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Three Essays on the Economics of Foreign Aid

A dissertation submitted in partial fulfillment
of the requirements for the degree of
Doctor of Philosophy in Economics

by

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Abstract

Recent years have seen a burgeoning interest in the issue of foreign aid especially in the context of developmental economics. As foreign aid is designed to help those less-privileged nations with developmental objectives such as poverty reduction and/or economic growth, fundamental questions include whether aid has been effective and what motivates donors to provide aid. This dissertation is composed of three essays that examine different issues concerning foreign aid. First, I focus on the Millennium Development Goals (MDGs) and its impact on aid allocation among sectors. If specification of the MDGs affected aid flows, it should be observed that more financial resources were given after the MDGs were announced. Moreover, sectors associated with the MDGs should have received more aid. Second, researchers do not agree on the effect of aid on the recipient countries' economic growth. I apply social network theory to analyze the aid environment as a two-mode network. Network-based indicators are developed to capture aid connectivity and I find a positive relationship between the aid connectivity and the recipient countries' average annual growth of GDP. Third, I look at two donors (South Korea and Turkey) who have transitioned from aid recipients to donors. Having experienced rapid economic development while receiving foreign assistance, these two nations may have a better understanding of how to make aid more effective for recipients. I then compared their aid allocation patterns with traditional donors.

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1 Essay 1: Flows and Allocation of Foreign Aid - the Impact of Millennium Development Goals

1.1 Introduction

The last few years have seen a burgeoning interest in the issue of foreign aid especially in the context of developmental economics. The general idea behind foreign aid is to allow the flow of financial resources from the wealthier nations to the less-privileged ones in order to help with developmental objectives such as poverty reduction and/or economic growth. Along this line, at the dawn of the new millennium, all member states of the United Nations (UN) made a promise to promote peace, eradicate poverty, protect the environment, improve human rights, protect the vulnerable, and meet the special needs of Africa (United Nations Millennium Declaration, 2000). This pledge turned into the eight Millennium Development Goals (MDGs).

Thirteen years have passed, and there are many discussions on the MDGs progress based on time frames along with suggested interventions. It is supported by many papers that most of the MDGs cannot be met with the current resources available in low-income countries (Dodd & Cassels, 2006; Hogan et al., 2010; Sahn & Stifel, 2003). Suggestions were given on how to help meet MDGs such as higher levels of aid commitment and improvement of aid effectiveness (Bourguignon, 2008; Clemens et al., 2007; Dodd & Cassels, 2006). Moreover, attentions were given to the importance of defining success. Easterly (2009) argues that the simple definition of success in achieving MDGs may make Africa look like a failure even when the progress the continent made was above the historical experience of other regions. Fukuda-Parr and Greenstein (2013) also pointed out that the definition of success should not be based on achieving the goals but on the pace of the progress with which African countries actually outperformed the global averages.

This essay analyzes MDGs from a different perspective. I want to examine the impact of MDGs not only on aid volumes but also on aid allocation among sectors. This essay first looks at whether donor countries have been giving more overall support and resources to developing countries after MDGs were announced, and then studied whether the allocation of these resources across sectors had in fact

considered MDGs. In summary, this essay attempts to test the null-hypothesis that the announcement and adoption of the MDGs had no effect time-path to achieving these goals. In the Organisation for Economic Co-operation and Development (OECD) Development Assistance Committee's (DAC) Creditor Reporting System (CRS), 198 aid sectors are reported from the education policy and administrative management to the promotion of development awareness. Foreign aid sectors are linked to specific goals based on the key words and indicators of MDGs. As a robustness check, aid sectors are linked to MDGs based on the donors' reports on their objectives of aid activities. Two goals were looked at specifically: promoting gender equality and empowering women (MDG3) and ensuring environmental sustainability (MDG7). Disaggregated aid as share of total aid was also examined.

Difference-in-Difference approach is adopted to identify the treatment effect of whether the aid allocation across sectors is in line with the MDGs. The announcement may have an impact on the aid amount overall. In addition, if the aid allocation among sectors took the MDGs as guidelines, the treatment effect should be observed, where the increase of the MDG-related sectors is more than that of the non-MDG-related sectors after the goals were announced. The results show that although more aid was given after the announcement it failed to find evidence that the aid allocation among sectors is in accordance with the MDGs on either levels or shares. Furthermore, donors behave differently and have different priorities on aid targets. Germany, Norway, and Sweden have priorities on gender equality and women empowerment. Regarding environmental sustainability, DAC donors in general did allocate more resources to support this goal, but even more resources were distributed to other sectors. Significant donors such as the United States, France, Germany, the United Kingdom, Japan, Norway, Netherlands, and Sweden actually allocated less resources to sectors which are associated with ensuring environmental sustainability compared with the levels before the MDGs were announced.

This essay is organized in the following way. Section 2 provides a review of related literature. Section 3 introduces a model on how foreign aid is allocated and the application of difference-in-difference approach to the model, which yields a testable empirical estimation. Section 4 provides more details about the data, how aid sectors are linked with the MDG goals, and the empirical results. Section 5 concludes the essay.

1.2 Literature and Related Background

“The Millennium Declaration” was adopted in 2000 and this declaration essentially involved translating fundamental values which are essential to international relations in the 21st century viz., freedom, equality, solidarity, tolerance, respect for nature, and shared responsibility into more concrete actionable pledges (United Nations Millennium Declaration, 2000). Accordingly, all 189 member states of the United Nations made a promise to promote peace, eradicate poverty, protect the environment, improve human rights, protect the vulnerable, and meet the special needs of Africa (United Nations Millennium Declaration, 2000). This pledge turned into eight MDGs. These eight international development goals were agreed upon by all the world’s countries and leading development institutions with a target date by the end of 2015. Each goal has specific targets and the overall 8 goals and 18 targets are listed in Table 1.1. The origin of these goals and targets involves efforts from Assistant Secretary-General Michael Doyle and his team such as the United Nations Development Group (UNDP), the OECD, the World Bank, the International Monetary Fund, and the World Health Organization (McArthur, 2013).

Table 1.1

Millennium Development Goals and Targets

Goal	Target
GOAL 1: Eradicate extreme poverty and hunger	Target 1.A: Halve, between 1990 and 2015, the proportion of people whose income is less than \$1.25 a day. Target 1.B: Achieve full and productive employment and decent work for all, including women and young people. Target 1.C: Halve, between 1990 and 2015, the proportion of people who suffer from hunger.
GOAL 2: Achieve universal primary education	Target 2.A: Ensure that, by 2015, children everywhere, boys and girls alike, will be able to complete a full course of primary schooling.
GOAL 3: Promote gender equality and empower women	Target 3.A: Eliminate gender disparity in primary and secondary education, preferably by 2005, and in all levels of education no later than 2015.
GOAL 4: Reduce child mortality	Target 4.A: Reduce by two thirds, between 1990 and 2015, the under-five mortality rate.
GOAL 5: Improve maternal health	Target 5.A: Reduce by three quarters the maternal mortality ratio. Target 5.B: Achieve universal access to reproductive health.
GOAL 6: Combat HIV/AIDS, Malaria and other diseases	Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS. Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it.

Table 1.1 (Cont.)

Millennium Development Goals and Targets

Goal	Target
GOAL 6	Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases.
GOAL 7: Ensure environmental sustainability	Target 7.A: Integrate the principles of sustainable development into country policies and programmes and reverse the loss of environmental resources. Target 7.B: Reduce biodiversity loss, achieving, by 2010, a significant reduction in the rate of loss. Target 7.C: Halve, by 2015, the proportion of the population without sustainable access to safe drinking water and basic sanitation. Target 7.D: Achieve, by 2020, a significant improvement in the lives of at least 100 million slum dwellers.
GOAL 8: Develop a global partnership for development	Target 8.A: Develop further an open, rule-based, predictable, non-discriminatory trading and financial system. Target 8.B: Address the special needs of least developed countries. Target 8.C: Address the special needs of landlocked developing countries and small island developing States. Target 8.D: Deal comprehensively with the debt problems of developing countries through national and international measures in order to make debt sustainable in the long term. Target 8.E: In cooperation with pharmaceutical companies, provide access to affordable essential drugs in developing countries. Target 8.F: In cooperation with the private sector, make available the benefits of new technologies, especially information and communications.

Note. Retrieved from <http://mdgs.un.org/unsd/mdg/Host.aspx?Content=indicators/officialist.htm>

The OECD is related with MDGs as the objective of OECD has been to encourage cooperation and promote economic and social well-being of people around the world. Moreover, its DAC has provided financial resources and assistance in the form of concessional loans and grants to the low income countries since 1960s, known as foreign aid or Official Development Assistance (ODA). In addition to a state's self-effort, foreign aid from developed countries can help accelerate the progress in achieving the MDGs. The OECD's supports are made through financing the MDGs, building a global partnership for development, and supporting strategic areas of progress (OECD website).

There are two broad streams of research which have studied foreign aid and MDGs. The first stream of research looks at the MDGs progress based on the time frames along with suggested interventions. Sachs and McArthur (2005) looks at the progress that was made, with regards to the MDGs across countries, and finds that the performance had large disparities. For example, East and South Asia made remarkable progress, while Sub-Sahara African countries were far off-track. They also estimated the amount of foreign aid required in order to achieve MDGs. Considering a substantial increase in

domestic resource mobilization in all developing countries, required aid levels are \$135 billion in 2006, \$152 billion in 2010, and \$195 billion in 2015. Dodd and Cassels (2006) focuses on health-related MDGs. They point out that low-income countries cannot meet MDGs with their current resources and present aid volume. In addition to an increase in aid volume, donors should also make their aid more effective such as reducing the volatility of aid. If the aid volume is less likely to change, recipient countries can make more long-term plans such as widening access to AIDS treatment or scaling up health-service provision. Clemens et al. (2007) argues that more volume of aid is necessary but not sufficient for the MDGs to be achieved. Other conditions also need to be materialized such as the constituency for sustained engagement with poor countries. Bourguignon (2008) supports the need for greater aid from donors, and in addition concentrates on the ways to improve aid effectiveness in reaching the MDGs.

Another stream of research looks at the impact of MDGs on the aid allocation among its recipients. Radelet (2004) takes the normative approach and argues that donors should make their aid more MDG oriented. Donors should select their recipients based on the recipients' poverty level and quality of governance rather than the donors' strategic and commercial considerations. Furthermore, donors should provide recipients which have better governance with more long-term aid and allow such recipients to have more control in designing their aid projects. Baulch (2006) focuses on four indicators of MDGs including monetary poverty, child malnutrition, primary school enrollments, and under-five mortality, and assesses whether aid was allocated to recipients which needed it the most regarding MDGs. Drawing aid concentration curves with data from 2000-2002, the finding suggests that in general donors allocated much less aid to the countries than what MDGs indicators had suggested. Moreover, donors behave differently and some did not allocate aid in a way that is consistent with MDGs. The World Bank and the United Kingdom allocated two-thirds of their concessionary aid to low-income countries, while the United States and the European Commission distributed majority of their aid to middle-income countries which already met or were on track in achieving the goals.

In contrast to the use of aggregate foreign aid in the above literature, a few papers adopted disaggregated aid in analyzing the impact of MDGs on aid allocation and/or aid effectiveness. Thiele et al. (2007) disaggregated aid by sectors and evaluated whether aid committed in the period from 2002-2004 helped in meeting the MDGs. The sectorial aid were linked with the MDGs both at a more general level

and at a specific level. Take primary schooling as an example (MDG2). A relatively general way to link aid sectors to MDG3 is to look at aid given to education sectors; a relatively specific link would be the aid given to basic education. Indicators of need are then used to explain to what extent donors distributed aid in accordance with recipient countries' needs regarding the MDGs. Results show that donors considered fight against HIV/AIDS (MDG6) when distributing aid, while other MDGs such as primary education were hardly considered. Nunnenkamp and Ohler (2011) also uses disaggregated aid in examining aid effectiveness in reducing the numbers of HIV-related deaths and new infections (MDG6). They also disaggregated aid by sectors and only used aid from sectors which are associated with sexually transmitted diseases and HIV/AIDS control. Although it fails to find evidence of aid in preventing HIV-related new infections, it presents that bilateral aid helped alleviate the number of HIV-related death while multilateral aid did not. Hailu and Tsukada (2012) disaggregates aid by bilateral flows and multilateral flows and examines whether aid was allocated to the countries which are further away from achieving the MDGs. Applying correlation analysis, graphical analysis, and concentration curves, they find that aid allocation has become more MDG-sensitive i.e. aid was allocated to the countries which needed it the most.

The advantage of using disaggregated aid is that sector-specific aid should be more effective when analyzing its impact in helping specific goals. This essay assigns aid sectors to link with MDGs based on the key words in not only the goals but also its indicators. Moreover, as a robustness check, linkages are also established based on donors' reports on their policy objectives of aid activities. This essay also have a different perspective in analyzing the impact of MDGs on aid allocation. The focus is on the change of aid allocation among sectors. When the amount of resources given to a sector increases, the sector as share of total aid may decrease. To make a more precise analysis of the change in aid allocation among sectors, this essay examines the change at both the volume level and the share level. Difference-in-Difference approach is adopted to identify not only whether a sector has expanded after the MDGs were announced but also whether the change of the MDG-related sectors exceeds the chance of the non-MDG-related sectors.

1.3 Model and Estimation Strategy

This essay follows a hybrid model which includes variables of both the donors' interest and the recipients' needs. Dudley and Montmarquette (1976) first develops this model from the supply side of aid and the model was used and extended later serving a number of different research objectives. For example, Alesina and Dollar (2002) finds empirically that colonial past and political alliances are significant aid motivation, rather than the recipient countries' economic needs or policy performance. Gates and Hoeffler (2004) presents evidence that Nordic donors (Norway, Denmark, Sweden, Finland) tend to give more aid to democracies and to recipients with a good human rights record. This model serves this essay in a way that it controls the motivation of aid before and after the announcement of MDGs and allows me to focus only on the change of aid allocation among sectors.

Assuming that there is no administrative cost and only one good is consumed in the donor country other than foreign aid, donor i gets utility from the consumption of good X and the consumption of the subjectively measured impact of foreign aid A .

$$U_i = f(X_i, A) \quad (1.1)$$

$$A = \sum_{j=1}^m A_j = \sum_{j=1}^m A(n_j, a_j, y_j, Exp_j, w_j, Z_k) \quad (1.2)$$

where A is the sum of the subjectively measured impact of foreign aid from donor i to m recipient countries; n_j is the population of recipient j ; a_j is aid per capita from donor i to recipient j ; y_j is GDP per capita of recipient j ; Exp_j is the export of donor i to recipient j ; w_j is aid from other donors to recipient j ; Z_k is the political links between donor i and recipient j . More specifically, the impact function takes the following form:

$$A_j = n_j^\alpha \left(\frac{a_j}{y_j}\right)^\gamma Exp_j^\mu w_j^\phi \prod_{k=1}^r C_k^{Z_k} \quad 0 \leq \alpha \leq 1, 0 \leq \gamma < 1, \mu > 0, \phi > 0, C_k > 1 \quad (1.3)$$

where $Z_k = 0$ if there are no type k political links between donor i and recipient j , $k = 1, \dots, r$ and $Z_k = 1$ if there are type k political links between donor i and recipient j , $k = 1, \dots, r$. The donor country i also faces a budget constraint of his own national income:

$$X_i + \sum_{j=1}^m a_j n_j = Y \quad (1.4)$$

To maximize his utility, donor i has the following first order condition:

$$\frac{f_A}{f_X} = \frac{1}{\gamma \text{Exp}^\mu \prod_{k=1}^r C_k Z_k} n_j^{1-\alpha} a_j^{1-\gamma} y_j^\gamma \quad (1.5)$$

where f_A and f_X are the partial derivatives of U_i with respect to A and X_i . Equation (1.5) may be interpreted as the price of weighted foreign aid impact A in terms of other goods X_i foregone. In equilibrium the price of weighted aid impact in each recipient should be identical.

$$\frac{1}{\gamma \text{Exp}^\mu \prod_{k=1}^r C_k Z_k} n_j^{1-\alpha} a_j^{1-\gamma} y_j^\gamma = s \quad j = 1, \dots, m \quad (1.6)$$

where s is the marginal rate of substitution between the foreign aid and other good. The optimal amount of per capita aid from donor i to recipient j is given by equation (1.7).

$$a_j = \left(\frac{s \gamma \text{Exp}^\mu w_j^\theta \prod_{k=1}^r C_k Z_k}{y_j^\gamma n_j^{1-\alpha}} \right)^{1/(1-\gamma)} \quad (1.7)$$

Taking the natural logarithm of equation (1.7) yields the optimal amount of foreign aid from donor i to recipient j .

$$\ln a_j = \beta_0 + \beta_1 \ln y_j + \beta_2 \ln n_j + \beta_3 \ln \text{Exp}_j + \beta_4 \ln w_j + \sum_{k=1}^r \beta_k Z_k + \varepsilon_j \quad (1.8)$$

This model helps explain to what extent the amount of aid given to a recipient country is determined by the recipient's economic performance and population, the donor's economic interest and historical ties with the recipient, as well as the donor's political consideration of other donors' impact. This essay performs the difference-in-difference approach on equation (1.8) to examine empirically the impact of MDGs on foreign aid allocation across sectors. This method is appropriate here because it can combine two comparisons: before and after the MDGs were announced; and sector-specific aid which are associated with MDGs and those which are not associated with MDGs. Moreover, before-after comparison and with-without comparison help remove the time trend and the country effect. This essay is

particularly interested in examining whether the sectors which are associated with the MDGs have expanded faster than those which are not associated with them.

$$\ln a_j = \beta_0 + \beta_1 \ln y_j + \beta_2 \ln n_j + \beta_3 \ln Exp_j + \beta_4 \ln w_j + \sum_{k=1}^r \beta_k Z_k + \alpha_1 2nd + \alpha_2 MDG + \alpha_3 (2nd * MDG) + \varepsilon_j \quad (1.9)$$

Equation (1.9) is to be estimated adopting difference-in-difference method. Indicator variables include $2nd$, MDG , and $(2nd * MDG)$. $2nd$ takes a value of 1 if aid is given to a recipient country after year 2000 and a value of 0 otherwise. MDG takes a value of 1 if the sector-specific aid sector is associated with MDGs and a value of 0 otherwise. Addressing the null hypothesis, the coefficient α_1 indicates the change of sectors that are not associated with MDGs after the announcement was made; the coefficient $(\alpha_1 + \alpha_3)$ indicates the change of sectors that are associated with MDGs after the announcement was made; and the coefficient α_3 indicates the relative change between these two groups of sectors. For instance, if $\alpha_1 > 0$, it would indicate that the donor allocated more resources to sectors which are not associated with MDGs after the announcement; if $\alpha_1 + \alpha_3 > 0$, it would indicate that the donor allocated more resources to sectors that are associated with MDGs after year 2000; if $\alpha_3 > 0$, it would indicate that the change of sectors which are associated with MDGs exceeds the change of sectors which are not associated with MDGs.

