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THE DETERMINANTS OF AID VOLATILITY

Raj M. Desai
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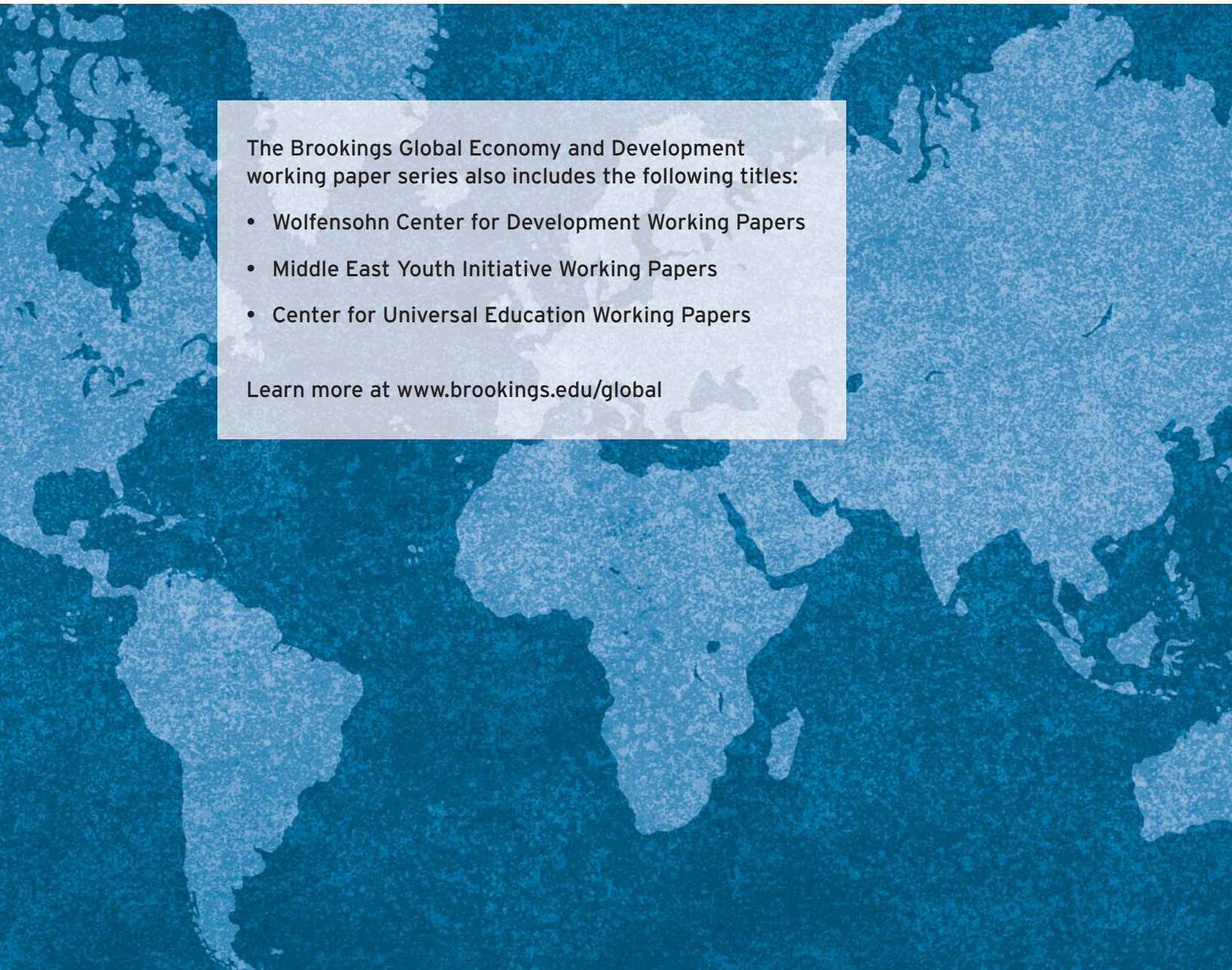

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ABSTRACT

Flows of official development assistance (ODA) to recipient countries have been highly volatile over the past 40 years, and there is significant evidence that volatile aid can negatively impact growth through several channels; but less is known about the sources of the volatility. Using an auto-regressive conditional heteroskedasticity model, we generate conditional variances for total aid flows to all aid-recipient countries between 1960 and 2008. We then examine the effects of both recipient-country and donor-related factors on this resulting volatility. We find that some degree of volatility is caused by events in recipient countries, mainly civil wars and adverse regime change—all of which increase the unpredictability of aid flows. But larger, unexpected swings in aid tend to be due to the concentration of aid portfolios combined with the prevalence of donor herding. Our results demonstrate, additionally, that the United States is the most volatile aid-giver, but that volatility is mostly due to U.S. aid recipients receiving unanticipated aid windfalls. Our findings are consistent when we remove aid flows for humanitarian assistance, emergency relief, food aid, technical assistance and debt relief. These results demonstrate the need for donor action in mitigating aid volatility.

