Do Foreign Aid and Globalization Affect Health in Developing Countries?

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Abstract

Health plays a crucial role for human development. Therefore, foreign aid is often directed to combat ill-health in the developing world. At the same time, globalization is a strong force that may affect health through various channels. But the two factors may also be interrelated. In this paper, I analyze the relationship between foreign aid, globalization, and health by estimating a fixed effects panel data model over 93 aid recipient countries between 1970 and 2009. As an important extension to previous studies, I include an interaction term of the two variables that turns out to be highly significant. In addition, I investigate what the relationship looks like for three different dimensions of globalization (economic, social, and political). The correlation between aid and health is negative at high levels of overall globalization. Overall globalization is positive for health at low levels of aid. The relationship is similar when looking at economic and social globalization. For the social dimension, though, lower levels of globalization generates a positive correlation between aid and health and high levels of aid leads to a negative relationship between social globalization and health. Political globalization is positively related to health at all levels of aid, but the interaction effect is insignificant. A battery of sensitivity analyses suggests that the results are fairly stable toward specification and sample alterations.

Keywords: Foreign Aid, Globalization, Health, Developing Countries

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Nomenclature

FDI Foreign Direct Investments

HDI Human Development Index

LAC Latin America and Caribbean

MDGs Millennium Development Goals

MENA Middle East and North Africa

ODA Official Development Assistance

SSA Sub-Saharan Africa

WDI World Development Indicators

1 Introduction

Health is an essential factor for human development. Three of the eight UN Millennium Development Goals (MDGs) that were introduced in 2000 directly focus on reducing ill-health and six of the goals relate to other health issues. To meet the MDGs by 2015, the amount of aid directed to improve the health of people in poor countries has been scaled up and there has been an increased focus on health related development issues (Kawachi and Wamala, 2007). At the same time, the progression of globalization is a strong force in shaping the economic, social, and political interactions between countries across the globe and it is widely accepted that globalization affects health and human development, especially in developing countries. Developing countries are often encouraged to take a larger part in the globalization process in order to benefit from the gains of greater integration into the world economy (see e.g. Stiglitz, 2002).

Moreover, foreign aid and globalization may affect each other's influence on health. Dollar and Pritchett (1998), among others, advocate that donors of foreign aid should aim at directing their resources to countries with sound economic policy environments, which includes trade openness in terms of liberal trade policies, for aid to be more effective in combating low levels of development and ill-health in the developing world. In addition, Alesina and Dollar (2000) find that open trade policies is a criterion for receiving foreign aid. Such arguments indicate that there may be numerous ways in which the two can influence health alongside each other, as well as interesting impacts on health from the interaction of aid and globalization. Therefore, potential interaction effects are essential to examine since aid recipient countries become increasingly globalized and are encouraged by the donor community to take greater parts in the progression of globalization in various ways.

In this paper, I aim to disentangle the relationship between foreign aid, globalization, and health to investigate whether foreign aid and globalization interact to influence health in developing countries. Globalization is a complex phenomenon and is analyzed using three dimensions: economic globalization, social globalization, and political globalization. Economic globalization refers to the trade in goods and services and flows of foreign direct investment (FDI) across the world, social globalization refers to the process of how integration across countries affect norms and cultural values in society, and political globalization is when economies become more politically integrated through e.g. involvement international organizations. Here, I employ both a measure of overall globalization and measures separating globalization into its three components.

The empirical set-up is a fixed effects panel data model covering 93 aid recipient countries

over the 1970-2009 period. To examine if there are any interaction effects of foreign aid and globalization on health, I extend the previous literature by interacting the aid and the globalization variables. In addition to the principal variables of interest, I include a rich set of control variables, believed to be important determinants of health in developing countries.

This study relates to the economic literature on foreign aid effectiveness in improving physical health and human development as well as the literature on the impact on health of globalization. Many related studies focus on the effects of foreign aid on health or how globalization influence health but, to my knowledge, nobody analyze a possible interaction effect between foreign aid and globalization in relation to health in developing countries. Also, no other study investigates the influence foreign aid may interact with the three different dimensions of globalization to influence health.

The remainder of the paper is structured as follows. The next section describes the theoretical background of how foreign aid and globalization, along with the interactions of the two, are expected to influence health in developing countries. In section three, related research is discussed, followed by the empirical specification presented in section four. Section five presents the data and variables used in the empirical estimations, and section six gives the results and empirical analysis. A sensitivity analysis is found in section seven, which is followed by my conclusions in the eight and final section.

2 Theoretical Background

Many developing countries depend on external financing in the health sector (Mills, 2011). Aid flows are therefore important for health service provision and, presumably, for determining population health in developing countries. At the same time, other fundamental health determinants may be affected by the comprehensive and multidimensional progression of globalization. This section disentangles the effects of foreign aid and globalization on health outcomes in developing countries. In addition, I elaborate on potential interaction effects of the two factors.

There are many health determinants in developing countries. Fayissa and Gutema (2005) present a macro-level health production function, in line with the original micro-level model derived by Grossman (1972), in which population health, h, in developing countries is described by:

$$h = F(Y, S, V) \tag{1}$$

where Y represents economic variables, S represents social variables, and V represents environmental variables. These variables are e.g. income, health expenditures, food availability, education, and urbanization. Empirical studies confirm the importance of economic, social, and environmental factors as health determinants in poor countries. For example, Kabir (2008) finds that developing countries need to create better social sector policies and programs leading to better education, supply of nutrition, and health care services, which in turn improves health. Culter et al. (2006) suggest that poor delivery of health services in developing countries, along with other social factors, e.g. nutrition and education, are important determinants of health.

The economic, social, and environmental variables described in equation 1 may all be influenced by foreign aid and globalization separately. But the effects of foreign aid and globalization may also interact to influence health in poor countries.

2.1 Health Impacts of Foreign Aid

Theoretically, aid relax the recipient government's budget constraint and raise income that can be spent on health and other social expenditures. Public spending on e.g. health, education, and water sanitation may therefore be a key channel through which aid can improve health in developing countries (Gomanee et al., 2005). However, Boone (1996) finds that aid raises government consumption but not for the benefit of the poor, which may indicate little room for health improvements. Boone (1996) also suggests that aid inefficiency may be a sign of political elites benefitting from aid flows, while the lowest income quantiles do not receive their share of the additional resources from foreign aid. Such a situation, where only a small group gain from the external financial support in term of aid flows, may explain circumstances where aid fails to have a positive impact on health outcomes in poor countries.

The political regime of the aid recipient country may play a role and democratic checks and balances are often described as necessary to ensure that resources reach their intended recipients (e.g Boone, 1996; Svensson, 1999). In line with this argument, Kosack and Tobin (2006) suggest that aid works better for human development in a democratic environment since democratic governments tend to spend more on social development than autocracies. This is supported by findings indicating that democracies are healthier than autocracies (see e.g. Zweifel and Navia, 2000; Besley and Kudamatsu, 2006). Also, Kosack (2003) finds evidence of a positive effect on the growth in the Human Development Index (HDI) of aid in democratic countries. Nevertheless, Bjørnskov (2010) shows that aid to democratic countries may benefit a political elite, which may also mainly lead to aid being ineffective in combating ill-health.

If aid gives rise to economic growth in recipient countries, this is another channel through which aid may relax the governments' budget constraints. In addition, growth raises the wealth of the population enabling an increase in private consumption of goods and services that improves health outcomes, e.g. more and healthier food, health care, and vaccination. However, the question of whether aid generates growth is a widely debated question in the economic literature. While Burnside and Dollar (2000) find that aid is beneficial for economic development in a sound economic policy environment (with low inflation, balanced budget, and openness to trade), others, e.g. Easterly et al. (2004), question these results stating that aid has no significant relationship with growth. Dalgaard et al. (2004), show that aid has had a positive impact on productivity whereas Rajan and Subramanian (2005) find results in line with Easterly et al. (2004) indicating that aid has no significant effect on growth in any policy environment. Any effect of aid on health running through the growth channel is thus dependent of the effects of aid on growth, which is yet to be settled.

Another line of reasoning comes from, among others, Culter et al. (2006) and Acemoglu and Johnson (2007). They argue that growth in income cannot explain all improvements in health in poor countries over the last few decades. Other social and environmental factors have been at least as important. Aid to developing countries may have a direct effect on physical health by providing assistance in the form of health interventions such as vaccination programs, water sanitation, and maternal health projects (Mishra and Newhouse, 2009). Mishra and Newhouse (2009) find that aid directly aimed at the health sector has a significant effect on health. On the contrary, Williamson (2008) and Wilson (2011) find no such effects of health sector aid on health. There may also be a long-run effect of aid directed to other social sectors. For example, improving the level of education is likely to have a positive long-run impact on health.

As described above, there are many arguments suggesting that aid is good for health in developing countries. Nonetheless, external dependence on aid flows in financing the health sector can be a cause for concern. For example, Taylor and Rowson (2009) along with Mills (2011) argue that aid volatility can be detrimental for health outcomes. Dependence on aid flows brings along difficulties with predictability, fragmentation, and the politics of donors, which, in turn, may lead to problems with planning, management, and skewed resource allocation within countries, which can cause negative outcomes in population health. Furthermore, successful health interventions like vaccination and water sanitation programs may have direct effects on health in but do little to support the domestic health sector (Culter et al., 2006). Thus, the domestic health sector stands unsupported and is ill prepared to provide further improvements in population health.

Aid may also be fungible or cause crowding out of national resources originally meant for the health sector (Dollar and Pritchett, 1998). For example, Lu et al. (2010) suggest that health sector aid has lead to reductions in the public health spending of aid recipient countries. If fungible aid lead to higher spending on military means and lower social sector spending, the health impacts may be undesirable. Nonetheless, fungible aid may still lead to positive health effects if resources are spent on other social services that benefit health outcomes. From this it emerges that foreign aid may influence health in positive but also negative directions.

2.2 Health Impacts of Globalization

The progression of globalization is multidimensional and may affect physical health in various ways. In this paper, globalization is represented by three dimensions, namely, economic globalization, social globalization, and political globalization. Naturally, the different dimensions of globalization influence the health determinants described in equation 1 but the impacts are not always easy to separate. I therefore disentangle the health impacts of globalization without always distinctly specifying which dimension of globalization may be related to which effects on health.[1]

Despite the mixed evidence on the degree health is affected by income growth, income is a determinant of health in poor countries, as illustrated by equation 1. Consequently, if globalization enables economic growth, as found by Dreher (2006), or trade liberalization and openness lead to a rise in the income level, it is likely to have a positively impact on health. This may come as a result of people consuming more healthy food and health care, as well as increased social spending by the government.

But globalization also influences government size and social sector spending and if economic globalization leads to a "race-to-the-bottom" scenario with tax competition and reductions in government spending on health and other social sector expenditures, this may have adverse health effects (Bergh and Nilsson, 2010a). For example, Rudra (2002) shows that economic integration leads to reductions in social spending in less-developed countries with poorly organized workers and ill-functioning democratic institutions and Aizenman and Jinjarak (2009) find that economic globalization has lead to a reduction in tax revenues in developing countries. Hence, in developing countries, the increased tax competition from globalization may be a greater threat to welfare spending than in more developed economies, where governments have more resources to meet

[1] In the empirical analysis, the separation is more straightforward using data on both overall globalization and the different dimensions of globalization: economic, social, and political, which enables a deeper analysis regarding the health effects of the various aspects of globalization

the threats from globalization with increased social spending (Rodrik, 1998).

Globalization can also affect health through social variables, e.g. the level of education. Increased economic and social integration may lead to greater migration opportunities, which in turn create increased incentives for education (Stark, 2004). Larger flows of information via the Internet and tourism could have a positive effect on the level of education through e.g. literacy rates, which is positive for health. On the other hand, globalization could lead to "brain-drain" where educated workers in developing countries migrate to find work where wages are higher. This may have a negative impact on the education level, which is negative for health outcomes, especially in poor countries. In addition, Mills (2011) argues that this pattern of brain-drain may have a direct negative effect on the health sector in low-income countries since international mobility among doctors and nurses historically has been high.

Environmental variables in equation 1 are also affected by globalization. Economic and social integration have, for example, lead to increased urbanization in developing countries. Greater shares of the population living in cities instead of in rural areas may enable better conditions for health care services and availability of consumption goods that have positive health effects. But, urbanization in developing countries may also lead to negative health effects due to overcrowding and poor living conditions in the slum areas of fast growing cities. One example is poor access to clean water, which often leads to faster spread of water-borne diseases threatening the health of poor people (Godfrey and Julien, 2005).

There are other channels that may be important for how health outcomes in developing countries are affected by globalization. For example, Deaton (2004) argues that the transmission of health technology and knowledge is crucial for health improvements in the world. All dimensions of globalization may contribute to facilitate knowledge and technology transfers around the world. Therefore, medical treatments and pharmaceuticals may spread faster due to the progression of globalization. This is assumed to be positive for health in developing countries with poor access to existing and new health technologies and medical treatments that could save many lives. Owen and Wu (2007), e.g., find a positive relationship between health and trade openness, and the effect seems to be larger in poor countries compared to richer countries in their sample. Their results also imply that one of the channels through which increased trade and openness affects health positively is technology transfers and knowledge spillovers from trade.

Economic globalization affecting trade patterns may influence the supply of food and adjust relative food prices in developing countries. This may shape nutrition intakes that influence health outcomes in both positive and negative directions. In addition, social globalization may

have an impact on cultural and social conventions in society, which could lead to changes in nutrition intakes from increased consumption of food rich on sugar and saturated fats (Bergh and Nilsson, 2010a; Hawkes et al., 2009). Economic and social integration has also lead to increased consumption of bads, e.g. tobacco, in developing countries, which has lead to increases in cardiovascular disease and cancers (Yach et al., 2007).