Much of the prior works on aid effectiveness in promoting economic growth in developing countries have been criticized due to the non-random assignment of aid (Clemens et al., 2012; Deaton, 2010; Rajan & Subramanian, 2008). However, the endogeneity issue is less concerned for this study because the focus here is on testing whether aid allocation among sectors has changed after the announcement of MDGs and it is unlikely that the unobserved donor motivation would change in this time span. A better estimation strategy could be Two Stage Least Squares (2SLS) and thus valid instruments are required. The main variables used as instruments in the aid literature include political links, lagged aid flows, and the population size of recipients and it is well explained in Clemens et al. (2012) that these instrumental variables are quite questionable. The econometrics problem of employing weak instruments was understood (Bound et al., 1995). Addressing the possibility of endogeneity, I follow Wooldridge (2003) to introduce a one-year lag in dependent variables. Wooldridge (2003) states that if we assume

that the error term is uncorrelated with all past endogenous and exogenous variables then lagged endogenous variables are treated as predetermined variables and they are uncorrelated with error term. Equation (1.10) will be estimated in the next section.

$$\ln a_{jt} = \beta_0 + \beta_1 \ln y_{jt-1} + \beta_2 \ln n_{jt-1} + \beta_3 \ln Exp_{jt-1} + \beta_4 \ln w_{jt-1} + \sum_{k=1}^r \beta_k Z_{kt-1} + \alpha_1 2nd + \alpha_2 MDG + \alpha_3 (2nd * MDG) + \varepsilon_j \quad (1.10)$$

1.4 Data and Results

1.4.1 Data and Linkages between Sectors and MDGs

As a measure of foreign aid, this essay follows the definition of ODA provided by OECD and use disaggregated aid data drawn from CRS of OECD database for the period of 1995 to 2012. CRS dataset records not only the overall commitment amount, but also the disaggregated sector-specific aid such as Malaria control, basic drinking water supply, and basic sanitation. The advantage of using aid data at the disaggregated level is that I can then look at each sector and see whether it is associated with MDGs. Commitment data are favored for the following reasons: donor communities have more control on aid and the commitment data better reflect donors' intention and preference (McGillivray & White, 1993; Tarp et al., 1999). Actual disbursement, on the other hand, may be constrained by recipients' absorptive capacity. Hudson (2013) suggests that almost all commitments tend to be met within two years on average with the overwhelming majority met immediately. In addition, the correlation between commitment and disbursement is 0.8. Figure 1.1 shows the DAC aid commitment flows over time and it is obvious that the donors promise different amount of financial resources. This essay looks at the total amount provided by DAC and then only focuses on significant donors in terms of aid volume. These donors include the United States, Norway, Japan, Germany, France, the United Kingdom, Sweden, and Netherland. The Export data are from United Nations Conference on Trade and Development (UNCTAD), while data on population, GDP per capita are from Penn World Table (PWT 7.1). Data on political links are from Central Intelligence Agency (CIA).

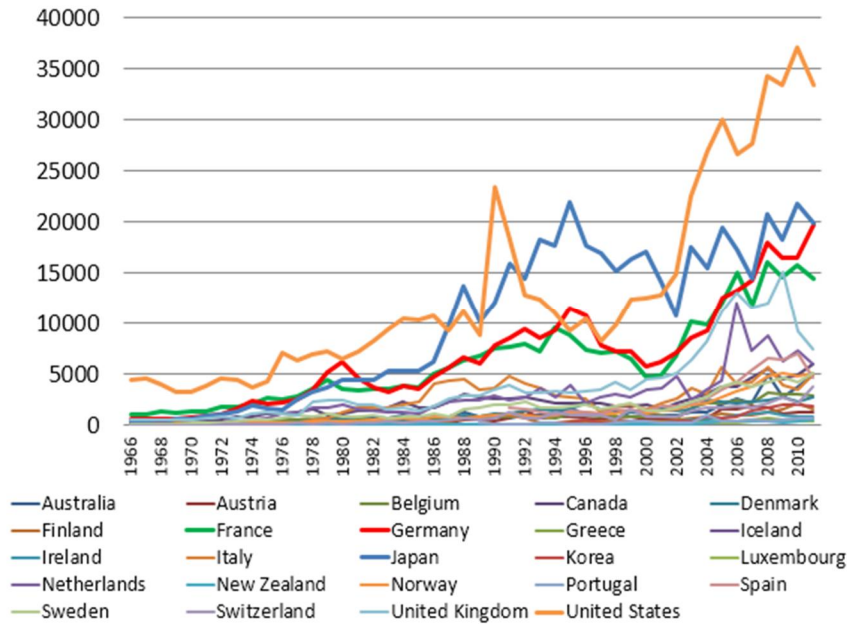


Figure 1.1 DAC Aid Commitment Flows (constant price)

This essay assigns aid sectors to link with MDGs based on the key words in not only the goals but also its indicators. For example, MDG2 is to achieve universal primary education. A specific aid sector recorded in OECD is exactly primary education. The linkages are clear when the goals and targets coincide with aid sectors. However, defining MDG-related sectors may be arguable when the goals are not perfectly coincide with aid sectors. For example, MDG3 targets to eliminate gender disparity in education. In addition to aid from sectors of education or basic education, one may argue that aid from other sectors may also relate to this goal. Aid given to institutions working for gender equality and women's empowerment is one such example. Aid given to support and apply legislation designed to prevent recruiting child soldier is another example. Even aid given to agrarian reform could help. Therefore, the arbitrary link between aid sectors and MDGs may influence the results. This essay therefore uses a narrow definition and links sectors with MDGs only if the explanation of the sectors provided by OECD coincides with the key words in MDGs and its indicators. There are overall 8 goals, 21 targets, and 60 indicators. Table 1.2 is one example of MDG6 with the goal, targets, and indicators; and Table 1.3 shows the linkages between sectors and MDGs used in this essay for the sixth goal as an example.

Table 1.2

MDG6 and its Targets and Indicators

MDG6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	<ol style="list-style-type: none"> 1. HIV prevalence among population aged 15-24 2. Condom use at last high-risk sex 3. Proportion of population aged 15-24 years with comprehensive correct knowledge of HIV/AIDS 4. Ratio of school attendance of orphans to school attendance of non-orphans aged 10-14 years
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	<ol style="list-style-type: none"> 1. Proportion of population with advanced HIV infection with access to antiretroviral drugs
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	<ol style="list-style-type: none"> 1. Incidence and death rates associated with malaria 2. Proportion of children under 5 sleeping under insecticide-treated bednets 3. Proportion of children under 5 with fever who are treated with appropriate anti-malarial drugs 4. Incidence, prevalence and death rates associated with tuberculosis 5. Proportion of tuberculosis cases detected and cured under directly observed treatment short course

Note. Retrieved from <http://mdgs.un.org/unsd/mdg/Host.aspx?Content=indicators/officialist.htm>

Table 1.3

Linkages between Sectors and MDGs

MDG6: Combat HIV/AIDS, malaria and other diseases	
Target 6.A: Have halted by 2015 and begun to reverse the spread of HIV/AIDS	<ul style="list-style-type: none"> • 13040 STD control including HIV/AIDS • 13030 Family planning • 12261 Health education • 16010 Social/welfare services • 16064 Social mitigation of HIV/AIDS • 12262 Malaria control • 12263 Tuberculosis control
Target 6.B: Achieve, by 2010, universal access to treatment for HIV/AIDS for all those who need it	
Target 6.C: Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases	

1.4.2 Main Results

When looking at DAC overall, it appears that the total amount of aid to all developing countries increased dramatically since the new millennium (see Figure 1.2). Following the model used in the literature, Table 1.4 confirms that there is a statistically significant increase in the intercept after 2000. The results also confirms some findings in the literature. For instance, wealthier countries get less aid;

countries with large population get less aid (population bias); trade relationship with donors is associated with more aid. If I select the year 2001 to run the test, the findings are consistent. It could be arguable that the selection of year is arbitrary, so CUSUM test is adopted to test for structure changes. Figure 1.3 shows that without any time assumption, the data alone suggest a structural change around 2000/2001.

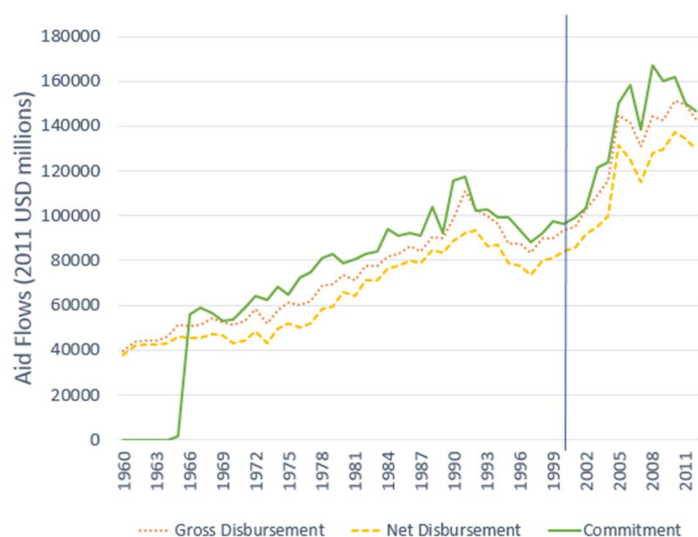


Figure 1.2 Foreign Aid from DAC (constant price)

Table 1.4

Test for changes in total aid

	Coefficient	Standard Errors
GDP(lagged)	-.696***	.019
Population(lagged)	-.167***	.009
Export(lagged)	.44***	.006
East Asia	.716***	.059
Sub Sahara	-.146***	.050
D	.268***	.037
constant	7.069***	.209

* $p < .1$; ** $p < .05$; *** $p < .01$.

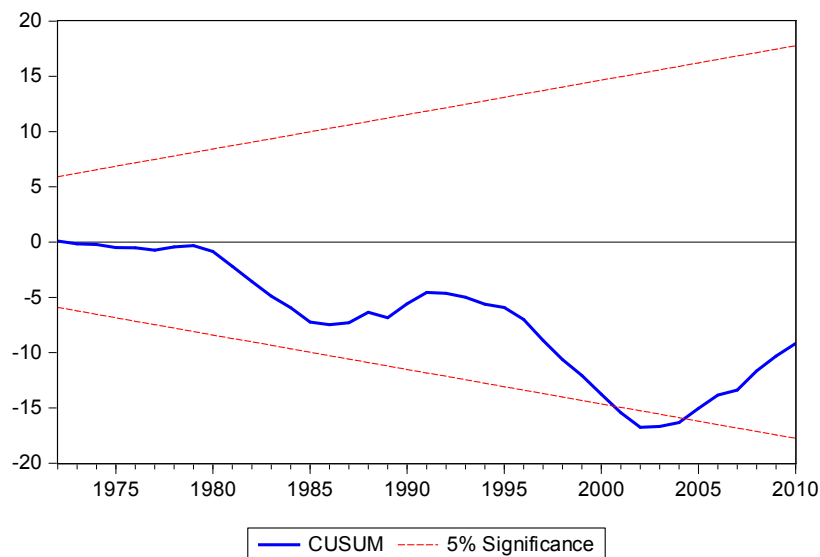


Figure 1.3 Test for structure change

Although the motivations of foreign aid are rather complex, they mainly determine which country will receive aid. Once the donor-recipient relationships are formed, donors may or may not mind the allocation of aid by different sectors. An important question therefore is to check whether donor countries were targeting the MDGs when allocating foreign assistance. This essay first disaggregates aid sectors into two broader groups: sectors which are associated with MDGs (hereafter MDG-sectors) and sectors which are not associated with MDGs (hereafter non-MDG-sectors), there are 76 MDG-sectors, 117 non-MDG-sectors, and 4 unspecified sectors. Figure 1.4 compares the aid flows from MDG-sectors with those from non-MDG-sectors. It appears that the sectors which are associated with MDGs got expanded significantly in early 2000s then slowed down in late 2000s although the level is still much higher than 1990s. Table 1.5 uses pooled regression as well as random effect model and it confirms that both sectors got expanded after 2000 but it fails to support that MDG-sectors increased more than the non-MDG-sectors. In addition, maintaining the same control group, if we look at each of the eight goals, treatment effects are found only in MDG2, MDG3, MDG7, and MDG8 for DAC in general (see Table 1.6), which means the change in aid volume supporting primary education, gender equality, environmental sustainability, and global partnership for development is more than the change in aid volume to the sectors which are not associated with MDGs.

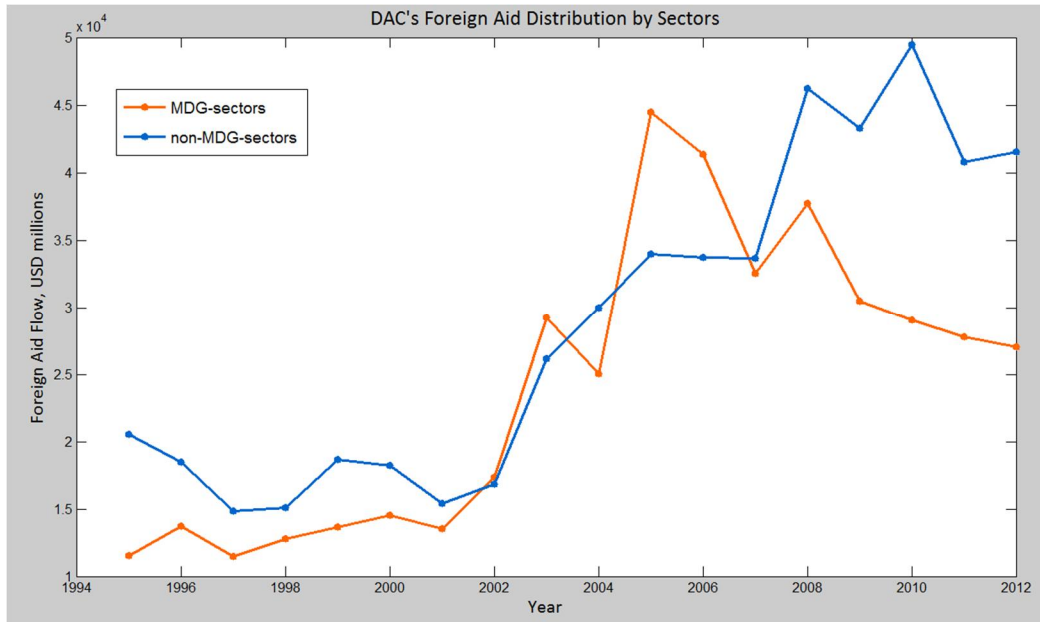


Figure 1.4 Aid flows to MDG-sectors and non-MDG-sectors (constant price)

Table 1.5

DAC Result for MDG-sectors and non-MDG-sectors

	Pooled Regression		Random Effect Model	
	MDG	Non-MDG	MDG	Non-MDG
GDP(lagged)	-.61***	-.65***	-.40***	-.16***
Population(lagged)	-.30***	-.30***	-.16***	-.19***
Export(lagged)	.05**	-.23***	.23***	-.10**
East Asia	.66***	.61***	.96***	1.28***
Sub Sahara	.09	-.47***	.73***	.35*
D	.37***	.41***	.29***	.26***
cons	8.95***	10.03***	4.90***	4.75***
Prob>chi2	0.6258		0.3134	

* $p < .1$; ** $p < .05$; *** $p < .01$.

Furthermore, this essay analyzes eight significant donors: the United States, France, Germany, the United Kingdom, Japan, Norway, Netherlands, and Sweden and examines their aid allocation patterns. Most of these eight donors allocated aid to less wealthy countries, countries with less population, countries which have trade relations with the donor, countries which have political links with the donor, and countries which received aid from other donors (see one example in Table 1.7). The exception is the failure to find population bias for Germany and the United Kingdom. The results for each individual donor are summarized in Table 1.8. Positive treatment effect was found for France in all MDGs, which implies that France's aid

allocation across sectors is perfectly in line with MDGs. Negative treatment effect was found for the United States, Germany, Norway, and Sweden in all eight goals, which suggests that the change of aid in MDG-sectors is less than that in non-MDG-sectors.

Table 1.6

MDG-specific Results for DAC

	MDG1	MDG2	MDG3	MDG4	MDG5	MDG6	MDG7	MDG8
GDP(lagged)	-.42***	-.42***	-.49***	-.43***	-.04***	-.40***	-.49***	-.48***
Population(lagged)	-.13***	-.14***	-.21***	-.15***	-.28***	-.12***	-.23***	-.17***
Export(lagged)	.04***	.07***	.12***	.00	.38	.02	.13***	.06***
East Asia	-.10**	.01	.15***	-.02	-1.41	-.01	.08	.06
Sub Sahara	-.15***	-.24***	-.24***	-.27***	.04***	-.24***	-.22***	-.25***
2nd	.35***	.36***	.38***	.36***	7.76***	.35***	.38***	.37***
MDG	-1.82***	-2.06***	-1.91***	-1.59***	-1.41***	-1.85***	-1.66***	-1.49***
2nd*MDG	-.25***	-.14**	.05	.03	.04	-.01	-.23***	-.22***
Cons	6.54***	6.59***	7.73***	6.74***	7.76***	6.25***	7.85***	7.32***

* $p < .1$; ** $p < .05$; *** $p < .01$.

Table 1.7

Result for USA for MDG-sectors

	MDG-sectors
GDP(lagged)	-.22***
Population(lagged)	-.06***
Export(lagged)	.06***
Military aid (lagged)	.21***
Bandwagon (lagged)	.06***
2nd	.57***
MDG	-.09
2nd*MDG	-.26***
Cons	1.62***

* $p < .1$; ** $p < .05$; *** $p < .01$.

It is notable that the treatment effect compares only the change (not the increase of aid) between the control group and the treatment group. Taking a close look at all coefficients provides richer information. Take France as an example. Less aid was allocated to sectors which are not associated with MDGs, and more aid was allocated to sectors targeting MDG1 (hunger), MDG2 (primary education), MDG3 (gender equality) and MDG8 (global partnership). Sectors targeting MDG4 (child mortality), MDG5 (maternal health), and MDG6 (HIV and Malaria) also got less amount of aid, but the decrease of these

MDG-related sectors was less than that of the non-MDG-sectors. Aid supporting environmental sustainability maintained the same after year 2000. The United States seemed to be following a different strategy. The non-MDG-sectors actually got expanded while sectors targeting six out of eight MDGs also got expanded although the increase in these MDG-sectors was less than that in non-MDG-sectors. The change in aid flows across sectors was not statistically significant for the United Kingdom and only the sectors targeting hunger reduction were expanded.

Table 1.8

MDG-specific Results for Individual Donor

	MDG1	MDG2	MDG3	MDG4	MDG5	MDG6	MDG7	MDG8
USA								
2nd	.57***	.56***	.56***	.57***	.57***	.57***	.56***	.56***
MDG	-.01	-.22***	-.36***	-.16***	-.18***	-.01	-.35***	-.37***
2nd*MDG	-.54***	-.66***	-.6***	-.41***	-.39***	-.52***	-.55***	-.54***
France								
2nd	-.10***	-.10***	-.10***	-.10***	-.10***	-.10***	-.10***	-.09***
MDG	-.51***	-.45***	-.43***	-.47***	-.40***	-.46***	-.36***	-.24***
2nd*MDG	.13***	.11***	.37***	.09***	.07**	.09***	.10***	.10***
Japan								
2nd	.12***	.11***	.10***	.11***	.10***	.10***	.11***	.10***
MDG	.04	-.39***	-.32***	-.46***	-.42***	-.41***	-.06	-.33***
2nd*MDG	.01	-.04	-.16***	-.05	-.03	-.14***	-.12**	-.09*
Germany								
2nd	.12***	.12***	.11***	.12***	.12***	.12***	.11***	.11***
MDG	-.23***	-.18***	-.15***	-.22***	-.22***	-.21***	-.06**	-.06**
2nd*MDG	-.14***	-.17***	-.05*	-.14***	-.13***	-.14***	-.15***	-.14***
UK								
2nd	-.02	-.02	-.02	-.02	-.02	-.02	-.02	-.01
MDG	-.10***	-.30***	-.29***	-.28***	-.26***	-.30***	-.28***	-.16***
2nd*MDG	.05*	.01	.01	.03	.02	.04	.00	.00
Netherlands								
2nd	.02	.02	.02	.02	.02	.02	.02	.02
MDG	-.22***	-.14***	-.18***	-.18***	-.14***	-.18***	-.11***	-.13***
2nd*MDG	-.01	-.04	-.02	-.02	-.05	-.03	-.05	-.07***
Norway								
2nd	.05***	.05***	.05***	.05***	.05***	.05***	.05***	.05***
MDG	-.19***	-.15***	-.16***	-.16***	-.15***	-.16***	-.14***	-.16***
2nd*MDG	-.04*	-.05***	-.04**	-.04**	-.04*	-.04**	-.05**	-.05***
Sweden								
2nd	.05***	.05***	.05***	.05***	.05***	.05***	.05***	.05***
MDG	-.18***	-.14***	-.15***	-.16***	-.15***	-.16***	-.15***	-.15***
2nd*MDG	-.04**	-.06***	-.05***	-.04**	-.05**	-.05**	-.06***	-.05**

* $p < .1$; ** $p < .05$; *** $p < .01$.

