028)	0.083** (0.028)	0.080** (0.028)	0.091** (0.029)
Initial ln(population)	0.004 (0.004)	0.007 (0.004)	0.006 (0.004)	0.004 (0.004)	0.004 (0.004)	0.007 (0.004)
ppi (Initial Price level of capital formation)	-0.142*** (0.036)	-0.138*** (0.035)	-0.139*** (0.035)	-0.145*** (0.036)	-0.140*** (0.034)	-0.140*** (0.036)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.107* (0.043)	0.100* (0.041)	0.102* (0.042)	0.109* (0.043)	0.103* (0.041)	0.102* (0.042)
Initial rule of law	0.038*** (0.009)	0.029** (0.009)	0.031*** (0.009)	0.030*** (0.009)	0.034*** (0.009)	0.025** (0.009)
ODA/GDP	0.127 (0.156)					
PRI/GDP	-0.197 (0.123)					
(ALL economic grant and loan)/GDP		1.694* (0.753)				
(ODA economic grant and loan)/GDP			1.366 (0.810)			2.020* (0.910)
(ODA economic grant)/GDP				0.109 (1.110)		
(ODA economic loan)/GDP				3.164 (1.636)		
(ODA Economic-Infrastructure grant and loan)/GDP					3.120** (1.054)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-3.017 (1.728)	
(ODA education grant and loan)/GDP						3.547 (2.579)
(ODA health grant and loan)/GDP						-0.454 (0.931)
(ODA government grant and loan)/GDP						-3.483** (1.142)
Constant	0.001 (0.095)	-0.055 (0.081)	-0.031 (0.084)	0.001 (0.080)	0.021 (0.078)	-0.024 (0.085)
Observations	219	219	219	219	219	209
R-squared	0.378	0.387	0.380	0.388	0.399	0.416
rss	0.896	0.884	0.894	0.882	0.867	0.801

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXXI. FIXED EFFECTS ESTIMATION FOR INV/GDP, PANEL DATA WITH 10 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	-0.012 (0.019)	-0.007 (0.019)	-0.010 (0.019)	-0.013 (0.021)	-0.011 (0.019)	-0.008 (0.019)
Trade/GDP	0.053 (0.043)	0.080* (0.040)	0.078 (0.040)	0.077 (0.040)	0.077 (0.040)	0.090* (0.039)
Initial ln(population)	0.005 (0.063)	0.007 (0.065)	0.015 (0.066)	0.014 (0.066)	0.018 (0.066)	0.013 (0.071)
ppi (Initial Price level of capital formation)	-0.103** (0.034)	-0.104** (0.036)	-0.107** (0.036)	-0.109** (0.036)	-0.107** (0.036)	-0.093* (0.037)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.049 (0.034)	0.048 (0.035)	0.048 (0.034)	0.048 (0.034)	0.047 (0.034)	0.044 (0.036)
Initial rule of law	0.025 (0.017)	0.034 (0.018)	0.037* (0.018)	0.039* (0.018)	0.038* (0.019)	0.037* (0.018)
ODA/GDP	-0.307* (0.126)					
PRI/GDP	0.230 (0.226)					
(ALL economic grant and loan)/GDP		-0.862 (0.534)				
(ODA economic grant and loan)/GDP			-1.282** (0.479)			-0.673 (0.811)
(ODA economic grant)/GDP				-1.836* (0.714)		
(ODA economic loan)/GDP				-0.355 (1.201)		
(ODA Economic-Infrastructure grant and loan)/GDP					-0.933 (0.771)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-2.314 (1.860)	
(ODA education grant and loan)/GDP						1.381 (2.734)
(ODA health grant and loan)/GDP						0.864 (0.807)
(ODA government grant and loan)/GDP						-3.724* (1.700)
Constant	0.321 (0.249)	0.261 (0.245)	0.279 (0.247)	0.311 (0.255)	0.285 (0.244)	0.255 (0.251)
Observations	219	219	219	219	219	209
R-squared	0.454	0.435	0.443	0.446	0.445	0.447
rss	0.164	0.169	0.167	0.166	0.166	0.153