The increased exchange of goods and people across countries have lead to faster and more effective ways for infectious diseases, e.g. HIV and SARS, to spread around the world. This could be a serious threat to developing countries where health systems are ill prepared to handle large scale outbreaks of disease (Saker et al., 2007). In addition, greater political integration through multilateral and bilateral agreements on health and other global issues may threaten countries in weak positions to defend their national health interests in international negotiations. For example, intellectual property rights governing the use of pharmaceuticals could stop developing countries from accessing cheap generic drugs that could improve the health of many people (Dollar, 2001). Yet, increased international cooperation and political integration on strategies for how to combat the larger and wider spread of communicable diseases could be positive for health. Therefore, as with foreign aid, the health impacts of the different dimensions of globalization may be both positive and negative.

2.3 Health Impacts of the Interaction of Foreign Aid and Globalization

As described above, both foreign aid and globalization may influence all of the health determinants in equation 1. But these factors are also likely to interact in shaping health in developing countries. It is therefore essential to include the interaction effects of foreign aid and globalization on health.

Certain aspects of globalization may be preconditions for foreign aid to improve health in aid recipient countries. For example, Dollar and Pritchett (1998) argue that open trade policies, along with other sound economic policies, are necessary for aid to be effective in combating ill-health in developing countries. In line with this argument, economic globalization with more open trade policies may be essential to make more trade and investments in health technology available, which, in turn, may be a precondition for aid to influence health positively. Also, Deaton (2004) argues that globalization would have an essential and positive impact on global health if it accelerates the transmission of health technology from developed countries to developing countries. Thus, aid may play an important role in the process of improving health in globalized developing countries if it contributes to making more and better health technologies

and medicines available in poor countries. Globalized countries may in this way benefit more from aid than less globalized countries and the effects of being both globalized and receiving foreign aid may be larger than if the effects were simply woking side by side. Social globalization leading to increases in literacy rates and higher levels of education (Stark, 2004) in the aid recipient countries may enable better use of resources from foreign aid and thus lead to improvements in health. Economic, social, and political globalization may also enable faster spread of more and better health knowledge among the population, which can come to use if increased resources are made available through aid flows and direct health interventions.

Nevertheless, in a country where social globalization spreads more and better health knowledge and leads to healthier behavior of the people, foreign aid may contribute to offset this effect if large amounts of aid is directed to create more and better health care services, people may start to expect that health care services will automatically generate better health and alter their behavior in a negative way believing that the health care system will take care of their adverse health when it occurs. This moral hazard situation implies a negative interaction effect on health in more globalized countries that receive large amounts of foreign aid.

There are also situations where globalization may be negative for health, which in turn could lead to negative conditions for foreign aid to improve health. For example, if economic globalization leads to tax competition and less social spending, as found by e.g. Rudra (2002) and Aizenman and Jinjarak (2009), the circumstances for foreign aid to generate health improvements are reduced and the interaction effect of foreign aid and economic globalization may be smaller than if the effects only took place alongside each other. In addition, if globalization leads to large problems of e.g. brain-drain in the health sector (Mills, 2011), the conditions for foreign aid to combat ill-health in developing countries may be poor and combined with the potential harmful effects of volatile and unmanaged aid, the negative interaction may be problematic. Globalization causing rapid spreads of communicable as well as noncommunicable diseases could also cause an environment where aid is less likely to benefit health the more globalized the aid recipient is.

Positive effects of globalization may be enhanced by foreign aid flows and create a positive interaction effect of the two factors. Deaton (2004) describes how globalization will generate important medical technology transfers in developing countries. However, Culter et al. (2006) reason that the problem is not primarily that there are not enough medicines and treatments available at affordable prices, but that the necessary treatments and medicines fail to reach the people most in need. Hence, under these circumstances, more globalized developing countries

may benefit from aid flows and the interaction effect may be positive for health. On the other hand, if aid flows are volatile and badly managed, the conditions for globalization to benefit health may be reduced with the level of foreign aid and, hence, generate a negative interaction effect.

3 Related Research

A large number of empirical studies investigate the effects of foreign aid on human development indicators such as the HDI and infant mortality, and there are studies particularly focusing on the health impacts of aid in developing countries. The potential impacts of globalization on health have also been debated in the economic literature and there are a few studies discussing how globalization may impact health in developing countries. However, as far as I know, there are no studies examining the interaction effect of foreign aid and globalization on health.

The empirical literature on foreign aid and health shows mixed results on the effects of total bilateral and multilateral foreign aid on health in developing countries. For example, Masud and Yontcheva (2005) examine the effects of annual total bilateral aid and NGO aid in a panel of 58 countries over the 1990-2001 period. Their results indicate that total bilateral aid has no impact on infant mortality, while NGO aid does seem to have a positive effect. They test for endogeneity in the aid variables but find none. Gomanee et al. (2005) investigate the effects of aid on human welfare, measured by the infant mortality rate and the HDI. They estimate a fixed effects model of 104 countries for the period 1980-2000 (four four-year periods and one five-year period) and their results indicate that aid is associated with lower infant mortality, but the results do not seem to be altogether robust to various model specifications and subsamples. Although aid seems robustly related to a higher HDI, the interpretation of the health effects of this result is problematic because HDI is an index comprising of life expectancy, GDP per capita (PPP US$), literacy, and primary, secondary, and tertiary school enrollment. Gomanee et al. (2005) do not discuss the potential endogeneity of aid.

A similar mixed picture holds for the health effects of foreign aid directly aimed at the health sector. A few studies discuss the impact of health sector aid on health in developing countries. Williamson (2008) uses a panel over six five-year periods and one two-year period between 1973 and 2009 and 208 countries, where not all countries are aid recipients, to analyze the health effects of health sector aid. Health is measured by infant mortality, life expectancy at birth, the death rate, and level of immunization among the population. The endogeneity of aid is handled

by applying lagged values of the aid variable as instruments and her findings show that aid to the health sector cannot be argued to have had an impact on health and neither can overall aid. In contrast, Mishra and Newhouse (2009) find positive effects of health aid on health in developing countries, measured by infant mortality. They estimate a system GMM model using a panel of 118 countries over six five-year periods between 1975 and 2004. This method can control for endogeneity and include a lagged dependent variable as a regressor, but is nonetheless still sensitive to reverse causality. Similar to Williamson (2008), Mishra and Newhouse (2009) fail to find a positive health effect of overall aid. Moreover, Wilson (2011) show that health aid does not seem to have a significant effect on health, and also, that health aid seems to follow health improvements instead of causing them. His sample covers 96 aid recipient countries over one two-year period and five five-year periods between 1973 and 2004.

Foreign aid may affect health differently depending on the economic environment in the aid recipient country. This is investigated by Burnside and Dollar (1998) who analyze the effects of aid and the importance of sound economic policies on poverty reduction using infant mortality as a proxy for poverty reduction. Employing a panel of 56 aid recipients in six four-year periods (1970-1993), the results suggest that aid has a positive effect on reductions in infant mortality in a sound economic policy environment with low inflation, low corruption, open trade policies, and budget surplus. To control for the endogeneity of aid, they apply instrumental variables while treating policy as exogenous. Their results may indicate that openness is a precondition for aid to affect health positively, but because their openness variables is the Sachs-Warner measure of trade openness, which takes the value one if the country is open and zero if it is not (Sachs and Warner, 1995), the openness measure is open for criticism as it does not allow for variation in levels. In addition, the policy specification does not allow for further discussion on the particular characteristics of trade openness that could be positive for enabling health improvements from foreign aid.

The disaggregated dimensions of globalization also influence health in poor countries in different ways and this is discussed by some studies in the economic literature. The effects of openness to trade, measured as trade volumes in relation to GDP, on health are investigated by Owen and Wu (2007). Their results indicate that economic integration and openness is positive for health, measured by life expectancy and infant mortality, and that the effects are larger in poor countries. Their sample consists of 219 countries from 1960 to 1995 (five-year intervals). The results further suggest that knowledge spillovers and aid (to water resources) are potential channels through which openness benefits life expectancy and infant mortality. Using the KOF

index of globalization, Bergh and Nilsson (2010a) find that overall globalization is positively related to life expectancy. Their sample consists of high, middle, and low income countries, and the results seem to hold for rich as well as for poor countries included in the analysis. In addition, their analysis, in line with Owen and Wu (2007), indicates that economic globalization is the driving force of the positive effects of overall globalization on health. Tsai (2007) also applies the KOF index of globalization, but investigates its effects on HDI instead of pure health variables. His sample consists of 112 countries in three ten-year waves, i.e. 1980, 1990, 2000. His findings imply that overall globalization and political globalization are positively associated with higher levels of HDI. The effects also seem larger in developed than developing countries. Nevertheless, because it is difficult to clarify the health effects of HDI improvements, the interpretation of Tsai's (2007) results is problematic.

The mixed empirical findings on the impacts of foreign aid and globalization on health suggest that further investigation is necessary. But the empirical findings discussed here also implies that the potential health impacts of the interaction between foreign aid and globalization need to be examined empirically since this is a blank spot in the economic literature.

4 Empirical Specification

In this section, I present the empirical model. The section also includes a brief discussion on the interaction term between foreign aid and globalization. In addition, I discuss some of the limitations of this study and how they affects the interpretation of the results.

4.1 The Model

To investigate the potential relationship between foreign aid, globalization, and the interaction effects of aid and globalization on health in developing countries, I estimate a panel data model using the following empirical specification:

$$h_{it} = \alpha + \beta_1 A_{it-1} + \beta_2 G_{it-1} + \beta_3 A_{it-1} * G_{it-1} + X_{it-1}\beta_4 + Z_{it}\beta_5 + \gamma_i + \alpha_t + \epsilon_{it} \qquad (2)$$

where the health variable, h_{it} is explained by lagged foreign aid, A_{it-1}, lagged globalization (the overall or different dimensions of globalization), G_{it-1}, the interaction term of foreign aid and the globalization measures, $A_{it-1} * G_{it-1}$, and two sets of control variables in vectors X_{it-1} and Z_{it}. γ_i is the country specific effect, α_t represent period dummies in the specification and α

is the constant. As usual, ϵ_{it} is the error term. The different measures of globalization, i.e. overall globalization and the three different dimensions, are investigated in separately and are not included simultaneously.

To avoid problems with measurement errors and annual fluctuations in the explanatory variables, each time period, t, is an average of five years. This is commonly applied in the economic literature on the relationships between aid, globalization, and health (see e.g. Williamson, 2008; Mishra and Newhouse, 2009; Bergh and Nilsson, 2010a). Because neither aid nor globalization are expected to affect health instantly, these variables, along with the interaction of the two variables, are lagged one period so that the variables in period 1970-1974 explain average health between 1975-1979. This setup also reduces problems of reverse causality between the health outcomes and the aid and globalization variables, as described by e.g. Bergh and Nilsson (2010a) and Mishra and Newhouse (2009).

The control variables in X_{it-1} and Z_{it} are mediators and exogenous controls, respectively. Mediators are expected to affect health but also be influenced by aid and globalization, whereas the exogenous controls are believed to influence the health variable but not be influenced by the globalization or aid variables. When mediators are included in the model, they are presumed to reduce the influence of aid and globalization on health since these are some of the channels through which aid and globalization influence health, as described in section 2. The controls found in X_{it-1} are lagged one period, while those in Z_{it} are not.

The country specific effect in equation 2, γ_i, takes into account time invariant unobservable country heterogeneity in the data. In this specification, such time invariant heterogeneity is e.g. geographic location where certain diseases are prevalent, which affects population health. This specification reduces problems of omitted variables bias. Country heterogeneity can be accounted for by applying the random or fixed effects estimators in panel data models. The underlying assumption in the random effects estimator is that the country specific effects are uncorrelated with the explanatory variables and therefore placed in the error term. On the contrary, the fixed effects estimator does allow for the specific effects to vary alongside the explanatory variables and they are therefore isolated from the error term. In my estimations, I apply the fixed effects estimator since the country heterogeneities in my sample are not expected to be independent from the variations in the explanatory variables in the model in equation 2. This is confirmed by a Hausman test in all estimations. The panel data model also allows for the use of time period effects, α_t, which control for effects that are common to all countries in the sample (Kennedy, 2008).

An essential part of the model is to analyze how foreign aid influence health depending on the level of globalization. This part of the analysis depends largely on the interaction term between aid and the measures of globalization, as described in equation 2. As can be derived from specification in equation 2, the marginal effect of foreign aid on health is given by $\partial h_{it}/\partial A_{it-1} = \beta_1 + \beta_3 G_{it-1}$, which means that the impact of aid on health depends on the levels of the globalization variable, G_{it-1}. For this marginal effect, a confidence interval can be calculated using $var[\beta_1 + \beta_3 G_{it-1}] = var[\beta_1] + G^2_{it-1} var[\beta_3] + 2G_{it-1} cov[\beta_1, \beta_3]$ (see e.g. Friedrich, 1982). This confidence interval illustrates whether the marginal effect of foreign aid is statistically significantly different from zero at various levels of globalization.

4.2 Limitations

Many studies investigating the effects of aid on various factors of development have pointed to the problem of reverse causation between aid and the variables of development. Researchers often attempt to solve this problem by applying instrumental variables. In such situations, the variables applied as instruments should preferably be highly correlated with the aid variable but not with the indicator of development or, as in this case, health. The same difficulties appear when one wishes to sort out the causality between globalization and health. In this study, I am particularly interested in the interaction effects of foreign aid and globalization on health, which makes it problematic to use instrumental variables because there are no reasonable instruments for the interaction variable. Therefore, the causal effects from the results in this empirical analysis should be considered with some caution. It is nonetheless important to investigate the relationship between aid, globalization, and health, and especially the interaction between foreign aid and globalization and the relationship with health, because it gives an indication of what the correlation looks like. This is essential as countries receiving large amounts of foreign aid to promote health improvements, at the same time, are becoming increasingly integrated in the world economy. Thus, the two factors occur simultaneously and the interaction of the impacts on health need to be highlighted in order to identify the true effects. In addition, the results from the estimations on the interaction variable between aid and globalization may give an indication of the nature of the causal relationship and point toward future areas of economic research on the health effects of aid and globalization.