INTRODUCTION

Developing countries face many sources of economic uncertainty. Low-income countries tend to be dependent on primary product exports, and are therefore vulnerable to climate and trade shocks, as well as other factors affecting commodity prices. Middle-income countries have historically been dependent on short-term capital flows, leaving them vulnerable to currency and real-sector shocks from capital flight. Political instability and policy uncertainty tend to plague these countries to a greater degree, dampening private sector growth and investment. And in addition to these factors, developing countries also receive aid flows that are highly volatile.

Recent evidence shows that aid flows to developing countries are much more volatile than government revenues, household consumption or GDP. The adverse effects of aid unpredictability are well-known: volatile aid flows worsen public financing, shift government expenditures from investment to consumption and exacerbate business cycles, among other effects.

Both donors and recipients tend to overestimate aid disbursements. Shortfalls in aid due to disbursements below expectations are often followed by cuts in recipient-country government expenditure and sometimes by increases in taxation or both. Not only do aid shortfalls interrupt disbursements, general unpredictability of aid leads to consistently lower-than-projected disbursements and within-year fluctuations in aid flows. For these reasons, aid volatility has been of great concern to policymakers. The *Paris Declaration on Aid Effectiveness* underscored the determination of aid donors to make aid more predictable. Several studies have documented the cost of aid volatility and the channels through which this operates.[1] Kharas (2008), for example, notes that the current foreign aid system has generated, since 1970, approximately the same negative income shock to developing countries as two world wars and the Great Depression, combined, did to richer countries.

Much less attention, however, has been devoted to understanding the sources of aid volatility. We argue that, from the perspective of the aid recipient, there are two main sources of volatility in official development assistance (ODA): strategic responses to recipient events or behavior and donor responses to domestic or global events. First, changing events or behaviors of recipient countries—institutions, policies, elections, disasters or other factors—can cause shifts in aid disbursements. Second, donor behavior, including bad planning or shifting priorities in terms of country allocations, can also contribute to volatility. These factors may come together in several ways. Donors may respond to changes in recipient country behavior by changing aid disbursements. Donors may also move in herds, whereby donors base aid decisions on the actions of other donors, potentially causing major swings in aid allocations. Finally, volatility may be affected by the nature of the aid portfolio in that drawing from multiple aid sources can mitigate the effects of any single donor's change in aid disbursement. Using panel data on aid flows to over 80 countries between 1960 and 2008, we examine these determinants of volatility. Rather than relying on variation in aid flows to a given recipient over the entire period—which would produce a cross section of volatility measures—we use different measures of volatility that proxy country-year aid uncertainty.

In this paper we analyze the political and economic correlates of aid volatility. Our approach enables us to look at annual aid volatility for each recipient—which is, in essence, at the heart of donor efforts to harmonize aid allocations and to make aid streams less

uncertain. Standard measures that rely on the variance in aid disbursements over a period of time do not permit this.

The paper is organized as follows. The following section reviews why aid is volatile, and how the causes of volatility have been explained, and presents some stylized facts. The third section goes beyond analyses of covariance to estimate a series of aid-uncertainty equations controlling for recipient-country characteristics, as well as for the composition of aid across different donors. The last section concludes by drawing some implications of our findings for reducing the unpredictability of aid.

AID AS VOLATILE FINANCING

A glance at aid fluctuations over four decades reveals that, despite the greater attention paid to the problems of aid volatility, donors have been unable to make much progress in reducing it. Some donors, however, appear to be consistently more volatile than others. Figure 1 compares changes in (gross) total aid disbursements over the past five decades from all donors, European Union member states and the European Commission, the United States and all multilateral donors. Overall, the United States is the donor whose aid allocations tend to fluctuate the most, the EU the least. Note the large aid swings for multilateral donors—a consequence of debt relief in the 2000s.

