THE UNIVERSITY OF MELBOURNE

Department of Economics

Working Paper Series

Ethnic Fractionalization and Aid Effectiveness

Roland Hodler & David S. Knight

August 2009

Research Paper Number 1082

ISSN: 0819-2642
ISBN: 978 0 7340 4435-8

Department of Economics
The University of Melbourne
Parkville VIC 3010
www.economics.unimelb.edu.au

Ethnic Fractionalization and Aid Effectiveness*

Roland Hodler† and David S. Knight‡

August 13, 2009

Abstract

We test the hypothesis that the effect of foreign aid on economic growth is positive in ethnically homogenous countries, but decreasing in ethnic fractionalization. Using panel data covering 114 aid recipient countries over the period 1962 to 2001, and employing two-stage least squares and GMM estimation techniques, we find strong support for this hypothesis. Our estimates suggest that foreign aid may have retarded economic growth in many fractionalized countries, most of which are located in Sub-Saharan Africa.

JEL classification: C23; F35; F43; O11

Keywords: Foreign aid; ethnic fractionalization; economic growth

*We would like to thank Manisha Shah for helpful comments, and Kyriakos Neanidis for sending us their data.

†Corresponding Author: Department of Economics, University of Melbourne, VIC 3010, Australia. Email: rhodler@unimelb.edu.au.

‡Department of Economics, University of Melbourne.

1 Introduction

Foreign aid to harmonious recipient countries in which everybody cooperates to improve standards of living should be effective. Recent contributions scrutinizing the voluminous aid effectiveness literature however find no robust evidence for a positive effect of foreign aid on economic growth (Doucouliagos and Paldam, 2008; Rajan and Subramanian, 2008). In at least some recipient countries, foreign aid must thus have indirect negative effects on economic growth that offset any positive growth effects.

Svensson (2000) presents a model in which aid inflows may have an indirect negative effect because they induce people from rivalling social or ethnic groups to divert time and resources away from productive to rent seeking activities. These rent seeking activities can be any type of socially wasteful activities that help to channel aid inflows and potentially other public funds towards one's own group. Such activities may include bribery and corruption, lobbying and political campaigning, distorted policies as well as intimidation or even violence and civil warfare. Indeed, Svensson finds foreign aid to raise corruption in ethnically fractionalized, but not in ethnically homogenous countries.[1] Hodler (2006) studies a similar model, but assumes that institutional quality is endogenous and decreasing in the share of aggregate resources devoted to rent seeking activities. His model predicts that the direct positive effect of foreign aid dominates the negative effect of higher rent seeking and lower institutional quality if the number of rivalling groups is low, while the negative effect dominates if the number of rivalling groups is high.[2]

The models of Svensson (2000) and Hodler (2006) predict that the effect of foreign aid on economic growth should be clearly positive in homogenous countries, but smaller or

[1] Knack (2001), Bräutigam and Knack (2004), and Djankov et al. (2008) provide further evidence that foreign aid can undermine the quality of institutions and governance.

[2] Hodler (2006) focuses on natural resource rents, but it is often argued that windfall gains in the forms of resource rents and (unconditional) aid inflows are likely to have similar effects on a country's economy, its institutions and the political situation (e.g., Acemoglu et al., 2004; Hodler, 2006; Dalgaard and Olsson, 2008). See Lane and Tornell (1996), Tornell and Lane (1999), and Hodler (2007) for dynamic models of rent seeking and windfall gains.

even negative in countries with many rivalling ethnic groups. In this paper, we test this hypothesis using panel data covering 114 aid recipient countries over the period 1962 to 2001. We are interested in the growth effects of both foreign aid and its interaction with the index of ethnic fractionalization, which serves as our proxy for the number of rivalling groups. Employing two-stage least squares and GMM estimation techniques, we find a positive coefficient on foreign aid and a negative coefficient on the interaction term. These findings, which survive various robustness exercises, support our hypothesis. Our estimates suggest that about one half or even more of the countries in Sub-Saharan Africa (and a few countries in other continents) are so ethnically fractionalized that foreign aid tends to retard their economic growth.

This paper contributes to the aid effectiveness literature, in particular its newer branch – the conditional aid effectiveness literature[3] – which studies the conditions under which foreign aid is effective (rather than whether or not foreign aid is effective in an average country). Despite some doubts about the robustness of their findings, Burnside and Dollar (2000) must be credited for initiating the conditional aid effectiveness literature.[4] Major contributions to this literature include Hansen and Tarp (2000, 2001), Lensink and White (2001), Dalgaard et al. (2004), and Angeles and Neanidis (2009).[5] Hansen and Tarp, and Lensink and White find diminishing returns to foreign aid, i.e., a negative coefficient on aid squared. Dalgaard and his co-authors find that aid is more effective outside the tropics than within. In particular, they find a positive coefficient on aid, but a negative coefficient on the interaction term between aid and the fraction of a country's area located in the tropics. Angeles and Neanidis hypothesize that aid effectiveness depends on the size of

[3]To the best of our knowledge, Doucouliagos and Paldam (2009) were the first to call this branch the conditional aid effectiveness literature.

[4]Studies questioning the robustness of the Burnside and Dollar (2000) findings include Hansen and Tarp (2000, 2001), Dalgaard and Hansen (2001), Lensink and White (2001), Easterly et al. (2004), Roodman (2004, 2007), and Doucouliagos and Paldam (2009).

[5]Roodman (2004, 2007) discusses most contributions to the conditional aid effectiveness literature. He also conducts various robustness exercises. His results suggest that the findings of Hansen and Tarp (2001) and Dalgaard et al. (2004) tend to be more robust than other findings in this literature.

the local elite, which they proxy by the share of colonial settlers. They find a positive coefficient on aid, but a negative coefficient on the interaction term between aid and the share of colonial settlers.