The more altruistic donors also did not appear to align their aid distribution with the MDGs. More specifically, Norway increased its aid to all sectors although non-MDG-sectors got more resources than the MDG-sectors. Sweden increased its aid to non-MDG-sectors but maintained similar aid volume to most of the MDG-sectors. Netherlands did not change its aid distribution.

1.4.3 Robustness Check

As a robustness check, linkages are also established based on donors' reports on their policy objectives of aid activities. However, OECD only provides data on two goals: MDG3 and MDG7. Again using gender equality (MDG3) as an example. According to OECD, donors were requested to indicate explicitly to CRS whether an aid activity considers gender equality as the policy objectives (specifically principal objective, significant objective, not targeted, or not screened/reported). This essay defines that a sector targets MDG3 if more than 50% of the resources in this sector report gender equality as principal or significant objectives. Similarly, it defines a sector to be not targeting MDG3 if less than 5% of the resources in this sector report gender equality as principal or significant objectives.

Aligning aid sectors with MDGs using donors' report, the results in Table 1.9 and Table 1.10 are consistent with the main results in general. The slight change is the finding of positive treatment effect for Germany, Netherlands, and Sweden regarding gender equality and the finding of negative treatment effect for France regarding environmental sustainability.

Table 1.9

Results for MDG3 with Linkages Based on Donors' Reports

	Arbitrary Link	Non-arbitrary Link (level)			Non-arbitrary Link (share)		
	Treatment effect	Non-MDG3	MDG3	Treatment Effect	Non-MDG3	MDG3	Treatment Effect
DAC	.05	.04	.079	.039	-.004	0	.004
US	-.6***	.129***	-.029***	-.158***	.041***	-.001***	-.051***
France	.37***	-.047***	-.004***	.043***	-.028***	-.003***	.025***
Germany	-.05*	-.037***	.004***	.041***	-.022***	.001***	.023***
UK	.01	-.014***	-.005***	.009*	-.009***	-.005***	.004
Japan	-.05	-.005	-.011	-.006	.002	-.004	-.006
Norway	-.04**	-.006**	.005**	.011**	-.001	0	.001
Netherlands	-.02	-.028***	-.008***	.020**	-.021***	-.002***	.019***
Sweden	-.05***	-.005***	.003***	.008***	-.01***	0***	.010***

* $p < .1$; ** $p < .05$; *** $p < .01$.

Table 1.10

Results for MDG7 with Linkages Based on Donors' Reports

	Arbitrary Link	Non-arbitrary Link (level)			Non-arbitrary Link (share)		
	<i>Treatment effect</i>	<i>Non-MDG3</i>	<i>MDG3</i>	<i>Treatment Effect</i>	<i>Non-MDG3</i>	<i>MDG3</i>	<i>Treatment Effect</i>
DAC	-.23***	.435***	.07***	-.365***	.032***	.007***	-.025**
US	-.55***	.579***	-.059***	-.638***	.217***	-.012***	-.229***
France	.10***	.15***	-.018***	-.168***	.075***	-.033***	-.108***
Germany	-.15***	.108***	-.045***	-.153***	.059***	-.033	-.092***
UK	.00	.001	.004	.003	.035***	-.011***	-.046**
Japan	-.12**	.207***	-.032***	-.239***	.173***	-.021***	-.194***
Norway	-.05**	.039***	0***	-.039**	.039***	-.023***	-.062***
Netherlands	-.05	-.014	-.028	-.014	.009	-.036**	-.045**
Sweden	-.06***	.046***	-.003***	-.049***	.032**	-.001**	-.042**

* $p < .1$; ** $p < .05$; *** $p < .01$.

So far, this essay has been using aid volumes (aid level). But as aid volumes increase, its share of total aid could increase, decrease, or remain the same. The United States distributed more amount of aid targeting both environmental sustainability and diseases such as HIV and Malaria. But when looking at its share of total aid, sectors which are associated with environmental protection remain 1% of its total aid while sectors which are associated with major diseases increased its share from 3% in 1995 to 20% in 2011 (see Figure 1.5). This essay then runs another robustness check using sectorial aid as a share of total aid. The linkages are again established based on donors' reports. The results are reported in the last three columns in Table 1.9 and Table 1.10. The results are consistent with the main results in general.

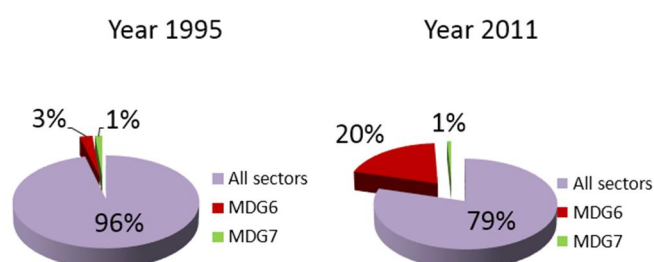


Figure 1.5 Share of aid for USA

1.5 Conclusion

This essay focuses on the Millennium Development Goals and its impact on foreign aid allocation among sectors. It is found that the overall aid flows has increased dramatically since the announcement. However, in general, there is no clear evidence that the aggregated aid allocation takes MDGs as guidelines. When looking at the eight most influential donors in terms of aid volume, they exhibited different aid distribution patterns. France contributed more resources to MDG-sectors while reducing resources to non-MDG-sectors. Japan and Germany devoted more resources in general but maintained the same aid allocation across sectors. The United States and Norway also gave more resources in general but the non-MDG-sectors got more aid than the MDG-sectors. The United Kingdom and Netherlands maintained the same aid level and sectorial distribution after year 2000. Furthermore, donors behave differently in terms of prioritized aid targets. For example, the United States turned its attention to hunger, health environmental sustainability, and global partnership; France shifted its resources to hunger reduction, primary education, and gender equality, and global partnership; Norway focused more on hunger, gender equality, and health sectors.

In summary, the MDGs have shaped the aid allocation of some donors, but not all donors. The essays try to explore the reasons in a few ways as follows. First, although donors agree that MDGs target important development issues, MDGs may not be accepted as the modern development norm. Donors may consider MDGs to some extent but may not use it as aid policy guideline. Peterson (2010) states that MDGs are not a best development strategy for Africa. For example, MDGs focus on social services and the failure to address revenue mobilization makes it financially unsustainable. Second, when development reaches certain levels, the marginal utility of aid on these sectors would be decreasing. Donors may want to devote more resources to those sectors where marginal utility still is increasing although these sectors may not be associated with MDGs. Third, donors may have strategic considerations. For example, if other donors contribute more to sectors which are associated with MDGs and the goals are achieved, this credit would be shared among all donors. Fourth, donors may be supporting sectors where they have expertise. These sectors are important although they may not be MDG-sectors. In the end, donors may consider MDGs less for bilateral aid instead they provide financial

resources to multilateral institutions such as the World Bank and International Monetary Fund and expect the multilateral donors to target MDGs when allocating aid to recipient countries. Donors may have such intention but it appears that multilateral aid distribution by sectors are not in line with MDGs either (see Figure 1.6).

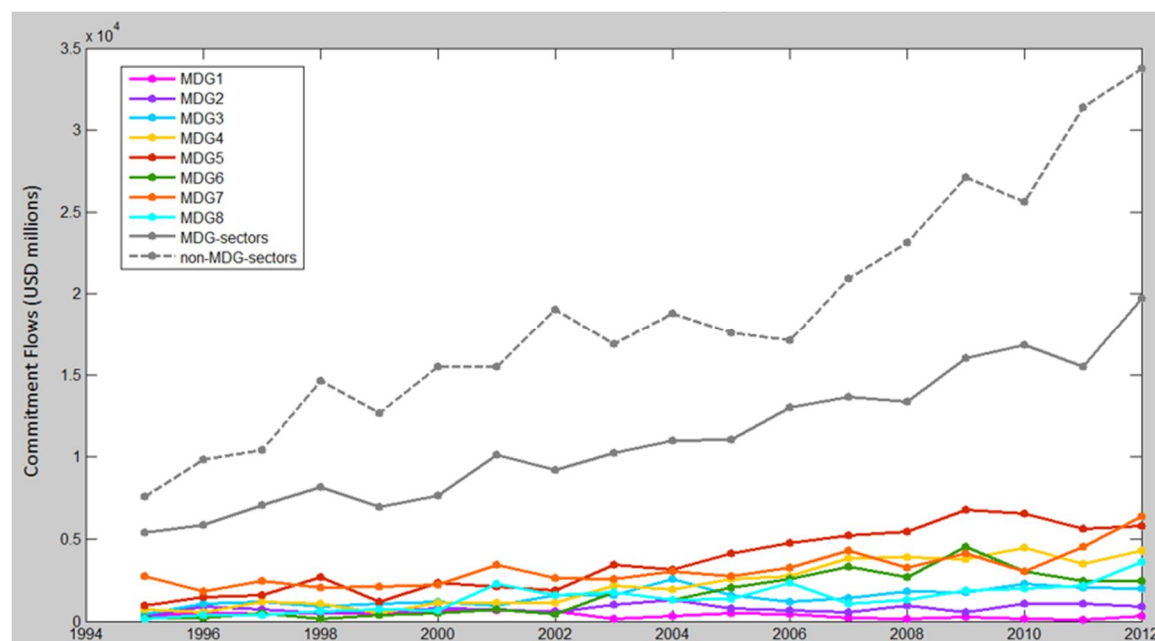


Figure 1.6 Multilateral aid allocation across sectors

The findings in this essay are mixed and controversial. This could be caused by the non-arbitrary link between aid sectors and MDGs. Further analysis could be done if donors' report are published on all eight goals. But the findings also help explain why some goals are hard to achieve than others. The reason could be that resources were not fully devoted to the sectors which are associated with MDGs. In addition, it opens further discussion on important questions such as aid effectiveness and donor co-operation. Maybe huge amount of aid itself has limitations and donors' co-operation is crucial for development.

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2 Essay 2: Topological Properties of Foreign Aid - A Social Network Perspective

2.1 Introduction

Official Development Assistance (ODA) is generally associated with the financial flow and assistance that come from the wealthier (Organization for Economic Co-operation and Development, OECD) countries to low income countries in the form of loans and/or grants. The last few years have seen a burgeoning interest in the issue of ODA especially in the context of development economics. Prominent research streams include the understanding about what drives ODA (donors' motivation), how systemic shocks influence the amount of ODA, and evaluation of the actual impact of ODA on recipient outcomes (e.g., Burnside & Dollar, 2000; Dudley & Montmarquette, 1976; Fleck & Kilby, 2010; Neanidis & Varvarigos, 2009; Rajan & Subramanian, 2008; Svensson, 2003). Although the volume of research in these areas continues to increase, traditional analyses have not fully resolved these questions.

Measurement based issues may negatively impact the ODA research as they could compromise the validity of existing findings and preclude thorough evaluation of critical research questions in certain areas. I utilize social network theory to introduce new measures of foreign aid hoping to provide a new perspectives to explore these questions. Much of the extant research relies heavily on measures such as the aid volume and the aid/GDP ratio. These measures have been useful but they do not capture the underlying changes in aid patterns in terms of specific donor-recipient pairs and sub-groups. Similarly, the volume of foreign aid is often used as the main predictor to evaluate the growth outcomes for recipient countries. This could be an incomplete proxy as it fails to account for the number and relative importance of the donors that provide ODA to a particular recipient, which might have a significant impact on the growth outcomes. Such limitation also exists in the research related to aid motivation. There is growing acceptance that ODA is increasingly motivated by strategic (as opposed to altruistic) considerations (e.g., Fuchs & Nunnenkamp, 2014; Radelet, 2006). To fully understand aid motivation, several nuances of within-donor, within-recipient and donor-recipient competition/ strategic dynamics need to be understood.

The social network analysis enables the focus to shift from monadic attributes of countries to dyadic attributes (e.g. social relations) of pairs of countries. In this paper, I draw from the literature on social networks (Borgatti & Everett, 1997; Jackson, 2008; Newman, 2010; Robins & Alexander, 2004) to

propose a set of measures that can be applied to ODA research. The system of ODA is essentially a two-mode (bipartite) network, comprising two sets of actors (donors and recipients) whereby connections are only between two sets but not within. By treating ODA as a bipartite social network, I am able to examine foreign aid as an interdependent and sophisticated system and introduce a comprehensive set of network-based measures (density, degree, degree centrality, eigenvector centrality, and betweenness centrality) that capture the relational attributes between pairs of countries, and address various complex interdependencies that exist between actors.

To my knowledge, the only prior work that applies network analysis to foreign aid is by Peterson (2011) which uses eigenvector centrality as proxies of donor expansiveness and recipient attractiveness. It is examined how being more or less attractive for aid affects the number of International Non-Governmental Organization (INGO) in a recipient country and vice-versa. This essay hopes to show that the network-based measures of ODA could help examine novel foreign aid questions, and/or provide additional information on questions investigated previously through aid volume. The network-based measures could enhance our understanding of ODA by capturing more dimensions of connectivity between donors and recipients. Specifically, the relative position of a country in the network could be captured by the number of connections it has with other countries; the strength of its connections; and the frequency of its intermediary position connecting other countries. To illustrate the practical utility of this approach, I compute statistical values for each network measure using ODA data retrieved from the OECD website. I also provide a fuller exposition of the network based indicator in the context of the effect of ODA on recipients' economic growth outcomes.

This essay is organized as follows. Section two provides background information on ODA with justification for the specific selection of donors and recipients used in subsequent network analysis. Section three introduces an explanation of network concepts applicable to ODA. In section four, I provide a formal application of one network-based measure. Discussion and concluding comments will follow in section five.

2.2 Data and Stylized Facts

Network analysis focuses on the relationships between different actors in a particular system. In the network terminology, actors are referred to as nodes and the connections between actors are referred to as links (Newman, 2010). From the perspective of foreign aid, donors and recipients represent nodes while links capture the flow of aid from donors to recipients. Before getting into network related details, I will briefly review foreign aid, explain the data source, and justify the choice of donors and recipients.

The general idea behind foreign aid is to allow financial resources to flow from wealthier nations (termed donors) to less privileged ones (termed recipients) in order to help the latter with developmental objectives such as poverty reduction and economic growth. Given the significant role played by foreign aid in the global landscape, a significant amount of research has been directed at understanding aid evolution patterns, donors' motivation, recipient absorptive capacity, and evaluation of the impact of aid on developmental outcomes (Clemens et al., 2012; Fleck & Kilby, 2010; Fuchs & Nunnenkamp, 2014; Rajan & Subramanian, 2008). Foreign aid related empirical research is typically conducted using data made available through the OECD. The OECD defines foreign aid in terms of official development assistance (ODA) provided by a donor to a recipient, and provides clear reporting guidelines that ensure uniform and accurate reporting of aid. For instance, military aid, anti-terrorism funds, and peacekeeping expenditures are not counted as ODA, but the donors' costs of armed forces in delivering humanitarian aid are reportable (OECD, 2011). Several bilateral donors (all DAC members and several non-DAC donors) and various multilateral donors (such as the World Bank) report aid as ODA in accordance with OECD guidelines. Given its wide usage based on a consistent reporting system, OECD provided ODA statistics are considered a trustworthy data source for foreign aid researcher. While the OECD reports ODA data for all donors and recipients; in this research I use data¹ for a narrower subset of donors and

¹ The ODEC reports foreign aid (ODA) data in terms of both commitments and disbursements. Commitment records include the full amount of expected transfer of financial resources, whereas disbursement data is typically broken down as gross (the actual transfer recorded) or net (actual transfer less repayments) disbursements. Commitment data are favored because they better reflects donors' aid intention and preferences (McGillivray & White, 1993; Tarp et al., 1999). It is also worth noting that commitment and disbursement measures are highly correlated (average correlation coefficient=0.955 for the period of 1965 to 2012).

recipients that represent only the more important aid relationships. Next I will explain and justify the criteria used to select donors and recipients.

2.2.1 Selection of Donor Nodes

Foreign aid donors can be disaggregated as bilateral (including DAC and non-DAC members) and multilateral aid. Table 2.1 represents ODA commitment data over a 50-year period (1970-2010) in terms of 2012 US dollars (constant price) reported separately for bilateral DAC donors, bilateral non-DAC donors and multilateral donors.² Data is reported both in terms of ODA commitment amount as well as the proportion of total aid provided by each donor class. These data show that the bilateral donors are by far the largest contributors³ of foreign aid, responsible for an average of 87% of the total aid for the period. It is also noteworthy to observe the increasing contribution of multilateral donors since 2000.

Table 2.1

Foreign Aid Commitment Flows (2012 USD billions, constant price)

	1970	1980	1990	2000	2010
DAC (bilateral)	52.218	76.404	113.064	93.473	158.141
Non-DAC (bilateral)	..	22.926	10.843	1.398	1.955
Multilateral	0.674	4.715	4.768	14.412	14.034
All Donors	52.892	104.046	128.676	109.283	174.131

While table 2.1 provides general insights into the relative importance of different donor groups, my interest is to identify key donor nodes. I start this process by analyzing the relative ODA contributions of DAC members. Figure 2.1 presents each bilateral donor's aid as a share of the total bilateral aid (averaged annually for the period 1970-2012). The pie-chart shows that over this period, the top 15 bilateral donors account for 97% of the world's reported total bilateral aid. As a result, I include these 15 bilateral donors for the analysis.

² Some countries such as China, Brazil, and Russia do not follow the ODA definition and do not report their aid numbers publically.

³ Note that the use of the term contribution implies commitment throughout this paper.

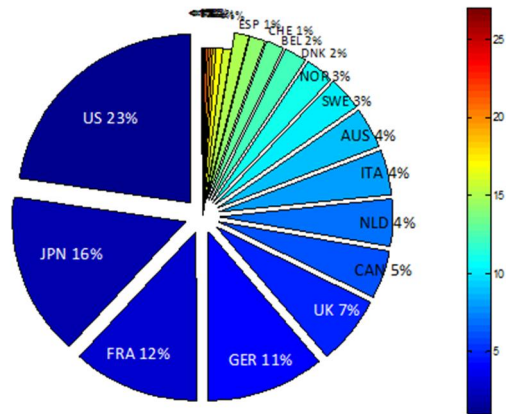


Figure 2.1 Average Share of Total Bilateral Aid by Donors (1970-2012)

In terms of multilateral donors, OECD statistics reveal two key players - The International Development Association (IDA) (the foreign aid arm of the World Bank) and the European Union (EU) Institutions (a branch of the European Union that focuses on foreign aid). On average, the IDA and EU Institutions respectively accounted for 33.65% and 25.64% of the total multilateral aid respectively over 1970-2012. Figure 2.2 compares the IDA and EU Institutions with the average contributions made by DAC donors and confirms their influential position in the aid system. For most years, aid flows from each of these two biggest multilateral donors is more than the average and the median aid flows from DAC donors. Based on this, my final set of donor nodes totals 17 (15 DAC donors and 2 multilateral donors).