Another issue, as pointed out by other researchers, is that estimating this type of empirical model with the system GMM estimator allows for the use of a lagged dependent variable as an explanatory variable along with country specific effects without imposing endogeneity bias

as in the case of the fixed effects estimator with a lagged dependent variable (e.g. Mishra and Newhouse, 2009; Dreher and Gaston, 2008; Bergh and Nilsson, 2010b). The system GMM estimator uses the lagged levels of the regressors as instruments for the first-difference regressors and the first-differences of the regressors as instruments for the lagged levels of the regressors in a single equation system. It can be applied in situations with a large number of countries and small number of time periods. The system GMM estimator is, however, very sensitive to overidentification of instruments (Roodman, 2009). Despite limiting the number of lags used as instruments in the estimations, the problem of overidentification is fundamental when employing the system GMM estimator in this empirical set-up. In addition, applying a large number of lags as instruments will lead to loss of information in the model. The estimator is also sensitive to serial correlation, which, if present, may lead to inconsistent estimates (Roodman, 2009). In this paper, the problems of overidentification of instruments and serial correlation in the regressors are eminent and the system GMM estimator is therefore not employed.

With regard to the limitations to the model specification discussed here, I argue that the most suitable empirical specification in this paper is the fixed effects estimator described above.

5 Data

5.1 Patterns of Foreign Aid Flows, Globalization, and Health

The figures 1(a) and 1(b) illustrate patterns of total aid flows and globalization in low, medium, high, and very high mortality countries over the 1970-2009 period. Countries are separated into the low, medium, high, and very high mortality group based on the average infant mortality rate over the whole period. The low mortality group consists of countries with average infant mortality rates up to 35 deaths per 1000 live births, countries with average infant mortality rates between 35 and 60 belong to the medium mortality group, the high mortality countries have average infant mortality rates from 60 to 90, and the very high mortality group of countries have rates starting at 90 and ending at 163 deaths per 1000 live births. Information on which countries that belong to which group can be found in table A.1 in appendix A.

Looking at figure 1 (a), low mortality countries have received the lowest amount of aid in the sample, whereas the high mortality group seems to have received more aid than the very high mortality group up until the beginning of the 1990s. After that, very high mortality countries have received more aid than high mortality countries.

As can be seen in figure 1 (b), the patterns of globalization over the 1970-2009 period are, as expected, more stable than aid flows. For the four mortality groups, the figure shows the average levels of globalization. The low mortality countries are the most globalized, followed by the medium mortality countries, high mortality countries, and finally, the least globalized group, the very high mortality countries. It is also interesting to note the very similar patterns of globalizations across the groups with different mortality. Between the 1970s and early 1990s, all mortality groups became more globalized at a steady pace, which the increased after the mid-1990s until the end of the period in 2009.

5.2 Variables and Data Sources

I use an unbalanced panel data set covering 93 aid recipient countries over eight five-year time periods between 1970 and 2009: 1970-1974, 1975-1979, 1980-1984, 1985-1989, 1990-1994, 1995-1999, 2000-2004, and 2005-2009. A complete list of countries included in the sample can be found in table A.1 in appendix A. I employ the Hadi method for multivariate outlier detection (Hadi, 1992). At the 1 percent significance level, I identify and consequently drop two outliers from the sample, China 1980-1984 and Kuwait 1990-1994[2]. Table 1 gives descriptive statistics on the variables included in the empirical analysis.

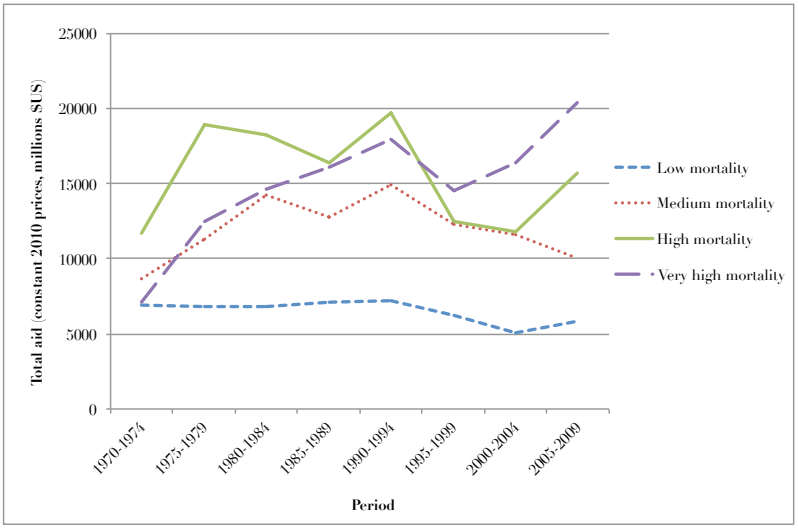
Table 1: Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min.	Max.
Infant mortality rate (per 1000 live births)^L	500	3.850	0.776	1.078	5.236
Child mortality rate (per 1000 live births)^L	500	4.170	0.892	1.297	5.795
Life expectancy at birth (total population)^L	500	4.109	0.169	3.363	4.376
Aid per capita^L	489	-3.395	1.323	-7.843	0.111
Aid as share of GDP	494	0.040	0.055	-0.001	0.462
KOF	500	42.225	12.552	13.117	77.761
KOF1	468	43.852	15.748	10.031	84.182
KOF2	500	56.382	17.134	16.117	92.958
KOF3	500	31.256	14.252	7.994	81.428
Real GDP per capita (PPP adjusted)^L	500	7.901	1.012	5.656	10.673
Dependency ratio	500	77.591	17.165	32.153	120.927
Urban population	500	44.274	21.625	3.640	98.240
Number of physicians per 1000 people^L	500	-1.116	1.479	-4.962	1.856
Nutrition (avg. daily calorie intake per capita)^L	500	7.793	0.169	7.363	8.221
Avg. years in school (total population, years 15+)^L	500	1.556	0.573	-0.665	2.447
Avg. years in school (female population, years 15+)^L	500	1.374	0.754	-1.599	2.438
Democracy	500	0.325	6.636	-10	10
Government consumption	500	10.640	5.827	2.658	40.225

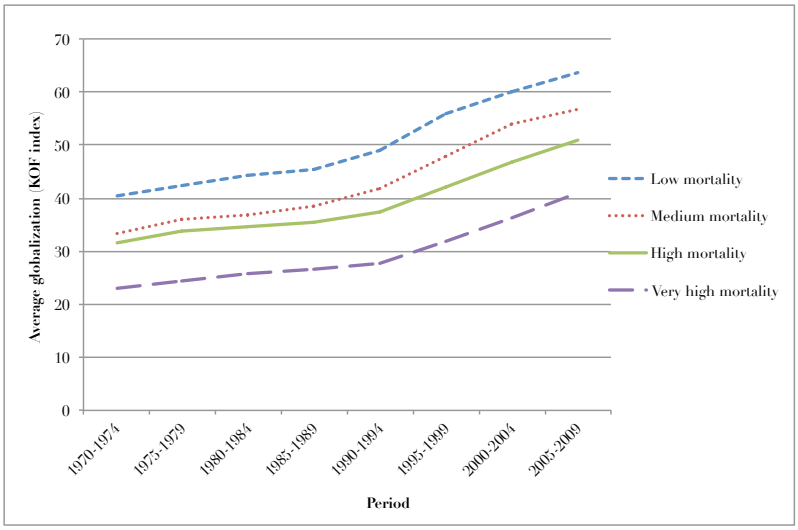
^{L}Variable is in natural logarithms

[2]The removal of the two outliers does not affect the conclusions.

Figure 1: Patterns of Foreign Aid flows, Globalization, and Infant Mortality 1970-2009



(a) Foreign Aid Flows and Infant Mortality, 1970-2009



(b) Globalization and Infant Mortality, 1970-2009

5.2.1 Dependent Variable: Health

The dependent variable, health (h_{it} in equation 2), is proxied by the infant mortality rate, i.e the number of infants dying before reaching one year of age per 1000 live births. The infant mortality rate is a good indicator of the health conditions of the poor, which makes it suitable for investigating health in developing countries (Boone, 1996). In addition, infant mortality explains large parts of improvements in life expectancy in poor countries over the past 50 years (Culter et al., 2006). Furthermore, Mishra and Newhouse (2009) reason that the measure is better suited for cross-country comparisons of health in developing countries than life expectancy since changes in life expectancy have taken place following reductions in mortality among different age groups in different countries. As a sensitivity analysis, I also use life expectancy at birth (of the total population) and the child mortality rate, defined as the number of children dying before reaching 5 years of age per 1000 live births. Data on all health variables are collected from the World Bank's World Development Indicators (WDI) database (The World Bank, 2011). As commonly applied in the empirical literature on aid and infant mortality, the infant mortality variable is expressed in natural logarithms (see e.g. Mishra and Newhouse, 2009; Masud and Yontcheva, 2005).

5.2.2 Independent Variables: Foreign Aid and Globalization

Data on aid flows are gathered from the OECD DAC database on bilateral and multilateral flows of official development assistance (ODA). ODA is defined as flows provided by official agencies, including state and local governments, with economic development and welfare of developing countries as their main objective, that is concessional in character and conveys a grant element of at least 25 percent (OECD, 2012). The ODA data is net disbursements[3] and measured in constant 2010 US dollars. This variable is expressed in per capita terms and in natural logarithms, which is standard in the literature on aid effectiveness and health (see e.g Williamson, 2008; Mishra and Newhouse, 2009; Masud and Yontcheva, 2005). This allows for the interpretation of the coefficient estimate of aid as elasticities since the health variable, i.e. the infant mortality rate, is also in natural logs. In addition, as a sensitivity analysis, the aid per capita measure is replaced by aid measured as a share of GDP.

For the different globalization measures, I use the KOF index of globalization developed by Dreher (2006) and updated in Dreher et al. (2008). The composite index covers three di-

[3]Repayments of ODA loans is measured as negative flows and deducted from the total inflow of ODA yielding the net ODA.

mensions, economic globalization, social globalization, and political globalization, with equal weights. Economic globalization is measured by e.g. trade flows, FDI flows, and trade policies, social globalization is represented by e.g. tourism, telephone calls, and Internet usage, and political globalization is given by e.g the number of embassies and memberships in international organizations. The composite as well as the disaggregated indices take values between 0 and 100, where a higher value represents a higher degree of globalization. The composite index is used as a measure of overall globalization and the disaggregated indices are used to investigate the different dimensions of globalization. More details about the KOF index of globalization can be found in table A.2 in appendix A.

The aid per capita variable and the various measures of globalization are multiplied to form the interaction term between the two, as described in equation 2.

5.2.3 Control Variables

A number of control variables are included in the model to account for factors that are important in explaining the level of health in developing countries. The real GDP per capita (PPP adjusted) is included to control for the level of economic development. This data is published by Heston et al. (2011) and it is expressed in natural logarithms. Higher GDP per capita is expected to be positively associated with health, and hence negatively associated with the health variable, infant mortality. A variable measuring the number of physicians per 1,000 people is introduced to control for the availability of doctors and health services in developing countries and this data is collected from the WDI. Food supply is also an essential determinant of health in poor countries, and I control for this using a measure of the average nutritional status of the population, namely, the national average daily intake of calories per capita. Data on food supply is published by the Food and Agricultural Organization of the UN (FAO, 2011). Both the number of physicians per 1000 people and food supply are presumed to be positively related to health, and thus, a negative coefficient estimate is to be expected. Both variables are in natural logs.

To control for demographic and economic structures that may affect health in developing countries, I include the national dependency ratio, defined as the share of the young (under 15 years) and old (over 64 years) in relation to the working-age population, and the urban share of the population. The data on urban share of the population is only available every five years, e.g. 1970, 1975, 1980, etc, so to get the average for the 1970-1974 period I take a weighted average of the years 1970 and 1975. These data are gathered from the WDI database. The dependency ratio is believed to be negatively associated with health, since a larger share of young or old

in relation to the working age population is likely to increase the pressure on the health care system. A positive sign is therefore predicted for the dependency variable. The urban share of the population, however, may be both negatively and positively associated with health in developing countries, depending on the forces at play, as described in section 2.2. I also include the number of years in school of the population over 15 years of age to control for the level of education. The educational attainment data is published by Barro and Lee (2010) and is expressed in natural logs. As with the data on the urban share of the population, the educational attainment data is only available every five years and the same procedure is applied to obtain the average of every five-year time period in the analysis. Educational attainment is believed to be positive for health, and the variable is expected to take a negative sign in the estimations.

Because the political environment is often described as important in the aid effectiveness literature and the literature on economic integration and globalization, I include an additional control variable measuring the level of democracy. The democracy variable will account for the fact that democracies have been found to be healthier than autocracies (e.g. Besley and Kudamatsu, 2006) and the data is gathered from the Polity IV index of democracy (Marshall et al., 2011). The dataset used is the Polity2 score, which ranges from minus 10 to plus 10, where a higher score implies a higher degree of democratic rights in the country. The coefficient for this variable is expected to be negative since democracy is assumed to be positively related to health. Finally, government consumption may influence health in developing countries, although it may also be affected by both foreign aid and globalization. Therefore, I introduce the variable government consumption as a share of GDP to account for potential health effects. Government consumption is expected to be positively related to health so the sign should be negative. The source of the data is Heston et al. (2011).

6 Results

A correlation matrix that illustrates the pairwise correlation between the explanatory variables is presented in table B.1 in appendix B. The KOF and KOF3 variables and the GDP per capita variable are fairly highly correlated with each other and with some of the other explanatory variables, e.g. urban population and average years in school, which could pose a problem for the estimation results by inflating the standard errors. However, examining the variance inflation factor indicates no such problems with multicollinearity. The values range from 1.13 to 4.20, and the mean value is 2.59, which are all below the critical values of 5 or 10.

All estimations performed use fixed country specific effects. Time period dummies are included in all regressions and joint F-tests imply that they are jointly significant in all estimations. Diagnostic testing suggests the presence of both heteroskedasticity and serial correlation and to handle this, robust standard errors are used in all regressions.