We compare our results to these findings. We find that the interaction term between aid and ethnic fractionalization tends to be more robust than aid squared and the interaction term between aid and the fraction of a country's area located in the tropics. Hence previous studies may have found strong evidence for aid to be less effective in the tropics and when given in large amounts partly because fractionalized countries tend to be located in the tropics and to receive a lot of aid. We also find evidence that ethnic fractionalization and the share of colonial settlers both lower aid effectiveness. Inspired by Caselli and Coleman (2006), we argue that this finding may suggest that rent seeking contests for aid inflows do not only get more detrimental as the number of ethnic groups raises, but also as the racial differences between the major ethnic groups grow larger.

Our paper also relates to the literature on the consequences of ethnic fractionalization for economic development. Easterly and Levine (1997) find that ethnic divisions may be responsible for Sub-Saharan Africa's poor growth performance by causing rent seeking, poor policies and weak institutions. La Porta et al. (1999) and Alesina et al. (2003) also find that ethnic fractionalization leads to poor policy outcomes and bad governance. Miguel and Guerty (2005) illustrate the negative effect of ethnic divisions on the provision of local public goods in rural Kenya. We complement these findings by showing that ethnic fractionalization further retards economic development by undermining the otherwise positive growth effects of foreign aid.

The remainder of this paper is structured as follows: Section 2 discusses our empirical methodology and the data. Section 3 presents our main results and various robustness exercises. Section 4 concludes.

2 Methodology and data

We employ panel data covering 114 aid recipient countries over the period 1962 to 2001.[6] We use four year averages of our measures of foreign aid and economic growth. To test whether the aid-growth relationship varies systematically with ethnic fractionalization, we estimate the following model:

$$GROWTH_{it} = \alpha + \beta_1 AID_{it} + \beta_2 (AID_{it} \times ETHNIC_i) + \beta_3 ETHNIC_i + X'_{it}\Lambda + \varepsilon_{it},$$

where $GROWTH_{it}$ is the average growth rate of real per capita GDP in country i from year t to year $t+3$, AID_{it} a measure of average yearly aid inflows in this period, $ETHNIC_i$ an index of ethnic fractionalization, and X_{it} a vector of other control variables.

We are mainly interested in the effect of a change in AID_{it} on $GROWTH_{it}$. The point estimate of this effect is $\beta_1 + \beta_2 ETHNIC_i$. Our hypothesis suggests that β_1 should be significantly positive, and β_2 significantly negative. It would then follow that $GROWTH_{it}$ is increasing in AID_{it} if $ETHNIC_i$ is below the threshold of $-\beta_1/\beta_2$, but decreasing in AID_{it} otherwise.

We use the measures of $GROWTH_{it}$ and AID_{it} from the extensive data set compiled by Roodman (2004).[7] This data set contains three measures of aid inflows: Effective development assistance (EDA) relative to real GDP, net overseas development assistance (ODA) relative to real GDP, and ODA relative to exchange rate GDP, i.e. GDP converted to US dollars using market exchange rates rather than purchasing power parities. The EDA data corrects for a number of short-comings in the ODA data and should therefore be conceptually superior in measuring the true aid element of grants and loans (Chang et al., 1998). We follow the recent literature by using EDA-to-real GDP in our baseline

[6] Due to data limitations, the panel is unbalanced and not all specifications cover exactly 114 countries.
[7] Appendix A provides definitions and sources of all variables used.

specifications, and the ODA variables to check the robustness of our results. We denote EDA-to-real GDP by AID_{it}, ODA-to-real GDP by ODA^R_{it}, and ODA-to-exchange rate GDP by ODA^X_{it}.

We use the index of ethnic fractionalization ($ETHNIC_i$) by Alesina et al. (2003) to proxy for the number of rivalling ethnic groups. This index measures the probability that two randomly selected individuals of a particular country belong to different ethnolinguistic groups. Hence higher scores indicate a more fractionalized country. This index is only available as a cross-section, but we are not concerned by this because the ethnic composition of countries tends to be very slow-moving (Alesina et al., 2003). We also use the similarly constructed indices of linguistic and religious fractionalization ($LANGUAGE_i$ and $RELIGION_i$). Table 1 provides summary statistics for our three main variables – $GROWTH_{it}$, AID_{it} and $ETHNIC_i$ – based on all observations used in our baseline specifications.

Following the literature, our control variables include "initial" per capita GDP in year t (GDP_{it}), and a dummy variable for the fast-growing East Asian countries ($EASIA_i$). Over the period 1962 to 2001, the average growth rate in these countries was close to 5% compared to 1% in the rest of the sample.

Many studies in the aid effectiveness literature further add control variables that proxy for fiscal, monetary and trade policies, institutional quality, political stability and governance. We refrain from adding such control variables. The models of Svensson (2000) and Hodler (2006) suggest that the rent seeking activities caused by aid inflows in ethnically diverse countries go hand-in-hand with poor (fiscal) policies and lead to a deterioration in institutional quality. The resulting rent seeking contests are also likely to be associated with political instability and bad governance. These models therefore predict that in fractionalized countries, foreign aid has an indirect negative effect on economic growth working via rent seeking, poor policies, bad governance, political instability and weak institutions.

We can only test this hypothesis if we exclude these variables. Otherwise, we *would* be testing whether ethnic fractionalization impacts upon the aid-growth relationship through some channel unrelated to policies, governance, political stability and institutional quality. To address the potential omitted variable bias, we add year dummies to account for time varying common shocks and regional dummies to control for regional fixed effects.[8]

As a positive side-effect of excluding policy, governance and institutional variables, our sample contains a larger cross-section of countries than previous studies. Our baseline specifications are based on 763 observations from 114 countries, while the baseline specification is based on, for example, 275 observations from 56 countries in Burnside and Dollar (2000), and 449 observations from 67 countries in Angeles and Neanidis (2009). As policy, governance and institutional variables tend to be missing more often for countries with poor policies, bad governance, weak institutions and low growth rates, we expect our results to be less prone to sample selection bias than those of previous studies.