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX B (continued)

TABLE XXXII. OLS ESTIMATION FOR INV/GDP, ANNUAL PANEL DATA

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	0.024*** (0.004)	0.029*** (0.004)	0.029*** (0.004)	0.027*** (0.004)	0.027*** (0.004)	0.029*** (0.004)
Trade/GDP	0.094*** (0.011)	0.099*** (0.010)	0.098*** (0.010)	0.096*** (0.010)	0.096*** (0.010)	0.102*** (0.011)
Initial ln(population)	0.003 (0.001)	0.005*** (0.001)	0.005** (0.001)	0.004** (0.001)	0.004** (0.001)	0.006*** (0.002)
ppi (Initial Price level of capital formation)	-0.170*** (0.015)	-0.165*** (0.015)	-0.164*** (0.015)	-0.166*** (0.015)	-0.164*** (0.015)	-0.173*** (0.015)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.066** (0.020)	0.066*** (0.019)	0.065*** (0.019)	0.069*** (0.019)	0.068*** (0.019)	0.067*** (0.020)
Initial rule of law	0.032*** (0.004)	0.026*** (0.004)	0.027*** (0.004)	0.026*** (0.004)	0.028*** (0.004)	0.023*** (0.004)
ODA/GDP	0.088* (0.044)					
PRI/GDP	-0.031 (0.020)					
(ALL economic grant and loan)/GDP		1.215*** (0.216)				
(ODA economic grant and loan)/GDP			1.220*** (0.258)			1.476*** (0.293)
(ODA economic grant)/GDP				0.548 (0.315)		
(ODA economic loan)/GDP				2.228*** (0.418)		
(ODA Economic-Infrastructure grant and loan)/GDP					1.940*** (0.367)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-0.452 (0.485)	
(ODA education grant and loan)/GDP						1.991** (0.642)
(ODA health grant and loan)/GDP						-0.080 (0.288)
(ODA government grant and loan)/GDP						-1.970*** (0.384)
Constant	0.030 (0.036)	-0.022 (0.032)	-0.025 (0.034)	-0.006 (0.034)	-0.007 (0.033)	-0.019 (0.035)
Observations	1631	1650	1650	1650	1650	1575
R-squared	0.343	0.351	0.347	0.352	0.353	0.365
rss	8.980	8.925	8.973	8.912	8.894	8.202

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXXIII. FIXED EFFECTS ESTIMATION FOR INV/GDP, ANNUAL PANEL DATA

	(1)	(2)	(3)	(4)	(5)	(6)
Initial ln(GDP_per_capita)	0.005 (0.018)	0.006 (0.017)	0.004 (0.017)	0.004 (0.017)	0.004 (0.017)	0.005 (0.018)
Trade/GDP	0.118*** (0.022)	0.123*** (0.022)	0.122*** (0.021)	0.122*** (0.021)	0.122*** (0.021)	0.126*** (0.024)
Initial ln(population)	0.083 (0.053)	0.082 (0.053)	0.086 (0.053)	0.087 (0.053)	0.085 (0.053)	0.099 (0.057)
ppi (Initial Price level of capital formation)	-0.129*** (0.023)	-0.123*** (0.023)	-0.124*** (0.023)	-0.123*** (0.023)	-0.124*** (0.023)	-0.119*** (0.024)
ppidev (Magnitude of the deviation of ppi from sample mean)	0.051 (0.028)	0.045 (0.028)	0.045 (0.028)	0.045 (0.029)	0.045 (0.029)	0.038 (0.029)
Initial rule of law	0.028* (0.011)	0.027* (0.011)	0.029* (0.011)	0.029* (0.011)	0.029* (0.011)	0.029* (0.011)
ODA/GDP	-0.080 (0.067)					
PRI/GDP	0.022 (0.021)					
(ALL economic grant and loan)/GDP		-0.063 (0.201)				
(ODA economic grant and loan)/GDP			-0.317 (0.259)			-0.246 (0.253)
(ODA economic grant)/GDP				-0.412 (0.313)		
(ODA economic loan)/GDP				-0.158 (0.465)		
(ODA Economic-Infrastructure grant and loan)/GDP					-0.361 (0.353)	
(ODA Economic-Production-Sectors grant and loan)/GDP					-0.215 (0.578)	
(ODA education grant and loan)/GDP						-0.830 (0.897)
(ODA health grant and loan)/GDP						0.108 (0.361)
(ODA government grant and loan)/GDP						-0.288 (0.351)
Constant	0.016 (0.194)	0.005 (0.181)	0.015 (0.180)	0.013 (0.180)	0.015 (0.181)	-0.026 (0.198)
Observations	1631	1650	1650	1650	1650	1575
R-squared	0.259	0.255	0.257	0.257	0.257	0.256
rss	3.529	3.600	3.594	3.593	3.594	3.328