Table 2 presents the estimation results with control variables GDP per capita, dependency ratio, urban share of the population, number of physicians, average daily nutrition intakes, average years in school, democracy and government consumption. The table is structured as follows, column (1) presents the results with the aid per capita variable and the control variables, column (2) presents the results with the overall globalization variable and the control variables, and in column (3), both aid per capita and overall globalization are included with the controls. Column (4) shows the regression results with aid per capita, overall globalization, and the interaction term of the two variables, along with the control variables. The composite KOF index of globalization is labeled KOF in all tables and figures. Table 3 illustrates the estimations with aid per capita and the disaggregate KOF indices of globalization. Because the dependent variable is the infant mortality rate, a variable that is positively associated with health takes a negative sign in the estimations.

Starting with the control variables, as can be seen in table 2, GDP per capita is insignificant in all but one estimation. This indicates that the potential impact of economic development on health is largely picked up by the other control variables in the estimations. Dependency is highly significant, and is, as expected, positively related to the infant mortality rate. Urban population is, on the other hand, statistically insignificant in all four regressions. The number of physicians is negatively associated with infant mortality and the variable is significant at the 5 or 10 percent levels. Also, nutrition intakes seem negatively related to infant mortality in this sample. Rather unexpectedly, the number of years in school is positively associated with the infant mortality rate in all three regressions. This seems unreasonable from a theoretical perspective, but there may be a realistic explanation for the results in this sample of aid recipient countries. For example, the more educated people are, the easier it is to get reports on events such as infant mortality, while among lower educated groups, the number of reported infant deaths are smaller in relation to the actual numbers. Also, more educated people tend to live in cities where it is less troublesome to keep records of infant deaths, rather than in rural areas where it is relatively more troublesome to report such events. Democracy is significantly negatively associated with infant mortality in all four regressions. Government consumption is positive but insignificant in all estimations.

In column (3), aid per capita is positively associated with infant mortality and significant at

Table 2: Aid and the KOF index on Infant Mortality

Dependent variable: Infant mortality rate$_t$				
	(1)	(2)	(3)	(4)
Aid per capita$_{t-1}$	0.023		0.031**	-0.081**
	(0.121)		(0.045)	(0.027)
KOF$_{t-1}$		-0.010**	-0.011**	0.002
		(0.049)	(0.032)	(0.763)
Aid per capita$_{t-1}$*KOF$_{t-1}$				0.003***
				(0.003)
GDP per capita$_{t-1}$	-0.148*	-0.125	-0.109	-0.085
	(0.070)	(0.124)	(0.176)	(0.270)
Dependency$_t$	0.006***	0.006***	0.005***	0.005***
	(0.003)	(0.003)	(0.006)	(0.005)
Urban population$_t$	0.004	0.004	0.004	0.005
	(0.346)	(0.388)	(0.335)	(0.266)
Physicians$_t$	-0.051*	-0.054**	-0.047*	-0.053**
	(0.064)	(0.050)	(0.089)	(0.049)
Nutrition$_t$	-0.480*	-0.370	-0.413*	-0.491**
	(0.061)	(0.140)	(0.092)	(0.039)
Average years in school$_t$	0.286**	0.237**	0.240**	0.240**
	(0.016)	(0.048)	(0.044)	(0.040)
Democracy$_{t-1}$	-0.007**	-0.006**	-0.007**	-0.007**
	(0.014)	(0.029)	(0.015)	(0.013)
Government consumption$_t$	0.004	0.004	0.004	0.004
	(0.371)	(0.456)	(0.407)	(0.349)
Constant	7.238***	6.709***	7.088***	6.991***
	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	500	500	500	500
Number of countries	93	93	93	93
R^2 (within)	0.818	0.822	0.825	0.833
F-statistic (p-value)	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. p-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

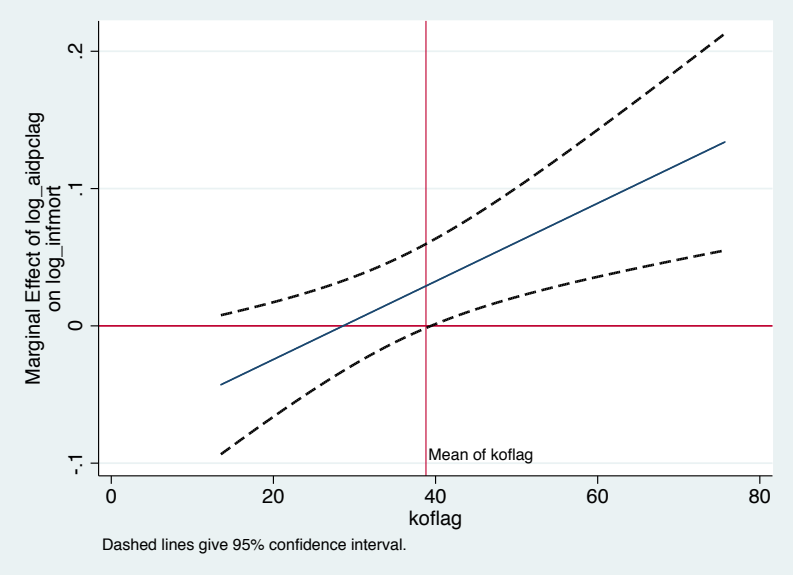
the five percent level. A 10 percent increase in foreign aid per capita in the previous period is associated with 0.3 percent higher infant mortality in the current period. It should be noted, though, that this may also be due to reverse causality, despite the lagged nature of the aid variable. The overall globalization variable is negatively related to infant mortality and this is in line with the results of Bergh and Nilsson (2010a) as the sign of the coefficient is negative.

The coefficient estimate of the interaction variable in column (4) is still highly significant and positive, which implies that the relationships between aid per capita and infant mortality and the composite KOF index and infant mortality need to be considered with the interaction term in mind. Recall that in the presence of an interaction term, the underlying variables cannot be interpreted in the usual manner. To take a closer look at the results in column (4) in table 2 and investigate how the relationship between aid and globalization is related to infant mortality, I illustrate the marginal effect of foreign aid, given the level of globalization, in a figure. To do this, I calculate the marginal effect with a 95 percent confidence interval, as described in section 4.1, using the GRINTER command in Stata 12.1 (Boehmke, 2008).

Figure 2 illustrates the marginal effect of the lagged foreign aid variable on infant mortality on the y-axis, given the level of the lagged overall globalization variable on the x-axis. The dashed lines indicate the 95 percent confidence interval. This shows that foreign aid given to a more globalized country is positively associated with infant mortality in the next period because the marginal effect on infant mortality is significantly positive when the level of the KOF index exceeds approximately 40 (on the scale from 0 to 100). The figure also shows that the positive association between foreign aid per capita and infant mortality increases with the level of globalization in a country. This may indicate that overall globalization does not create good conditions for foreign aid to combat ill-health in developing countries. Possible reasons for this result is set out in section 2.3. For a KOF index value higher than approximately 60, a 10 percent higher level of foreign aid in the previous period is associated with a 1 percent higher rate of infant mortality in the current period. For lower values of the KOF index in the sample, however, the marginal relationship of foreign aid and infant mortality is not statistically significantly different from zero at the five percent level. In the sample, 52 countries (approximately 56 percent of the sample) have average values of the KOF index that are higher than 40, while the rest, 41 countries (approximately 44 percent of the sample), have lower average KOF index values than the threshold level of 40. An explanation is that more foreign aid may be given to countries with higher levels of infant mortality and lower overall levels of development (see figure 1). The increasing negative association between foreign aid and infant mortality for higher levels of overall

globalization may therefore emanate from the fact that overall globalization does not improve health in countries that are heavily dependent on aid. A more tentative explanation for the relationship illustrated in figure 2 is that globalization is generally positive for health because of the spread of knowledge on health, which enables healthier behavior. But when countries receive large amounts of aid aimed at enabling better health services, the behavior of the population worsens because of a rise in the optimism about health care services and treatments. Thus, a moral hazard situation arises where the relationship between foreign aid and health worsens in countries that are more globalized.

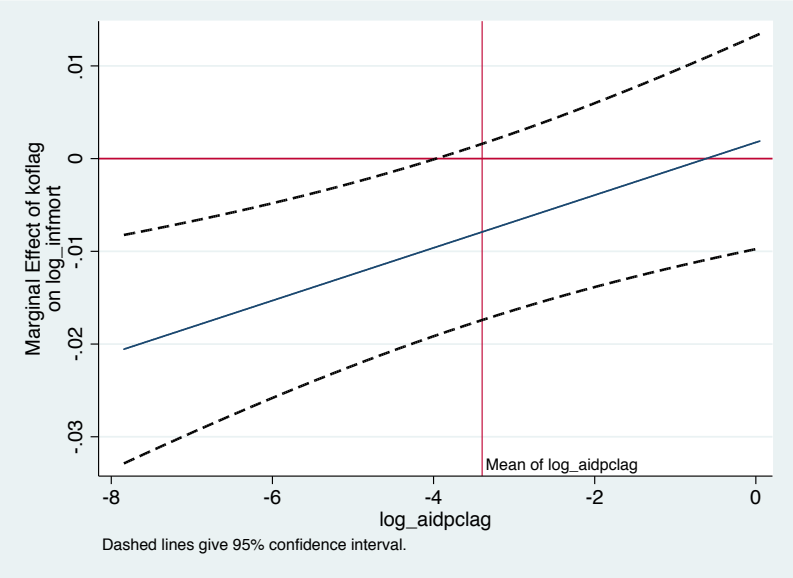
Figure 2: Marginal Effect of Aid on Infant Mortality Given the KOF Index



Examining the marginal effect of globalization on infant mortality for given levels of foreign aid per capita may also shed some light on the overall relationship between aid, globalization, and infant mortality. In figure 3, the marginal effect of the lagged composite KOF index is illustrated for different levels of lagged foreign aid per capita. For low levels of foreign aid per capita, the relationship between the composite KOF index and infant mortality is negative and statistically significant at the 5 percent level. This result indicates that globalization is positively associated with health in countries that are not heavily dependent on aid, whereas for higher levels of aid dependency, the relationship moves toward being less positive and insignificant. Nonetheless, the fact that globalization is negatively related to infant mortality at lower levels of aid in the figure suggests that globalization have a positive impact on health, as suggested by e.g. Bergh and Nilsson (2010a) and Owen and Wu (2007). Also, the result suggests that foreign aid is not

positive for enhancing the favorable impacts of overall globalization on health, as discussed in section 2.3. Of course, this relationship may be explained by the fact that we do not give foreign aid to healthy and very globalized countries (see figure 1).

Figure 3: Marginal Effect of the KOF Index on Infant Mortality Given the Level of Aid



Looking at different dimensions of globalization, table 3 shows the estimation results of the relationships between foreign aid per capita, globalization, and infant mortality, when globalization is disaggregated into economic, social, and political globalization. Here, the disaggregated globalization indices, economic, social, and political, are labeled KOF1, KOF2, and KOF3, respectively. Columns (1) and (2) present the results with the KOF1 index, columns (3) and (4) presents the results with the KOF2 index, and finally, columns (5) and (6) presents the results with the KOF3 index.

The coefficient estimates of the control variables are similar to the earlier results. As can be seen in column (2), the interaction term between foreign aid per capita and economic globalization is highly significant, and so is the interaction term between foreign aid per capita and social globalization in column (4). The interaction term between aid per capita and political globalization is, however, not statistically significant at any conventional level. This suggest that the result of the interaction between foreign aid and the composite KOF index is driven by economic and social globalization, while aid and political globalization does not seem to interact to affect infant mortality. That is, economic globalization, e.g. greater flows of trade and FDI and more liberal trade policies, along with social globalization, e.g. greater inflows of tourists and

telephone and Internet usage, are the driving forces behind the relationship of the interaction effects of foreign aid and globalization on infant mortality.

Moving on to analyze the marginal effects of foreign aid on infant mortality for different levels of the disaggregated indices of globalization, the relationship is illustrated in figure 4. As can be see in figure 4(a), for levels of the KOF1 index higher than approximately 40 (on the scale from 0 to 100), the marginal effect of foreign aid on infant mortality is positive and statistically significant at the 5 percent level. For higher levels of the KOF1 index, the marginal effect of foreign aid per capita on infant mortality increases, which indicates an increasing negative association with health. This means that a greater degree of economic integration with e.g. higher levels of trade and FDI inflows and more liberal trade policies generates a negative environment for foreign aid to affect health. Of the 86 countries with data on economic globalization, 54 have an average level of economic globalization higher than 40.

Looking at figure 4(b), the positive relationship between aid per capita and infant mortality increases with the level of the social globalization. For values of the KOF2 index larger than approximately 50, the relationship between foreign aid per capita and infant mortality is negative. 54 of the 93 countries in the sample have average levels of social globalization greater than 50, indicating that the relationship holds for more than half of the countries in the sample. It is also important to point out that for low values of the KOF2 index, below approximately 25-30, the marginal association between foreign aid and infant mortality is negative, since the marginal effect of aid on infant mortality is negative and significant at the 5 percent level. However, only two countries in the sample, Moldova and Laos, have average levels of the KOF2 index lower than 25. Social globalization includes the spread of information and increased communication around the world, which is expected to be good for generating more healthier behaviors in developing countries. Thus, this result is consistent with the tentative explanation of a moral hazard situation in more socially globalized countries that receive large amounts of foreign aid for improving health care services, as discussed in the section on the marginal effects of aid given the levels of overall globalization.

