Understanding the Link Between Aid and Corruption: A Causality Analysis

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Abstract

This paper addresses the causal link between aid and corruption. While the relation between aid and corruption has been widely studied, no work has ever investigated the causality between both dimensions. We perform Granger-causality tests in a dynamic GMM panel framework to evaluate the sign and direction of causality between aid and corruption on a dataset of 71 developing countries over the period 1996-2009. We find no significant relation between aid and corruption running in both directions. These findings support the view that aid does not influence corruption in its current design, while corruption level does not influence incentives of donor countries to allocate aid.

Keywords: Aid, corruption.

JEL codes: F35, K4, O17

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1. Introduction

As aid and corruption are two key issues for developing economies, it does not appear as a surprise that a large strand of literature has investigated the relation between both dimensions. First, one strand of the literature has examined the consequences of aid on corruption (Alesina and Dollar, 2000; Knack, 2001; Tavares, 2003; Charron, 2011). Findings are not straightforward. On the one hand, aid can have beneficial effects on governance by reducing corruption as it can help increasing salaries of civil servants and can give the possibility for recipient countries to implement institutional reforms. On the other hand, aid can give bad incentives for recipient countries to rule out such reforms by notably reducing the need for governments to collect taxes. Empirical literature tends to show that aid enhances corruption (Knack, 2001; Alesina and Weder, 2002) although the studies are not consensual.

Second, diverse studies have investigated the potential influence of corruption on aid (Berthélemy and Tichit, 2004; De la Croix and Delavallade, 2014). Since the end of the nineties, the global movement toward institutional improvements has assigned donor countries to focus on a global partnership designed to eradicate corruption in the developing world. Donors may have increased their aid inflows toward countries willing to improve their institutions quality (Santiso, 2001). Hence, as fighting corruption has become listed as a motivation of donor's allocations, greater corruption can deter donor countries to give aid to guarantee the optimal use of aid inflows. On the other hand, corruption can favour aid allocations as corrupt countries have lower productivity and hence per capita income which supports a greater allocation of aid (Alesina et al., 2000). Overall literature found mixed evidence on the impact of corruption on aid.

Our aim in this paper is to fill this loophole in the literature by looking at the sign and direction of causality between aid and corruption. We then provide a contribution to the debated aid-corruption literature by providing new evidence on the direction of the causality running between aid and corruption. We analyze the relation and causality between aid and corruption on a data set of 71 developing countries for the period 1996-2009. We perform Granger-causality tests to check the direction of causality. We embed Granger-causality estimations in Generalized Method of Moments (GMM) dynamic panel estimators designed to handle auto regressive properties in the dependent variables when lagged values are included as explanatory variables. Granger causality methods have scarcely been used in the aid literature (Bowles, 1987; Giles, 1994; Roodman, 2008) to test for causal relations between aid and political or economic outcomes. Yet, the Granger causality allows analyzing the direction of the causality between two variables. We are then able to disentangle “the chicken and the egg” problem for the relation between aid and corruption.

The paper is organized as follows. Section 2 presents a review of the literature on the aid-corruption nexus. Section 3 outlines the methodology and presents the data. Section 4 displays the results while Section 5 presents the robustness tests. Section 6 concludes.

2. Literature review

In this section we review the studies on the aid-corruption nexus. As explained above, the former literature has chosen to examine this relation either from aid to corruption or from corruption to aid. We therefore present the most relevant studies from each of both strands of literature.

2.1 From aid to corruption

A large set of papers has studied the potential influence of aid on corruption and more generally on governance. One of the key interest to investigate this nexus is that aid can help training local officials and particularly to increase their salaries. As a consequence, Van Rijckeghem and Weder (2001) suggested that corruption would decrease as bribes are strongly related to the fact that wages for civil servants are lower than wages in the private sector. Knack (2001) investigated the influence of aid on quality of governance for a sample of 80 countries over the period 1975-1995. He tested the hypothesis that aid should give the possibility to the recipient country to undertake institutional reforms. However, he showed that aid is a rent for the recipient country. He controlled for the fact that donors may give more aid to countries with a low quality of governance to support institutional reforms. Even though, aid decreases the quality of governance. In particular, aid gives the recipient country the ability to bear the cost of ruling out institutional reforms and may grab conflicts over the control of aid funds, without any coordination. Hence aid would foster corruption instead of reducing it. Bräutigam and Knack (2004) used a similar framework to show that high dependence on foreign assistance reduces incentives for the recipient government to collect revenues from taxation. In turn, it breaks away the government from being accountable to its citizens. This channel may explain why aid is found to decrease the quality of governance in 32 Sub-Saharan African countries between 1982 and 1977.

Alesina and Weder (2002) focused on corruption and took a first look on how it can be shaped by aid. On a sample of 63 countries between 1981 and 1995, they found that more aid is not associated with decreases in corruption. Using data from 1980 to 1994 over 66 countries, Svensson (2000) stated, however, that aid seems to increase corruption in recipient countries, in particular in ethnically fragmented countries. Because aid increases public resources, groups may compete to have the stranglehold on these resources. The fact that some aid flows (in particular bilateral aid) are more tied to cultural and historical linkages may explain why almost 70% of all aid is used for public consumption (Alesina and Dollar, 2000). Rajan and Subramanian (2007) assumed that good institutions are a necessary condition for the development of manufactures. An expansion of the industrial sector should be a sign of improvements in terms of governance because these sectors are particularly dependent on a good quality of governance able to limit corruption, enforce law and protect investment. They evidenced that industries and manufacture would decline due to high aid inflows: one percentage point increase in aid (instrumented with the colonial history and cultural ties) in GDP reduces the share of manufacturing in GDP by 0.3 point. They concluded that aid (even technical assistance) damages local institutions (measured by the quality of bureaucracy, the rule of law, corruption and the protection of investment). Based on data covering 108 countries between 1960 and 1999, Djankov et al. (2008) corroborated the adverse relationship between aid dependence and the quality of institutions (measured by the Polity IV index). Their GMM and IV estimations showed that the aid effect is even more detrimental to the recipient country that deriving rents from natural resources.