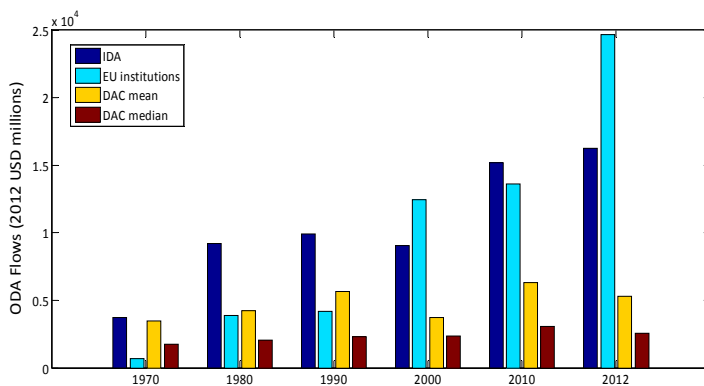


Figure 2.2 Average Aid Flows from IDA and EU Institutions relative to DAC (1970-2012)

2.2.2 Selection of Recipient Nodes

Having identified a donor node set, I next turn attention to explaining the criteria for including recipients (relative to the donor set) and specifying foreign aid links. A general feature of foreign aid is that while donors may give aid to several recipients, the distribution of aid is not equal. Some recipients receive a considerable proportion of a donor's aid, whereas others receive an insignificant fraction. In order to capture those more economically significant aid relationships, I define a link in the network to be present only when a recipient receives an aid amount that is above a particular threshold in relation to the donor's total aid. By using $\left(\frac{aid_{ij}}{aid_i}\right)$ as a threshold variable, I capture the proportion of aid received by recipient j from donor i as a ratio of the donor i 's total aid budget. By using different threshold values, I can limit the number of recipient nodes and aid linkages. For instance, a threshold value of 0% then gives the full network as a link is present when a recipient gets any positive amount of aid from a donor. With a 1% threshold value, however, a recipient will only have a link if it gets at least 1% of a donor's total aid. Similar threshold approach was adopted by Kali and Reyes (2007) in identifying the economically important trade links in the international trade network. It is clear that raising the threshold value will lead to a reduction in the number of links, and the choice of threshold requires careful judgment.

Tables 2.2 and 2.3 demonstrate the impact of different threshold values on recipient inclusion for bilateral (DAC members) and multilateral donors respectively. Table 2.2 shows that in general, the average number of recipients per DAC donor (0% threshold column) has increased from 47 recipients in 1970 to 113 in 2012. As the threshold value is increased to 0.1%, there is a drastic reduction in the mean number of recipients per donor (drop from 47 to 29 in 1970, and drop from 113 to 65 in 2012). However, the remaining number of fewer recipients still captures the lion's share of a donor's total aid budget (on average 99%). Going to 0.5% threshold value leads to a greater reduction in the mean number of recipients, with the reduced set still accounting for 90% of a donor's total aid in these years. Finally, at 1% threshold value, the mean number of recipients is further reduced (ranging from 14-24), while capturing more than 80% of a donors' total aid in all years. Similar results are obtained for the two multilateral donors as well (summarized in Table 2.3).

Table 2.2

Mean Number of Recipients and Percentage of 15 bilateral Donor's Budget

Year	Threshold 1%			Threshold 0.5%			Threshold 0.1%			Threshold 0%	
	# of recipients	% of recipients	% of a donor's budget	# of recipients	% of recipients	% of a donor's budget	# of recipients	% of recipients	% of a donor's budget	# of recipients	% of a donor's budget
1970	14	30%	93.2	19	40%	96.6	29	62%	99.3	47	100
1975	16	25%	89.9	21	33%	94.6	39	62%	99.3	63	100
1980	19	23%	86.9	28	34%	93.3	50	60%	99.0	83	100
1985	23	25%	86.1	33	35%	93.1	56	60%	98.9	93	100
1990	21	23%	85.2	31	34%	93.0	53	59%	98.8	90	100
1995	23	22%	83.6	35	34%	92.3	62	60%	98.95	104	100
2000	24	22%	81.7	38	35%	91.5	66	61%	98.7	108	100
2005	21	19%	83.5	32	29%	92.0	60	54%	98.6	111	100
2010	24	21%	83.0	37	32%	91.9	64	55%	98.7	116	100
2012	24	21%	81.7	38	34%	91.7	65	58%	98.7	113	100

30

Table 2.3

Mean Number of Recipients and Percentage of 2 Multilateral Donors' Budget

Year	Threshold 1%		Threshold 0.5%		Threshold 0.1%		Threshold 0%	
	# of recipients	% of a donor's budget	# of recipients	% of a donor's budget	# of recipients	% of a donor's budget	# of recipients	% of a donor's budget
1970	22	94.9	26	98.4	31	99.9	33	100
1975	22	89.4	32	96.7	42	99.9	55	100
1980	24	84.4	36	93.1	57	99.4	73	100
1985	26	85.5	38	94.1	59	99.4	78	100
1990	28	87.3	34	91.8	63	99.2	82	100
1995	32	79.2	49	90.98	81	99.8	100	100
2000	26	78.4	41	89.4	76	99.2	93	100
2005	27	79.4	45	91.3	73	99.0	101	100
2010	26	76.4	43	88.1	82	99.1	98	100
2012	22	78.9	38	90.2	68	98.8	95	100

Based on this threshold value analysis, I conclude that using up to a 1% threshold value provides a favorable tradeoff in terms of capturing significant aid links between donor and recipient nodes and ignoring minor recipients. The following thresholds are used for the aid network analysis in the next section.

- 1) $\frac{aid_{ij}}{aid_i} \geq 1\%$ is used for the network diagram: A link between a donor and a recipient is present only if a recipient gets at least 1% of a donor's total aid budget.
- 2) $\frac{aid_{ij}}{aid_i} \geq 0.5\%$ is used for network-based measures: A link between a donor and a recipient is present only if a recipient gets at least 0.5% of a donor's total aid budget.

2.3 A Network Approach to Analyze Foreign Aid

This section demonstrates how network analysis can be used to better understand and explain foreign aid relationships. First, I provide some background information on salient network concepts and then develop several network based measures. Next, I discuss how the specific network measures are value added tools that can be used to better understand foreign aid such as the evolution of the aid system, changes in donors' motivation, the overall aid distribution patterns, and response to events such as the demise of the Soviet Union and the 9/11 terror attack.

2.3.1 Aid Network Overview

My first step in understanding the topological properties of the aid network is to examine its structure i.e. the nodes and links in the network. There are different types of network structures based on the number of underlying characteristic that holds nodes together (termed mode). A one-mode network involves linkages between a single set of actors. A typical example of such a network structure is international trade, where all countries (actors) are viewed as part of a single set (one world-system of trade), and linkages are created when trade relations exist. Another type of network structure is referred to as two-mode network, affiliation network, or bipartite network. This type of structure involves two different sets of actors; with linkages only existing between the actors across sets but not within. It is

notable that the lack of ties within sets is by design, not happenstance (Borgatti & Halgin, 2011). Foreign aid falls under the two-mode network category (see Figure 2.3) as it involves two different sets of actors (donors, *set U* and recipients, *set V*)⁴. More importantly, linkages are only possible between actors across these the two sets. No linkages exist within U and V.

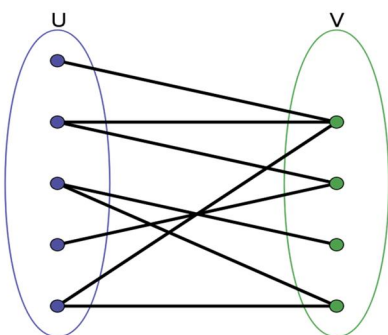


Figure 2.3 Two-mode Structure

One approach in dealing with two-mode data is to transform them into two one-mode data on which the standard network analysis could be applied. Latapy et al. (2008) suggest applying a projection such that two nodes in the same set are considered to have a link only if they have a common neighbor in the network. However, it is not always clear how to interpret this transformed connection between actors within the same set and there could also be a loss of information. Borgatti and Everett (1997) look at data in Gardner et al. (1941) which records women attending a series of social events. They point out that two pairs of women could have the same degree of overlap but through entirely different events, but the transformed one-mode data fail to provide such information. Faust (1997) also states that the relationship between the centrality of one set of actors and the centrality of the other set of actors cannot be studied just by looking at the transformed one-mode data separately. An alternative approach is to leave the two-mode matrix as it is and use new techniques to analyze them. In this paper, I follow the methodology established in Borgatti and Everett (1997) to work with a two-mode matrix directly.

⁴ There are a few countries which were aid recipients and currently are aid donors. But these transition countries enter only the recipient set of nodes under the threshold being used. As an example, South Korea was a recipient before 2000, so it was in the recipient set. When it became an aid donor, it only contributed 0.31% of the total bilateral aid on average and was not included in the network using any threshold.

The data used for foreign aid network were extracted from OECD Aid Statistics for the period 1970 to 2012. Again countries are the nodes of the network and links between them represent aid relations among these countries. I organize the data in matrix form as 2-mode structure, letting columns denote aid donors and rows denote aid recipients. Suppose the sizes of the donor set and recipient set are l_i and l_j respectively. I use a $l_i * l_j$ binary matrix where $R_{ij} = 1$ if a link between donor i and recipient j is present at a certain threshold and $R_{ij} = 0$ otherwise. As an illustration, Table 2.4 is the 2-mode binary matrix for the 17 donors and the first 5 recipients in the sample when 0.5% threshold is used for 2012. For example, $R_{16} = 1$ denotes that there is a link between Albania and Germany and Albania gets more than 0.5% of Germany's total aid budget in 2012.

A useful feature of network analysis is the generation of topological maps from which useful insights regarding nodes and links can be gleaned. Figure 2.4 is an ODA network diagram for 2012. Round and square symbols on the map represent donor and recipient nodes respectively, and connecting lines represent aid links. Sizes of symbols are direct representations of the volume of aid donated/received. Hence, large round symbols represent major donors and large square symbols represent major recipients. The position of nodes on the map provides insights regarding aid relationships. For example, recipients and donors with aid relationships are placed closer to each other on the map. Furthermore, donors that share common recipients are placed closer to each other as are recipients that receive aid from a common donor.

Table 2.4

Partial Binary Matrix for 0.5% Threshold in 2012

	Aid Donors																
	<i>AUS</i>	<i>BEL</i>	<i>CAN</i>	<i>DNK</i>	<i>FRA</i>	<i>GER</i>	<i>ITA</i>	<i>JPN</i>	<i>NLD</i>	<i>NOR</i>	<i>ESP</i>	<i>SWE</i>	<i>CHE</i>	<i>UK</i>	<i>US</i>	<i>EUI</i>	<i>IDA</i>
<i>Aid Recipients</i>																	
<i>Albania</i>	0	0	0	0	0	1	1	0	0	0	0	1	1	0	0	1	0
<i>Belarus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Bosnia-Herzegovina</i>	0	0	0	0	0	0	0	0	0	1	0	1	1	0	0	1	0
<i>Croatia</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>Cyprus</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

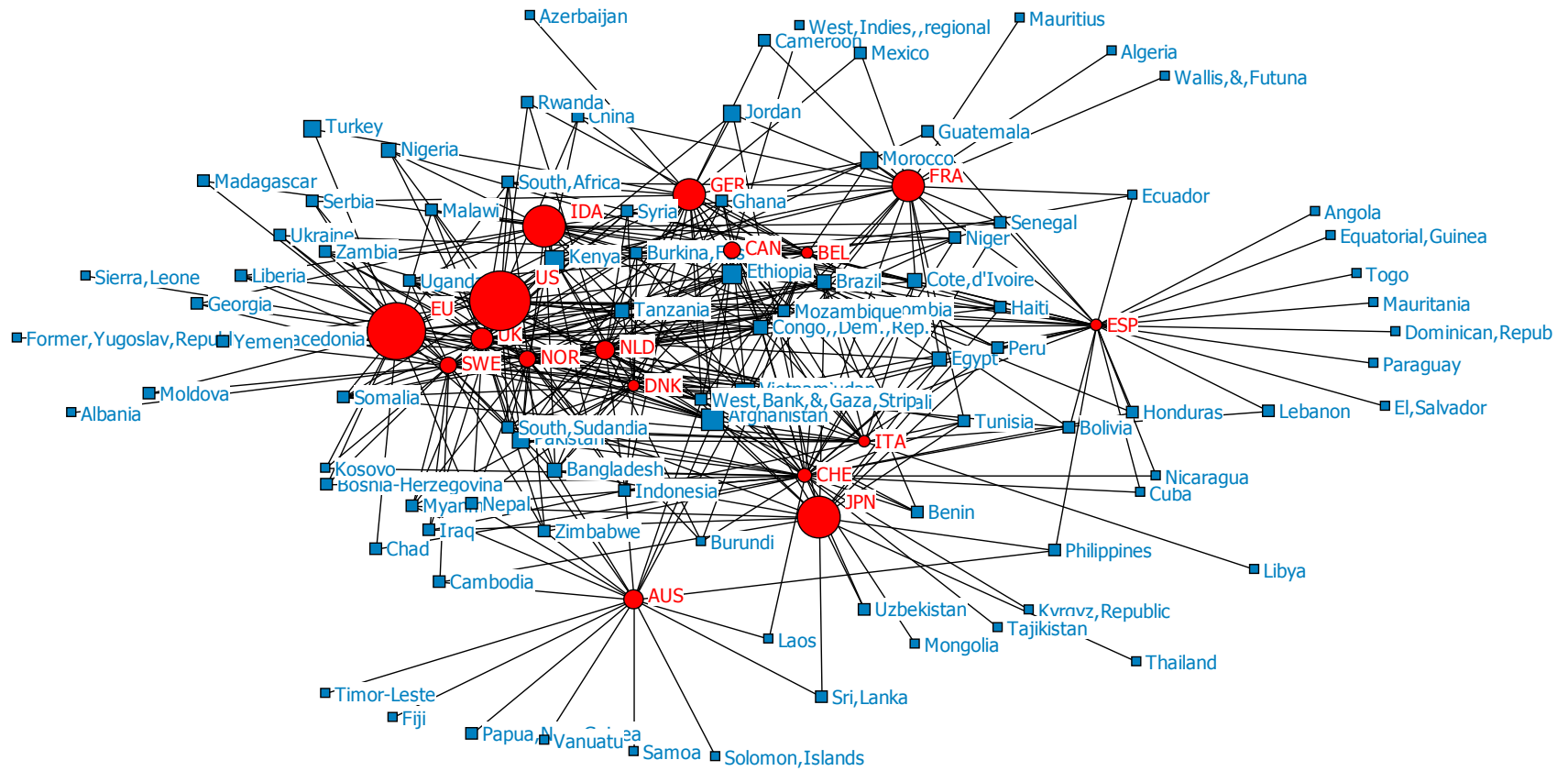


Figure 2.3 Two-mode Structure

The next step is to develop some network based measures and use them in combination with visual diagrams to provide useful information regarding the global aid system. Here, I discuss five such network indicators and explain how they apply to the foreign aid context. The first two measures - density and clustering - are usually applied to describe the overall aid network. The remaining three measures – degree centrality, eigenvector centrality, and betweenness centrality - are used to evaluate the relative influence a country has in the aid system.

2.3.2 Density

Network density is a good measure of how integrated a system is as a whole. It is defined as the number of present links in a network as a proportion of maximum possible number of links in a network (Borgatti & Everett, 1997). For two-mode data, the maximum number of links possible occurs when every node in one set is connected to every node in the other set. Thus the foreign aid network density is expressed in the following function:

$$\Delta^D = \frac{L}{l_i l_j}$$

where i and j represent nodes from donor and recipient sets respectively; L is the total number of aid links; l_i and l_j are the size of the two sets respectively. This measure can be used to evaluate the evolution of aid linkages over time. As an example, I compare the foreign aid density over time. Figures 2.5 and 2.6 represent foreign aid network for 1970 and 1995 respectively.