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX B (continued)

TABLE XXXIV. OLS ESTIMATION FOR LOG DIFFERENCE OF YEARS OF SCHOOLING, DATA WITH 15 YEAR AVERAGES

	(1)	(2)	(3)	(5)	(4)	(6)
Initial ln(years of schooling)	-0.283*** (0.032)	-0.284*** (0.035)	-0.284*** (0.035)	-0.282*** (0.036)	-0.279*** (0.035)	-0.292*** (0.037)
Initial ln(GDP_per_capita)	0.011 (0.029)	0.010 (0.029)	0.010 (0.029)	0.008 (0.029)	0.008 (0.029)	0.009 (0.031)
Trade/GDP	0.099 (0.054)	0.073 (0.056)	0.073 (0.057)	0.072 (0.056)	0.070 (0.055)	0.079 (0.057)
Initial ln(population)	0.026** (0.009)	0.019 (0.010)	0.019 (0.010)	0.018 (0.010)	0.016 (0.010)	0.019 (0.010)
Initial urban population	0.059 (0.078)	0.039 (0.081)	0.039 (0.081)	0.045 (0.081)	0.057 (0.083)	0.131 (0.102)
ODA/GDP	0.432 (0.298)					
PRI/GDP	0.561 (0.306)					
(ALL education grant and loan)/GDP		3.168 (7.499)				
(ODA education grant and loan)/GDP			3.213 (7.539)			-5.235 (11.932)
(ODA education grant)/GDP				-2.601 (9.252)		
(ODA education loan)/GDP				22.528 (16.282)		
(ODA Education-Level-Unspecified grant and loan)/GDP					4.010 (18.164)	
(ODA Education-Basic grant and loan)/GDP					15.746 (14.248)	
(ODA Education-Secondary grant and loan)/GDP					-21.755 (61.971)	
(ODA Education-Post-Secondary grant and loan)/GDP					-12.435 (18.076)	
(ODA health grant and loan)/GDP						4.798 (4.498)
(ODA economic grant and loan)/GDP						-0.911 (2.401)
(ODA government grant and loan)/GDP						3.022 (2.866)
Constant	0.474* (0.219)	0.542* (0.226)	0.542* (0.226)	0.556* (0.221)	0.547* (0.218)	0.492* (0.240)
Observations	81	80	80	80	80	79
R-squared	0.750	0.729	0.729	0.735	0.736	0.746
rss	0.562	0.600	0.600	0.587	0.584	0.559

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables.

APPENDIX B (continued)