According to Dalgaard and Olsson (2008), the effect of aid on corruption is not linear. For low levels of aid, aid succeeds in decreasing corruption (while it does not for high levels of aid). In addition, Dunning (2004) asserted that the end of the Cold War has changed the aid-corruption relationship. During the Cold War, donors allocations where tightly correlated to their own political and strategic interests, which have weakened the credibility of aid allocation. Since the end of the nineties, donors have seemingly paid more attention to fighting corruption in developing countries. Dunning (2004) evidenced that aid seems to support African countries in the provision of basic public services. Tavares (2003) focused on corruption to examine the influence of aid. He found that an increase of one percent of aid inflows reduces corruption by 0.2 points. He then concluded that the results of Alesina and Weder (2002) are biased due to aid reverse causality in the corruption regression and because they only account for bilateral aid flows. If aid reduces corruption, the fact that the most corrupt countries tend to receive more aid biases the size of the coefficient. Charron (2011) confirmed that, after 1997, aid is able to make corruption decline. Using data from 68 countries between 1986 and 2006, he first evidenced with instrumentation techniques (using GMM and 2SLS estimators) that the global effect of aid is unclear. But once the effect of bilateral aid is considered to be different that the effect of multilateral aid, in particular in the post-Cold war period, a consistent pattern may appear. While bilateral aid has neither a positive nor a significant effect on the level of corruption, multilateral aid begins to decrease corruption after 1997.

Based on data from 1995 to 2009, Okada and Samreth (2012) used both a simple OLS regression and a Quantile Regression approach allowing them to analyze the effects of aid on corruption at different intervals (not only at the mean). They found that aid tends to help fighting corruption, in particular when aid is allocated by multilateral agencies and in recipient countries that already do efforts to control their level of corruption. Asongu (2012) used particular data on African countries from 1996 to 2010 in a dynamic panel data framework to redo the study of Okada and Samreth (2012). His GMM estimates showed that aid (even bilateral or multilateral) increases the level of corruption in Africa. Jellal (2013) nuanced the aid-corruption relationship found for African countries. Accordingly, if aid goes through public consumption, which may support rent-seeking behaviors from public officials, corruption would hence increase. However, when aid is targeted to private investment or to attract FDI, corruption decreases. Kangoye (2013) suggested that, when leaders face uncertainty about future aid flows, they want to over extract rent from this resource in case of aid flows stop. Using data covering the 1984-2004 period and a 2SLS estimation procedure, he found that high aid inflows in a recipient country may reduce public corruption while aid unpredictability intensifies corruption. Results appear to differ among empirical studies, perhaps due to different sampling and methodologies. All in all, the literature on the influence of aid on corruption rather suggests a positive effect in the sense that aid tends to foster corruption.

2.2 From corruption to aid

Many works have also examined how corruption can affect the allocation of aid. Though colonial history, trade and commercial considerations, and strategic views matter when allocating aid (Alesina and Dollar, 2000), the quality of institutions has been listed as a target for the donor community. The key argument is based on the fact that since the end of the nineties, the global movement toward institutional improvements has assigned donor countries to focus on a global partnership designed to eradicate corruption in the developing world, as stressed notably by Santiso (2001) and Berthélemy and Tichit (2004). Hence the need for developing countries to have good governance and fight corruption in order to guarantee the good management of aid inflows has been at the heart of the donors community claim.

More specifically, many scholars have been interested in the presumable relationship between aid and institutions (as measured by governance, civil and political liberties, corruption or democracy in particular). Anecdotal evidence is in favour of a positive influence of good governance on aid. Using gravity equations covering 1980 to 1999 for 22 donors and 137 recipient countries, Berthélemy and Tichit (2004) showed that the quality of governance matters for most of bilateral donors, in particular in the nineties. Trumbull and Wall (1994) also recorded that greater political and civil rights were rewarded by greater aid inflows on data before the nineties. However, De la Croix and Delavallade (2014) found that corrupt countries seem to receive more than others on a sample of 159 developing countries. They explain that it may be rationale that aid goes to more corrupt countries because donors target countries with a low productivity when allocating aid while low productive countries are also more corrupt. Dreher et al. (2011) confirmed that both new (as China and Hungary) and old donors give more aid to more corrupt countries, running counter the donors community claims about rewarding efforts in terms of governance improvements. Neumayer (2003a) observed that controlling corruption in aid recipient countries is not associated to greater aid inflows. Even multilateral agencies, supposed to be less tied to strategic interests, seem to be indifferent to low corrupt countries. In particular, corruption is statistically not significant for UN agencies.

Svensson (2000) and Alesina and Weder (2002) confirmed in their studies that donors do not reward countries with a low level of corruption. Svensson (2000) applied IV estimations on pooled data over the 1980-1994 period to control for possible simultaneity biases. He particularly focused on the effect of aid on corruption in recipient countries, but he also evidenced that donors are not likely to allocate aid to countries with less corruption. Alesina and Weder (2002) have focused their attention on bilateral aid allocations. Their data covering 63 countries between 1981 and 1995 revealed that the United States tend to increase their allocations to more corrupt countries while Australia and Scandinavian countries (not concerned by historical ties with potential recipient countries) allocate more aid to countries with less corruption. In average, among all bilateral donors and no matter the period between 1975 and 1995, donors do not pay attention to the level of corruption of recipient countries when allocating their funds.