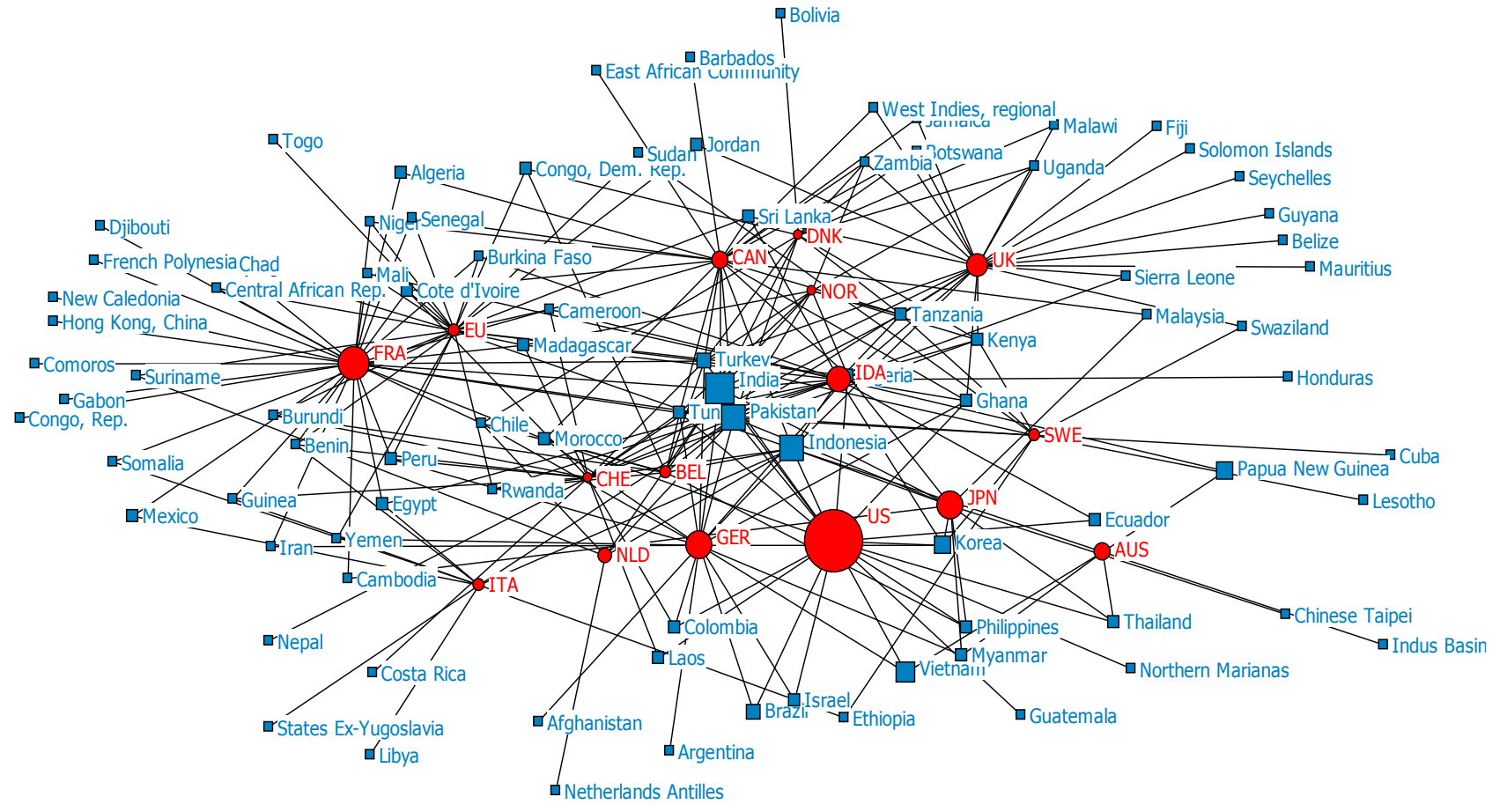


Figure 2.5 ODA Network for 1970

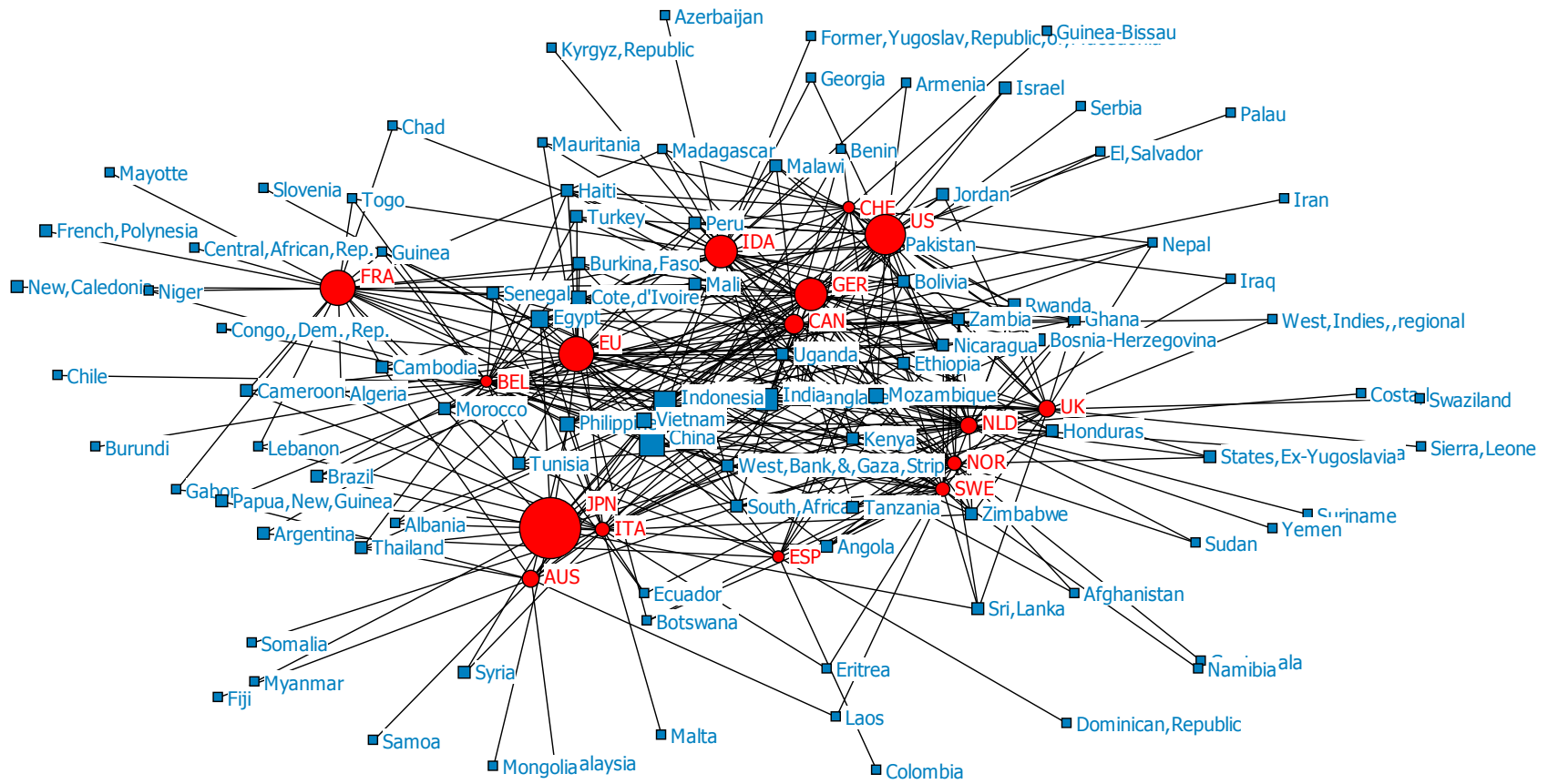


Figure 2.6 ODA Network for 1995

A chronological glance at aid diagrams (viewing aid diagrams in order of 2.5, 2.6 and 2.4) reveals an increased crowding i.e., the network maps appear denser over time. The density measure allows for quantitative capture of increased crowding (Table 2.5).

Table 2.5

Aid Network Density over Time

	1970	1995	2012
Network Density	0.104	0.199	0.206

A follow up network mapping and analysis can be used to decipher the evolution of increased density. For example, Figure 2.7 is a network diagram that represents the changes in the aid network between 1970 and 1995.

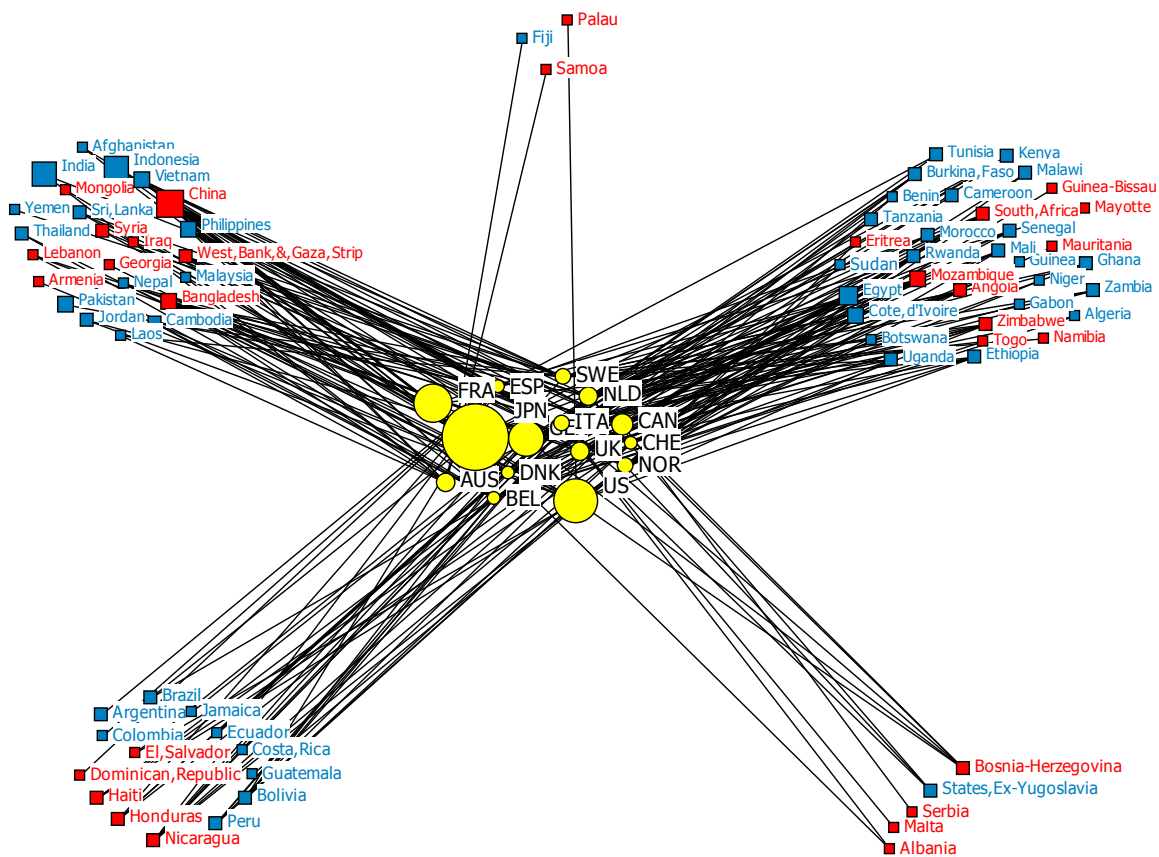


Figure 2.7 Increased Number of Aid Relationships by 1995

Links shown in Figure 2.7 represent only the newly established aid relations (the relationship existed in 1995 but not in 1970). The donor community is positioned in the center (yellow color nodes)

whereas the recipients are located at the corners and grouped according to geographic continents -- America, Europe, Africa, Asia, and Oceania. In addition, map also separates recipients in terms of whether they are entirely new to the aid network (i.e., they previously never received aid from any donor) or whether they received aid from some donors in 1970 (existing recipients). Entirely new recipients (e.g., Samoa) are captured through red dots, whereas existing recipients with new linkages are captured through blue dots (e.g., Fiji). An analysis of Figure 2.7 shows that a total of 240 new foreign aid links were created between 1970 and 1995 and that these new linkages comprised both new and existing recipients. Furthermore, the geographical grouping shows that certain continents such as Africa and Asia had a larger proportion of new links (43.75% and 33.75%) as opposed to America, Europe and Oceania (16.25%, 5%, and 1.25% respectively).

Network density measures can also provide different information regarding foreign aid evolution as compared to aid volume numbers. Data computed over an extended period of time shows a consistent rise in the foreign aid network density over time across different thresholds (see Table 2.6). The network density drops as the threshold value increases indicating that smaller number of aid relations are formed at higher level of aid. In addition, the returned values of density over time enable the observation of the evolution of the aid network. For the period 1970-2012, the density increased in general at all thresholds, but by a smaller margin with higher threshold values. Network density increased by 125% at the 0.1% threshold, by 98% at the 0.5% threshold, and by 61% at the 1% threshold. The implication is that aid relations increased much more at the lower levels of aid.

Table 2.6

Aid Network Density

Threshold	1970	1975	1980	1985	1990	1995	2000	2005	2010	2012
1% (donor budget)	0.081	0.085	0.098	0.117	0.116	0.13	0.135	0.119	0.136	0.131
0.5% (donor budget)	0.104	0.121	0.146	0.169	0.169	0.199	0.21	0.186	0.205	0.206
0.1% (donor budget)	0.158	0.211	0.26	0.285	0.291	0.348	0.368	0.333	0.362	0.357

Over the same time period, however, the volume of foreign aid does not have a similar pattern. Figure 2.8 compares aid volumes (in constant dollars) with the density of the aid system at a 0.5% threshold over time. Before 1990, both aid volume and density increased implying the establishment of new aid relations with increased flow of ODA. However, paying attention to certain time periods

representing unexpected shocks to the system (e.g., end of cold war), I find different foreign aid patterns in terms of aid volume and network density. First, in the post-Cold War era (early 1990s) there was a sharp *decrease* in aid volumes but an *increase* in the network density. This tends to suggest that more new aid relations were established in this period even though total amount of financial resources provided was actually being reduced. One potential explanation could be that the dissolution of the Soviet Union allowed the DAC donors to establish relationships with those newly independent nations and ease their transition towards a market economy. A second shock worth investigating is the 9/11 terror attack. At this time, it is observed that the volume of aid started to increase again suggesting that donors began to use aid as a tool of diplomacy. However, network density started to fall during this period so that aid was concentrated towards those strategically important recipients. Thus, network density measure, by emphasizing the relational aspects of foreign aid, provides different and useful information as compared to the total aid volume.

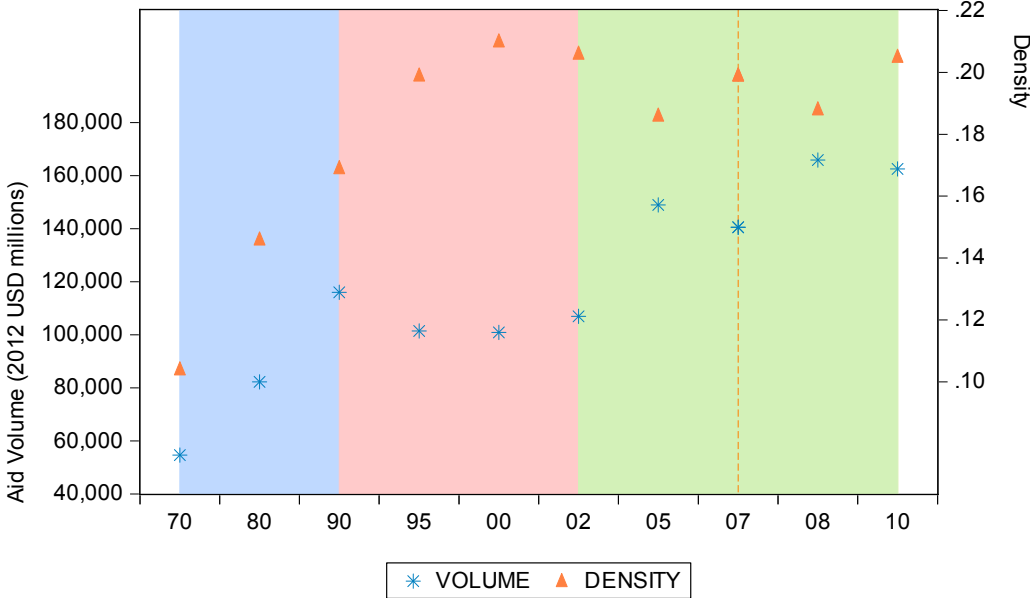


Figure 2.8 Aid Volumes and Network Density

2.3.3 Node Degree and Degree Distribution

Some network measures advance understanding of the topological relationships by focusing more directly on nodes. One way to evaluate the importance of a particular node in the network is through

node degree, which records the number of links connected to a given node. The formula for node degree is:

$$d(n_i) = \sum_{j=1}^{l_j} L_{ij}$$

where L_{ij} is the link between donor i and recipient j , and l_j is the size of the opposite set. In the aid context, the degree of a donor is determined by the number of recipients it reaches, and the degree of a recipient is determined by the number of donors it gets aid from.

Node degree reflects each country's involvement in the aid system and helps identify main donors and recipients as a function of their connections. Figures 2.9 and 2.10 show the degree distribution from both donors' and recipients' perspectives at the 0.5% threshold. It seems that the degree distribution from the recipient side follows the power-law where the number of nodes with degree k follows an exponential distribution, or mathematically $N(k) \approx k^{-\gamma}$. This finding reflects the existence of a Pareto distribution and implies that a large fraction of recipients have ties with a few donors while only a handful of recipients have ties with a large number of donors.

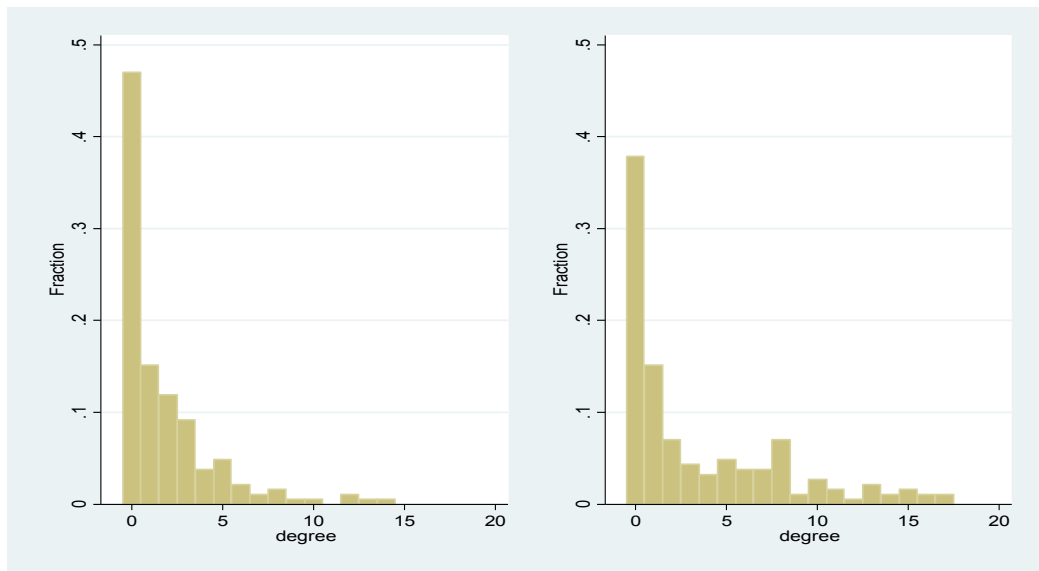


Figure 2.9 Recipients' degree distribution in 1970 and 2010

On the other hand, the degree distribution from the donor side seems to resemble a normal distribution. In 1990 the majority of donors had degrees between 20 and 40, then this range changed into

30-50 in the post-Cold War era, and returned to 20-40 by 2005 after the 9/11 terror attack. This finding is consistent with the change of network density in Figure 2.8.

2.3.4 Degree Centrality

Degree centrality identifies the power and influence a given node has in the system with respect to other nodes. This measure is computed through the following formula:

$$C_D(n_i) = \frac{d(n_i)}{l_j}$$

The node centrality enables the identification of the presence of a center of gravity for the network. In the aid context, a country with higher degree centrality is more central in the system. Figure 2.10 summarizes the node centrality for both donors and recipients over time at the 0.5% threshold. The transparent bars show the range of scores and blue bars show the mean with standard deviation. The country that has the highest score is labeled on the upper bound of the score range. The results suggest France, Germany, and EU institutions are the most central donors in general with Switzerland becoming the most central donor in 2012; Pakistan, Bangladesh, Kenya, Mozambique, China, India, Indonesia, Iraq, Afghanistan are the most central recipient at different times.

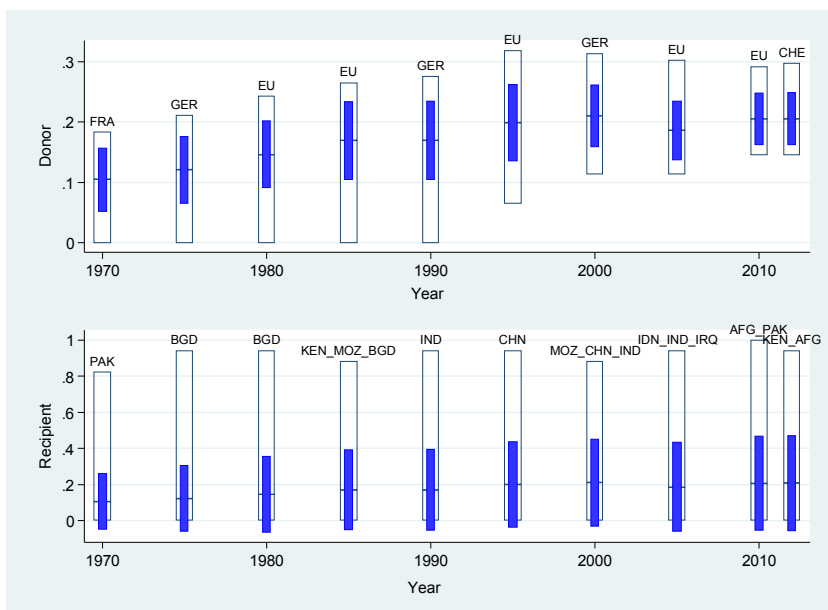


Figure 2.10 Descriptive Statistics for Node Centrality

2.3.5 Eigenvector Centrality

A limitation of degree centrality is that it fails to differentiate nodes which have the same number of links. For instance, it's hard to compare Afghanistan with Pakistan in 2010 as they both return the same value of 1 based on degree centrality in Figure 2.10. One way to overcome this is by looking at eigenvector centrality of the node. This is defined as the principal eigenvector of the adjacency matrix and can be obtained by computing the eigenvectors of XX' and $X'X$, where X is the raw two-mode incidence matrix. It may be thought of as a weighted degree measure in which the centrality of a node is proportional to the centrality of all the nodes connected to it (Borgatti & Everett, 1997). I use the UCINET program (Borgatti et al., 1990) which normalizes eigenvector centrality by the maximum attainable score (i.e. square root of one half).