TABLE XXXV. OLS ESTIMATION FOR THE DIFFERENCE OF RULE OF LAW, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)
Initial rule of law	-0.094*** (0.018)	-0.093*** (0.017)	-0.093*** (0.017)	-0.094*** (0.017)	-0.090*** (0.017)
Growth of real GDP per capita	0.419 (0.329)	0.399 (0.333)	0.396 (0.333)	0.395 (0.333)	0.438 (0.342)
Trade/GDP	0.035 (0.054)	0.037 (0.051)	0.033 (0.051)	0.034 (0.051)	0.031 (0.054)
Initial ln(population)	-0.002 (0.008)	-0.001 (0.007)	-0.002 (0.007)	-0.002 (0.007)	-0.003 (0.007)
ODA/GDP	0.192 (0.254)				
(ALL government grant and loan)/GDP		3.894* (1.550)			
(ODA government grant and loan)/GDP			3.418* (1.542)		4.484* (2.080)
(ODA government grant)/GDP				3.257 (1.950)	
(ODA government loan)/GDP				4.185 (5.757)	
(ODA education grant and loan)/GDP					1.846 (3.021)
(ODA health grant and loan)/GDP					-0.857 (1.700)
(ODA economic grant and loan)/GDP					-0.996 (1.423)
Constant	-0.091 (0.048)	-0.087* (0.039)	-0.085* (0.039)	-0.085* (0.039)	-0.076 (0.041)
Observations	440	428	428	428	420
R-squared	0.121	0.137	0.135	0.135	0.133
rss	20.491	18.511	18.558	18.557	18.038

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include regional dummy variables and time dummy variables.

APPENDIX B (continued)

TABLE XXXVI. FIXED EFFECTS ESTIMATION FOR THE DIFFERENCE OF RULE OF LAW, PANEL DATA WITH 5 YEAR AVERAGES

	(1)	(2)	(3)	(4)	(5)
Initial rule of law	-0.538*** (0.069)	-0.542*** (0.064)	-0.541*** (0.064)	-0.546*** (0.064)	-0.560*** (0.063)
Growth of real GDP per capita	0.268 (0.297)	0.170 (0.274)	0.168 (0.274)	0.168 (0.272)	0.197 (0.276)
Trade/GDP	0.270 (0.138)	0.230* (0.106)	0.222* (0.107)	0.204 (0.107)	0.184 (0.108)
Initial ln(population)	-0.101 (0.219)	-0.220 (0.203)	-0.237 (0.206)	-0.278 (0.209)	-0.334 (0.206)
ODA/GDP	0.072 (0.404)				
(ALL government grant and loan)/GDP		9.290*** (2.217)			
(ODA government grant and loan)/GDP			9.078*** (2.229)		5.595* (2.776)
(ODA government grant)/GDP				11.637*** (2.374)	
(ODA government loan)/GDP				-0.021 (6.342)	
(ODA education grant and loan)/GDP					3.298 (3.777)
(ODA health grant and loan)/GDP					1.118 (2.345)
(ODA economic grant and loan)/GDP					1.987 (1.797)
Constant	-0.173 (0.402)	0.054 (0.384)	0.090 (0.391)	0.170 (0.396)	0.277 (0.406)
Observations	440	428	428	428	420
R-squared	0.288	0.324	0.322	0.326	0.336
rss	12.244	10.544	10.577	10.507	10.081

All standard errors are robust and reported below coefficient estimates. ***, **, and * denote significance at 0.1%, 1%, and 5%. All specifications include time dummy variables.

APPENDIX C

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

100- SOCIAL INFRASTRUCTURE AND SERVICES	
110	EDUCATION
111	Education, level unspecified
11110	Education policy and administrative management
11120	Education facilities and training
11130	Teacher training
11182	Educational research
112	Basic education
11220	Primary education
11230	Basic life skills for youth and adults
11240	Early childhood education
113	Secondary education
11320	Secondary education
11330	Vocational training
114	Post-secondary education
11420	Higher education
11430	Advanced technical and managerial training
120	HEALTH
121	Health, general
12110	Health policy and administrative management
12181	Medical education/training
12182	Medical research
12191	Medical services
122	Basic health
12220	Basic health care
12230	Basic health infrastructure
12240	Basic nutrition
12250	Infectious disease control
12261	Health education
12262	Malaria control
12263	Tuberculosis control
12281	Health personnel development
130	POPULATION POLICIES/PROGRAMMES AND REPRODUCTIVE HEALTH
13010	Population policy and administrative management
13020	Reproductive health care
13030	Family planning
13040	STD control including HIV/AIDS
13081	Personnel development for population and reproductive health