Assuming that foreign assistance should promote growth in low corrupt countries, Büthe et al. (2012) investigated whether donors are indeed paying attention to the quality of governance in aid recipient countries. Focusing on the US assistance, either provided by the government (public aid) or by NGOs (private aid), they found that corruption in aid-recipient countries is not statistically significant at all. According to Neumayer (2005a), corruption is not relevant for aid allocations not only for the United States but also for almost all major donors. The United States, the United Kingdom, Germany, France, Italy, Norway, and UN agencies do neither account for the level of corruption when allocating foreign assistance. Japan only seems to give higher aid to more corrupt countries while Canada and Sweden pay attention to countries that control their level of corruption. To sum it up, literature on the influence of corruption on aid provides ambiguous results. No clear consensus emerges from the studies which differ on the sign and the significance of the impact.

3. Data and method

This section details the methodology adopted to assess the direction of the causality between aid flows and corruption in recipient countries. To address the existence of causality, we evaluate the nature of the linkage between aid and corruption. We want to know whether aid "Granger causes" corruption, and vice versa. Aid is said to cause corruption in the Granger sense if the forecast for corruption improves when lagged values of aid are taken into account (Granger, 1969).

Corruption will be "Granger caused" by aid if the coefficients of the lagged values of aid are significantly different from zero in the corruption regression. In other words, the Granger-causality equations explain how much of the current corruption level can be explained by past levels of corruption and whether adding past values of aid can improve this explanation – that is if the coefficients on the lagged values of aid are statistically significant. We then redo the same approach to investigate whether corruption "Granger causes" aid.

We use the panel data Granger causality procedure and apply generalized method-of-moments (GMM) dynamic panel estimators. The panel data dimension offers more information to test the causal relationships than the time dimension alone, which increases the degree of freedom, useful to test with greater efficiency the causality relationships between our two variables (Dumitrescu and Hurlin, 2012). We first test for the overall causality hypothesis represented by the following equations:

$$Corruption_t = \beta_0 + \sum_{j=1}^{J} \beta_j Corruption_{t-j} + \sum_{k=1}^{K} \gamma_k Aid_{t-k} + \epsilon_t \tag{1}$$

$$Aid_t = \beta'_0 + \sum_{j=1}^{J} \beta'_j Aid_{t-j} + \sum_{k=1}^{K} \gamma'_k Corruption_{t-k} + \epsilon'_t \tag{2}$$

where *Corruption* stands for our measure of corruption, *Aid* for our measure of aid and ε and ε' for the error terms.

If no causality between aid and corruption is observed, there will be no need to go further in investigating whether the causality is either heterogeneous or not, namely no need to examine the contribution of each country to the existence of causality.

The study of the Granger causality requires that variables are stationary, say the distribution of these variables does not follow any trend nor change over time. We therefore test whether our series on aid and corruption are time-stationary to avoid the problem of spurious regression. Using panel data, we follow the test for panel unit root using a Fisher-type test statistic, which runs with unbalanced panel data. The null hypothesis is that all panels contain a unit root and hence are non-stationary. The null hypothesis is rejected if the test statistic is lower than the critical value (chosen to be 0.01). Table 3 shows our results: we reject this hypothesis for all variables. It means there are no unit roots in our panels under the given test conditions (included panel mean and time trend).

After checking that our series are stationary, we use the Blundell and Bond (1998) estimator. A potential benefit of GMM estimator is that it can be used in dynamic panel data models and can handle endogenous variables provided that there is no autocorrelation in the error term. Using panel data estimation techniques allows accounting for country-specific characteristics. We employ the two-step system GMM estimator, which is robust to heteroskedasticity in residuals. The system GMM estimator exploits all the orthogonality conditions between endogenous variables and the error term.

We estimate equations (1) and (2) to investigate the inter-temporal relation between aid and corruption. The first equation evaluates whether changes in aid temporally precede variations in corruption, while the second equation tests whether changes in corruption temporally precede variations in aid. Because the first and second lags of the lagged dependent and the independent variables may be correlated with the error term, they are no valid instruments for the first-differenced equation of the system GMM equation. We use lagged levels of our series dated t–3 and earlier as instrumental variables for the equations in first-differences. We test for no second auto-correlation in residuals to be sure that lagged differences variables used to instrument endogenous variables are good instruments. The validity of instruments is also checked with the Hansen J test of over-identifying restrictions. Critical is also the choice of lags j and k. Dumitrescu and Hurlin (2012) used the formula $T > 5 + 2X$, T being the number of time periods and X the number of lags to determine the minimum time extend we need for each number of lags. To conserve the largest data set, we restrict the number of lags to three. We keep the 71 countries for which at least 12 time periods of observations are available for both aid and corruption. Instead, if we drop countries with less than twelve years of observations.

Our sample is an unbalanced panel data that includes 71 countries between 1996 and 2009. Data for aid and corruption were collected from World Development Indicators. Our variable *Aid* is measured by the net inflows of Official Development Assistance divided by recipient GDP as standard in the literature (see, for example, Bräutigam and Knack (2004)). *Corruption* is measured by the World Bank control of corruption indicator (as in Asongu (2012) among others). Greater values mean that corruption is lower (better control of corruption). Descriptive statistics for the variables are displayed in Table 1, while list of recipient countries is presented in Table 2.

4. Results

This section presents the results for the relation between aid and corruption. We start with the main estimations and afterwards provide additional tests.

4.1. Main estimations

We present our estimations in order to investigate the sign and the sense of causality between aid and corruption. Table 4 contains the results. We observe that *Aid* and *Corruption* are affected by their past values. However the key finding deals with the Granger-causality, which is tested by a Wald test in which we check whether the sum of the coefficients of the lagged explaining variable in question is significantly different from zero. Our data reveal that aid does not Granger-cause corruption, as the sum of the lagged variables for *Aid* is not significantly different from zero. This finding speaks in favor of the fact that no effect dominates between the positive one and the negative one suggested by the literature. It does not accord with all the studies of the literature, which find various results. However, our study differs from former ones on many aspects. First, we have more recent data than Van Rijckeghem and Weder (2001) or Knack (2001) and as such the results can differ on the recent years. Second, we have a broader sample of countries than Bräutigam and Knack (2004) for instance. Third, we also do not use the same method than Okada and Samreth (2012).