In the foreign aid context, eigenvector centrality of a recipient takes into account not only its own degree but also the degree of its donors. So fewer countries have the same eigenvector score. A recipient country is more central if it gets aid from donors who support many other recipients. This can to some extent differentiate recipients by the strength of their connections assuming that connections to a central donor indicate more than a peripheral donor. Table 2.7 reports the top recipients with high eigenvector centrality at 0.5% threshold.

Table 2.7

Recipients' rankings by different measures of aid

Country	by Amount	by Degree	by Eigenvector Centrality	by Betweenness
India	1	10	not-top-10	8
Afghanistan	2	1	1	1
Pakistan	3	1	2	2
Vietnam	4	5	7	4
Haiti	5	3	3	3
Congo, Dem. Rep.	6	10	not-top-10	not top-10
Kenya	7	8	8	not top-10
Ethiopia	8	5	5	7
Tanzania	9	10	10	not top-10
Indonesia	10	10	not-top-10	9
Mozambique	not-top-10	3	4	5
West Bank & Gaza Strip	not-top-10	5	6	6
Sudan	not-top-10	8	9	10

2.3.6 Betweenness Centrality

Betweenness is usually measured as the number of geodesic paths that pass through a given node, expressed as a proportion of maximum possible number of equivalent paths between the same two nodes including those which do not pass through the given node. It is notable that the chief criteria for betweenness centrality is not the number of links a node has but whether a node is able to create a critical link between two nodes that otherwise would not be linked. Following Borgatti and Everett (1997), the denominator is given by

$$\begin{cases} 2(n_o - 1)(n_i - 1), & n_o > n_i \\ \frac{1}{2}n_i(n_i - 1) + \frac{1}{2}(n_o - 1)(n_o - 2) + (n_o - 1)(n_i - 1), & n_o \leq n_i \end{cases}$$

where n_o is the size of a node's own set and n_i is the size of the opposite set. In the context of foreign aid, a recipient is more central if it creates ties between donors, and similarly a donor is more central if it creates ties between recipients. For example, a donor with higher betweenness score indicates that this particular donor is found more frequently in an intermediary position along the geodesic paths linking other recipients. Therefore, the information of one recipient's aid experience or effectiveness can be passed to another through these central donors. Betweenness centrality can also serve as a useful proxy for a country's ability to serve as a mediator between groups of countries. For example the United States has been able to reduce tensions between Egypt and Israel and allowed them to come to security agreements. So a donor with high betweenness centrality is more capable of getting disparate recipients closer and to work towards common goal or objective.

In general, using betweenness centrality the United Kingdom, France, Germany, and EU institutions are the most central donors and Pakistan, Bangladesh, Kenya, Mozambique, China, India, Iraq, Afghanistan are the most central recipient (Table 2.7). Table 2.7 presents the changes in recipients' rankings by aid amount, degree, eigenvector centrality, and betweenness centrality. While the degree, eigenvector, and betweenness centrality measures are correlated, they have different emphasis in the aid network prominence.

2.4 Application: Recipients' Aid Connectivity and Growth

In this section, I provide an in-depth application example of one particular network based measure -- recipient degree centrality -- as a foreign-aid based predictor of economic growth.

2.4.1 Aid and Growth: Empirical Model

Literature considers a country's per capita income growth as a function of the volume of aid controlling for initial income, policy, institutional quality, and geographic location, and find mixed results exploring the effect of aid on growth (Boone, 1996; Burnside & Dollar, 2000; Clemens et al., 2012; Rajan & Subramanian, 2008). I propose that in addition to the overall amount of resources (aid volume), the recipient's connectivity in the aid system (such as degree centrality) may also have an impact on their growth rate.

In order to evaluate the influence of the recipients' aid connectivity on economic growth, I revisit a prominent study conducted by Rajan and Subramanian (2008) and follow the model specification and estimation strategy using extended data for the period 1970-2005 from Clemens et al (2014). The following equation is estimated for recipient i at period t .

$$rgdpchg_{it} = \beta_0 + \beta_1(aid/GDP)_{it} + \beta_2yc_{it} + \beta_3policy_{it} + \beta_4le_{it} + \beta_5geog_{it} + \beta_6inst_{it} + \beta_7inf_{it} + \beta_8(M2/GDP)_{it} + \beta_9bb_{it} + \beta_{10}revol_{it} + \beta_{11}ethfra_{it} + \varepsilon_{it}$$

where $rgdpchg$ is the five-year average annual growth of per capita GDP, aid/GDP is aid to GDP (a normalized measure of aid volume), yc is the initial level of per capita GDP, $policy$ is the initial level of trade policy index, le is the initial level of life expectancy, $geog$ is geography (the average of number of frost days and tropical land area), $inst$ is institutional quality, inf is the initial inflation, $M2/GDP$ is the initial financial depth, bb is the budget balance as proportion of GDP, $revol$ is the average number of revolution, and $ethfra$ is the ethnic fractionalization.

The recipient degree centrality is then added to the above equation (resulting in the new equation shown below) and test the null hypothesis that highly connected recipients in the aid network does not accelerate their own economic growth.

$$rgdpchg_{it} = \beta_0 + \beta_1(aid/GDP)_{it} + \beta_2degc_{it} + \beta_3yc_{it} + \beta_4policy_{it} + \beta_5le_{it} + \beta_6geog_{it} + \beta_7inst_{it} + \beta_8inf_{it} + \beta_9(M2/GDP)_{it} + \beta_{10}bb_{it} + \beta_{11}revol_{it} + \beta_{12}ethfra_{it} + \varepsilon_{it}$$

where $degc_{it}$ is the network measure capturing the five-year average connectivity of recipient i .

2.4.2 OLS Results

A general relationship is tested in OLS regression for periods 1970-1980, 1980-1990, and 1990-2000. Table 2.8 juxtaposes original aid/GDP estimates (columns 1, 3, and 5) with recipient degree centrality estimates (columns 2, 4, and 6) using. The original model specification shows that there is a positive relationship between the aid volume and the growth for the 1970 decade but a reverse (negative) relationship for the 1980 and 1990 decades. Furthermore, the estimated aid coefficient is significant only in for one time period (1980-1990) where a 1 percentage point increase in aid/GDP is associated with 0.18 percent point decrease in the average annual growth of GDP.

When the degree centrality is added to the model, there is a positive and statistically significant relationship between recipients' initial degree centrality and their growth in 1980s and 1990s. Moreover, the positive effect of higher degree centrality on the average annual growth of GDP is quite striking. Columns 5 and 8 report that a one percentage-point increase in the degree centrality increases the average annual growth rate of per capita GDP by 2.40 and 3.52 percentage points respectively in 1980s and 1990s.

Due to the non-random assignment of foreign aid, however, these estimates are subject to endogeneity concerns. Indeed, it is possible that there is potential simultaneous causation between growth and foreign aid. Lower growth rate at period $t - 1$ could result in a recipient receiving higher amount of aid at the beginning of period t resulting in higher growth rate measured at end of period t . This problem is well understood in the literature and a possible solution is the use of Generalized Method of Moments (GMM).

Table 2.8

Impact of Aid Volume and Connectivity on Growth: OLS Estimation

	1970-1980		1980-1990		1990-2000	
	(1)	(2)	(3)	(4)	(5)	(6)
aid/gdp	0.049 (0.080)	0.011 (0.088)	-0.182*** (0.057)	-0.173*** (0.056)	-0.003 (0.094)	0.103 (0.076)
initial degc		-2.530 (2.016)		2.399** (1.112)		3.524*** (1.026)
yc	-1.684** (0.744)	-1.891** (0.791)	-2.592*** (0.606)	-1.658*** (0.571)	-1.138* (0.591)	-0.152 (0.594)
policy	1.734* (0.958)	2.259* (1.179)	2.095** (1.022)	1.887* (0.962)	-0.164 (0.566)	-0.444 (0.502)
le	0.081 (0.071)	0.059 (0.075)	0.090 (0.065)	0.069 (0.060)	0.153** (0.065)	0.172*** (0.047)
geog	-0.011 (0.470)	0.199 (0.599)	0.462 (0.328)	0.389 (0.280)	0.693* (0.409)	1.091*** (0.321)
inst	9.796** (3.988)	10.43** (3.983)	6.924** (2.867)	6.931** (3.031)	2.963 (3.159)	2.806 (2.571)
Inf	-0.005 (0.011)	-0.006 (0.011)	-0.002 (0.005)	-0.006 (0.005)	-0.001*** (0.000)	-0.001*** (0.000)
M2/GDP	-0.009 (0.038)	-0.020 (0.041)	-0.008 (0.027)	-0.014 (0.025)	-0.004 (0.015)	-0.016 (0.014)
bb	0.035 (0.060)	0.031 (0.055)	0.013 (0.046)	-0.015 (0.042)	0.204*** (0.059)	0.207*** (0.054)
revol	-0.665 (1.011)	-0.979 (1.341)	-0.940 (0.710)	-0.716 (0.836)	-0.499 (0.656)	-0.849 (0.545)
ethfrac	0.958 (1.419)	1.423 (1.506)	-0.0489 (1.037)	-0.524 (1.030)	1.756 (1.104)	1.583* (0.921)
safrica	-1.668 (1.145)	-2.077* (1.179)	-0.213 (0.864)	0.398 (0.908)	-0.601 (1.104)	-0.600 (1.104)
east	-0.660 (1.161)	-0.906 (1.250)	0.718 (0.807)	0.976 (0.784)	0.898 (0.715)	0.790 (0.626)
Constant	5.914 (4.390)	9.317* (5.294)	13.56*** (3.634)	6.768 (4.320)	-0.182 (4.803)	-9.720* (4.862)
Observations	74	71	74	68	69	63
R-squared	0.381	0.393	0.594	0.644	0.618	0.731

* $p < .1$; ** $p < .05$; *** $p < .01$.

2.4.3 GMM Results

GMM estimations are employed to address the potential endogeneity of all the regressors and incorporate fixed effects. Identification relies on first-differencing and using lagged values of the endogenous variables as instruments. In the difference-GMM estimator (or the Arellano and Bond procedure), lagged levels are used as instrument for the differenced right-hand-side variables. Table 2.9 reports the results across different specifications.

Table 2.9 GMM Regressions (Arellano-Bond Procedure)

VARIABLES	(1)	(2)	(3)
aid/gdp	-0.105 (0.105)	-0.177* (0.103)	0.135 (0.154)
degc		6.831** (3.311)	8.012* (4.673)
degc*aid			-0.716** (0.321)
yc_penn	-2.654* (1.564)	-1.937 (1.953)	-2.041 (2.071)
le_wdi	-0.128 (0.135)	-0.119 (0.156)	-0.0846 (0.179)
sw1_i	0.440 (0.934)	0.314 (0.719)	0.223 (0.798)
INST_QLTY	-1.137 (2.994)	-1.335 (3.054)	0.0640 (2.756)
lninfl	-1.360** (0.635)	-0.810 (0.572)	-0.849* (0.439)
m2final	-6.563 (4.670)	-6.205 (4.861)	-7.300** (3.315)
bbfinal	12.04 (9.219)	8.218 (9.662)	18.46* (9.898)
revolutions	-2.674*** (0.765)	-2.185*** (0.627)	-2.271*** (0.797)
tdum3		-2.348** (0.969)	
tdum4	1.726** (0.697)	-0.707 (0.662)	1.337* (0.700)
tdum5	2.303** (1.022)	-0.124 (0.426)	1.976** (0.796)
tdum6	2.540*** (0.980)		2.029*** (0.751)
Endogenous variables used as instruments	Initial income, aid, policy, inst. quality, inflation, M2, budget balance, revolutions, life expectancy	Initial income, aid, degree centrality, policy, inst. quality, inflation, M2, budget balance, revolutions, life expectancy	Initial income, aid, degree centrality, policy, inst. quality, inflation, M2, budget balance, revolutions, life expectancy
Exogenous variable used as instrument	Ethnic Geography	Ethnic Geography	Ethnic Geography

* $p < .1$; ** $p < .05$; *** $p < .01$.

Column 1 reports the core specification of the Rajan and Subramanian (2008) and it fails to find a significant aid-growth relationship. In column 2, the centrality-growth evidence is tested controlling the aid/gdp ratio by adding the degree centrality term to the core specification. The result is quite interesting. There is some evidence (at 10% level) that a 1 percentage point increase in aid/GDP is associated with 0.18 percent point decrease in average annual growth of GDP. However, a one percentage-point increase

in degree centrality increases the average annual growth rate of per capita GDP by 6.8 percentage points (at 5% level). Column 3 adds the interaction of centrality and aid/gdp into the specification. We did not find evidence that aid connectivity works better with larger amounts of aid.

2.4.4 Discussion

A positive relationship was found between the recipients' degree centrality and their economic growth. The next step is to explain why a highly connected recipient in the aid system has better economic performance. One possible explanation is diversification. For aid to generate an impact on the overall growth several sectors may need simultaneous attention. Recipients with high degree centrality are likely to have a wider set of donors whose expertise and interests span across various sectors such as infrastructure, health, transportation, education, and banking financial services, allowing for joint progress in multiple areas. Second, donors are vested parties in the foreign aid system and they are likely to take an active role in understanding how to better optimize their disbursements. One way that donors gather information is through discussion with other donors, whereby they communicate their aid related experiences with each other. Such exchanges result in greater positive externalities for highly connected recipients as there are multiple donors who have information on such recipients. On the other hand, high degree centrality for recipients may motivate them to retain their favorable position in the network. Accordingly, such recipients might put more effort in promoting democracy, developing better governance, controlling for corruption etc., which has the desirable side effect of a favorable climate being created to convert aid into actual growth.

I am going to provide some evidence from the donors' perspectives. A higher number of donors could provide aid for more sectors. OECD/DAC Aid Statistics disaggregate ODA into 8 broad sectors: social infrastructure & services, economic infrastructure & services, production sectors, multisector/cross-cutting, commodity aid/general program assistance, action relating to debt, humanitarian aid, unallocated aid. I first check the number of sectors each donor contributes to. Table 2.10 shows each donor's average coverage in a five-year duration from 1971 to 2005. The evolution shows that donors reach more sectors over time and by 2005 all donors cover all sectors in general. The larger sector coverage along with the smaller variation among donors could imply that they do not utilize different expertise or cooperate with

each other. It is notable that there is a dramatic increase for multilateral donors (EU institution and World Bank) in the new millennium.

Table 2.10

Mean Number of Sectors

	1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05
AUS	5	5	5	5	5.8	8	8
BEL	5.4	5	5.2	5.4	6.4	8	8
CAN	5.2	5.2	5.6	5.4	6.2	8	7.8
DNK	4	5	4	4.4	5.2	6.6	7.6
FRA	6	5.6	5.8	6	6	7.2	7.8
GER	6	6	6	6	6	8	8
ITA	3.2	4.6	5.8	6	6.4	8	8
JPN	6	6	6	6	6.4	8	8
NLD	5.8	6	6	6	6.2	7.8	7.8
NOR	4.6	4.6	4.8	5	6.2	7.8	8
ESP					6	8	8
SWE	5	5.6	5	5.2	6.2	8	8
CHE	4.6	5.6	4.8	5.2	6.2	6.4	7.8
UK	5.2	6	6	6	6.2	7.8	8
US	5.2	5.4	5.4	6	5.8	7.6	8
EU			2.8	2	1.4	1.4	7.2
IDA			2.2	3.6	3.4	1.2	5.8

Although donors tend to reach all sectors, this does not necessary mean that they distribute aid equally to each sector. Priority may be given only to a few specific sectors. The standard deviation of aid across 8 sectors for each donor is reported in Table 2.11. A larger variation suggests the uniformly distribution across sectors or the concentration of aid in a few sectors. In general, Japan, France, the United States, Germany, and the World Bank concentrate on a few sectors while Switzerland, Denmark and Sweden distribute aid more evenly to all sectors.

Table 2.11

Standard Deviation of Sectorial Aid by Donors

	1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05
AUS	219.8312	63.62537	134.6147	178.0915	299.0531	282.9375	313.3018
BEL	317.8817	392.8004	151.1513	131.6177	81.82261	86.78602	194.9005
CAN	259.4989	205.5482	307.2197	291.6913	311.3715	279.8118	459.8277
DNK	67.4274	101.2733	116.0428	133.5514	190.8856	194.6834	243.3441
FRA	1706.317	1933.239	2128.255	1596.722	1109.995	1090.397	1164.058
GER	533.5482	641.3945	962.3649	915.1682	753.734	760.5669	961.0659
ITA	232.9508	35.65795	293.012	546.3988	340.9283	107.8246	286.3699
JPN	729.5164	1095.555	1471.307	1754.37	2366.686	2168.405	2094.463

Table 2.11

Standard Deviation of Sectorial Aid by Donors (Cont.)

	1971-75	1976-80	1981-85	1986-90	1991-95	1996-2000	2001-05
NLD	231.9554	414.3599	292.4818	357.5189	322.0508	407.6791	645.0789
NOR	73.44167	111.553	148.8919	160.4541	157.6094	240.8385	401.0973
ESP					213.45	189.8336	277.851
SWE	168.2013	224.8996	160.0577	176.422	208.4193	190.3205	291.0229
CHE	35.14334	71.06332	88.95475	97.62205	118.6218	84.24901	121.1389
UK	559.65	401.1402	247.2774	276.8866	254.4709	242.7294	706.0709
US	2914.161	2094.676	1195.228	2200.004	1360.524	1071.275	2853.905
EU			467.6546	781.8548	268.2892	838.3432	1203.642
IDA			1179.649	939.5867	1419.879	2133.714	2375.688

2.5 Conclusion

Treating foreign aid as a bipartite social network allows to evaluate it as a complex and interdependent system. I showed how a network diagram of foreign aid is an effective visual tool that helps account for properties of individual actors (e.g., size of donors and recipients) and also relational attributes between actors (links between donors and recipients). In addition to this, I demonstrated how observing differences in topological properties across network diagrams constructed for different time periods could provide a rich understanding of aid evolution patterns.

My main endeavor in this essay involved developing a set of network measures for foreign aid. The network based measures could be helpful in addressing different aspects of the intricate foreign aid picture. Some measures (e.g., density, degree distribution) are particularly useful in describing the overall network properties of the foreign aid system. Other measures (e.g., degree centrality, betweenness

centrality, and eigenvector centrality) are more node specific, thereby allowing the understanding of various complex considerations that determine the position of a particular donor and/or recipient in the network. Illustrating the usefulness of the network based measure, I follow a prominent study in this area conducted by Rajan and Subramanian (2008) and add recipients' connectivity (degree centrality) as an explanatory variable in the model. I find evidence of a positive and significant relationship between the recipients' connectivity in the aid system and their economic growth. This finding helps explain the effect of aid on economic growth from a different perspective. Maybe the amount of aid itself does not greatly promote growth. Instead, getting aid from a couple of donors with smaller amount from each donor returned better effect. I tried to explore how recipients' aid connectivity may help with their economic growth from the perspectives of both donors and recipients. Some potential explanations include diversification, complementary, and maintaining attractiveness.

Since this paper represents a preliminary exploratory effort in importing network concepts for foreign aid research usage, it has certain limitations that provide avenues for future research. In the development of measures, I did not account for differences in the weightage of links. While I used a threshold approach, each link included was given equal weight. A valuable avenue for future research is to use weighted measures for links (Fagiolo et al., 2010). This will allow for network measures to offer even greater sophistication in capturing relational attributes of links. Similarly, more network based indicators of foreign aid could be developed in the future work. In addition, numerous avenues are therefore available for future researchers to apply network measures for empirical investigation. I recommend keeping an open mind and encourage creativity in the use of network measures, with the choice dictated by the specifics of each investigation. When necessary, network measures can be used in a complementary fashion alongside traditional measures (as demonstrated by the application example). In other cases, however, a network measure might provide greater value addition as a substitute for a traditional measure.