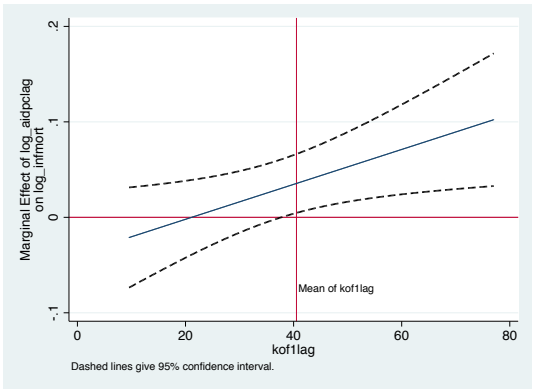
The results in column (6) in table 3, suggest that the interaction term of foreign aid and political globalization is not significantly different from zero. Considering the marginal effect of aid for various levels of political globalization, figure 4(c) illustrates that the relationship between foreign aid per capita and infant mortality for different levels of political globalization is never statistically significant at the 5 percent level. Thus, political globalization does not seem to be related to the positive association between foreign aid and infant mortality. In fact, in an

Table 3: Foreign Aid and the Disaggregated KOF Indices on Infant Mortality

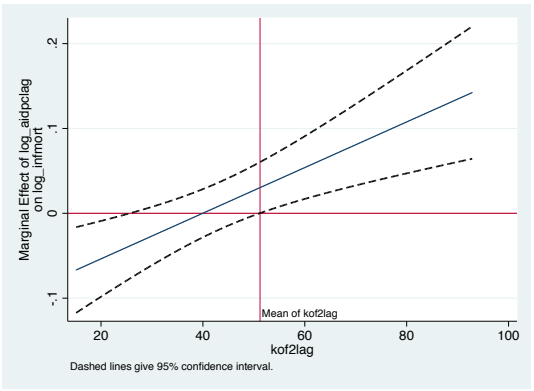
Dependent variable: Infant mortality rate$_t$						
	(1)	(2)	(3)	(4)	(5)	(6)
Aid per capita$_{t-1}$	0.036**	-0.039	0.021	-0.108***	0.022	0.007
	(0.018)	(0.240)	(0.145)	(0.003)	(0.147)	(0.826)
KOF1$_{t-1}$	-0.006*	-0.000				
	(0.062)	(0.965)				
KOF2$_{t-1}$			0.001	0.010***		
			(0.496)	(0.000)		
KOF3$_{t-1}$					-0.015***	-0.012**
					(0.000)	(0.050)
Aid per capita$_{t-1}$*KOF1$_{t-1}$		0.002**				
		(0.022)				
Aid per capita$_{t-1}$*KOF2$_{t-1}$				0.003***		
				(0.000)		
Aid per capita$_{t-1}$*KOF3$_{t-1}$						0.001
						(0.595)
GDP per capita$_{t-1}$	-0.195**	-0.169**	-0.151*	-0.112	-0.072	-0.072
	(0.019)	(0.042)	(0.064)	(0.123)	(0.314)	(0.318)
Dependency$_t$	0.006***	0.006***	0.006***	0.005***	0.006***	0.006***
	(0.006)	(0.003)	(0.002)	(0.005)	(0.001)	(0.001)
Urban population$_t$	0.007	0.009*	0.004	0.004	0.004	0.004
	(0.193)	(0.090)	(0.338)	(0.281)	(0.269)	(0.277)
Physicians$_t$	-0.053*	-0.052*	-0.050*	-0.056**	-0.042	-0.043
	(0.072)	(0.068)	(0.067)	(0.029)	(0.116)	(0.108)
Nutrition$_t$	-0.486*	-0.551**	-0.493*	-0.544**	-0.425*	-0.436*
	(0.056)	(0.030)	(0.061)	(0.019)	(0.066)	(0.058)
Average years in school$_t$	0.212*	0.199*	0.276**	0.267**	0.166	0.172
	(0.068)	(0.081)	(0.017)	(0.011)	(0.133)	(0.126)
Democracy$_{t-1}$	-0.009***	-0.009***	-0.007**	-0.006**	-0.007**	-0.007**
	(0.003)	(0.002)	(0.014)	(0.020)	(0.015)	(0.015)
Government consumption$_t$	0.004	0.004	0.004	0.005	0.003	0.003
	(0.454)	(0.393)	(0.394)	(0.301)	(0.504)	(0.505)
Constant	8.026***	8.020***	7.296***	7.059***	6.974***	6.967***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Number of observations	468	468	500	500	500	500
Number of countries	86	86	93	93	93	93
R^2 (within)	0.826	0.831	0.818	0.835	0.837	0.838
F-statistic (p-value)	0.000	0.000	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. p-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

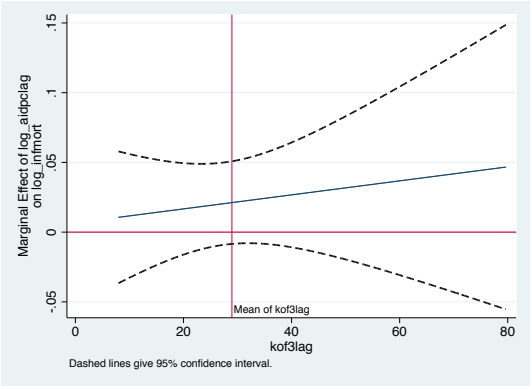
Figure 4: Marginal Effects of Aid on Infant Mortality Given the Levels of the Disaggregated KOF Indices



(a) Marginal Effect of Aid on Infant Mortality Given the KOF1 Index



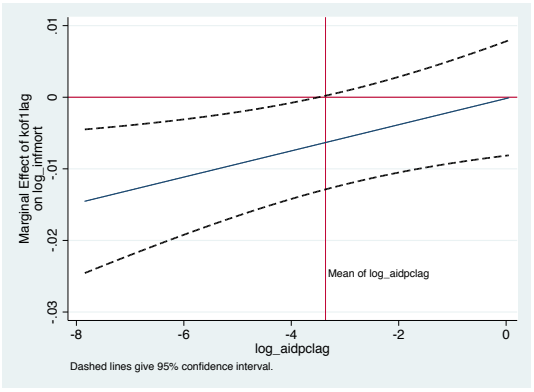
(b) Marginal Effect of Aid on Infant Mortality Given the KOF2 Index



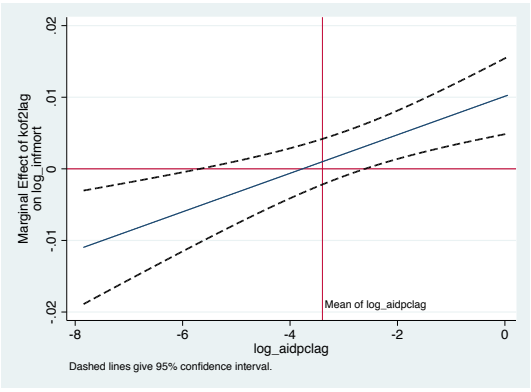
(c) Marginal Effect of Aid on Infant Mortality Given the KOF3 Index

environment of political integration, measured by e.g. the number of embassies a country has and the number of treaties with foreign powers a country has signed, the relationship between aid per capita and infant mortality seems to be zero or very close to zero.

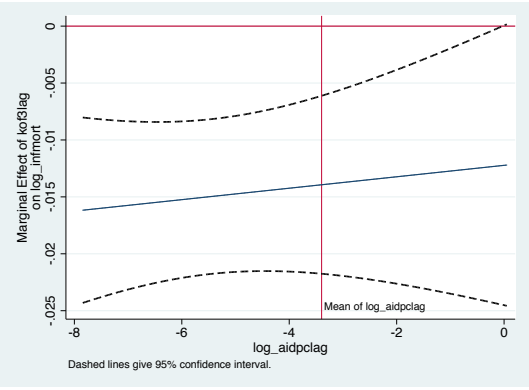
Figure 5: Marginal Effects of the Disaggregated KOF Indices on Infant Mortality Given the Levels of Aid



(a) Marginal Effect of the KOF1 Index on Infant Mortality Given the Level of Aid



(b) Marginal Effect of the KOF2 Index on Infant Mortality Given the Level of Aid



(c) Marginal Effect of the KOF3 Index on Infant Mortality Given the Level of Aid

Figure 5 presents the marginal effects of the KOF1, KOF2, and KOF3 indices on infant mortality given the levels of foreign aid per capita. Taking a look at the first picture, 5(a), the relationship between economic globalization and infant mortality is positive and statistically significant for low levels of foreign aid per capita. The same situation holds for the relationship between social globalization and infant mortality for lower values of foreign aid, but for levels of aid that are higher than the mean value, the association is positive (see figure 5(b)). This suggests that openness to trade and FDI, along with increased social integration in terms of personal

contact and information flows, is positively related to health. Hence, technology transfers and the spread of information may be channels through which globalization function to improve health in developing countries. For political globalization, the relationship with health is always statistically significantly positive, as seen in figure 5(c), which indicates that engagement in international political organizations is beneficial for health independent of the amounts of aid received. The fact that aid have a negative impact on the positive effects of economic and social globalization may be explained by the fact that countries with high or very high infant mortality receive larger amounts of aid (see figure 2(a)).

7 Sensitivity Analysis

To test the robustness of my results, I make various sensitivity analyses. First, I use different measures of health, i.e. the child mortality rate and life expectancy at birth for the total population, to see whether the baseline results (including the interaction terms) in tables 2 and 3 hold. Second, the aid per capita variable is replaced by aid as a share of GDP. Third, some control variables are removed and adjusted to make sure that such alterations do not affect the results. Finally, different subsamples are used to examine whether the results are applicable to various subgroups of the sample. Unless stated otherwise, I use the same control variables as in the estimations in tables 2 and 3 and in the tables in appendix B, the results are presented without the control variables.

7.1 Alternative Measures of Health

I replace the primary dependent health variable, the infant mortality rate, by a) the child mortality rate (under-5 mortality rate per 1000 live births) and b) life expectancy at birth for the total population. Both the child mortality variable and life expectancy variable are in natural logarithms. The results are presented in table B.2 in appendix B. Variables that are positively related to health take negative signs in the regressions with the child mortality rate as the dependent variable, and positive signs in the regressions using life expectancy at birth as the dependent variable.

The results for the estimations with child mortality as the dependent variable are almost identical to those with infant mortality. The similarity remains when examining the marginal effects (illustrated in figure B.1). This outcome is not unreasonable considering the similarity of the measures, but it is an indication of robustness of the earlier estimations and suggest that

the relationship between foreign aid, globalization, and health is fairly strong. However, the estimations using life expectancy at birth of the total population indicate that life expectancy is not statistically significantly related to foreign aid per capita, the composite KOF index, or the interaction term of foreign aid per capita and the KOF index. For the KOF1 index, all variables of interest are insignificant, while the interaction term of aid per capita and the KOF2 index is significant. The marginal effects in figure B.2 suggest that foreign aid is insignificantly related to life expectancy in most cases, but for very low levels of social globalization, aid is significantly positively associated with life expectancy. For higher levels of the KOF3 index, the relationship turns insignificant, but the result points in the same direction as the earlier estimations using infant and child mortality as the dependent variable. The weaker results on life expectancy is probably explained by the fact that changes in life expectancy are likely to take place at a slower pace than changes in the infant and child mortality rates, and are therefore not as responsive with the time lag used in this paper.

The results of the first part of the sensitivity analysis where the health variable is replaces suggest that the baseline results are not sensitive to replacing infant mortality by child mortality, while the stability is weaker when infant mortality is replaced by life expectancy at birth.

7.2 Alternative Measure of Foreign Aid

For further sensitivity tests of the model, I replace the aid per capita variable for aid measured as a share of GDP. This specification of the aid variable is commonly applied in the aid effectiveness literature (e.g. Boone, 1996; Burnside and Dollar, 2000). The results are found in B.3 and the estimations are similar to the earlier results. The marginal effects of aid as a share of GDP on infant mortality given the levels of the composite and disaggregated KOF indices show a fairly similar picture as when using aid per capita. The only difference is the result for the relationship between aid and health given the level of economic globalization in figure B.3(b), where using aid as a share of GDP turns the relationship insignificant. The overall impression is nonetheless that the results of the baseline estimations presented in section 6 hold when using aid as a share of GDP instead of aid per capita.

7.3 Alternative Control Variables

Instead of using the lagged versions of the GDP per capita and democracy variables, I use the variables from the same period as the health variable. The effect of GDP per capita and democ-

racy on health may be more instant than what has previously been investigated in this paper. In addition, the level of education of the female population may have a stronger relationship with health in terms of infant mortality than the level of education of the total population because women often take the greatest responsibility for the health of children. Female education may also be considered a proxy for maternal education, which is important for infant and child mortality in developing countries (Caldwell and McDonald, 1982). Therefore, the measure of the average number of years in school of the female population over 15 years is substituted for the average number of years in school of the total population over 15 years. The GDP per capita variable behaves no differently to the lagged version used in the earlier estimations and the average number of years in school of the female population older than 15 years does not behave differently than the educational attainment level of the total population. The contemporary democracy variable is statistically insignificant in all regressions. Furthermore, the changes do not, alter the results of the baseline estimations on the relationship between foreign aid per capita, the composite and disaggregate measures of globalization, and infant mortality.

7.4 Subsamples

Moving on to investigate the effects on the baseline results (in tables 2 and 3) when different subsamples are used instead of the full sample, I first present and discuss the results of removing different regional groups from the sample (found in table B.4) and then turn to whether the baseline estimations hold for different mortality groups (B.5).

Excluding the Latin American and Caribbean (LAC) countries from the sample may alter the baseline results because it is the second largest regional grouping in the sample and 87 percent of the LAC countries are low or medium mortality countries. Nevertheless, dropping the LAC countries yield similar results to those of the full sample estimations discussed in section 6. The interaction between aid per capita and the KOF index is significant, but the same does not hold for the interaction between aid and the KOF1 index. For the regressions with the KOF2 and KOF3 indices, however, the coefficient estimates of the interaction terms are in line with the baseline estimations. Looking at the marginal effects of foreign aid given the level of overall globalization, they suggest a similar pattern to the estimations using the full sample of countries, as can be seen in figure B.4. The relationship between aid and infant mortality given the level of economic globalization is, however, insignificant for most levels of the KOF1 index and not completely in line with the baseline results. The correlation holds fairly well given the level of social globalization, but the level of significance is lower than the previous estimates suggest. For

different values of the political globalization, the association between aid and infant mortality is insignificant, which is identical to the baseline results.