The potential endogeneity of foreign aid has been the main challenge in the empirical aid effectiveness literature. We follow the literature in choosing estimation techniques that help to address this potential endogeneity. The first technique that we use is two-stage least squares (2SLS). Following the literature (e.g., Burnside and Dollar, 2000; Hansen and Tarp, 2001; Dalgaard et al., 2004; Angeles and Neanidis, 2009), we use as instruments for AID_{it} a dummy for the Franc zone (FRZ_i), a dummy for Central American countries (CAM_i), a dummy for Egypt (EGY_i), arms imports divided by GDP ($ARMS_{it}$), and log population size (POP_{it}). These instruments are inspired by Alesina and Dollar's (2000) finding that strategic and cultural ties are important determinants of aid flows. Countries in the Franc zone and Central America receive more aid from France and the United States, respectively, for cultural reasons unrelated to economic performance, while Egypt receives more aid for geopolitical reasons. Donors also tend to give more aid per capita to small

[8]The regions are East Asia and the Pacific, Eastern Europe and Central Asia, Latin America and the Caribbean, the Middle East and North Africa, South Asia, and Sub-Saharan Africa.

countries as well as to countries that have arms deals with them, again for reasons unrelated to economic performance. However we deviate from most of the literature by not using lagged aid as an instrument for current aid. Rajan and Subramanian (2008) note that using such lagged variables as instruments may be problematic. The reason is that the average growth rate in, say, the period from 1998 to 2001 may well depend on aid inflows in, say, 1997, which would violate the instrument exogeneity requirement. To ensure that our set of instruments is sufficiently strong despite dropping lagged aid, we add quadratics of $ARMS_{it}$ and POP_{it}.[9] Since we need to instrument for AID_{it} as well as its interaction with $ETHNIC_i$, we also add $ARMS_{it} \times ETHNIC_i$ and $POP_{it} \times ETHNIC_i$ to our set of instruments.[10]

We address the potential endogeneity of foreign aid also by using the Generalized Method of Moments (GMM) panel estimators due to Arellano and Bond (1991), and Blundell and Bond (1998). These estimators have become increasingly popular in the aid effectiveness literature (e.g., Hansen and Tarp, 2001; Dalgaard et al., 2004; Roodman, 2004; Rajan and Subramanian, 2008; Angeles and Neanidis, 2009). They make use of standard instruments, such as those discussed above, but expand the instrument set to improve the efficiency of the first-stage regression. The Arellano-Bond estimator converts endogenous variables into first differences and uses lagged levels of the endogenous variables to instrument for these differences, which is why it is commonly referred to as the difference-GMM estimator. The Blundell-Bond estimator adds the levels of the endogenous variables to the system to be instrumented and uses the lagged first differences as additional instruments. This is known as the system-GMM estimator.[11] We apply these GMM estimators using a two-step estimation process, which tends to be more efficient than a one-step process, and

[9] Dividing arms imports by GDP rather than total imports serves the same purpose.

[10] Further adding $ARMS_{it}^2 \times ETHNIC_i$ and $POP_{it}^2 \times ETHNIC_i$ to our set of instruments would not lead to any noticeable change in our results.

[11] These estimators both have their limitations. The difference-GMM estimator often leads to a weak instruments problem, while the system-GMM is only valid if the lagged differences are orthogonal to the fixed effects.

the Windmeijer (2005) finite-sample correction to adjust the standard errors. To avoid dynamic panel bias we treat AID_{it} and $AID_{it} \times ETHNIC_i$ as well as GDP_{it} as endogenous variables.

Besides addressing the potential endogeneity of aid, these GMM estimators have the added advantage that they "incorporate (implicitly) fixed effects" (Rajan and Subramanian, 2008, p. 644). This possibility to control for unobserved country-specific heterogeneity is particularly valuable in our study, in which we cannot control for policy, governance and institutional variables because of the hypothesized channels through which ethnic fractionalization impacts upon aid effectiveness.

When employing these GMM panel estimators, one needs to be careful in the choice of the number of lags of the endogenous variables. We only use endogenous variables that are lagged at least twice as instruments. We first report results when the number of lags of the endogenous variables used as instruments is otherwise unrestricted. However, as pointed out by Roodman (2004, p. 25), GMM panel estimators may in this case create numerous instruments that "can overfit the instrumented variables." We follow his advice and also report results when using only the second and third lags of the endogenous variables as instruments, and when collapsing the set of instruments.

3 Findings

Table 2 presents our main results. In column (1) we estimate our model using OLS. The coefficients on AID_{it} and $AID_{it} \times ETHNIC_i$ have the predicted signs, but are statistically insignificant. The coefficients on $ETHNIC_i$ and GDP_{it} also have the expected negative signs, but are insignificant as well. Not surprisingly, the dummy variable for the fast-growing East Asian countries ($EASIA_i$) is highly significant.

In column (2) we address the potential endogeneity of AID_{it} and $AID_{it} \times ETHNIC_i$

using 2SLS with the set of instruments discussed in the previous section. Before looking at the coefficients, let us briefly discuss the two specification tests. The Hansen J-test is often used to assess the validity of the instruments. We cannot reject the null hypothesis that the excluded instruments are uncorrelated with the error term and, therefore, exogenous. The Anderson canonical correlations (ACC) LR-test can be used to assess the relevance of the instruments. The rejection of the null hypothesis indicates that the model is identified and the instruments relevant. Hence the model seems well specified. Moreover, the positive coefficient on AID_{it} and the negative coefficient on $AID_{it} \times ETHNIC_i$ are both statistically significant (with p-values of 0.034 and 0.053, respectively). These results support our hypothesis that the effect of AID_{it} on $GROWTH_{it}$ is unambiguously positive in ethnically homogenous countries, but decreasing in $ETHNIC_i$. The point estimates suggest that this effect turns negative once $ETHNIC_i$ exceeds the threshold level of 0.75. This is the case in 21 of the 114 countries in our baseline sample, including 20 of the 43 Sub-Saharan African countries. In these countries foreign aid tends to lower growth, presumably because the positive effect of the aid inflows is overshadowed by the negative consequences of the provoked rent seeking contests among the many rivalling ethnic groups. Interestingly, our results suggest that $ETHNIC_i$ has no direct negative effect on $GROWTH_{it}$.