Consider the following thought experiment: A finance minister in an aid-recipient country with volatile aid flows is asked by a donor to consider whether he would rather receive aid via projects, with notoriously volatile disbursements, or through more predictable budget support. The amount of the budget support would, however, be smaller. Using basic finance principles, the finance minister reasons that, as with any financial instrument, the required returns (i.e., the benefits from aid) should be correlated with risk (in this case, volatility). The finance minister would first determine the "certainty equivalent" associated with the two types of aid flows—i.e., the amount of aid the minister would be willing to accept under conditions of guaranteed disbursements—and then take whichever aid flow offered the greater certainty-equivalent. Would a finance minister really take less aid in return for reduced volatility as this thought experiment suggests? To answer this question we must understand how countries can incur substantial costs from unexpected aid fluctuations.

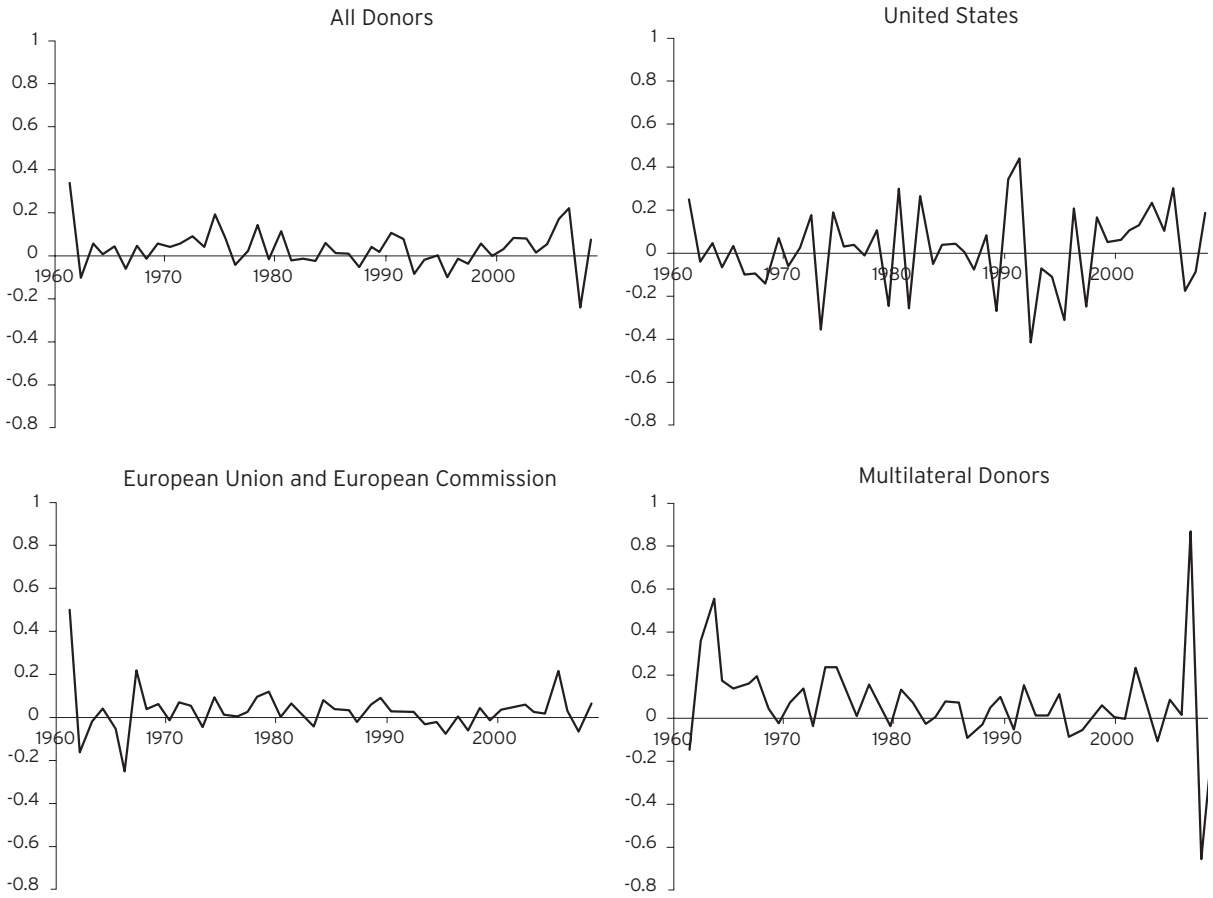
The real effects of aid volatility

There are three potential channels by which aid volatility can cause harm: by raising the costs of financial management, by worsening the composition of investment, and by amplifying the fiscal effects of business cycles.