I hope that this paper gets the conversation started in terms of how network methodology and related measures can help better understand foreign aid research. While prior research acknowledges the complexities associated with foreign aid measures, these are presented as a set of problems/limitations one has to live with. The differentiating feature of the network based approach is that it

acknowledges measurement problems with the agenda of providing solutions. While I offer several network related insights to address foreign aid issues, I view this paper as nothing more than a “first step” in this general direction. I remain optimistic that future research will further the knowledge base in this area by providing necessary refinements and extensions to this preliminary endeavor.

2.6 References

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3 Essay 3: When Aid Recipients Turned into Donors - Cases of South Korea and Turkey

3.1 Introduction

Through decades of research, foreign aid literature attempts to understand a fundamental question - what drives aid. Foreign aid is designed to help poverty alleviation and thus has an altruistic side, but motivations of aid are far more complex. Donors' motivations has been tested from mainly two perspectives – the recipient need model and the donor interest model. McKinlay and Little (1977, 1978a, 1978b, 1979) looks at both models and find that the donor interest model performed better for the United States, France, and the United Kingdom. Maizels and Nissanke (1984) studies bilateral donors and multilateral donors separately and find that bilateral donors are driven more by their own interests such as political/security and trade benefits while multilateral donors are driven more by the needs of recipient countries. Hybrid models are adopted later to consider the balance of recipients' needs and donors' interests (Alesina & Dollar, 2000; Cassen, 1994; Meernik, Krueger, & Poe, 1998; McGillivray & Oczkowski, 1991; Poe & Sirirangsi, 1993). Their findings generally confirm that historical connections, commercial ties, and strategic interests are significant determinants of aid allocation rather than the recipient countries' economic needs and performance.

Although foreign aid data has been long compiled by the DAC for OECD countries, rich OECD countries do not represent the entire donor community. Global development cooperation has been changing as more emerging economies start to help other developing countries. During the first decade of the 21st century, the number of the emerging economies that provided foreign assistance increased to more than 30 (Paulo & Reisen, 2010). Examples include countries such as China, India, Brazil, Thailand, and Indonesia. These donors are called emerging donors or new donors in the literature. Woods (2008) describes this fact as “a silent revolution” in the international development cooperation. Scholars have been trying to study the motivations of these emerging donors. However, several traits of this new type of foreign assistance create obstacles to further such research. For example, emerging donors may not follow the same definition of ODA that is commonly used by DAC and they suffer from the critiques of

data credibility and transparency (Chanana, 2009; Kragelund, 2008; McCormick, 2008; Paulo & Reisen, 2010).

In this essay I focus on two specific new donor countries: South Korea and Turkey. They follow the OECD/DAC definition of foreign aid as well as the comprehensive statistical reporting system. Moreover, unlike general emerging donors which are still aid recipients, South Korea has completed its transition from an aid recipient to a net donor. Along the line of donors' motivations, I will explore whether strategic considerations carry less weight when determining aid allocation for these two nations. One specific question is whether their past experience as aid recipients has any impact on their new roles as donors. Having achieved rapid economic development while receiving foreign assistance, South Korea and Turkey should be clear on what helped them the most and therefore may have a different understanding on how to make aid more effective for the recipients. This essay analyzes their aid allocation patterns assuming these patterns could reflect donors' motivations and goals of their foreign assistance. South Korea is also compared with its neighboring country, and predecessor, Japan. Similarity in their aid distribution by recipients' geographic regions and income groups could provide evidence on whether South Korea mirrored Japan's foreign aid policy.

This essay is organized as follows. Section 2 describes South Korea and Turkey's transition from aid recipients to donors. Section three analyzes their aid allocation by recipients' geographic regions and income groups with the focus on the evolution of aid allocation patterns and the similarity between South Korea and Japan. Concluding comments follow in section four.

3.2 Transitions from Aid Recipients to Donors

This section uses data from OECD/DAC Aid Statistics to illustrate South Korea and Turkey's foreign assistance both as aid recipients and as donors.

3.2.1 South Korea's Transition

Figure 3.1 plots South Korea's net ODA flows for the period 1960-2014 in constant prices. The solid line shows the net inflow of aid from 1960 to 1999 and represents South Korea as a recipient. The dashed line shows its net outflow of aid since 1987 and represents South Korea as a donor. In late 1980s,

South Korea started to provide aid although it was still a recipient country. By 1992, its total net disbursement as a donor was about \$103 million dollars while it received -14.7 million dollars from DAC and non-DAC donors as a recipient. The negative inflows of aid in the 1990s imply that its repayment of previous concessional loans exceeded the amount of aid it received. South Korea completely stopped receiving aid in 2000, and its net aid disbursement as a donor reached 1.7 billion US dollars.

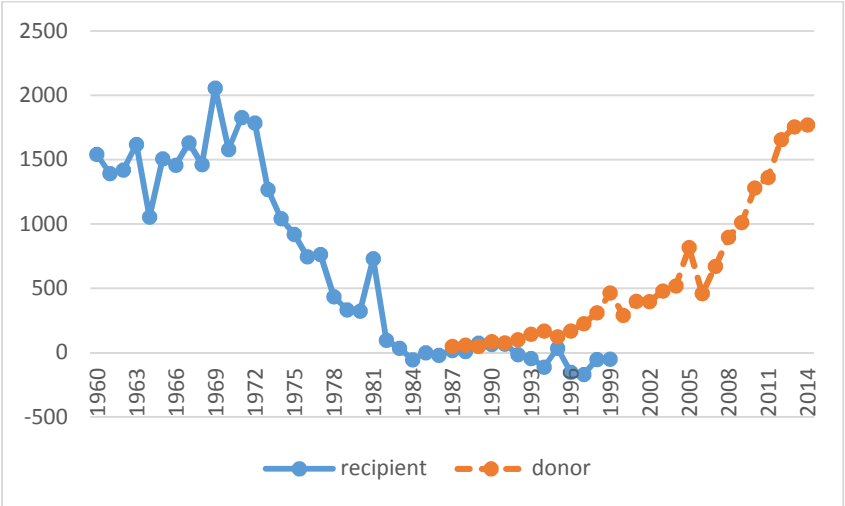


Figure 3.1 South Korea's Net Aid Flows (constant price: USD millions)

South Korea submitted its application to join DAC in 2008. The DAC then conducted a special review of South Korea's international development co-operation and provided sets of recommendations (OECD, 2008). In becoming the 24th formal DAC member on January 1, 2010, South Korea was obligated to improve the quality of its ODA. The United Nations encourages donor countries to meet the ODA target as 0.7% of their Gross National Income (GNI). This threshold was first raised in the Report of the Commission on International Development (Pearson, 1969). Although there's no clear explanation of how the target was estimated, the 0.7 percent threshold was mentioned in several cases such as the "Earth Summit" in Rio de Janeiro 1992 and the final declaration of the UN's International Conference on Financing for Development in Monterrey 2002 (Clemens & Moss, 2007). Figure 3.2 plots the average level of DAC donors' total ODA as a percent of GNI and Korea's relative position as a new donor. It is evident that South Korea's level is below the average DAC level, but its ODA/GNI ratio had been increasing steadily from 0.02% in 1990 to 0.14% in 2012. In addition, the Korean government has committed to triple its ODA volume to USD 3 billion or 0.25% of its GNI by 2015 (MOFAT Ministry News).

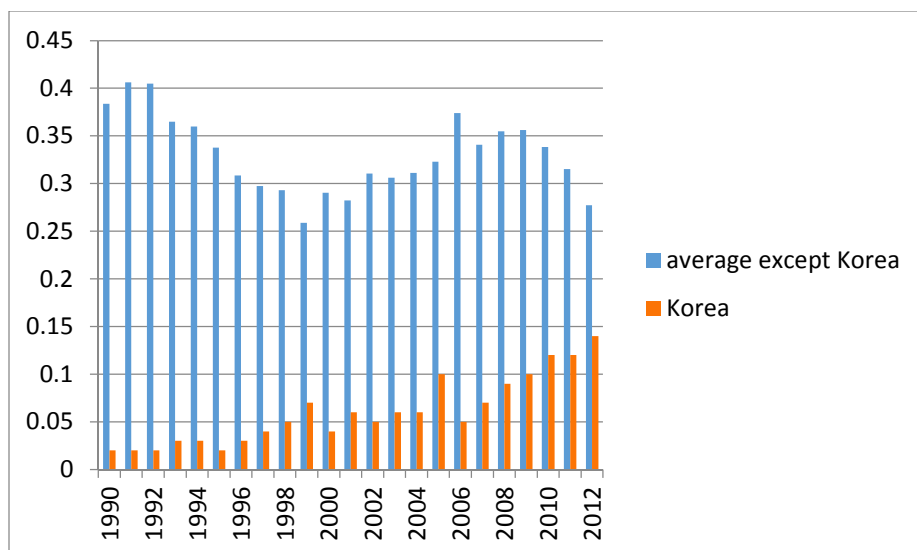


Figure 3.2 Total ODA as Share of GNI (%)

Despite the rapid increase in aid volume to developing countries, South Korea is not an influential donor in the DAC community when looking at the aid commitment data. As is shown in Table 3.1, the United State commits the highest amount of aid in general, with an exception in 2000 where Japan was the biggest donor. South Korea was the smallest donor in 1990 and committed about \$56 million dollars. By 2012, South Korea accounted for 0.31% of total bilateral aid commitment on average, but was no longer the smallest donor.

Table 3.1

DAC ODA Commitment (2012 USD millions, constant price)

	1970	1980	1990	2000	2010	2012
all DAC	52218.07	76404.20	113064.10	93473.22	158141.54	143401.62
number of DAC	15	18	20	25	25	27
max	15388.52 (US)	15279.00 (US)	36788.12 (US)	19713.65 (JPN)	38516.07 (US)	30870.92 (US)
mean	3481.20	4244.68	5653.21	3738.93	6325.66	5311.17
median	1741.99	2035.21	2310.38	2369.41	3065.70	2550.35
min	170.08 (AUS)	78.21 (IRL)	56.43 (KOR)	15.75 (SVK)	73.61 (SVK)	26.12 (ISL)

3.2.2 Turkey's Transition

Figure 3.3 plots Turkey's net ODA flows for the period 1960-2014 in constant price. The solid line shows the net inflow of aid from 1960 to 2013 and represents Turkey as a recipient. Distinct from the

consistent decreasing aid inflow in South Korea, Turkey's aid inflows fluctuated and had several peaks around 1980, 1991, and 2011 (see Figure 3.3). This sudden increase of aid inflows seems related to the economic performance when one compares Turkey's aid inflow and its GDP. The dashed line shows the net outflow of aid since 1990 and represents Turkey as a donor. Its net aid disbursement had a sharp increase after 2010. Unlike Korea, Turkey has maintained its double identities as both an aid recipient and a donor.

When comparing net aid disbursement between Turkey and South Korea, these two nations disbursed similar amount of aid initially but Turkey surpassed South Korea dramatically after 2011, although its GDP level is still significantly less than that of South Korea (see Figure 3.4). Like other DAC countries, Turkey also established the Turkish International Cooperation and Development Agency (TIKA) in 1992 to finance its foreign aid (Kulaklikaya & Nurdun, 2010).

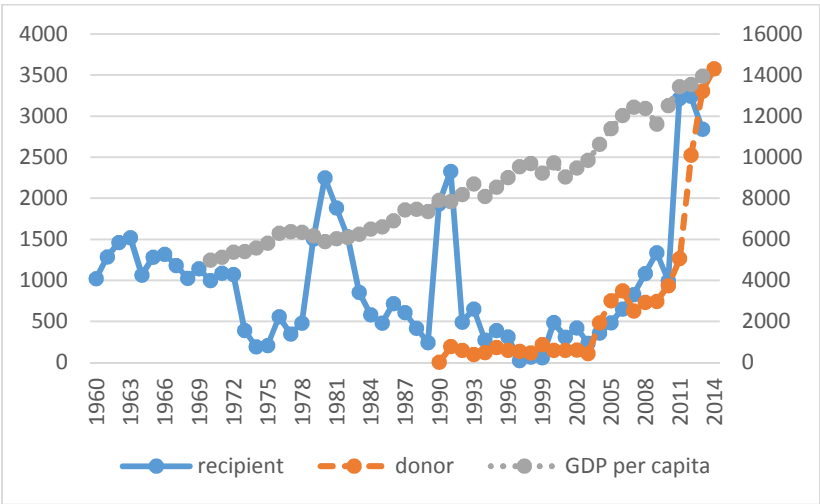


Figure 3.3 Turkey's Net Aid Flows (constant price: USD millions)

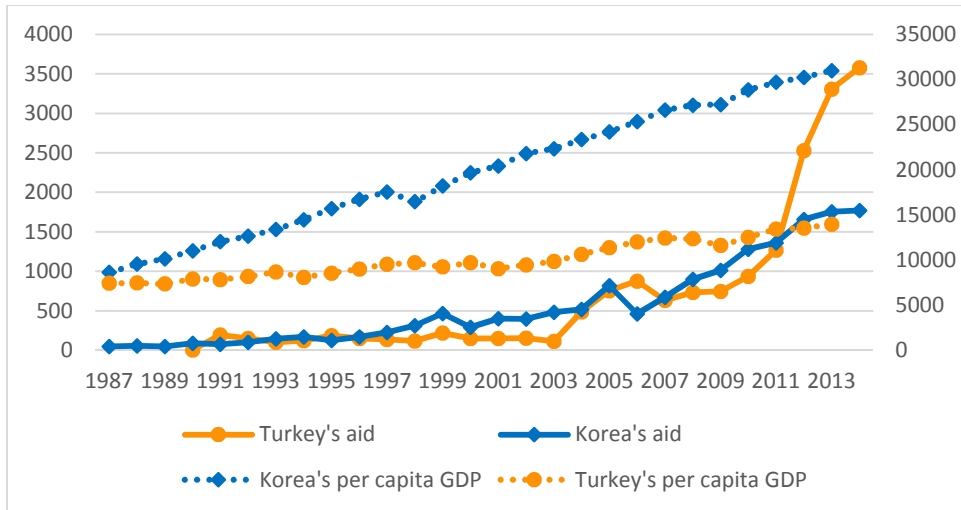


Figure 3.4 Net Aid Disbursement and Per-capita GDP (constant PPP price)

3.3 Allocation Patterns as New Donors

What are the motivations of South Korea and Turkey and do strategic considerations play an important role in determining their aid allocation? Based on the assumption that aid allocation patterns suggest the donors' motivations, this section studies the ODA distribution by geographic regions and income groups for South Korea and Turkey.

3.3.1 Motivations of New Donors' Aid

The Ministry of Foreign Affairs and Trade (MOFAT) of Republic of Korea claims that “as a recipient-turned-donor, Korea is fully committed to supporting the global efforts to alleviate poverty, promote sustainable growth ... and MDGs ...” (MOFAT Ministry News). President Lee also described South Korea’s foreign assistance as a “wholehearted commitment to pay back its debts to the world as an international donor” (Kiyokazu, 2008).

However, new donors may need a balance between the needs of their recipients and their own economic interests and strategic considerations. Walz and Ramachandran (2011) points out that the new donors' participation in international aid cooperation systems may be driven more by the opportunity to build their profile in the multilateral institutions and spread more influence both regionally and globally. Moreover, compared to the poor countries, higher income nations could be more attractive to the donor

community as they may carry more economic, political, and strategic weights. The literature does find an inverted U-shaped relationship between the recipients' per-capita income and the per-capita aid they received. This is referred as the "middle-income bias" (Isenman, 1976; Dowling & Hiemenz, 1985). In addition, a World Bank study (Assessing aid, 1999) stated that the foreign aid would be more effective in eliminating poverty if it was allocated to the poorest countries especially those with sounder policies and institutions. This argument is carried into the Monterrey Consensus in 2002 (United Nations, 2002). Therefore, this essay focuses on the aid distribution across both geographic regions and income groups to explore how important strategic considerations are to South Korea and Turkey.

The following section will examine several patterns: (i) the evolution of South Korea and Turkey's aid distribution by geographic regions and income groups; (ii) the similarity of the foreign aid policy between the two new donors and Japan. Beyond its role as South Korea's neighboring predecessor, Japan was among the earliest donors that joined the DAC and it is also a significant donor in terms of its aid volume (see Figure 3.5 and Table 3.1).

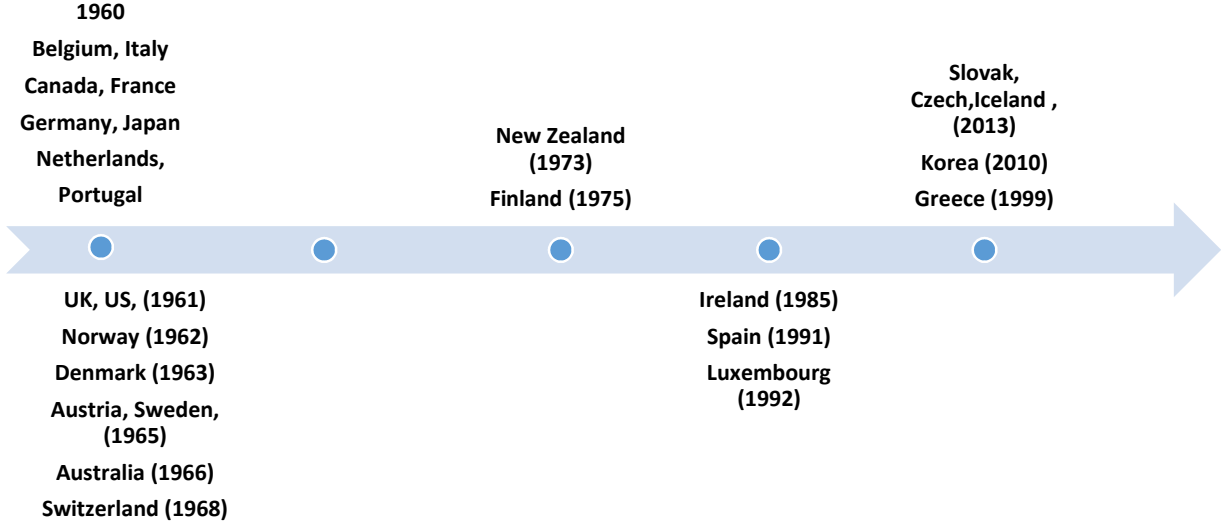


Figure 3.5 DAC Members and Dates of Membership

Again, foreign aid data are retrieved from OECD/DAC Aid Statistics. Net disbursements (gross disbursements less repayments) data in constant prices are used for the rest of the essay unless stated otherwise. Net disbursement is preferred because it could reflect the actual transfer of aid. The essay follows the World Bank's thresholds in categorizing recipient countries into different geographic regions and income groups.

3.3.2 Aid Allocation by Geographic Regions

World Bank categorizes developing countries into 6 geographical regions: East Asia and Pacific, Europe and Central Asia, Latin America and the Caribbean, Middle East and North Africa, South Asia, and Sub-Saharan Africa. Some characteristics of these six regions are summarized in Table 3.2.