When we study the reverse causality, we observe that corruption does not Granger- cause aid, because the sum of the lagged variables for *Corruption* is not significant. In other words, corruption does not exert any influence on the amount of aid. Hence, we do not support the view that corruption would favor aid in line with De la Croix and Delavallade (2014). Symmetrically we do not find that corruption would have a detrimental effect on aid as suggested by Berthélemy and Tichit (2004). Here again we can interpret our different results by differences in the method, the period, and the sample of countries. In summary, our estimations show that there is no link between aid and corruption in both directions. These findings moderate the pessimist view about the influence of development aid for corruption. More corrupt countries do not significantly receive more aid as well as aid does not significantly increase corruption.

4.2 Additional estimations

Our main estimations indicate that there is no relation between aid and corruption in both directions. However, former literature has shown that this relation can vary with the type of aid (namely bilateral and multilateral aid) or with the type of considered countries (see Okada and Samreth (2012) among others). We then extend our estimations to take these dimensions into account.

First, we investigate the underlying mechanisms of the relation between aid and corruption by analyzing the components of aid. Namely, we disaggregate total aid to distinguish between bilateral and multilateral aid. Both components can have different influences on corruption or reversely can be influenced in different ways by corruption. Following Charron (2011), we postulate that multilateral aid reward good governance and countries that fight corruption while bilateral aid, less attentive to the governance issue, is not. We then employ two variables, *Bilateral Aid* and *Multilateral Aid* respectively defined as net inflows of bilateral ODA to recipient GDP and net inflows of multilateral ODA to recipient GDP (as in Charron (2011)). Results by considering separately both components of aid are displayed in Table 5. They do not reveal any significant impact of multilateral aid and of bilateral aid on corruption in opposition to the results of Charron (2011). It is also of interest to stress that corruption does not influence both forms of aid. Hence our main finding on the absence of any causal link between aid and corruption is not affected by the disaggregation of aid.

Second, we examine whether the results differ for particular groups of countries. Bräutigam and Knack (2004) and Asongu (2012) have shown some evidence on the impact of aid on corruption and governance for African countries while Charron (2011) suggested that Asian countries can drive the results because both their corruption levels and ODA inflows have significantly decreased in the 2000s. It is then natural to consider that the aid-corruption nexus may differ across regions of the world. We therefore redo all estimations by considering four regions: Asia, Africa, Europe, and Latin America. We add alternatively interaction terms between both key variables and a dummy variable equal to one for each region to investigate if the relation differs across countries. We can then check if the impact of one variable on the other is significant by analyzing the significance of the sum of the interaction terms. Results are presented in Table 6. We find no significant result for the different regions. Our results differ from those observed for African countries by Asongu (2012) with a positive influence of aid on corruption, which can result from our different methodology.

5. Robustness checks

We check the robustness of our results in different ways.

First, we use an alternative measure for corruption: the Corruption Perception Index provided by Transparency International (higher values indicate greater corruption). This measure is also commonly used in the literature (see Charron (2011) and Asongu (2012) among others). However, we only have information for 32 countries for which we observe twelve time periods to have a comparison with a similar data period sample. We display the results in Table 7. We observe again no significant relation between aid and corruption. These results corroborate those obtained in our main estimations.

Second, we employ an alternative aid measure, namely log (plus one) of ODA, measured in 2011 constant US dollars (as done in Easterly and Williamson, 2011). Thirteen observations were missing leading us to drop two countries from the whole sample of 71 countries (Gabon and Thailand). Results are reported in Table 7. Despite this change in the specification of aid measure, we still observe the same results with no significant link between aid and corruption in both directions.

Third, we construct five year averages in order to smooth out fluctuations in aid flows and corruption. Though we would sacrifice information on our variables when averaging over time, averaging over time eradicates here first order autocorrelation (see the Durbin-Watson statistics reported at the bottom of Table 4). We report the results in Table 8. We see robust support for our benchmark results.

Fourth, we verify whether our results are driven by some extreme values. We exclude potential outliers in aid and corruption using the blocked adaptive computationally efficient outlier nominators (BACON) algorithm proposed by Billor et al. (2000). To do so, we use the 0.85 percentile of the chi-squared distribution as a threshold to separate outliers from non-outliers. 19 observations were dropped leading us to drop four countries from the main sample due to insufficient observations (the Democratic Republic of Congo, the Republic of Congo, Eritrea and Mauritania). Results are displayed in Table 8. Results are not sensitive to the exclusion of outliers.

Fifth, we take into account the fact that the relation between aid and corruption can have evolved over time. Namely, we consider that the international community focus on fighting corruption during the last decade may play a role in the aid-corruption nexus (see, for example, Charron, 2011). To examine this issue, we consider a dummy variable (*Post 2000*) equal to one for years after 2000 and we add interaction terms between both key variables and this dummy variable. We report also the results in Table 8. We still observe no significant relation between aid and corruption, but also no significant coefficient for the interaction term meaning that the relation has not changed after 2000.

Sixth, we redo estimations with alternative estimators, namely the one-step system GMM estimator and the Fixed Effects estimator, which allows controlling for time-invariant heterogeneity. The one-step GMM estimator is not robust to heteroskedasticity but it is more reliable for finite sample than the two-step estimator (Blundell and Bond, 2000). Results reported in Table 9 confirm that our main findings are not dependent on the choice of the estimator.

Our main results have thus been confirmed by several robustness tests. We therefore have strong support for the absence of relation between aid and corruption in both directions.