The group of Middle Eastern and North African (MENA) countries include a number of countries that are often described as special in the aid effectiveness literature. For example, Israel has received great amounts of financial and military support from the US. In addition, Egypt has long been a strategic partner of the US and have been given large amounts of aid over the time period analyzed in this paper. Moreover, this group also consists of oil exporting countries that have both received and given aid during the time period investigated (Boone, 1996). Therefore, dropping the MENA group may change the baseline results. As can be seen, the adjustments compared with the results in tables 2 and 3 are small. All interaction terms are significant at the 10 percent level while the interaction term between aid and political globalization was insignificant already in the earlier estimations. Figure B.5 confirms the picture that the full sample results hold when removing the MENA group. The relationships between aid and infant mortality for different levels of the composite and disaggregated KOF indices follow the same pattern as in the baseline estimations. In addition, for lower levels of overall, economic, and social globalization, the relationship is negative, whereas it is insignificant for all levels of political globalization. Therefore, the baseline results are stable to removing the group of MENA countries from the sample.

The group of Sub-Saharan African (SSA) countries is the largest group of countries in the sample and about 52 percent of the countries in the group are very high mortality countries. Therefore, this group is excluded as a test of robustness of the earlier estimations. Contrary to the outcomes when dropping the LAC and MENA groups, the full size sample estimations do not hold very well when removing the SSA countries. This can be seen both in table B.4 and figure B.6. All marginal effects of foreign aid given the levels of globalization are insignificant, except in the case of economic globalization where the relationship is significantly positive at the 5 percent level given economic globalization at a level of about 40-45. The results in the baseline estimations are thus greatly affected if the SSA group is removed from the sample.

Overall, the estimations with only high and very high mortality countries are in line with the full sample results, and the coefficient estimates of the interaction terms are similar to the results of the full sample estimations. However, the interaction term between aid and economic globalization is significant in the full sample estimations, while it is insignificant in the sample with only high and very high mortality countries. Taking a look at the marginal effects of aid for different levels of the KOF indices confirms that the results are fairly robust. Given the KOF

index, the pattern is in line with the earlier estimations, but for lower levels of globalization, aid is significantly negatively related to infant mortality. Also, the relationship turns significant at a higher level of the KOF index compared to the full sample results where aid is positively and significantly related to infant mortality when KOF is about 40. The association between aid and infant mortality is insignificant for all levels of economic globalization, and this is at odds with the full sample estimations. For social globalization, however, the pattern is in line with the baseline results, but the relationship is positive and significant for levels of the KOF2 index higher than approximately 85, instead of 50 in the full sample estimations. The relationship is insignificant for all levels of political globalization and this is in line with the full sample results. Therefore, it is reasonable to say that the baseline results are affected when the sample is reduced.

The last subsample analyzed to test the robustness of the full sample results is low and medium mortality countries. The full sample estimations are quite sensitive to dropping the high and very high mortality countries from the sample. The interactions between aid and overall globalization and aid and economic globalization are no longer significant but significant in the baseline regressions, while the interactions between aid and social globalization and aid and political globalization are the same as in the earlier estimations. Looking at the marginal effects in figure B.8 The marginal effects indicate that aid is insignificantly related to infant mortality for all levels of overall, economic, and political globalization, whereas in the full sample estimations, aid is significantly associated with infant mortality when looking at different levels of both overall globalization and economic globalization. For social globalization higher than about 50, the relationship is significant and positive, although the relationship is insignificant for lower levels of social globalization. So, when high and very high mortality countries are dropped from the sample, the baseline estimations do not hold very well.

The baseline results are not highly affected when LAC and MENA countries are dropped from the full size sample, but the results do not hold very well when SSA countries are removed, or when only high and very high mortality countries and only low and medium mortality countries are included.

8 Conclusion

In this paper, I analyze the relationship between foreign aid, globalization, and health in developing countries by estimating a fixed effects panel data model over 93 aid recipient countries between 1970 and 2009. As a measure of health I use the infant mortality rate. Foreign aid is

represented by ODA per capita, and globalization is the KOF index. To sort out how foreign aid and globalization influence health together, I include an interaction term of the two variables. In addition, I investigate what the relationship looks like for three different dimensions of globalization (economic, social, and political). I apply a number of sensitivity analyses to assess the robustness of my results. The overall impression is that the results are fairly robust toward various changes in the specification or sample.

The interaction term between foreign aid per capita and overall globalization is highly significant. Therefore, the relationship between aid, globalization, and health need to be analyzed with the interaction term in mind since not including it would give an incomplete portrayal of the effects at play. Hence, by including the interaction effect, this analysis extends the literature on aid, globalization, and health in an important direction.

In general, the control variables behave in line with the theoretical expectations. The outcome of the interaction between foreign aid and overall globalization suggests that the interaction effect on the level of health is negative. Analyzing the implications of this result using marginal effects indicates that aid is negatively associated with health at higher levels of overall globalization and that aid does not affect health at low or medium levels of globalization. At low levels of foreign aid, overall globalization is positively related to health but it is not significantly related to health for other levels of aid. The same holds when economic globalization is considered. For social globalization the pattern is similar but there are slight differences. Aid is negatively correlated with health in highly socially globalized countries, while the opposite holds when social globalization is low. Also, in countries receiving large amounts of aid, social globalization seems to be negatively related to health. Political globalization appears to be positively correlated with health at any level of foreign aid, but the level of political globalization does not influence the relationship between aid and health, which is insignificant at all levels of political globalization. Thus, economic and social globalization emerge as the driving forces behind the interaction effects between aid and overall globalization.

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Appendix A

Table A.1: Countries in the Sample

East Asia and Pacific (EAP)	Chile[a]	Saudi Arabia[b]	Namibia[b]
Cambodia[c]	Colombia[a]	Syria[b]	Niger[d]
China[b]	Costa Rica[a]	Tunisia[b]	Republic of the Congo[c]
Fiji[a]	Cuba[a]	United Arab Emirates[a]	Rwanda[d]
Indonesia[b]	Dominican Republic[b]	Yemen[d]	Senegal[c]
Laos[d]	Ecuador[b]		Sierra Leone[d]
Malaysia[a]	El Salvador[b]	**South Asia (SA)**	South Africa[b]
Mongolia[c]	Guatemala[c]	Bangladesh[d]	Sudan[c]
Philippines[b]	Guyana[b]	India[c]	Swaziland[c]
Republic of Korea[a]	Haiti[d]	Nepal[d]	Tanzania[d]
Thailand[a]	Honduras[b]	Pakistan[d]	Togo[d]
Vietnam[a]	Jamaica[a]	Sri Lanka[a]	Uganda[d]
	Mexico[b]		Zambia[d]
Europe and Central	Nicaragua[b]	**Sub-Saharan Africa (SSA)**	Zimbabwe[c]
Asia (ECA)	Panama[a]	Benin[d]	
Albania[a]	Paraguay[b]	Botswana[b]	
Armenia[b]	Peru[b]	Burundi[d]	
Croatia[a]	Trinidad and Tobago[a]	Cameroon[d]	
Cyprus[a]	Uruguay[a]	Central African Republic[d]	
Kazakstan[b]	Venezuela[a]	Côte d'Ivoire[d]	
Kyrgyz Republic[c]		Gabon[c]	
Moldova[a]	**Middle East and**	The Gambia[c]	
Tajikistan[c]	**North Africa (MENA)**	Ghana[c]	
Slovenia[a]	Algeria[c]	Kenya[c]	
Turkey[c]	Egypt[c]	Lesotho[c]	
	Iran[b]	Liberia[d]	
Latin America and	Israel[a]	Malawi[d]	
Caribbean (LAC)	Jordan[b]	Mali[d]	
Argentina[a]	Kuwait[a]	Mauritania[c]	
Bolivia[c]	Libya[b]	Mauritius[a]	
Brazil[b]	Morocco[c]	Mozambique[d]	

[a]Low mortality, [b]Medium mortality, [c]High mortality, [d]Very high mortality

Table A.2: The KOF Index of Globalization

A. Economic Globalization
i) *Actual Flows*
Trade (percent of GDP)
Foreign Direct Investment, stocks (percent of GDP)
Portfolio Investment (percent of GDP)
Income Payments to Foreign Nationals (percent of GDP)

ii) *Restrictions*
Hidden Import Barriers
Mean Tariff Rate
Taxes on International Trade (percent of current revenue)
Capital Account Restrictions

B. Social Globalization
i) *Data on Personal Contact*
Telephone Traffic
Transfers (percent of GDP)
International Tourism
Foreign Population (percent of total population)
International letters (per capita)

ii) *Data on Information Flows*
Internet Users (per 1000 people)
Television (per 1000 people)
Trade in Newspapers (percent of GDP)

iii) *Data on Cultural Proximity*
Number of McDonald's Restaurants (per capita)
Number of Ikea (per capita)
Trade in books (percent of GDP)

C. Political Globalization
Embassies in Country
Membership in International Organizations
Participation in U.N. Security Council Missions
International Treaties

Appendix B

Table B.1: Correlation Matrix

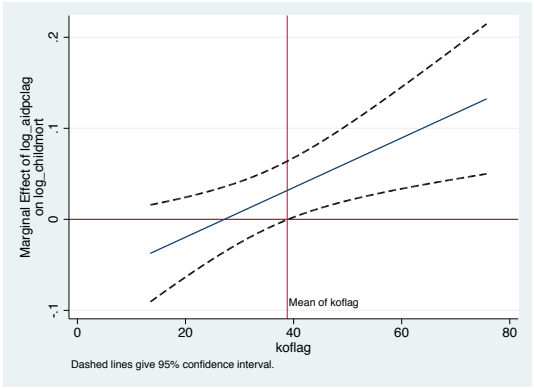
	Aid per capita	KOF	KOF1	KOF2	KOF3	Real GDP per capita (PPP adjusted)	Dependency ratio	Urban population	Nutrition (avg. daily calorie intake per capita)	Avg. years in school (total population, years 15+)	Democracy	Government consumption
Aid per capita	1.000											
KOF	-0.183	1.000										
KOF1	0.020	0.865	1.000									
KOF2	-0.426	0.609	0.225	1.000								
KOF3	-0.082	0.888	0.754	0.320	1.000							
Real GDP per capita (PPP adjusted)	-0.290	0.706	0.565	0.345	0.752	1.000						
Dependency ratio	0.445	-0.662	-0.525	-0.425	-0.621	-0.625	1.000					
Urban population	-0.263	0.661	0.497	0.488	0.594	0.774	-0.528	1.000				
Nutrition (avg. daily calorie intake per capita)	-0.262	0.630	0.440	0.464	0.604	0.676	-0.582	0.596	1.000			
Avg. years in school (total population, years 15+)	-0.168	0.701	0.651	0.300	0.685	0.662	-0.626	0.574	0.486	1.000		
Democracy	-0.165	0.484	0.404	0.299	0.442	0.407	-0.454	0.348	0.208	0.454	1.000	
Government consumption	0.310	-0.199	-0.085	-0.246	-0.162	-0.200	0.245	-0.267	-0.241	-0.175	-0.092	1.000

Table B.2: Foreign Aid and the Composite and Disaggregated KOF Indices on Child Mortality and Life Expectancy

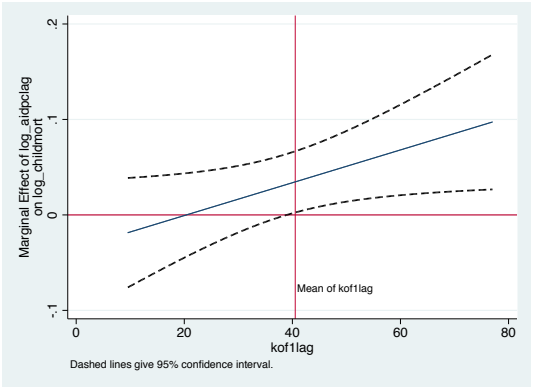
Dependent variable:	*Child mortality*$_t$				*Life expectancy at birth*$_t$			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Aid per capita$_{t-1}$	-0.084**	-0.035	-0.121***	0.007	0.012	-0.004	0.029**	-0.008
	(0.033)	(0.327)	(0.002)	(0.830)	(0.336)	(0.726)	(0.029)	(0.324)
KOF$_{t-1}$	0.002				-0.001			
	(0.802)				(0.550)			
KOF1$_{t-1}$		-0.002				0.002		
		(0.736)				(0.172)		
KOF2$_{t-1}$			0.011***				-0.003***	
			(0.000)				(0.004)	
KOF3$_{t-1}$				-0.013*				0.003**
				0.055				0.046
Aid per capita$_{t-1}$*KOF$_{t-1}$	0.003***				-0.000			
	(0.004)				(0.354)			
Aid per capita$_{t-1}$*KOF1$_{t-1}$		0.002**				0.000		
		(0.039)				(0.838)		
Aid per capita$_{t-1}$*KOF2$_{t-1}$			0.003***				-0.001**	
			(0.000)				0.045	
Aid per capita$_{t-1}$*KOF3$_{t-1}$				0.000				0.000
				(0.658)				(0.123)
Number of observations	500	468	500	500	500	468	500	500
Number of countries	93	86	93	93	93	86	93	93
R^2 (within)	0.838	0.837	0.843	0.842	0.515	0.512	0.542	0.520
F-statistic (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. P-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

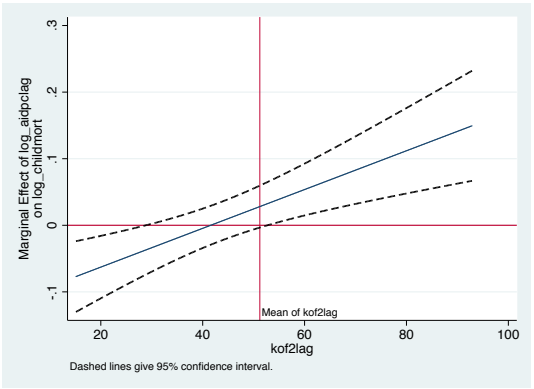
Figure B.1: Marginal Effects of Aid on Child Mortality Given the Levels of the Composite and Disaggregated KOF Indices