Table 3.2

Geographic Regions Defined by the World Bank

Region	Number of Countries	Population (million)	Population Growth Rate	Avg Life Expectancy	GNI per capita (\$)
Latin America and the Caribbean	29	582	1.1%	74 years	7733
Europe and Central Asia	23	405	0.4%	71 years	7272
Middle East and North Africa	13	331	1.7%	72 years	3874
East Asia and Pacific	24	1900	0.7%	72 years	3696
Sub-Saharan Africa	47	853	2.5%	54 years	1776
South Asia	8	1600	1.4%	65 years	1176

Note. Data are from the World Bank website. Retrieved from <http://data.worldbank.org/about/country-classifications/country-and-lending-groups>

Regarding recipients' geographic regions, South Korea's aid net disbursement (in constant prices) is plotted in Figure 3.6. The panel on the left shows the aid volume as well as the composition across six regions. It is evident that disbursement flows were in the steady increase phase until early 2000s. This seems to be consistent with South Korea's stated motivation of supporting MDGs. Then the sudden decrease of aid disbursement appears to coincide with the recent global financial crisis although the impact did not last long. The aid volume recovered in the following year. A second observation is that Asian recipients especially East Asia is a priority for South Korea. For the period of 1987-2011, South Korea on average allocated 59% of its total bilateral aid to Asian countries with 41% to East Asia and 18% to South Asia. This is clearer on the right panel of Figure 3.6 where each year's total ODA takes 100%. It seems to have a regime change in early 1990s where good amount of financial resources were distributed to Sub-Saharan Africa. For example, Sub-Saharan Africa received 5% of South Korea's foreign assistance in 1987 but this number increased to more than 82% in 1990. Around the new millennium, Europe and Central Asia got some attention with about 19% of Japan's bilateral aid in 1999, 17% in 2000, and 12% in 2001, when compare to 2% on average before 1999. For the period 2003-2006, priority to some extent was given to countries in the Middle East and North Africa (29% on average

compared with 5% prior to this period).

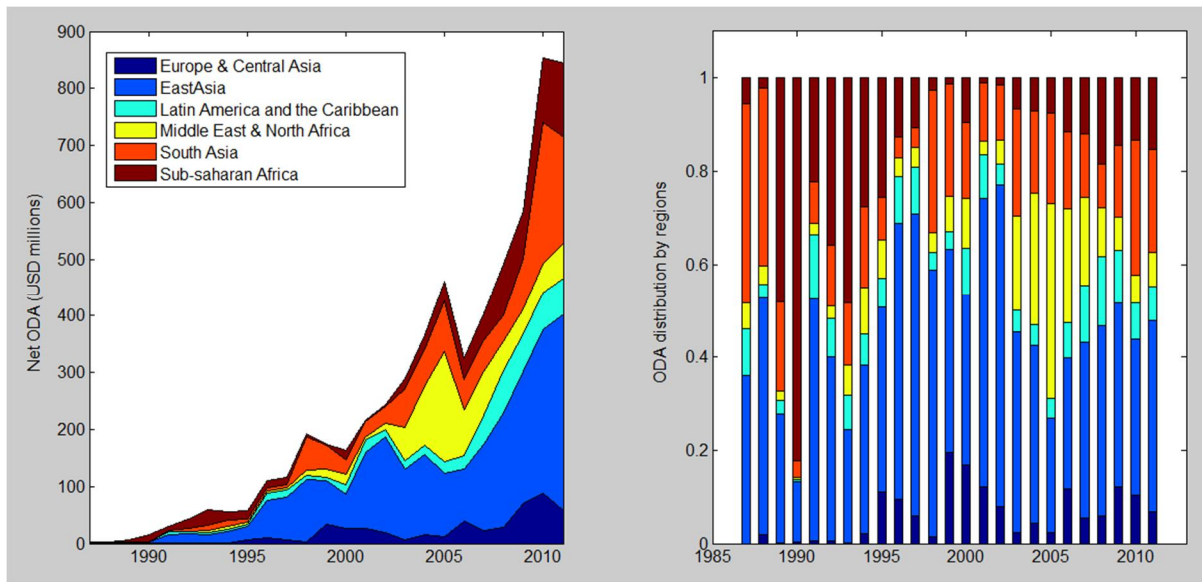


Figure 3.6 Evolution of South Korea's ODA Distribution by Geographic Regions

Similarly, Japan's aid disbursement (in constant price) across geographic regions also concentrates on Asian countries (see Figure 3.7). For the entire period, about 73% of Japan's bilateral aid was provided to developing Asian countries with 50% to East Asia and 23% to South Asia. Sub-Saharan Africa received consistent support after 1980 with an average of 19% of Japan's total bilateral aid. It seems to have a regime change in recent years (since 2006). Priorities are shifted from East Asia (14% on average) to South Asia (27% on average), Sub-Saharan Africa (31% on average), and Middle East and North Africa (15% on average, 38% in 2005, 40% in 2008).

The aid allocation across geographic regions is compared between South Korea and Japan annually from 1987 to 2011 via Kolmogorov-Smirnoff test. It fails to reject the null hypothesis of equality of distribution between these two donors level (see Table 3.3).

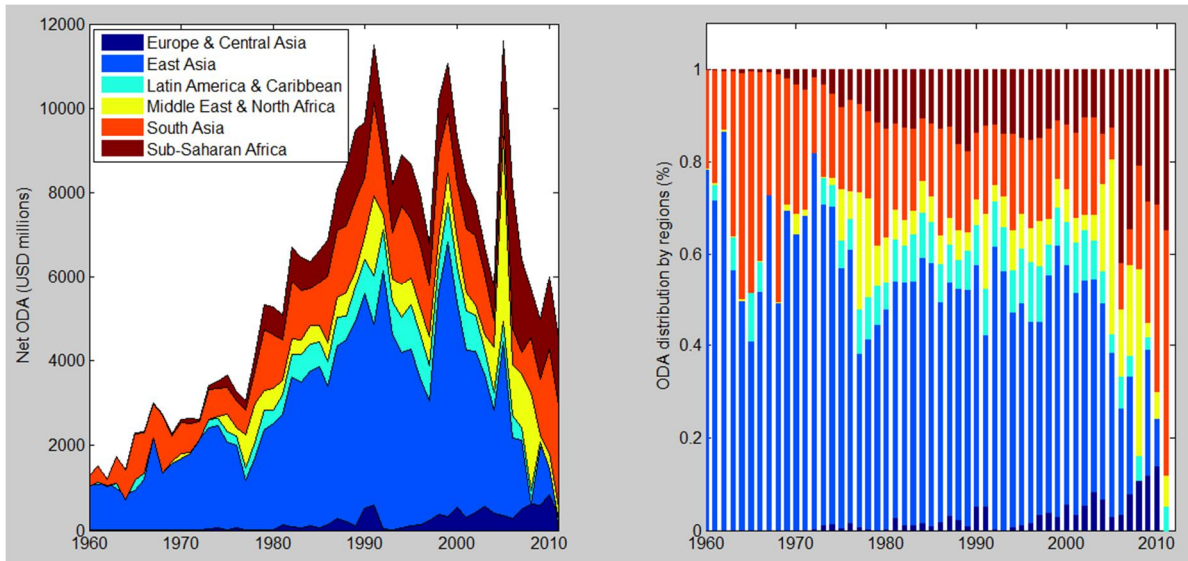


Figure 3.7 Evolution of Japan's ODA Distribution by Geographic Regions

Table 3.3

Comparisons between new donors and Japan regarding Aid Distribution across Regions

	P_value for two-sample Kolmogorov-Smirnov test
Korea / Japan	0.389
Turkey / Japan	0.000***

*** $p < .01$.

As is shown in Figure 3.8, Turkey's aid initially focused heavily on Europe and Central Asia. In the recent years, Turkey also gives reasonably proportion to South Asia and Middle East and North Africa. For example, suggested in the right panel, in the year 2011 32% of its ODA was allocated to South Asia, followed by 28% to Middle East and North Africa and 25% to Europe and Central Asia. However, it rejects the null hypothesis of equality of distribution between Turkey and Japan regarding their aid allocation across recipients' geographic regions (see Table 3.3).

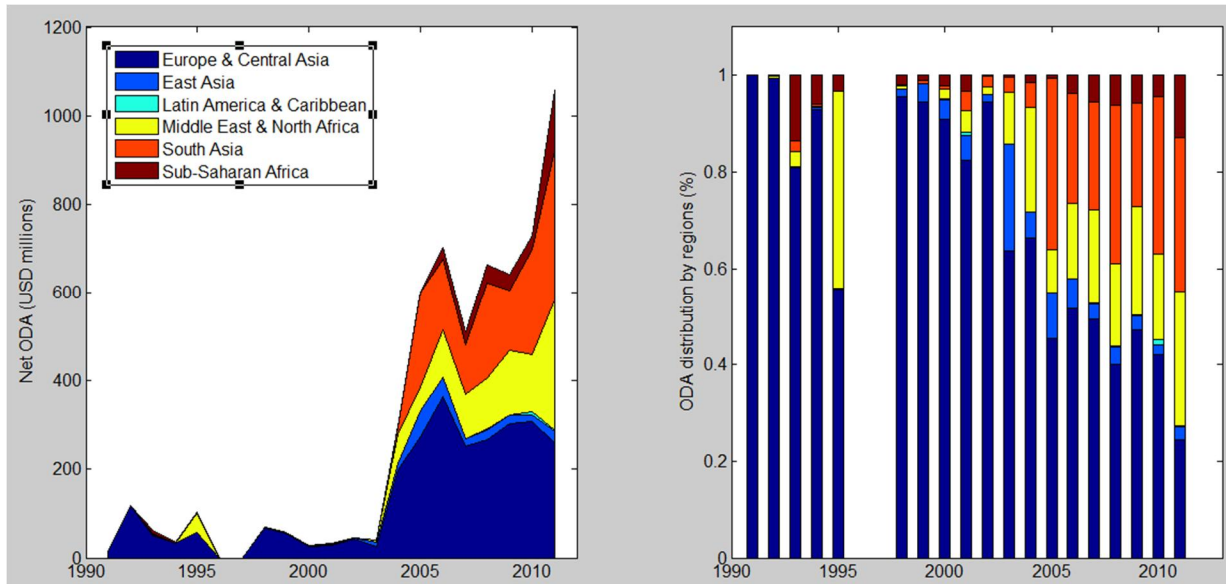


Figure 3.8 Evolution of Turkey's ODA Distribution by Geographic Regions

3.3.3 Aid Allocation by Recipients' Income Levels

Using the Atlas method, the World Bank divides economies into four income groups based on their GNI per capita: Low Income Countries (LICs), Lower Middle Income Countries (LMICs), Upper Middle Income Countries (UMICs), and High Income Countries (HICs). The thresholds for four income groups vary over time but recipient countries maintain in the same categories in general. In this section, the ODA allocation by income groups for each donor is plotted by the thresholds of 2012 GNI per capita. Such thresholds are summarized in Table 3.4. I also checked different annual thresholds and the results are consistent.

Table 3.4

Thresholds of Income Groups by the World Bank

	2012 GNI per capita
LICs	\$1,035 or less
LMICs	\$1,036 - \$4,085
UMICs	\$4,086 - \$12,615
HICs	\$12,616

Note. Data are from the World Bank Website. Retrieved from http://data.worldbank.org/about/country-classifications/country-and-lending-groups#Low_income

South Korea's aid disbursement (in constant price) by income groups is plotted in Figure 3.9. In

general, the aid volume to its recipients increased sharply during the whole period (see the left panel). The downturns appeared to coincide with the financial crisis in late 1990s and late 2000s. The right panel weighs the annual total given aid as 100%. This ignores the amount of aid and focuses only on its distribution and thus enables the analysis of its evolution. For the entire period, about 52% of Japan's bilateral aid is allocated to LMICs on average followed by 26% to UMICs, 21% to LICs, and 1% to HIEs. It is observed that South Korea initially gave the LICs and LMICs similar weight. For example, in 1987, about 37% of its bilateral aid went to LICs and 44% to LMICs. This seems to be a strong priority towards the LMICs in early 1990s as South Korea allocated about 95% of its bilateral aid to LMICs in 1990 although this number dropped to 74% in 1993. The UMICs also increased its weight since 1990s. Prior to 1993, the UMICs received an average of 12% of South Korea's total bilateral aid. This number increased to about 21%, 33%, and 60% in 1994, 1995, and 1996 respectively and remained 30% on average after that. Around the time of the 9/11 terror attack, there was a sudden increase of aid to HIEs (8% in 2001 and 10% in 2002). In recent years, South Korea has had a consistent favor towards LMICs.

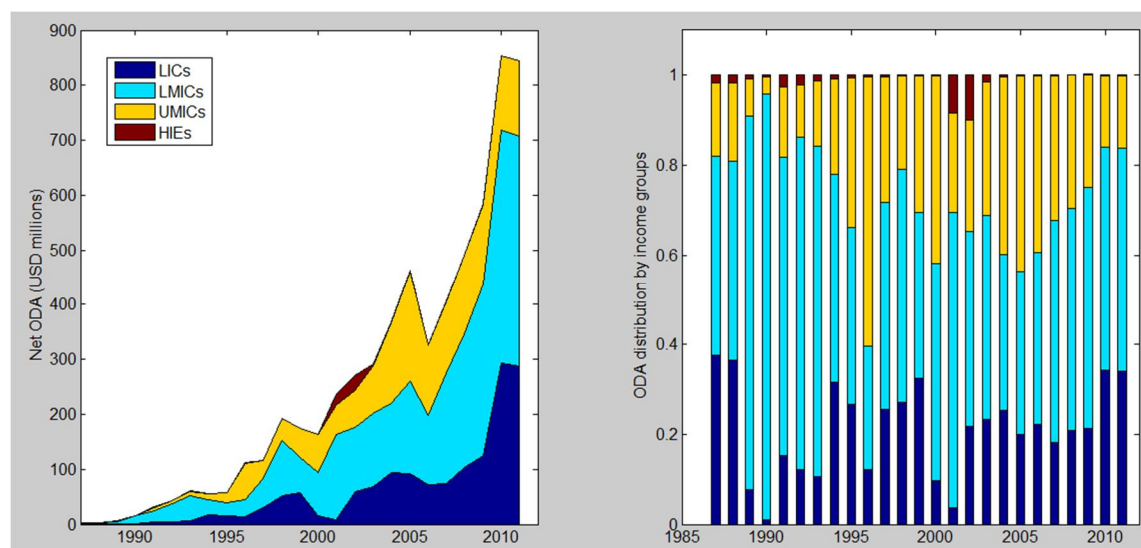


Figure 3.9 Evolution of South Korea's ODA Distribution by Income Groups

Turkey's aid allocation had strong favors for the UMICs initially. As is shown in Figure 3.10, prior to 1995, on average 72% of Turkey's aid went to UMICs with 100% in 1991. In the new millennium, this weight dropped but UMICs remained their chief attraction. Financial resources were also shared with LMICs and LICs. In recent years (since 2005), aid was distributed more equally towards LICs, LMICs, and UMICs.

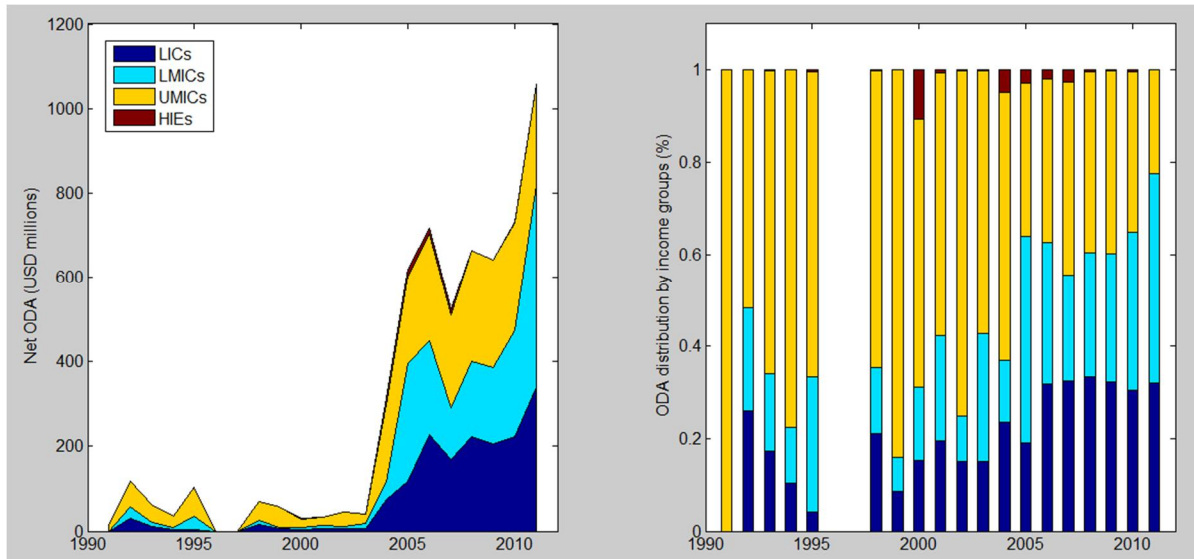


Figure 3.10 Evolution of Turkey's ODA Distribution by Income Groups

When comparing two donors aid allocation across recipients' income groups, it fails to reject the null hypothesis of equality of distribution for both South Korea and Turkey (see Table 3.5).

Table 3.5

Comparisons between new donors and Japan regarding Aid Distribution across Income groups

	P_value for two-sample Kolmogorov-Smirnov test
Korea / Japan	0.642
Turkey / Japan	0.733

*** $p < .01$.

3.4 Conclusion

The global aid system has undergone significant changes with the emergence of new donors. This essay begins to explore the motivation of new donors and to evaluate the impact of new donors on the current foreign aid system. This essay chooses two nations: South Korea and Turkey. Unlike emerging economies such as China and India, whose reliable quantitative data are hard to find, South Korea and Turkey have well-defined ODA programs, efficient development agency to finance their aid, as well as comprehensive statistical reporting system. Moreover, South Korea is an important case because it is the first nation which successfully completed the transition from an aid recipient to a donor and eventually joined DAC. Given this specific history, it is important to examine whether such a recipient-

turned donor would have a different perspective on the needs of recipients' countries when compared to traditional donors.

Besides the goal of poverty reduction, donors may have certain strategic considerations when determining their aid allocation. Such political and strategic considerations could be reflected in their aid distribution across recipients' geographic regions and income level. This essay adopts the World Bank thresholds of geographic regions and income groups to analyze the ODA allocation of South Korea and Turkey. As donors are not monolithic, it is not surprising to find that South Korea and Turkey have different aid delivery patterns. In the regional distribution, South Korea's bilateral aid concentrates on developing Asian countries especially East Asia in general. Comparing South Korea with its neighboring predecessor Japan, similarities include the priority to Asian developing countries although in recent years Japan has been shaping its bilateral aid from East Asia to South Asia and Sub-Saharan Africa. On the other hand, Turkey favors countries in Europe and Central Asia. A reasonable proportion of its bilateral aid goes to South Asia and Middle East and North Africa in recent years. In terms of aid distribution across income groups, South Korea favors LICs while Turkey favors UMICs.

Such findings could to some extent provide evidence that strategic considerations and even economic interests play important roles in aid determination for both South Korea and Turkey. Establishing aid relations with neighboring countries and middle income countries may help new donors create opportunities to spread their regional influence, promote international trade, and facilitate the Foreign Direct Investment (FDI). In fact, some papers find that strategic considerations as well as the trade and investment concerns with recipient countries are important determinants for aid for South Korea and Turkey (Chun, et al., 2010; Kang & Lee & Park, 2011; Kulaklikaya & Nurdun, 2010; Park, et al., 2008).

This essay finds little evidence regarding the change in aid patterns following systemic shock. On one hand, the 9/11 terror attack moderately changed the ODA allocation by geographic regions for South Korea but not Turkey. On the other hand, both donors disbursed less aid volume following the recent financial crisis but maintained the same distribution pattern.

When comparing with traditional DAC donors, this essay did not find adequate evidence that new donors have less strategic considerations and economic interests. This is in line with the finding in Walz

and Ramachandran (2011) that South Korea and Turkey constitute DAC followers. Although this essay mainly focuses on the cases of South Korea and Turkey, it could shed lights on a broader exploration of other emerging donors such as the Estonia, Hungary, Poland, and Slovenia.

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