To get an idea how sizeable the effect of ethnic fractionalization on aid effectiveness is, let us consider the case of Uganda. Uganda is the most ethnically fractionalized country in the world with $ETHNIC_{UGA} = 0.930$. Over the period 1998 to 2001, it received EDA equal to only 1.2% of its GDP, and its average yearly growth rate was 2.5%. Our point estimates suggest that the contribution of these aid inflows to its growth rate was -0.4%, i.e., that Uganda would have grown at a rate of 2.9% in the absence of foreign aid. However the contribution of these aid inflows to its growth rate would have been 0.6% if Uganda were about as ethnically fractionalized as the average country in our sample (such as Nicaragua or Venezuela), and even 1.7% if Uganda were perfectly ethnically homogenous (such as

Comoros).[12] These counterfactuals illustrate that the effect of ethnic fractionalization on aid effectiveness is economically significant.

Given that most ethnically fractionalized countries are located in Sub-Saharan Africa, we might suspect that our results are driven by countries from this region. In column (3) we therefore omit Sub-Saharan African countries from our sample. We find that the results remain very similar except that the coefficients on AID_{it} and $AID_{it} \times ETHNIC_i$ get somewhat larger in magnitude. Hence ethnic fractionalization lowers aid effectiveness also outside Sub-Saharan Africa. In column (4) we account more systematically for the possibility that outliers may drive our results by using the Hadi (1992) procedure to identify and remove outliers. In the absence of outliers the coefficients of interest are of similar magnitude and statistical significance as when the full sample is used.[13]

We next employ GMM estimation techniques to address the potential endogeneity of foreign aid as well as to account for country-specific unobserved heterogeneity. In column (5) we use the system-GMM estimator with all possible lags of the endogenous variables as instruments starting from the second lag. The coefficients of interest again have the predicted signs, and they are highly statistically significant. The Hansen J-test suggests that the exogeneity of the instruments cannot be rejected; and the Arellano-Bond test for AR(2) fails to reject the null hypothesis of no autocorrelation.[14] Even though the number of instruments is not overly high, we follow Roodman's (2004) recommendation and reduce the number of instruments by using only twice and thrice lagged endogenous variables in column (6), and by collapsing the set of instruments in column (7). In both instances, our

[12] These contributions are calculated as follows: $(1.399 - 1.874 \times 0.930)0.012 = -0.004$, $(1.399 - 1.874 \times 0.492)0.012 = 0.006$, and $1.399 \times 0.012 = 0.017$.

[13] The Hadi (1992) procedure is used by, e.g., Roodman (2004) and Angeles and Neanidis (2009). Following Roodman's suggestion, we use a 5% significance level to remove outliers to the partial scatter plot of $GROWTH_{it}$ against the predicted values of $AID_{it} \times ETHNIC_i$ after projection onto the instruments. Our main results also survive if we use other standard tests for outliers based on Cook's Distance, DFITS and the standardized residuals.

[14] The appropriate null hypothesis is absence of second-order autocorrelation because first-differencing of endogenous variables directly induces first-order autocorrelation.

results survive. In column (8), we show that the coefficients of interest have the predicted signs and are close to being significant even when using the difference-GMM estimator. Compared to the 2SLS estimates, the GMM estimates imply somewhat lower threshold levels of $ETHNIC_i$. Hence aid inflows may retard economic growth in considerably more than half of the countries in Sub-Saharan Africa as well as in some fractionalized countries in Latin America and elsewhere.[15]

In the remainder of this section we present further robustness exercises based on the 2SLS regression of column (2) and the GMM regression of column (6) of table 2. In table 3 we test whether our results are robust when controlling for geographical and institutional variables. In columns (1) and (2) we add the distance from the equator ($LATITUDE_i$) and the fraction of a country's area located in the tropics ($TROPICS_i$) to our baseline 2SLS regression. We note that the coefficients on AID_{it} and the interaction term have the predicted signs and remain statistically significant.[16]

As argued earlier, we expect ethnic fractionalization to impact upon aid effectiveness via rent seeking, poor policies, bad governance, political instability and weak institutions. To test our hypothesis we therefore generally refrain from controlling for these variables. However institutions are arguably slower-moving and, consequently, less sensitive to changes in aid than policies and governance. In columns (3) to (8) we therefore test whether our results still hold when controlling for institutional quality in our baseline 2SLS and GMM regressions. We use the indices of political rights ($POLITICAL_{it}$) and civil liberties ($CIVIL_{it}$) from Freedom House, which are inverse measures of institutional quality. We find that the coefficients on AID_{it} and the interaction term still show the predicted signs and remain statistically significant at least at the 10% level.

[15]The point estimates in column (5) suggest a threshold level of 0.51. $ETHNIC_i$ exceeds 0.51 in 58 of the 114 countries in our baseline sample, including 34 Sub-Saharan African and 10 Latin American countries.

[16]Not surprisingly, our GMM results also survive when controlling for these time-invariant geographical variables.

In table 4 we test whether our results are robust to the use of alternative measures of foreign aid and fractionalization. In columns (1) to (4) we replace AID_{it} by the two ODA-based aid measures ODA^R_{it} and ODA^X_{it} in our baseline 2SLS and GMM regressions. We note that the coefficients on these aid measures and their interactions with $ETHNIC_i$ have the predicted signs and are statistically significant in all four regressions, except that $ODA^X_{it} \times ETHNIC_i$ is marginally insignificant in column (3). These results lend further support to our hypothesis.