6. Conclusion

In this paper, we have investigated the relation between aid and corruption by examining the causality of this link. While this relation has been analyzed in one direction in many works, none has ever considered the potential for reverse causality in the same way. We do so by performing Granger-causality tests on a dataset of developing countries. We find no impact of aid on corruption, and reversely corruption does not exert a significant influence on aid. Additional estimations that take into account the components of aid and the region lead to the same findings.

As a consequence, our main conclusion is that there is no causality between aid and corruption. Our results then shed light on the debate over “the chicken and the egg” problem for the relation between aid and corruption. They do not accord with all the former studies of the large literature on aid and corruption which finds various results but differ from ours through differences in methodologies and samples. We can notably stress that the use of very recent data can contribute to influence the results. The relation between aid and corruption might have become less significant in the recent years with the evolution of the motives to allocate aid on the donors’ side.

Our findings have major policy implications by suggesting that aid and corruption should be disentangled. As aid does not influence corruption, it cannot be rejected by claiming that it enhances corruption but cannot be used to reduce it. On the other side, as corruption does not affect aid, it cannot be accused of favoring aid or reversely of attracting aid and then giving wrong incentives. Hence both these major issues for developing countries should be considered separately or at least in a wider framework.

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Table 1: Summary statistics

Variable	Observations	Mean	Standard deviation	Minimum	Maximum
Aid	967	5.28	7.52	-0.69	99.51
Corruption	967	0.44	0.56	-2.22	1.51
Bilateral aid	969	2.93	474	-0.69	84.04
Multilateral aid	970	1.98	2.85	-1.3	16.45

Note: Aid, Bilateral aid and Multilateral aid are types of ODA scaled by GNI.

Table 2: List of recipient countries (71)

Albania	Croatia	Madagascar	Sri Lanka
Armenia	Cuba	Malaysia*	Sudan
Azerbaijan	Ecuador*	Mali	Swaziland
Benin	Egypt, Arab Rep.*	Mauritania	Syrian Arab Republic
Bolivia*	El Salvador*	Mauritius*	Tajikistan
Bosnia and Herzegovina	Eritrea	Mexico*	Tanzania*
Brazil*	Ethiopia	Moldova	Thailand*
Burkina Faso	Gabon	Morocco	Togo
Cambodia	Guatemala	Mozambique	Tunisia*
Cameroon*	India*	Namibia*	Turkey*
Cape Verde	Indonesia*	Nicaragua	Uganda*
Chile*	Iran, Islamic Rep.	Pakistan*	Uruguay*
China*	Jordan*	Panama	Uzbekistan
Colombia*	Kazakhstan	Paraguay	Venezuela, RB*
Congo, Dem. Rep.	Kenya*	Peru*	Vietnam*
Congo, Rep.	Kyrgyz Republic	Philippines*	Yemen, Rep.
Costa Rica*	Lebanon	Senegal*	Zambia*
Cote d'Ivoire	Lesotho	South Africa*	

Note: The 32 countries with a star are countries available when using the Corruption Perception Index as a measure of corruption.

Table 3: Phillips-Perron unit-root tests for Corruption and Aid

	Corruption		Aid	
	Statistic	Probability	Statistic	Probability
Inverse chi-squared (144)	249.883	0.000	246.657	0.000
Inverse normal	-3.732	0.004	-4.941	0.000
Inverse logit t (354)	-3.469	0.003	-5.513	0.000
Modifier inverse chi-squared	5.827	0.000	6.049	0.000

Notes: The null hypothesis is that all panels contain unit roots (variables were generated by a stationary process). Panel means are included to mitigate the impact of cross-sectional dependence. Time trend is also included. Average number of periods: 13.41. Number of panels: 71.

Table 4: Results for benchmark Granger Causality tests

	(1)	(2)
	Aid → Corruption	Corruption → Aid
$Corruption_{t-1}$	1.018***	1.823
	(5.75)	(0.56)
$Corruption_{t-2}$	-0.056	-2.579
	(-0.27)	(-0.55)
$Corruption_{t-3}$	0.023	-0.828
	(0.37)	(-0.75)
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$	0.985***	-1.584
	(16.73)	(-0.60)
Aid_{t-1}	-0.003	0.391***
	(-0.83)	(3.22)
Aid_{t-2}	-0.002	0.112
	(-1.34)	(1.52)
Aid_{t-3}	0.000	0.088**
	(0.34)	(2.52)
$\sum_{i=1}^{3} \text{Aid}_{t-i}$	-0.005	0.591***
	(-1.49)	(4.38)
Constant	0.010	0.954
	(0.37)	(1.25)
Observations	736	736
Hansen J (p-value)[a]	0.792	0.714
Difference-in-Hansen[b]	0.258	0.116
AR(1) (p-value)[c]	0.007	0.114
AR(2) (p-value)[c]	0.750	0.896

Notes: Table 4 reports the system GMM results of equations (1) and (2). [a] The null hypothesis of the Hansen J test (robust to autocorrelation) is that the instruments are not correlated with the residuals. [b] The null hypothesis of the Difference-in-Hansen test of exogeneity of instrument is that instruments for endogenous variables are exogenous to the dependent variable. [c] The null hypothesis of the AR(1) test (respectively AR(2)) is that the errors in the first difference regression exhibit no first (respectively second) order serial correlation. Probabilities reported. *Corruption* is the World Bank indicator (Control of Corruption). *Aid* is ODA scaled by GNI. The dependent variable in Column (1) (respectively Column (2)) is *Corruption* (respectively *Aid*). Robust standard errors (to heteroskedasticity) in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.