An aid-dependent country's financial planning problem can be thought of as a two stage process (Martin and Morgan 1988). In the first stage, there is an evaluation of expenditure and funding requirements in the next period. In the second stage, a decision is made about how much to finance externally in the current period (and have available with certainty next period) and how much to finance externally in the next period. Optimum financing behavior usually leads to a decision to pre-finance some portion of next year's needs in the initial period (i.e., before expenditures come due) with the precise share driven by the desire to minimize transaction costs of financing, reduce uncertainty and to give a signal about a country's investment opportunities. The decision is also driven in part because the signal associated with deviating from a financial plan is mixed. It can be positive if it reflects the emergence of good new investment opportunities; or it can be negative if it reflects a shortfall of expected revenues. The combination of these effects pushes finance ministries to develop predictable financing plans, even if it entails some real costs compared to the "finance-as-you-go" alternative.[2]

For a developing country, aid can be uncoordinated and fragmented. Donors support one sector for a year and then move toward a different sector. They are unaware of each others' operations and often duplicate analytical work. The whole system produces volatility, waste and overlap of activities because of an inability to predict and plan resource flows over the medium term (Kharas 2008).

Figure 1: Aid fluctuations, 1960 – 2008



Source: DAC Tables 2a

A second channel by which aid volatility can reduce welfare is by deteriorating the composition of investment. Volatility in domestic liquidity changes the composition of domestic financing away from growth-enhancing long-term investment toward short-term investment and consumption. This effect is largest when domestic financial markets are less developed (a characteristic of most aid-dependent countries) (Aghion *et al*. 2005). Sub-optimal decisions being made in the composition of investment due to risk-aversion by investors can contribute to a large portion of deadweight losses due to aid volatility Moreover, aid shortfalls force governments to slash investment, while aid windfalls typically lead to increases in government consumption—which, unlike investment spending, can be adjusted quickly.

Third, because aid volatility is linked with fiscal spending (indeed, much aid is disbursed only after budget expenditures have actually been made), volatility in aid is also linked with volatility in fiscal spending and hence with volatility in the real exchange rate. Real exchange rate volatility, in turn, has been linked to lower growth (Schnabel 2007; Tressel and Prati 2006), presumably through the impact on behavior of exporters.

Fatas and Mihov (2005) present evidence that countries where governments extensively use discretionary fiscal policy experience lower growth. To the extent that aid volatility responds to and facilitates such discretionary fiscal policy, it directly contributes to a loss—for example, when aid is used to amplify electoral business cycles. When aid takes the form of a concessional credit (rather than a grant), then there can be an additional deadweight loss associated with excessive debt build-up. Persson and Tabellini (2001) argue that excessive spending can result when the costs of debt are not fully internalized by the authorities who may have a short time horizon.[3] The deadweight losses again arise from inefficient spending.

To summarize, deadweight losses from aid volatility can be observed directly in the actions taken to mitigate such losses. They can accrue in the form of high costs of financial management, lost "good" investment opportunities and a sub-optimal composition of investment, the amplification of real business cycles and other elements of inefficient public spending. From the perspective of a country and of the welfare of its citizens, there appears to be a substantial body of empirical literature suggesting that these deadweight losses are substantial. Just as many firms try to securitize their revenue streams to obtain predictable financing for investors, so countries would perhaps want to securitize aid receipts and generate more predictability if this option was made available.

The benefits from using aid as a smoothing device are very high. Pallage, Robe and Berube (2004) conclude that the welfare gain from improving the timing of aid flows could reach 5.5 percent of permanent consumption in aid-recipient countries. Benefits may not be linear. As Barro (2005) shows in other contexts, large rare shocks may have disproportionate effects. There is evidence that aid shocks also display a low probability, large shortfall pattern.

Lucas (2003) observed that regardless of cost one should only worry about volatility if there is a mechanism for reducing it. In the case of aid, there are several options.

Most recommendations for reducing aid volatility refer to donor behavior, on the assumption that aid shortfalls (or windfalls) are primarily due to the inability or unwillingness of donors to make long-term commitments to recipients. Donors, therefore, are encouraged to move away from fragmented, conditionality-based funding and make multi-year pre-commitments, with safeguards, to ensure a longer time horizon (Eifert and Gelb 2005; 2008). Recipients are told to protect themselves from fickle donors by developing a repertoire of "cushioning" devices such as reserves, stabilization funds or other adjustments to central bank assets (Prati and Tressel 2006).