In columns (5) to (8) we replace $ETHNIC_i$ by the indices of linguistic and religious fractionalization ($LANGUAGE_i$ and $RELIGION_i$). The coefficients on AID_{it} and its interaction with these indices still show the predicted signs, but most of them are small (in absolute values) and statistically insignificant. These results suggest that the hypothesized rent seeking contests for aid inflows mainly occur along ethnic lines rather than religious or purely linguistic lines. Caselli and Coleman (2006) provide a plausible explanation for such a pattern. They present a model in which conflicts over resources, say aid inflows, emerge if winners can easily identify losers and prevent them from infiltration when it comes to sharing the spoils of victory. They argue that not all distinctions are equally effective ways of ensuring that group members can be identified, with racial differences and other differences in physical appearance being more infiltration proof than linguistic or religious differences.

In table 5 we compare our hypothesis to other findings and hypotheses advanced in the conditional aid effectiveness literature. We thereby focus on the finding of Hansen and Tarp (2000, 2001) and Lensink and White (2001) that there are decreasing returns to aid; the finding of Dalgaard et al. (2004) that aid is more effective outside the tropics; and the finding of Angeles and Neanidis (2009) that aid is more effective in countries with few colonial settlers and therefore no overly strong elite. In columns (1) and (2) we add aid squared (AID^2_{it}) to our baseline 2SLS and GMM regressions. We note that the

coefficients on AID_{it} and $AID_{it} \times ETHNIC_i$ retain the predicted signs and their statistical significance, while the coefficient on AID_{it}^2 is significant in column (2), but not in column (1). These results provide further support for our hypothesis. They moreover suggest that earlier studies may have found robust evidence for the hypothesis of decreasing returns to aid partly because more fractionalized countries (paradoxically) tend to receive more aid (with the correlation between AID_{it} and $ETHNIC_i$ being 0.25).

To compare our hypothesis to the finding of Dalgaard et al. (2004), we add the interaction term $AID_{it} \times TROPICS_i$ in columns (3) and (4). Since we need to instrument also for this interaction term, we add $ARMS_{it} \times TROPICS_i$ and $POP_{it} \times TROPICS_i$ to the set of our instruments. Again, the coefficients on AID_{it} and $AID_{it} \times ETHNIC_i$ retain the predicted signs and their statistical significance. The interaction term $AID_{it} \times TROPICS_i$ has the expected sign and is statistically significant in column (4), but not in column (3). Hence Dalgaard and his co-authors may have found that aid is more effective outside the tropics partly because countries in the tropics tend to be more ethnically fractionalized (with the correlation between $TROPICS_i$ and $ETHNIC_i$ being 0.53).

We finally compare our hypothesis to the findings of Angeles and Neanidis (2009). In columns (5) and (6) we add an interaction term between AID_{it} and the share of colonial settlers ($SETTLERS_i$) to our baseline 2SLS and GMM regressions. We also add $ARMS_{it} \times SETTLERS_i$ and $POP_{it} \times SETTLERS_i$ to the set of our instruments. We find that the coefficients on AID_{it}, $AID_{it} \times ETHNIC_i$ and $AID_{it} \times SETTLERS_i$ all have the predicted signs and are statistically significant. These results provide further support for our hypothesis as well as for the hypothesis of Angeles and Neanidis. Hence foreign aid becomes less effective when there are many rivalling groups as well as when there exists a strong elite of colonial settlers. These results are also consistent with the idea that rent seeking contests caused by aid inflows do not only get more detrimental as the number of ethnic groups raises, but also as the racial differences between the major ethnic groups

grow larger.

4 Conclusions

Using panel data covering 114 aid recipient countries over the period 1962 to 2001, we find that foreign aid is effective in promoting economic growth in ethnically homogenous countries and that higher ethnic fractionalization reduces aid effectiveness. Our estimates suggest that foreign aid may have retarded economic growth in many fractionalized countries, most of which are located in Sub-Saharan Africa. These findings are consistent with our hypothesis that there is a direct positive effect of foreign aid on economic growth, which is offset in fractionalized countries in which aid inflows may provoke detrimental rent seeking contests associated with poor policies, bad governance, political instability and possibly a deterioration in institutional quality.

These findings have implications for future foreign aid policy. They suggest that more focus should be placed on the degree of integration of distinct groups in a country. If a country is starkly fractionalized, fungible aid flows without conditions and close oversight may do more harm than good. A clearer view on practical methods that are effective in counteracting the negative effects of aid in fractionalized countries would certainly benefit from further research on a more microeconomic level.

Appendix: Data description

$GROWTH_{it}$: Growth rate of real per capita GDP, averaged over the period from year t to year $t+3$. *Source:* Roodman (2004)

AID_{it}: Effective development assistance relative to real GDP, averaged over the period from year t to year $t+3$. *Source:* Roodman (2004)

ODA^R_{it}: Net overseas development assistance relative to real GDP, averaged over the period from year t to year $t+3$. *Source:* Roodman (2004)

ODA^X_{it}: Net overseas development assistance relative to exchange rate GDP, averaged over the period from year t to year $t+3$. *Source:* Roodman (2004)

$ETHNIC_i$: Index of ethnic fractionalization. *Source:* Alesina et al. (2003)

$LANGUAGE_i$: Index of linguistic fractionalization. *Source:* Alesina et al. (2003)

$RELIGION_i$: Index of religious fractionalization. *Source:* Alesina et al. (2003)

GDP_{it}: Real per capita GDP in year t. *Source:* Roodman (2004)

$EASIA_i$: Dummy variable equal to 1 for fast-growing East Asian countries. *Source:* Roodman (2004)

$LATITUDE_i$: Absolute latitude. *Source:* Gallup et al. (1999)

$TROPICS_i$: Fraction of a country's area located in the tropics. *Source:* Gallup et al. (1999)

$POLITICAL_{it}$: Index of political rights, ranging from 1 to 7, with higher values indicating less rights, averaged over the period from year t to year $t+3$. *Source:* Freedom House