Table 5: Results for Granger causality tests – Disaggregating aid

	(1)	(2)	(3)	(4)
	Aid → Corruption		Corruption → Aid	
	Bilateral aid	Multilateral aid	Bilateral aid	Multilateral aid
Corruption_{t-1}	0.968***	1.127***	1.469	-0.319
	(4.75)	(7.10)	(0.48)	(-0.11)
Corruption_{t-2}	-0.026	-0.200	-2.388	0.900
	(-0.12)	(-1.08)	(-0.85)	(0.26)
Corruption_{t-3}	0.006	0.015	-0.208	-0.062
	(0.08)	(0.26)	(-0.29)	(-0.06)
$\sum_{i=1}^{3}\text{Corruption}_{t-i}$	0.948***	0.942***	-1.127	0.518
	(11.94)	(13.16)	(-1.18)	(0.90)
Aid_{t-1}	-0.007	-0.009	0.122	0.978***
	(-1.26)	(-0.99)	(1.48)	(5.39)
Aid_{t-2}	-0.002	0.001	0.081**	0.071
	(-1.24)	(0.08)	(2.09)	(0.51)
Aid_{t-3}	-0.000	0.004	0.148***	-0.067
	(-0.25)	(0.82)	(4.47)	(-0.77)
$\sum_{i=1}^{3}\text{Aid}_{t-i}$	-0.009	-0.004	0.352***	0.981***
	(-1.38)	(-0.97)	(2.84)	(9.38)
Constant	-0.006	-0.021	0.930**	0.242
	(-0.19)	(-0.69)	(2.01)	(1.11)
Observations	736	736	736	736
Hansen J (p-value)[a]	0.855	0.960	0.860	0.939
Difference-in-Hansen[a]	0.440	0.416	0.132	0.100
AR(1) (p-value)[a]	0.015	0.002	0.199	0.026
AR(2) (p-value)[a]	0.917	0.447	0.189	0.398

Notes: Table 5 reports the system GMM results of equations (1) and (2) when aid is disaggregated between *Bilateral aid* and *Multilateral aid*. [a] See footnotes of Table 4 for description. Probabilities reported. *Corruption* is the World Bank indicator (Control of Corruption). *Aid* is either bilateral or multilateral ODA scaled by GNI. The dependent variable in Columns (1) and (2) (resp. Columns (3) and (4)) is *Corruption* (resp. *Aid*). Robust standard errors in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.

Table 6: Results for Granger causality tests – By region

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	Aid → Corruption				Corruption → Aid			
	Africa	Asia	Europe	LA	Africa	Asia	Europe	LA
Corruption_{t-1}	0.954***	1.040***	1.176***	1.054***	-3.677	1.145	-3.440	0.445
	(5.12)	(3.79)	(4.57)	(5.76)	(-1.01)	(0.14)	(-0.85)	(0.14)
Corruption_{t-2}	-0.090	-0.047	-0.078	-0.014	5.011	-1.356	3.032	-1.412
	(-0.42)	(-0.16)	(-0.32)	(-0.06)	(1.34)	(-0.12)	(0.72)	(-0.34)
Corruption_{t-3}	0.064	-0.031	-0.079	-0.012	1.196	-1.143	-1.080	-1.103
	(0.90)	(-0.35)	(-0.63)	(-0.16)	(1.24)	(-0.54)	(-0.85)	(-0.80)
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$	0.929***	0.962***	1.012***	1.029***	2.531*	-1.355	-1.484	-2.079
	(13.82)	(14.72)	(11.86)	(18.19)	(1.85)	(-0.42)	(-0.58)	(-0.54)
Aid_{t-1}	-0.003	-0.002	-0.004	-0.005	0.201**	0.399***	0.409***	0.407***
	(-0.58)	(-0.59)	(-0.96)	(-1.36)	(2.19)	(3.01)	(3.21)	(3.57)
Aid_{t-2}	-0.002	-0.003	-0.001	-0.001	0.433***	0.098	0.087	0.096
	(-0.56)	(-1.63)	(-0.84)	(-0.56)	(6.71)	(1.39)	(1.33)	(1.48)
Aid_{t-3}	-0.001	0.000	0.001	0.001	0.169**	0.075*	0.052	0.071**
	(-0.30)	(0.17)	(0.59)	(0.73)	(2.25)	(1.71)	(1.37)	(2.07)
$\sum_{i=1}^{3} \text{Aid}_{t-i}$	-0.006*	-0.004	-0.05	-0.005	0.803***	0.572***	0.549***	0.573***
	(-1.79)	(-1.22)	(-1.29)	(-1.54)	(8.86)	(3.79)	(3.91)	(4.11)
$\text{Corruption}_{t-1} \times$ Africa	0.098				2.132			
	(0.28)				(0.25)			
$\text{Corruption}_{t-2} \times$ Africa	0.091				-2.397			
	(0.23)				(-0.30)			
$\text{Corruption}_{t-3} \times$ Africa	-0.147				-3.714			
	(-1.08)				(-1.16)			
$\sum_{i=1}^{3} \text{Corruption}_{t-i} \times$ Africa	0.001				-0.286			

	(0.26)			(-1.50)		
Aid_{t-1} × Africa	-0.000			0.182		
	(-0.05)			(1.13)		
Aid_{t-2} × Africa	0.000			-0.355***		
	(0.08)			(-4.31)		
Aid_{t-3} × Africa	0.001			-0.113		
	(0.35)			(-1.50)		
$\sum_{i=1}^{3} Aid_{t-i}$ × Africa	0.042			-3.979		
	(0.50)			(-0.88)		
Aid_{t-1} × Asia		0.000			0.263	
		(0.06)			(1.18)	
Aid_{t-2} × Asia		0.004			0.087	
		(0.57)			(0.57)	
Aid_{t-3} × Asia		-0.001			-0.031	
		(-0.17)			(-0.39)	
$\sum_{i=1}^{3} Aid_{t-i}$ × Asia		0.003			0.319*	
		(0.49)			(1.92)	
$Corruption_{t-1}$ × Asia		-0.013			1.046	
		(-0.03)			(0.11)	
$Corruption_{t-2}$ × Asia		-0.178			0.358	
		(-0.45)			(0.03)	
$Corruption_{t-3}$ × Asia		0.244			1.420	
		(1.20)			(0.65)	
$\sum_{i=1}^{3} Corruption_{t-i}$ × Asia		0.053			2.824	
		(0.68)			(0.80)	
Aid_{t-1} × Europe			-0.011			-0.350
			(-1.37)			(-1.06)
Aid_{t-2} × Europe			-0.010			0.175
			(-0.92)			(0.81)
Aid_{t-3} × Europe			-0.003			0.164