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

140	WATER AND SANITATION
14010	Water sector policy and administrative management
14015	Water resources conservation (including data collection)
14020	Water supply and sanitation - large systems
14021	Water supply - large systems
14022	Sanitation - large systems
14030	Basic drinking water supply and basic sanitation
14031	Basic drinking water supply
14032	Basic sanitation
14040	River basins' development
14050	Waste management / disposal
14081	Education and training in water supply and sanitation
150	GOVERNMENT AND CIVIL SOCIETY
151	Government and civil society, general
15110	Public sector policy and administrative management
15111	Public finance management
15114	Tax policy and tax administration support
15112	Decentralisation and support to subnational government
15113	Anti-corruption organisations and institutions
15130	Legal and judicial development
15150	Democratic participation and civil society
15151	Elections
15152	Legislatures and political parties
15153	Media and free flow of information
15160	Human rights
15170	Women's equality organisations and institutions
15180	Ending violence against women and girls
152	Conflict prevention and resolution, peace and security
15210	Security system management and reform
15220	Civilian peace-building, conflict prevention and resolution
15230	Participation in international peacekeeping operations
15240	Reintegration and SALW control
15250	Removal of land mines and explosive remnants of war
15261	Child soldiers (Prevention and demobilisation)
160	OTHER SOCIAL INFRASTRUCTURE AND SERVICES
16010	Social/ welfare services
16020	Employment policy and administrative management
16030	Housing policy and administrative management
16040	Low-cost housing
16050	Multisector aid for basic social services
16061	Culture and recreation
16062	Statistical capacity building
16063	Narcotics control
16064	Social mitigation of HIV/AIDS

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

200- ECONOMIC INFRASTRUCTURE AND SERVICES	
210	TRANSPORT AND STORAGE
21010	Transport policy and administrative management
21020	Road transport
21030	Rail transport
21040	Water transport
21050	Air transport
21061	Storage
21081	Education and training in transport and storage
220	COMMUNICATION
22010	Communications policy and administrative management
22020	Telecommunications
22030	Radio/television/print media
22040	Information and communication technology (ICT)
230	ENERGY GENERATION, DISTRIBUTION AND EFFICIENCY
231	Energy generation, distribution and efficiency - general
23110	Energy policy and administrative management
23181	Energy education/training
23182	Energy research
23183	Energy conservation and demand-side efficiency
232	Energy generation, renewable sources
23210	Energy generation, renewable sources - multiple technologies
23220	Hydro-electric power plants
23230	Solar energy
23240	Wind energy
23250	Marine energy
23260	Geothermal energy
23270	Biofuel-fired power plants
233	Energy generation, non-renewable sources
23310	Energy generation, non-renewable sources - unspecified
23320	Coal-fired electric power plants
23330	Oil-fired electric power plants
23340	Natural gas-fired electric power plants
23350	Fossil fuel electric power plants with carbon capture and storage (CCS)
23360	Non-renewable waste-fired electric power plants
234	Hybrid energy electric power plants
23410	Hybrid energy electric power plants
235	Nuclear energy electric power plants
23510	Nuclear energy electric power plants
236	Heating, cooling and energy distribution
23610	Heat plants
23620	District heating and cooling
23630	Electric power transmission and distribution
23640	Gas distribution