$CIVIL_{it}$: Index of civil liberties, ranging from 1 to 7, with higher values indicating less liberties, averaged over the period from year t to year $t+3$. *Source:* Freedom House

$SETTLERS_i$: Share of European settlers in colonial times. *Sources:* Angeles and Neanidis (2009)

$ARMS_{it}$: Arms imports divided by GDP, averaged over the period from year t to year $t+3$. *Source:* SIPRI Arms Transfers Database

POP_{it}: Natural logarithm of population, averaged over the period from year t to year $t+3$. *Source:* Roodman (2004)

FRZ_i: Dummy variable equal to 1 for member countries of the Franc Zone. *Source:* Roodman (2004)

CAM_i: Dummy variable equal to 1 for Central American countries. *Source:* Roodman (2004)

$EGYPT_i$: Dummy variable equal to 1 for Egypt. *Source:* Roodman (2004)

References

[1] Acemoglu, D., Robinson, J.A., Verdier, T., 2004, Kleptocracy and divide-and-rule: a model of personal rule, Journal of the European Economic Association 2(2-3), 162-192.

[2] Alesina, A., Devleeschauwer, A., Easterly, W., Kurlat, S., 2003, Fractionalization, Journal of Economic Growth 8(2), 155-194.

[3] Alesina, A., Dollar, D., 2000, Who gives foreign aid to whom and why?, Journal of Economic Growth 5(1), 33-63.

[4] Angeles, L., Neanidis, C., 2009, Aid effectivness: The role of the local elite, Journal of Development Economics 90(1), 120-134.

[5] Arellano, M., Bond, S., 1991, Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations, Review of Economic Studies 58(194), 277-297.

[6] Blundell, R., Bond, S., 1998, Initial conditions and moment restrictions in dynamic panel data models, Journal of Econometrics 87(1), 115-143.

[7] Bräutigam, D.A., Knack, S., 2004, Foreign aid, institutions, and governance in Sub-Saharan Africa, Economic Development and Cultural Change 52, 255-285.

[8] Burnside, C., Dollar, D., 2000, Aid, policies, and growth, American Economic Review 90(4), 847-868.

[9] Caselli, F., Coleman II, J.W., 2006, On the theory of ethnic conflict, LSE Working Paper.

[10] Chang, C.C., Fernandez-Arias, E., Serven, L., 1998, Measuring aid flows: A new approach, World Bank Policy Research Paper No. 387.

[11] Dalgaard, C.J., Hansen, H., 2001, On aid, growth and good policies, Journal of Development Studies 37(6), 17-41.

[12] Dalgaard, C.J., Hansen, H., Tarp, F., 2004, On the empirics of foreign aid and growth, Economic Journal 114(496), F191-F216.

[13] Dalgaard, C.J., Olsson, O., 2008, Windfall gains, political economy and economic development, Journal of African Economies 17(1), 72-109.

[14] Djankov, S., Montalvo, J.G., Reynal-Querol, M., 2008, The curse of aid, Journal of Economic Growth 13, 169-194.

[15] Doucouliagos, H., Paldam, M., 2008, Aid effectiveness on growth: A meta study, European Journal of Political Economy 24(1), 1-24.

[16] Doucouliagos, H., Paldam, M., 2009, Conditional aid effectiveness: A meta study, Journal of International Development, forthcoming.

[17] Easterly, W., Levine, R., 1997, Africa's growth tragedy: Policies and ethnic divisions, Quarterly Journal of Economics 112(4), 1203-1250.

[18] Easterly, W., Levine, R., Roodman, D., 2004, Aid, policies and growth: Comment, American Economic Review 94(3), 774-780.

[19] Gallup, J., Sachs, J., Mellinger, D., 1999, Geography and economic development, International Regional Science Review 22(2), 179-232.

[20] Hadi, A., 1992, Identifying Multiple Outliers in Multivariate Data, Journal of the Royal Statistical Society B(54), 761-777.

[21] Hansen, H., Tarp, F., 2000, Aid effectiveness disputed, Journal of International Development 12(3), 375-398.

[22] Hansen, H., Tarp, F., 2001, Aid and growth regressions, Journal of Development Economics 64(2), 547-570.

[23] Hodler, R., 2006, The curse of natural resources in fractionalized countries, European Economic Review 50(6), 1367-1386.

[24] Hodler, R., 2007, Rent seeking and aid effectiveness, International Tax and Public Finance 14(5), 525-541.

[25] Knack, S., 2001, Aid dependence and the quality of governance: cross-country empirical tests, Southern Economic Journal 68(2), 310-329.

[26] La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1999, The quality of government, Journal of Law, Economics and Organisation 15(1), 222-279.

[27] Lane, P.R., Tornell, A., 1996, Power, growth and the voracity effect, Journal of Economic Growth 1(2), 213-241.

[28] Lensink, R., White, H., 2001, Are there negative returns to aid?, Journal of Development Studies 37(6), 42-65.

[29] Miguel, E., Guerty, M.K., 2005, Ethnic diversity, social sanctions, and public goods in Kenya, Journal of Public Economics 89, 2325-2368.

[30] Rajan, R.G., Subramanian, A., 2008, Aid and growth: What does the cross-country evidence really show?, Review of Economics and Statistics 90(4), 643-665.

[31] Roodman, D., 2004, The anarchy of numbers: Aid, development, and cross-country empirics, Center for Global Development Working Paper 32.

[32] Roodman, D., 2007, The anarchy of numbers: Aid, development, and cross-country empirics, World Bank Economic Review 21(2), 255-277.

[33] Svensson, J., 2000, Foreign aid and rent-seeking, Journal of International Economics 51(2), 437-461.

[34] Tornell, A., Lane, P.R., 1999, The voracity effect, American Economic Review 89(1), 22-46.

[35] Windmeijer, F., 2005, A finite sample correction for the variance of linear efficient two-step GMM estimators, Journal of Econometrics 126, 25-51.