Of course, donors could reduce the volatility of their own aid contributions to each country. Unfortunately, the common practice is the opposite. Several studies have documented donors' tendency to "herd," implying that the correlation between each donor's aid flow and the total received by a country is high. Donors also actively promote harmonization, which again contributes to high correlations among their aid flows.[4] They have moved slowly in expanding instruments such as long-term budget support which could reduce the volatility of their own contributions to aid

recipient countries. Not surprisingly, the largest contributions to deadweight losses per dollar lent come from donors who have linked aid most closely to conditionality, eschewing long term commitments.

The sources of volatility

Aid commitments, as with any international transaction, are negotiated agreements. And as with any international agreement, the result may be shaped by both the different relative bargaining capabilities of donors and recipients and the various commitment mechanisms that donors and recipients employ against one another. It would be a mistake to assume that either donors or recipients are at an advantage in this regard. Donors may engage in bad or myopic planning, but donors (particularly multilateral donors) with large portfolios outstanding to major recipients may also be swayed by recipient pressure for additional commitments.

Not all aid volatility is bad. First, changes in recipient-country demands can lead to variation in aid flows over time. When aid responds to natural disasters, as in the aftermath of the January 2010 Haitian earthquake, the 2004 Indian Ocean tsunami, or the successive droughts in Ethiopia between 2002 and 2004, it can generate volatility in disbursements; this kind of volatility is regarded positively. In other words, aid volatility can have a smoothing or insurance function. For some donors, the ability to reduce aid to corrupt governments or increase aid to reformist governments after a major conflict or crisis is also considered to be a good form of volatility.

On the other hand, governments in aid-recipient countries may wish to increase the number of donor-funded programs prior to elections, or when non-elected incumbents are challenged.[5] Aid provided as budget support, in particular, may be more susceptible to domestic electoral or business cycles, or other domestic political pressures in recipient countries that would normally prompt increases in public expenditures. This is normally considered a bad form of volatility.

A second source of aid volatility may be a consequence of the administration of aid programs. Bad donor planning, unexpected delays in implementing programs, and a slower-than-anticipated speed of disbursement are possible reasons for aid shortfalls. During 1990-2005, for example, annual aid disbursements in sub-Saharan Africa—the most volatile aid region—deviated from aid commitments by 3.4 percent of GDP. Disbursements and commitments diverge by 1.7-2.4 percent of GDP in other regions (Celasun and Walliser 2008). Almost all this volatility is considered bad.

Meanwhile, volatility can be affected by the composition of the "portfolio of donors" available to aid recipients. One possibility is that, just as portfolio risk can be reduced simply by holding combinations of instruments whose returns are not perfectly correlated, aid recipients can reduce aid volatility if their portfolio of donors is diverse. On the other hand, having a single, large donor-patron can also serve to smooth out shortfalls in aid—the so-called "steady" donor. An additional consideration lies in donor herding—an under-investigated but common phenomenon in official foreign assistance that can contribute to cascades in withdrawals of aid, or alternatively, countries being given aid in excess of their absorptive capacity. Individual donor volatility, in this case, is only bad if it is correlated with an increase in aggregate aid volatility faced by the recipient.

METHODS AND DATA

We seek to examine some possible determinants of aid volatility using time-varying measures of aid uncertainty. The few investigations of systematic causes of aid volatility have used variation in aid receipts over a period of years (Fielding and Mavrotas 2008). But reliance on sample variance suffers, in our view, from three flaws as a measure of volatility. First, the time-invariant nature of the measure precludes explanations of potential changes in volatility over time, particularly since the late 1990s when most major donors accepted the need to harmonize aid flows and to reduce overall aid shortfalls to developing countries. The high level of variability of some potential explanatory factors, moreover, suggests a large amount of missing information in cross-sectional analysis. Second, sample variability is not the same as volatility, except when events are unpredictable, and therefore more accurate measures of uncertainty are needed. Third, because recipient countries are highly diverse, it is possible that cross-sectional findings could be distorted by heterogeneity—i.e., unmeasured country-specific factors affecting both recipient-country characteristics and aid volatility.

Measuring aid volatility

Our data on aid flows comes from the OECD's Development Assistance Committee (DAC) creditor reporting system. We use gross disbursements of official development assistance in constant (2000) dollars to calculate our main dependent variables. Our primary outcome of interest is the uncertainty of aid disbursements by recipient country-year. Our aim here is to separate sample variability from uncertainty, since the former can overstate the latter by including both unpredictable as well as (predictable) cyclical movements. For this we use two different measures of volatility.