			(-0.75)				(1.40)	
$\sum_{i=1}^{3} \text{Aid}_{t-i}$ × Europe			-0.023				-0.011	
			(-1.30)				(-0.04)	
Corruption_{t-1} × Europe			-1.029				3.087	
			(-1.25)				(0.33)	
Corruption_{t-2} × Europe			-0.350				-7.768	
			(-0.65)				(-0.98)	
Corruption_{t-3} × Europe			0.851				6.825	
			(1.31)				(1.57)	
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$ × Europe			-0.537				2.143	
			(-1.14)				(0.39)	
Aid_{t-1} × LA				-0.001				-0.014
				(-0.38)				(-0.31)
Aid_{t-2} × LA				-0.002				0.034
				(-1.23)				(1.40)
Aid_{t-3} × LA				-0.000				0.048
				(-0.22)				(1.45)
$\sum_{i=1}^{3} \text{Aid}_{t-i}$ × LA				-0.003				0.673
				(-0.89)				(1.27)
Corruption_{t-1} × LA				-0.011				-0.750
				(-0.15)				(-0.72)
Corruption_{t-2} × LA				-0.061				0.783
				(-0.59)				(0.64)
Corruption_{t-3} × LA				0.015				0.315
				(0.38)				(0.44)
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$ × LA				-0.057				0.349
				(-1.20)				(0.30)
Constant	-0.009	0.005	0.017	0.024	2.150**	1.482*	1.356	0.769
	(-0.37)	(0.20)	(0.56)	(0.95)	(2.56)	(1.73)	(1.61)	(0.71)

Observations	736	736	736	736	736	736	736	736
Hansen J (p-value)[a]	0.637	0.886	0.998	0.955	0.669	0.909	1.000	0.985
Difference-in-Hansen[a]	0.254	0.293	0.782	0.984	0.213	0.866	0.628	0.987
AR(1) (p-value)[a]	0.008	0.011	0.014	0.004	0.121	0.104	0.098	0.094
AR(2) (p-value)[a]	0.853	0.683	0.912	0.788	0.809	0.816	0.738	0.801
Number of lags used as instruments	10	10	10	10	10	10	10	10
Countries/Instruments	69/71	69/71	69/71	69/71	69/71	69/71	69/71	69/71

Notes: Table 6 reports the system GMM results of equations (1) and (2) by region. LA stands for Latin America. [a] See footnotes of Table 4 for description. Probabilities reported. *Corruption* is the World Bank indicator (Control of Corruption). *Aid* is either bilateral or multilateral ODA scaled by GNI. The dependent variable in Columns (1), (2), (3) and (4) (resp. Columns (5), (6), (7) and (8)) is *Corruption* (resp. *Aid*). Robust standard errors in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.

Table 7: Results for Granger Causality tests – Alternative measures

	(1)	(2)	(3)	(4)
	Aid → Corruption		Corruption → Aid	
	CPI	Aid (in log)	CPI	Aid (in log)
Corruption_{t-1}	0.779***	-1.800*	1.124***	-0.450
	(4.83)	(-1.66)	(7.24)	(-0.62)
Corruption_{t-2}	0.006	1.856*	-0.198	0.481
	(0.04)	(1.64)	(-1.35)	(0.70)
Corruption_{t-3}	-0.032	-0.151	-0.001	-0.091
	(-0.33)	(-0.51)	(-0.02)	(-0.50)
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$	0.753***	-0.950	0.920***	-0.072
	(5.26)	(-0.11)	(13.85)	(0.21)
Aid_{t-1}	0.001	0.431***	0.024	0.358
	(0.07)	(3.93)	(0.35)	(1.52)
Aid_{t-2}	-0.019**	0.261**	-0.047	0.281***
	(-2.26)	(2.52)	(-1.18)	(2.75)
Aid_{t-3}	0.005	0.168	-0.028	0.044
	(0.42)	(1.55)	(-1.46)	(0.44)
$\sum_{i=1}^{3} \text{Aid}_{t-i}$	-0.137	0.859***	-0.053	0.675***
	(-1.03)	(8.96)	(1.30)	(3.06)
Constant	0.888*	0.714	0.962	6.289
	(1.72)	(0.22)	(1.19)	(1.47)
Observations	310	310	736	736
Hansen J (p-value)[a]	0.988	0.996	0.927	0.935
Difference-in-Hansen[a]	0.139	0.964	0.623	0.542
AR(1) (p-value)[a]	0.021	0.015	0.001	0.052
AR(2) (p-value)[a]	0.882	0.887	0.499	0.327

Notes: Table 7 reports the system GMM results of equations (1) and (2) using alternative measures for *Aid* and *Corruption*. [a] See footnotes of Table 4 for description. Probabilities reported. *Corruption* is measured by CPI. *Aid* is measured by the log of net ODA in 2011 constant US dollars. The dependent variable in Columns (1) and (2) (resp. Columns (3) and (4)) is *Corruption* (resp. *Aid*). Robust standard errors in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.