Table 1: Summary Statistics

Variable	Number of observations	Mean	Standard Deviation	Minimum	Maximum
$GROWTH_{it}$	763	0.013	0.042	-0.425	0.165
AID_{it}	763	0.014	0.024	-0.005	0.237
$ETHNIC_i$	114	0.492	0.261	0.000	0.930

Table 2: Baseline results

	(1) OLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) SYS-GMM	(6) SYS-GMM	(7) SYS-GMM	(8) DIFF-GMM
AID_{it}	0.507	1.399	2.113	1.249	0.718	0.776	1.395	1.658
	(0.176)	(0.034)	(0.029)	(0.044)	(0.009)	(0.005)	(0.000)	(0.105)
$AID_{it}*ETHNIC_i$	-1.066	-1.874	-2.859	-1.822	-1.407	-1.577	-2.212	-3.111
	(0.139)	(0.053)	(0.053)	(0.058)	(0.005)	(0.001)	(0.002)	(0.072)
$ETHNIC_i$	-0.016	-0.005	-0.005	-0.007				
	(0.158)	(0.750)	(0.684)	(0.635)				
GDP_{it}	-0.002	0.003	-0.000	-0.001	-0.002	-0.002	0.001	-0.020
	(0.750)	(0.554)	(0.957)	(0.896)	(0.603)	(0.524)	(0.915)	(0.111)
$EASIA_i$	0.037	0.056	0.075	0.055				
	(0.006)	(0.004)	(0.004)	(0.003)				
Further Controls:								
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Regional Dummies	YES	YES	YES	YES	NO	NO	NO	NO
Implied threshold $-\beta_1/\beta_2$	(0.48)	0.75	0.74	0.69	0.51	0.49	0.63	(0.53)
Countries	114	114	71	114	114	114	114	107
Observations	763	763	492	752	763	763	763	649
R squared	0.176	0.209	0.231	0.239	-	-	-	-
Hansen J-test (p-value)	-	0.342	0.273	0.484	0.495	0.470	0.521	0.333
ACC LR-test (p-value)	-	0.000	0.000	0.000	-	-	-	-
AR(2) test (p-value)	-	-	-	-	0.855	0.617	0.521	0.517
GMM instrument count	-	-	-	-	76	56	33	58
Omitted Observations			Sub-Saharan Africa	Outliers				
Lags of endogenous variables used as instruments					Unrestricted starting with two lags	Two and three lags	Unrestricted starting with two lags and collapsed set	Unrestricted starting with two lags

Notes: Dependent variable is $GROWTH_{it}$. p-values in parentheses are based on robust and clustered standard errors in columns (1)-(4), and on robust standard errors and the Windmeijer (2005) finite-sample correction in columns (5)-(8). In columns (2)-(8) exogenous variables used as instruments are FRZ_i, CAM_i, EGY_i, POP_{it}, POP_{it}^2, $POP_{it}*ETHNIC_i$, $ARMS_{it}$, $ARMS_{it}^2$ and $ARMS_{it}*ETHNIC_i$. In column (4) outliers are removed using the Hadi (1992) procedure (see footnote 13 for details). The outliers are GAB 1974-1977; GNB 1974-1977, 1982-1985, 1986-1989; IRQ 1990-1993; JOR 1974-1977, 1978-1981, 1982-1985; LBR 1990-1993, 1998-2001; and SOM 1974-1977.

Table 3: Geographical and institutional control variables

	(1) 2SLS	(2) 2SLS	(3) 2SLS	(4) 2SLS	(5) 2SLS	(6) SYS-GMM	(7) SYS-GMM	(8) SYS-GMM
AID_{it}	3.028	2.970	1.135	1.121	2.336	0.646	0.672	0.661
	(0.057)	(0.027)	(0.052)	(0.057)	(0.027)	(0.014)	(0.014)	(0.011)
AID_{it}*$ETHNIC_i$	-4.122	-3.863	-1.517	-1.489	-3.080	-1.387	-1.442	-1.402
	(0.056)	(0.037)	(0.081)	(0.089)	(0.036)	(0.003)	(0.003)	(0.003)
$ETHNIC_i$	0.026	0.020	-0.008	-0.008	0.021			
	(0.343)	(0.363)	(0.615)	(0.588)	(0.348)			
$LATITUDE_i$	0.001				0.000			
	(0.087)				(0.477)			
$TROPICS_i$		-0.011			-0.003			
		(0.115)			(0.842)			
$POLITICAL_{it}$			-0.002		-0.002	-0.001		-0.002
			(0.077)		(0.388)	(0.173)		(0.277)
$CIVIL_{it}$				-0.003	0.002		-0.001	0.001
				(0.158)	(0.577)		(0.383)	(0.656)
Further Controls:								
GDP_{it}	YES	YES	YES	YES	YES	YES	YES	YES
$EASIA_i$	YES	YES	YES	YES	YES	NO	YES	NO
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Regional Dummies	YES	YES	YES	YES	YES	NO	NO	NO
Implied threshold $-\beta_1/\beta_2$	0.73	0.77	0.75	0.75	0.76	0.47	0.47	0.47
Countries	98	95	114	114	93	114	114	114
Observations	715	710	656	656	591	656	656	656
R squared	0.174	0.178	0.204	0.202	0.181	-	-	-
Hansen J-test (p-value)	0.258	0.270	0.205	0.207	0.205	0.479	0.505	0.472
ACC LR-test (p-value)	0.000	0.000	0.000	0.000	0.000	-	-	-
AR(2) test (p-value)	-	-	-	-	-	0.712	0.702	0.705
GMM instrument count	-	-	-	-	-	55	55	56

Notes: Dependent variable is $GROWTH_{it}$. p-values in parentheses are based on robust and clustered standard errors in columns (1)-(5), and on robust standard errors and the Windmeijer (2005) finite-sample correction in columns (6)-(8). In all columns exogenous variables used as instruments are FRZ_i, CAM_i, EGY_i, POP_{it}, POP_{it}^2, POP_{it}*$ETHNIC_i$, $ARMS_{it}$, $ARMS_{it}^2$ and $ARMS_{it}$*$ETHNIC_i$. In columns (6)-(8) the second and third lags of the endogenous variables are used as instruments.