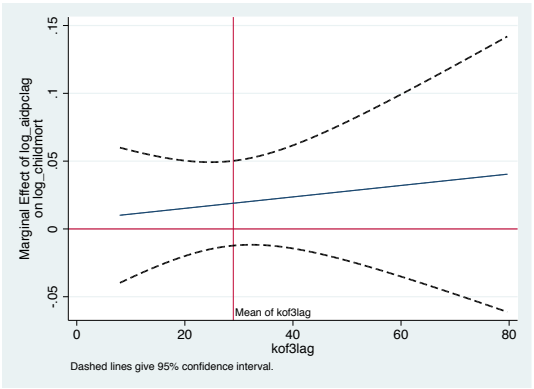
(a) Marginal Effect of Aid on Child mortality Given the KOF Index



(b) Marginal Effect of Aid on Child mortality Given the KOF1 Index

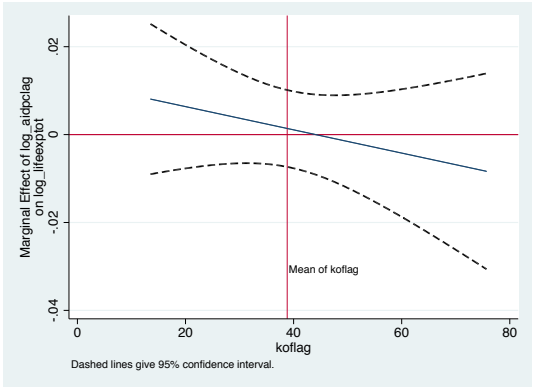


(c) Marginal Effect of Aid on Child mortality Given the KOF2 Index

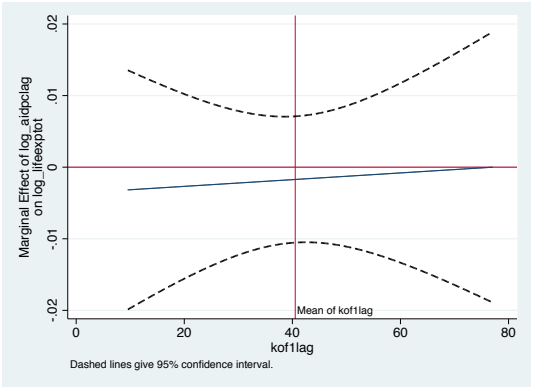


(d) Marginal Effect of Aid on Child mortality Given the KOF3 Index

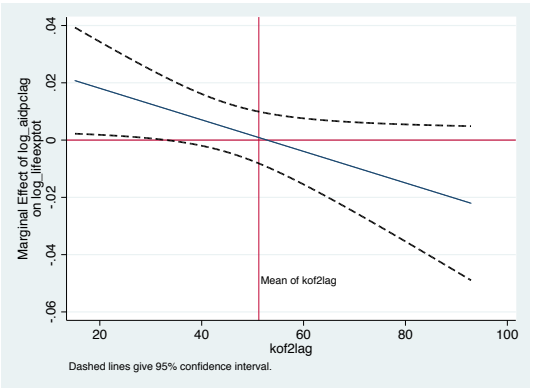
Figure B.2: Marginal Effects of Aid on Life Expectancy Given the Levels of the Composite and Disaggregated KOF Indices



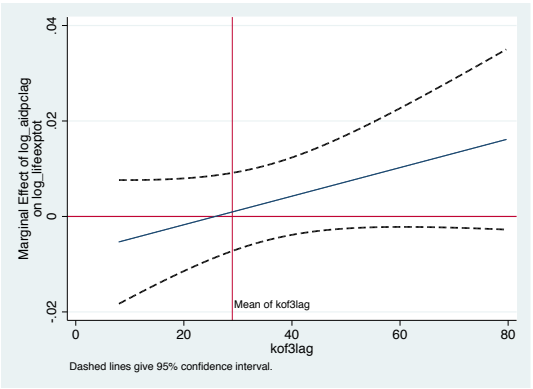
(a) Marginal Effect of Aid on Life Expectancy Given the KOF Index



(b) Marginal Effect of Aid on Life Expectancy Given the KOF1 Index



(c) Marginal Effect of Aid on Life Expectancy Given the KOF2 Index



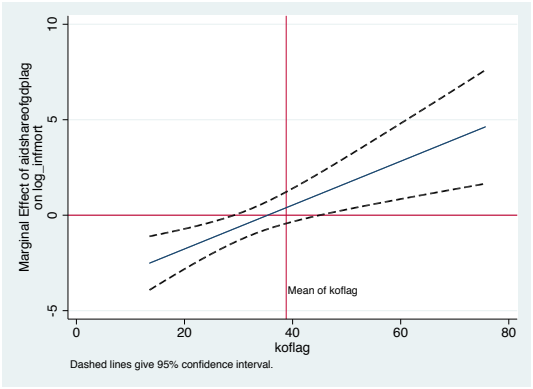
(d) Marginal Effect of Aid on Life Expectancy Given the KOF3 Index

Table B.3: Foreign Aid and the Composite and Disaggregated KOF Indices on Infant Mortality - Aid as a Share of GDP

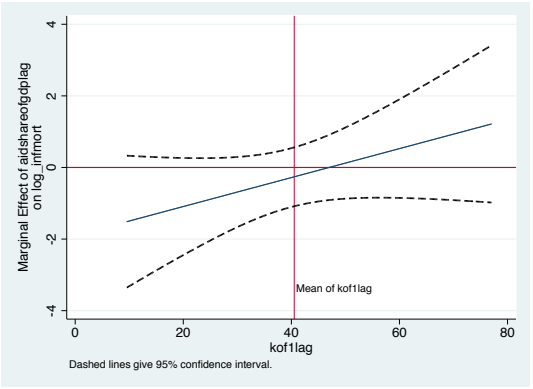
Dependent variable: Infant mortality rate$_t$				
	(1)	(2)	(3)	(4)
Aid/GDP$_{t-1}$	-4.065***	-1.900	-4.303***	-0.986
	(0.000)	(0.106)	(0.000)	(0.133)
KOF$_{t-1}$	-0.011**			
	(0.023)			
KOF1$_{t-1}$		-0.007**		
		(0.040)		
KOF2$_{t-1}$			-0.003	
			(0.160)	
KOF3$_{t-1}$				-0.014***
				(0.000)
Aid/GDP$_{t-1}$*KOF$_{t-1}$	0.115***			
	(0.001)			
Aid/GDP$_{t-1}$*KOF1$_{t-1}$		0.040		
		(0.143)		
Aid/GDP$_{t-1}$*KOF2$_{t-1}$			0.101***	
			(0.000)	
Aid/GDP$_{t-1}$*KOF3$_{t-1}$				0.028
				(0.233)
Number of observations	500	468	500	500
Number of countries	93	86	93	93
R^2 (within)	0.835	0.826	0.842	0.837
F-statistic (p-value)	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. p-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

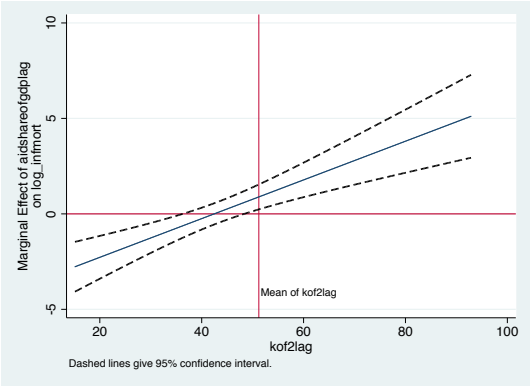
Figure B.3: Marginal Effects of Aid on Infant Mortality Given the Composite and Disaggregated KOF Indices - Aid as a Share of GDP



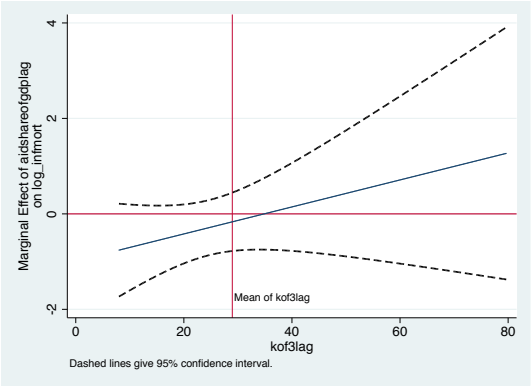
(a) Marginal Effect of Aid as a Share of GDP on Infant Mortality Given the KOF Index



(b) Marginal Effect of Aid as a Share of GDP on Infant Mortality Given the KOF1 Index



(c) Marginal Effect of Aid as a Share of GDP on Infant Mortality Given the KOF2 Index



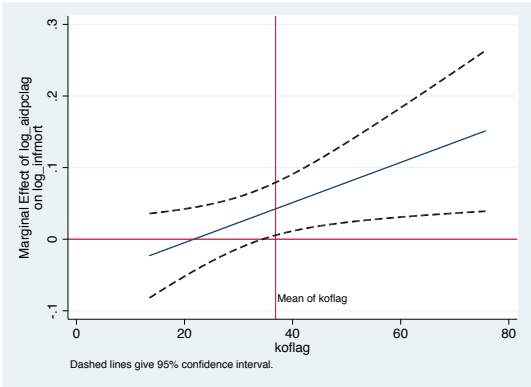
(d) Marginal Effect of Aid as a Share of GDP on Infant Mortality Given the KOF3 Index

Table B.4: Subsamples - LAC, MENA, and SSA Excluded

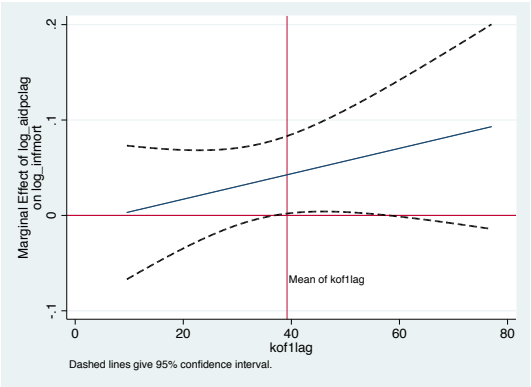
	LAC Excluded				MENA Excluded				SSA Excluded			
Dependent variable: Infant mortality rate$_t$												
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Aid per capita$_{t-1}$	-0.061	-0.010	-0.082*	0.014	-0.133***	-0.094***	-0.153***	-0.043	0.004	0.017	-0.000	0.024
	(0.169)	(0.829)	(0.053)	(0.680)	(0.001)	(0.007)	(0.000)	(0.156)	(0.914)	(0.603)	(0.994)	(0.459)
KOF$_{t-1}$	0.003				0.003				-0.001			
	(0.656)				(0.661)				(0.842)			
KOF1$_{t-1}$		0.001				0.001				-0.003		
		(0.794)				(0.841)				(0.569)		
KOF2$_{t-1}$			0.008**				0.012***				0.003	
			(0.017)				(0.000)				(0.353)	
KOF3$_{t-1}$				-0.008				-0.009*				-0.005
				(0.305)				(0.083)				(0.459)
Aid per capita$_{t-1}$*KOF$_{t-1}$	0.003**				0.004***				0.001			
	(0.026)				(0.000)				(0.557)			
Aid per capita$_{t-1}$*KOF1$_{t-1}$		0.001				0.003***				0.000		
		(0.257)				(0.001)				(0.645)		
Aid per capita$_{t-1}$*KOF2$_{t-1}$			0.003***				0.003***				0.001	
			(0.008)				(0.000)				(0.512)	
Aid per capita$_{t-1}$*KOF3$_{t-1}$				0.001				0.002*				-0.000
				(0.556)				(0.069)				(0.962)
Number of observations	366	340	366	366	440	414	440	440	318	297	318	318
Number of countries	70	64	70	70	81	76	81	81	61	56	61	61
R^2 (within)	0.815	0.814	0.821	0.816	0.829	0.8244	0.8272	0.8334	0.907	0.906	0.907	0.907
F-statistic (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. p-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

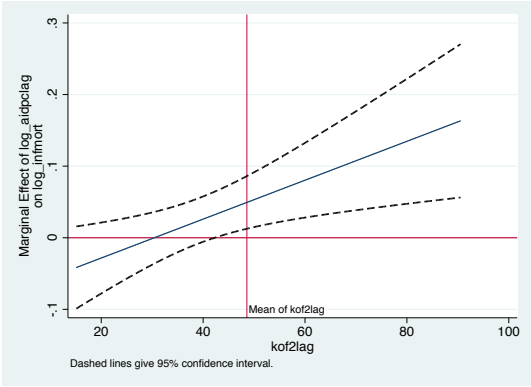
Figure B.4: Marginal Effects of Aid on Infant Mortality Given the Composite and Disaggregated KOF Indices - LAC Excluded



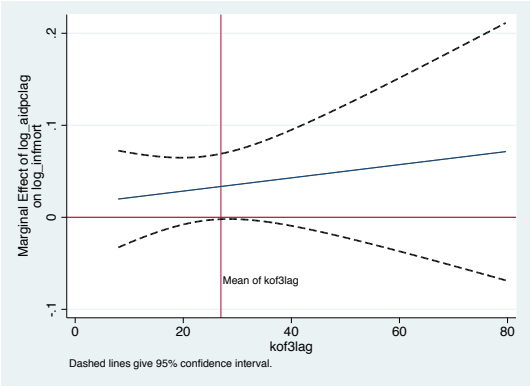
(a) Marginal Effect of Aid on Infant Mortality Given the KOF Index