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

240	BANKING AND FINANCIAL SERVICES
24010	Financial policy and administrative management
24020	Monetary institutions
24030	Formal sector financial intermediaries
24040	Informal/semi-formal financial intermediaries
24081	Education/training in banking and financial services
250	BUSINESS AND OTHER SERVICES
25010	Business support services and institutions
25020	Privatisation
300-	PRODUCTION SECTORS
311	AGRICULTURE
31110	Agricultural policy and administrative management
31120	Agricultural development
31130	Agricultural land resources
31140	Agricultural water resources
31150	Agricultural inputs
31161	Food crop production
31162	Industrial crops/export crops
31163	Livestock
31164	Agrarian reform
31165	Agricultural alternative development
31166	Agricultural extension
31181	Agricultural education/training
31182	Agricultural research
31191	Agricultural services
31192	Plant and post-harvest protection and pest control
31193	Agricultural financial services
31194	Agricultural co-operatives
31195	Livestock/veterinary services
312	FORESTRY
31210	Forestry policy and administrative management
31220	Forestry development
31261	Fuelwood/charcoal
31281	Forestry education/training
31282	Forestry research
31291	Forestry services
313	FISHING
31310	Fishing policy and administrative management
31320	Fishery development
31381	Fishery education/training
31382	Fishery research
31391	Fishery services

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

321	INDUSTRY
32110	Industrial policy and administrative management
32120	Industrial development
32130	Small and medium-sized enterprises (SME) development
32140	Cottage industries and handicraft
32161	Agro-industries
32162	Forest industries
32163	Textiles, leather and substitutes
32164	Chemicals
32165	Fertilizer plants
32166	Cement/lime/plaster
32167	Energy manufacturing
32168	Pharmaceutical production
32169	Basic metal industries
32170	Non-ferrous metal industries
32171	Engineering
32172	Transport equipment industry
32182	Technological research and development
322	MINERAL RESOURCES AND MINING
32210	Mineral/mining policy and administrative management
32220	Mineral prospection and exploration
32261	Coal
32262	Oil and gas
32263	Ferrous metals
32264	Nonferrous metals
32265	Precious metals/materials
32266	Industrial minerals
32267	Fertilizer minerals
32268	Offshore minerals
323	CONSTRUCTION
32310	Construction policy and administrative management
331	TRADE POLICY AND REGULATIONS AND TRADE-RELATED ADJUSTMENT
33110	Trade policy and administrative management
33120	Trade facilitation
33130	Regional trade agreements (RTAs)
33140	Multilateral trade negotiations
33150	Trade-related adjustment
33181	Trade education/training
332	TOURISM
33210	Tourism policy and administrative management

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

400- MULTISECTOR/CROSS-CUTTING	
410	General environmental protection
41010	Environmental policy and administrative management
41020	Biosphere protection
41030	Bio-diversity
41040	Site preservation
41050	Flood prevention/control
41081	Environmental education/ training
41082	Environmental research
430	Other multisector
43010	Multisector aid
43030	Urban development and management
43040	Rural development
43050	Non-agricultural alternative development
43081	Multisector education/training
43082	Research/scientific institutions
500- COMMODITY AID AND GENERAL PROGRAMME ASSISTANCE	
510	General budget support
51010	General budget support-related aid
520	Developmental food aid/Food security assistance
52010	Food aid/Food security programmes
530	Other commodity assistance
53030	Import support (capital goods)
53040	Import support (commodities)
600- ACTION RELATING TO DEBT	
60010	Action relating to debt
60020	Debt forgiveness
60030	Relief of multilateral debt
60040	Rescheduling and refinancing
60061	Debt for development swap
60062	Other debt swap
60063	Debt buy-back
700- HUMANITARIAN AID	
720	Emergency Response
72010	Material relief assistance and services
72040	Emergency food aid
72050	Relief co-ordination; protection and support services
730	Reconstruction relief and rehabilitation
73010	Reconstruction relief and rehabilitation
740	Disaster prevention and preparedness
74010	Disaster prevention and preparedness

APPENDIX C (continued)

TABLE XXXVII. LIST OF OECD, DAC CRS PURPOSE CODES

910- ADMINISTRATIVE COSTS OF DONORS	
91010	Administrative costs (non-sector allocable)
930- REFUGEES IN DONOR COUNTRIES	
93010	Refugees in donor countries (non-sector allocable)
998- UNALLOCATED/ UNSPECIFIED	
99810	Sectors not specified
99820	Promotion of development awareness (non-sector allocable)

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- Regularly prepare domestic debt reports and analysis and participate in the official meetings with government officials and representatives from international organizations such as World Bank, IMF.
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