Table 8: Results for Granger Causality tests – Alternative samples

	(1)	(2)	(3)	(4)	(5)	(6)
	Aid → Corruption			Corruption → Aid		
	Mean	Post 2000	Outliers	Mean	Post 2000	Outliers
Corruption_{t-1}	0.720***	0.878***	0.922***	-4.220	2.765	-1.817
	(4.18)	(6.58)	(4.47)	(-1.00)	(0.76)	(-0.70)
Corruption_{t-2}	0.229	0.103	0.055	3.624	-2.228	2.663
	(1.41)	(0.62)	(0.25)	(0.99)	(-0.54)	(0.81)
Corruption_{t-3}	-0.018	-0.032	-0.010	-0.483	-0.906	-0.081
	(-1.17)	(-0.55)	(-0.15)	(-0.85)	(-0.60)	(-0.08)
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$	0.931***	0.949***	0.966***	-1.080	-0.369	& 0.765
	(20.18)	(45.11)	(12.26)	(-0.70)	(-0.60)	(0.90)
Aid_{t-1}	-0.004	0.000	0.009	0.935***	0.250	0.600*
	(-0.87)	(0.03)	(1.25)	(9.03)	(1.24)	(1.81)
Aid_{t-2}	0.002	-0.004	-0.012**	-0.073	0.197	0.292
	(0.36)	(-1.20)	(-2.14)	(-0.74)	(1.56)	(1.38)
Aid_{t-3}	0.000	0.002	-0.000	-0.031**	0.354***	0.171*
	(0.38)	(0.92)	(-0.08)	(-2.07)	(2.83)	(1.75)
$\sum_{i=1}^{3} \text{Aid}_{t-i}$	-0.002	-0.002	-0.004	0.831***	0.801***	1.062***
	(-1.60)	(-0.49)	(-0.95)	(21.23)	(6.06)	(7.76)
Aid_{t-1} × Post 2000		-0.001			0.275	
		(-0.07)			(1.19)	
Aid_{t-2} × Post 2000		0.003			-0.038	
		(0.73)			(-0.34)	
Aid_{t-3} × Post 2000		-0.001			-0.218	
		(-0.64)			(-1.59)	
$\sum_{i=1}^{3} \text{Aid}_{t-i}$ × Post 2000		0.001			0.018	
		(0.18)			(0.11)	
Corruption_{t-1} × Post 2000		0.007			2.273*	
		(0.15)			(1.78)	
Corruption_{t-2} × Post 2000		0.014			-2.296	
		(0.52)			(-1.45)	
Corruption_{t-3} × Post 2000		-0.002			0.140	
		(-0.07)			(0.29)	
$\sum_{i=1}^{3} \text{Corruption}_{t-i}$× Post 2000		0.020			0.117	
		(0.76)			(0.13)	
Constant	-0.032	-0.016**	-0.004	0.151	0.412**	0.109
	(-1.30)	(-1.96)	(-0.15)	(0.26)	(1.97)	(0.33)

Observations	736	736	696	736	736	696
Hansen J (p-value)[a]	0.531	0.832	0.621	0.915	0.670	0.835
Difference-in-Hansen[a]	0.016	0.705	0.673	0.215	0.049	0.837
AR(1) (p-value)^a	0.107	0.006	0.024	0.044	0.096	0.475
AR(2) (p-value)^a	0.142	0.619	0.552	0.971	0.504	0.663

Notes: Table 8 reports the system GMM results of equations (1) and (2) using alternative samples. [a] See footnotes of Table 4 for description. Probabilities reported. *Corruption* is the World Bank indicator. *Aid* is ODA scaled by GNI. The dependent variable in Columns (1), (2) and (3) (resp. Columns (4), (5) and (6)) is *Corruption* (resp. *Aid*). Columns (1) and (4) report the results of the Granger causality tests using time averages (over five years). Columns (2) and (5) report the results of the Granger causality tests considering the potential change of the post Cold War period. Columns (3) and (6) report the results of the Granger causality tests excluding outliers. Robust standard errors in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.

Table 9: Results for Granger Causality tests – Alternative estimators

	(1)	(2)	(3)	(4)
	Aid → Corruption		Corruption → Aid	
	One-step GMM	Fixed effects	One-step GMM	Fixed effects
Corruption_{t-1}	0.946***	0.791***	1.042	0.303
	(5.19)	(23.55)	(0.28)	(0.24)
Corruption_{t-2}	0.025	-0.050	-1.603	1.100
	(0.12)	(-0.89)	(-0.39)	(0.80)
Corruption_{t-3}	-0.007	-0.039	-1.167	2.039*
	(-0.14)	(-0.75)	(-0.50)	(1.82)
$\sum_{i=1}^{3}\text{Corruption}_{t-i}$	0.964***	0.703***	-1.728	3.442
	(18.89)	(20.80)	(-0.49)	(1.41)
Aid_{t-1}	-0.004	0.001	0.370***	0.277***
	(-1.36)	(1.29)	(3.21)	(5.40)
Aid_{t-2}	-0.001	-0.001	0.111	0.004
	(-1.02)	(-1.30)	(1.47)	(0.08)
Aid_{t-3}	-0.000	0.000	0.092***	-0.043
	(-0.08)	(0.61)	(3.03)	(-1.13)
$\sum_{i=1}^{3}\text{Aid}_{t-i}$	-0.005	0.000	0.573***	0.238**
	(-1.55)	(0.11)	(3.47)	(2.48)
Constant	0.006	-0.142***	1.439	5.685***
	(0.26)	(-8.10)	(1.25)	(4.11)
Observations	736	736	736	736
R squared		0.550		0.099
Hansen J (p-value)[a]	0.939		0.908	
Difference-in-Hansen[a]	0.258		0.116	
AR(1) (p-value)[a]	0.014		0.119	

AR(2) (p-value)[a]	0.912	0.829

Notes: Table 9 reports the system GMM results of equations (1) and (2) using alternative estimators. [a] See footnotes of Table 4 for description. Probabilities reported. *Corruption* is the World Bank indicator. *Aid* is ODA scaled by GNI. The dependent variable in Columns (1) and (2) (resp. Columns (3) and (4)) is *Corruption* (resp. *Aid*). Robust standard errors in parentheses. The asterisks ***, **, and * are 1%, 5%, and 10% of significant levels, respectively.