(b) Marginal Effect of Aid on Infant Mortality Given the KOF1 Index

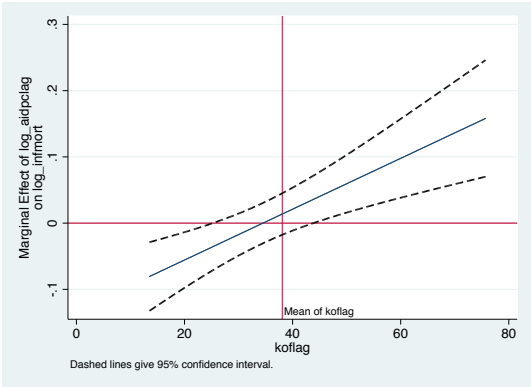


(c) Marginal Effect of Aid on Infant Mortality Given the KOF2 Index

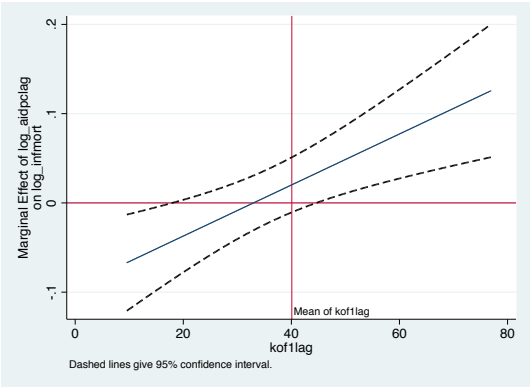


(d) Marginal Effect of Aid on Infant Mortality Given the KOF3 Index

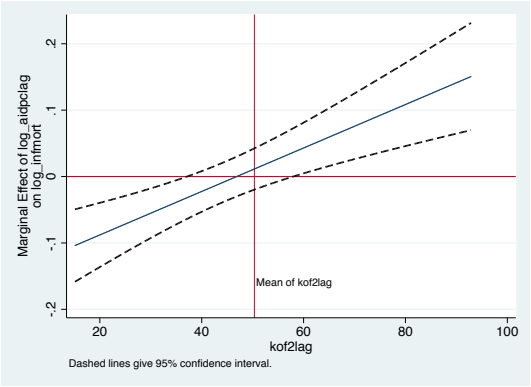
Figure B.5: Marginal Effects of Aid on Infant Mortality Given the Composite and Disaggregated KOF Indices - MENA Excluded



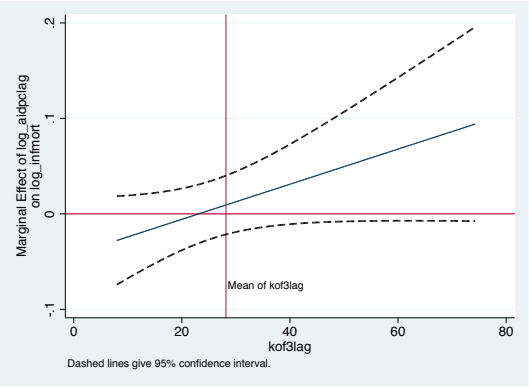
(a) Marginal Effect of Aid on Infant Mortality Given the KOF Index



(b) Marginal Effect of Aid on Infant Mortality Given the KOF1 Index

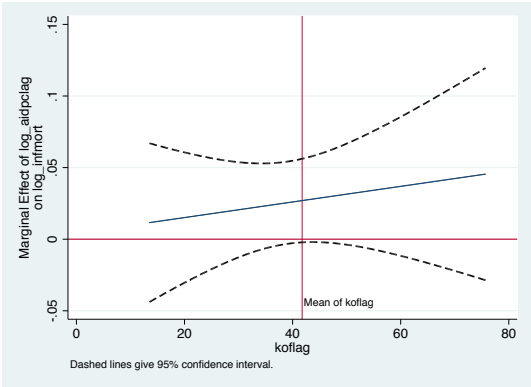


(c) Marginal Effect of Aid on Infant Mortality Given the KOF2 Index

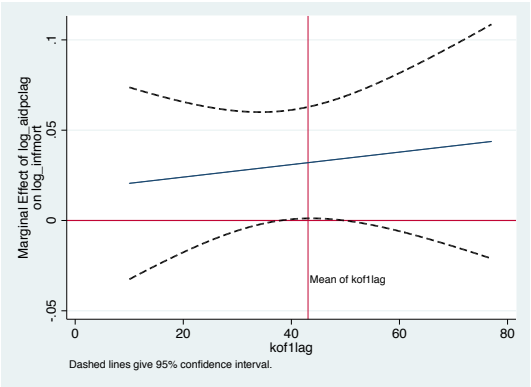


(d) Marginal Effect of Aid on Infant Mortality Given the KOF3 Index

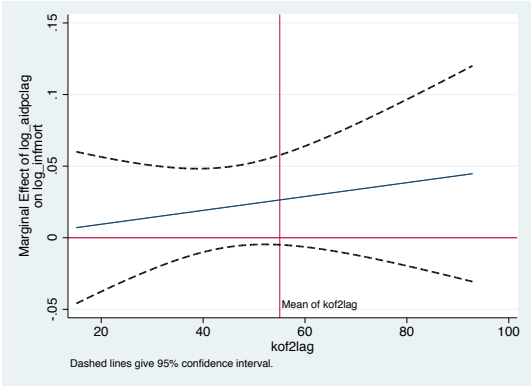
Figure B.6: Marginal Effects of Aid on Infant Mortality Given the Composite and Disaggregated KOF Indices - SSA Excluded



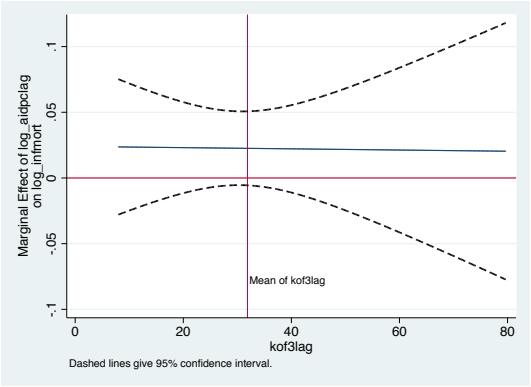
(a) Marginal Effect of Aid on Infant Mortality Given the KOF Index



(b) Marginal Effect of Aid on Infant Mortality Given the KOF1 Index



(c) Marginal Effect of Aid on Infant Mortality Given the KOF2 Index



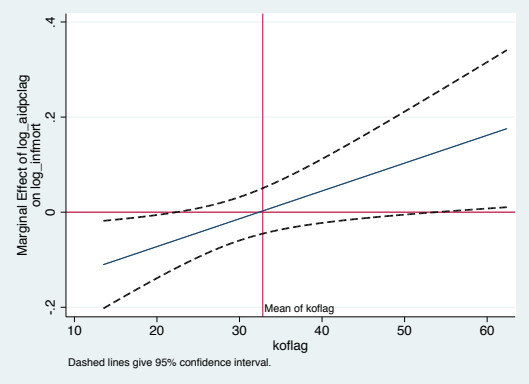
(d) Marginal Effect of Aid on Infant Mortality, Given the KOF3 Index

Table B.5: Subsamples - Only High and Very High Mortality Countries and Only Low and Medium Mortality Countries

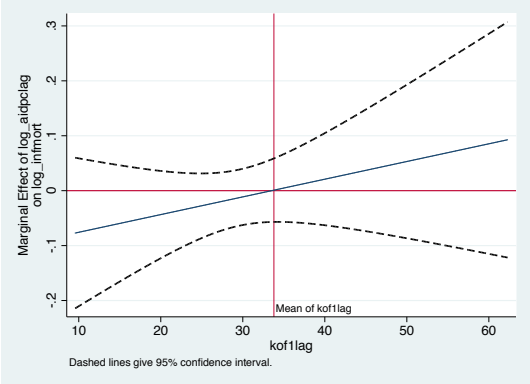
	Only High and Very High Mortality Countries				Only Low and Medium Mortality Countries			
Dependent variable: Infant mortality rate$_t$								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Aid per capita$_{t-1}$	-0.189**	-0.108	-0.178***	-0.091	0.002	0.015	-0.062*	0.067*
	(0.015)	(0.259)	(0.009)	(0.157)	(0.967)	(0.696)	(0.085)	(0.071)
KOF$_{t-1}$	0.011				-0.004			
	(0.219)				(0.604)			
KOF1$_{t-1}$		0.007				-0.003		
		(0.387)				(0.524)		
KOF2$_{t-1}$			0.011**				0.007***	
			(0.028)				0.009	
KOF3$_{t-1}$				-0.003				-0.013**
				(0.807)				(0.043)
Aid per capita$_{t-1}$*KOF$_{t-1}$	0.006**				0.001			
	(0.018)				(0.520)			
Aid per capita$_{t-1}$*KOF1$_{t-1}$		0.003				0.001		
		(0.302)				(0.565)		
Aid per capita$_{t-1}$*KOF2$_{t-1}$			0.004**				0.002**	
			(0.017)				(0.019)	
Aid per capita$_{t-1}$*KOF3$_{t-1}$				0.004				-0.001
				(0.196)				(0.177)
Number of observations	251	239	251	251	251	239	251	251
Number of countries	49	46	49	49	49	46	49	49
R^2 (within)	0.908	0.911	0.912	0.910	0.908	0.911	0.912	0.910
F-statistic (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Note: All estimations include period dummies. p-values in parentheses. Statistically significant coefficients at the 1, 5, and 10 percent levels are denoted ***, **, and *, respectively.

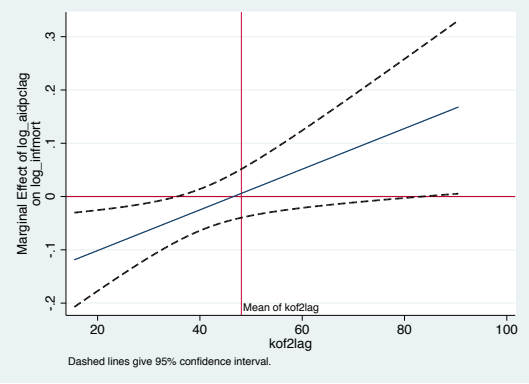
Figure B.7: Marginal Effects of Aid on Infant Mortality Given the Composite and Disaggregated KOF Indices - High and Very High Mortality Countries



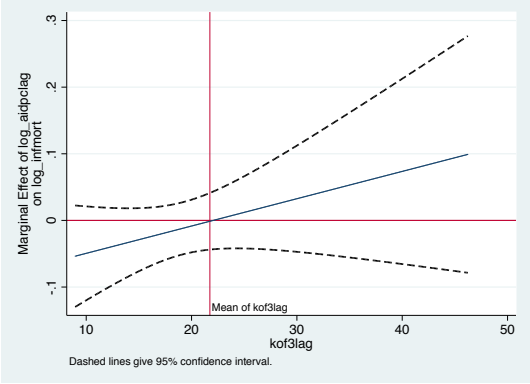
(a) Marginal Effect of Aid on Infant mortality Given the KOF Index



(b) Marginal Effect of Aid on Infant mortality Given the KOF1 Index

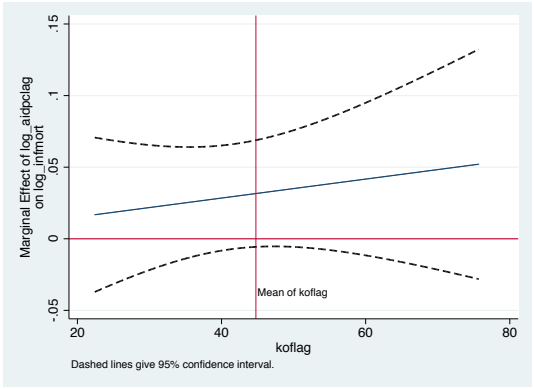


(c) Marginal Effect of Aid on Infant mortality Given the KOF2 Index

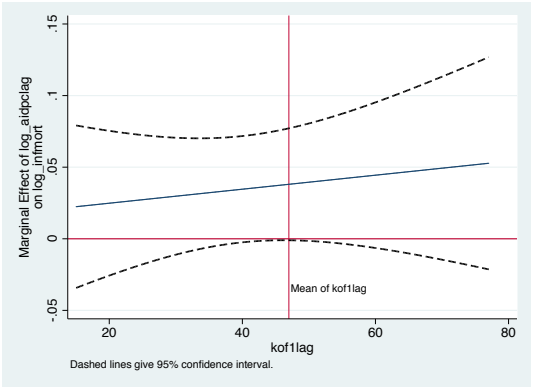


(d) Marginal Effect of Aid on Infant mortality Given the KOF3 Index

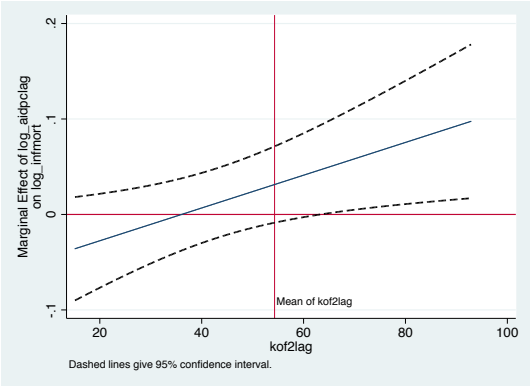
Figure B.8: Marginal Effect of Aid on Infant mortality Given the Composite and Disaggregated KOF Indices - Low and Medium Mortality Countries



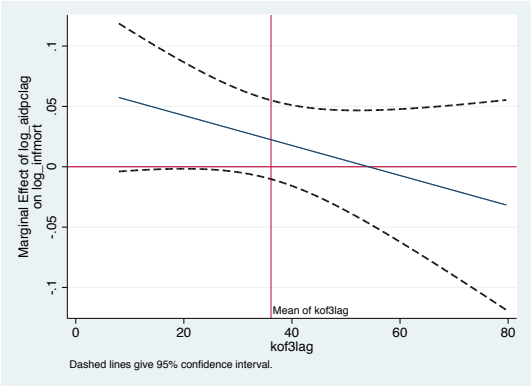
(a) Marginal Effect of Aid on Infant mortality Given the KOF Index



(b) Marginal Effect of Aid on Infant mortality Given the KOF1 Index



(c) Marginal Effect of Aid on Infant mortality Given the KOF2 Index



(d) Marginal Effect of Aid on Infant mortality Given the KOF3 Index