Table 4: Alternative measures of aid and fractionalization

	(1) 2SLS	(2) SYS-GMM	(3) 2SLS	(4) SYS-GMM	(5) 2SLS	(6) SYS-GMM	(7) 2SLS	(8) SYS-GMM
ODA^R_{it}	0.771	0.450						
	(0.037)	(0.003)						
ODA^X_{it}			0.354	0.162				
			(0.063)	(0.015)				
AID_{it}					0.349	0.160	0.444	0.012
					(0.222)	(0.431)	(0.063)	(0.934)
ODA^R_{it}*$ETHNIC_i$	-0.938	-0.994						
	(0.068)	(0.001)						
ODA^X_{it}*$ETHNIC_i$			-0.444	-0.193				
			(0.103)	(0.019)				
AID_{it}*$LANGUAGE_i$					-0.431	-0.653		
					(0.316)	(0.057)		
AID_{it}*$RELIGION_i$							-0.509	-0.067
							(0.443)	(0.819)
$ETHNIC_i$	-0.006		-0.002					
	(0.659)		(0.418)					
$LANGUAGE_i$					-0.017			
					(0.133)			
$RELIGION_i$							0.016	
							(0.261)	
Further Controls:								
GDP_{it}	YES	YES	YES	YES	YES	YES	YES	YES
$EASIA_i$	YES	NO	YES	NO	YES	NO	YES	NO
Year Dummies	YES	YES	YES	YES	YES	YES	YES	YES
Regional Dummies	YES	NO	YES	NO	YES	NO	YES	NO
Countries	114	114	114	114	108	108	114	114
Observations	763	763	748	748	736	736	763	763
R squared	0.215	-	0.208	-	0.223	-	0.172	-
Hansen J-test (p-value)	0.341	0.389	0.330	0.489	0.478	0.738	0.255	0.301
ACC LR-test (p-value)	0.000	-	0.000	-	0.000	-	0.000	-
AR(2) test (p-value)	-	0.924	-	0.596	-	0.964	-	0.937
GMM instrument count	-	66	-	66	-	56	-	56

Notes: Dependent variable is $GROWTH_{it}$.p-values in parentheses are based on robust and clustered standard errors in columns (1), (3), (5) and (7), and on robust standard errors and the Windmeijer (2005) finite-sample correction in columns (2), (4), (6) and (8). In all columns exogenous variables used as instruments include FRZ_i, CAM_i, EGY_i, POP_{it}, POP_{it}^2, POP_{it}*$ETHNIC_i$, $ARMS_{it}$, $ARMS_{it}^2$. We add POP_{it}*$ETHNIC_i$ and $ARMS_{it}$*$ETHNIC_i$ in columns (1)-(4), POP_{it}*$LANGUAGE_i$ and $ARMS_{it}$*$LANGUAGE_i$ in columns (5)-(6), and POP_{it}*$RELIGION_i$ and $ARMS_{it}$*$RELIGION_i$ in columns (7)-(8). In columns (2), (4), (6) and (8) the second and third lags of the endogenous variables are used as instruments.

Table 5: Alternative determinants of aid effectiveness

	(1) 2SLS	(2) SYS-GMM	(3) 2SLS	(4) SYS-GMM	(5) 2SLS	(6) SYS-GMM
AID_{it}	2.007 (0.041)	1.156 (0.005)	3.054 (0.030)	1.238 (0.000)	3.298 (0.044)	1.652 (0.006)
$AID_{it}*ETHNIC_i$	-1.662 (0.080)	-1.274 (0.008)	-4.888 (0.069)	-1.098 (0.057)	-4.319 (0.050)	-2.589 (0.002)
AID_{it}^2	-6.659 (0.355)	-4.071 (0.085)				
$AID_{it}*TROPICS_i$			0.903 (0.402)	-0.865 (0.000)		
$AID_{it}*SETTLERS_i$					-7.831 (0.028)	-3.639 (0.063)
$ETHNIC_i$	-0.005 (0.724)		0.032 (0.292)		0.012 (0.633)	
$TROPICS_i$			-0.018 (0.080)			
$SETTLERS_i$					0.001 (0.034)	
Further Controls:						
GDP_{it}	YES	YES	YES	YES	YES	YES
$EASIA_i$	YES	NO	YES	NO	YES	NO
Year Dummies	YES	YES	YES	YES	YES	YES
Regional Dummies	YES	NO	YES	NO	YES	NO
Countries	114	114	95	95	95	95
Observations	763	763	710	710	699	699
R squared	0.250	-	0.090	-	0.225	-
Hansen J-test (p-value)	0.297	0.338	0.320	0.433	0.100	0.551
ACC LR-test (p-value)	0.001	-	0.001	-	0.000	-
AR(2) test (p-value)	-	0.672	-	0.788	-	0.998
GMM instrument count	-	74	-	76	-	76

Notes: Dependent variable is $GROWTH_{it}$. p-values in parentheses are based on robust and clustered standard errors in columns (1), (3) and (5), and on robust standard errors and the Windmeijer (2005) finite-sample correction in columns (2), (4) and (6). In all columns exogenous variables used as instruments are FRZ_i, CAM_i, EGY_i, POP_{it}, POP_{it}^2, $POP_{it}*ETHNIC_i$, $ARMS_{it}$, $ARMS_{it}^2$ and $ARMS_{it}*ETHNIC_i$. In addition, $POP_{it}*TROPICS_i$ and $ARMS_{it}*TROPICS_i$ are used in columns (3)-(4), and $POP_{it}*SETTLER_i$ and $ARMS_{it}*SETTLER_i$ in columns (5)-(6). In columns (2), (4) and (6) the second and third lags of the endogenous variables are used as instruments.