For our first proxy, we rely on a procedure used by others to generate uncertainty estimates for macroeconomic variables; exchange-rate and investment (e.g., Servén 2003; Price 1996) as well as trade (Mansfield and Reinhardt 2008). In a first step, we construct a measure of aid disbursement volatility based on the conditional variance generated from the following standard first-order autoregressive conditional heteroskedasticity (ARCH) specification for each aid receiving country:

$$A_{i,t} = \alpha_0 + \alpha_1 A_{i,t-1} + \varepsilon_{it} \text{ , and} \quad (1)$$

$$\sigma^2_{i,t} = \gamma_0 + \gamma_1 \varepsilon^2_{i,t-1} \quad (2)$$

where A_{it} is real aid and $\sigma^2_{i,t}$ is the variance of ε_{it} conditional on information up until period t. We take the conditional variances as our relevant recipient country-year indicator of aid volatility. In a second step, we estimate the following panel specification:

$$\ln(\sigma^2_{i,t}) = \beta_0 + \beta_R R_{i,t} + \beta_D D_{i,t} + \beta_H H_{i,t} + \phi t + \upsilon_{i,t} \quad (3)$$

where $\sigma^2_{i,t}$ is the estimated conditional variance of aid disbursements from equations (1) – (2), R is a vector of recipient-country conditions and events, D a vector of characteristics that describe the portfolio of aid flows, H a measure of donor herding in aid disbursement, and $\upsilon_{i,t}$ is an error with standard properties, for aid flows to recipient country i at time t.

Using conditional variances to proxy recipient-year aid unpredictability does not provide information about the direction of the shifts in disbursements, which, as discussed previously, may be due to actual disbursements falling short of or exceeding commitments. For this we use a simple, dichotomous measure of aid shortfalls and windfalls, coded 1 if real aid disbursements to a recipient country fall or increase a

certain threshold percent over the preceding year. We estimate the following:

$$\Pr(\underline{q} = 1) = \Phi(\beta_0 + \beta_R R_{i,t} + \beta_D D_{i,t} + \beta_H H_{i,t} + \bar{\beta}_q q_{i,t-1} + \mu_t + \eta_i + \upsilon_{i,t} \quad (4)$$

Our dependent variable $\underline{q} = 1$ where the drop (or increase) in aid over the previous year is greater than a certain cutoff, 0 otherwise, i.e., if $|A_{i,t}/A_{i,t-1} - 1| \geq Q$, where $A_{i,t}$ is real aid disbursements to country *i* in period *t*, and Q is the cutoff, Φ is the normal distribution function, and as above, R is a vector of recipient-country conditions and events, D a vector of characteristics that describe the portfolio of aid flows, and H a measure of donor herding in aid disbursement, for aid flows to recipient country *i* at time *t*. The terms μ_t and η_i represent country- and time-invariant fixed effects, respectively. We examine aid shortfalls/windfalls of 10 percent and 25 percent or more in separate estimations. We also include a lagged shortfall (windfall) binary indicator ($\bar{q}$) in the windfall (shortfall) equations, coded 1 if the lagged increase (decrease) in aid was greater than 10 percent or 25 percent, 0 otherwise. Including this lagged indicator controls for the potential mean-reverting behavior of aid after a one-year drop or spike in aid flows to a recipient country.

Initially we examine the recipient-country-year conditional variance and shortfalls/windfalls of gross disbursements of total ODA. In subsequent estimations, however, we separate out from ODA all flows that might constitute "good volatility," i.e., flows that should be more volatile in responding to natural disasters or humanitarian crises, as well as debt relief, technical assistance and repayments to derive a measure of programmatic aid.

Recipient-country conditions and donor influence

We include several recipient-country macroeconomic factors as control variables. We include *GDP* and its lagged value, both in natural logs, on the assumption that smaller economies—which may be more vulnerable to terms-of-trade shocks and global economic conditions—may also experience more aid volatility. Including both contemporaneous GDP and its lag amounts to a log-difference of GDP over the preceding year, and therefore controls for business cycles in the aid receiving country. Aid recipients with smaller populations, may be similarly affected, so we also control for *Total Population*. On the assumption that external debt levels can influence a host of macroeconomic prices—including domestic prices and exchange rates—we include a measure of total outstanding *External Debt* as a percentage of gross national income (GNI). Additionally, we control for *Trade* (exports and imports), on the assumption that trade-dependent nations' vulnerabilities may translate into aid volatility, and *Fuel Exports*, or total exports of oil and gas as a percentage of GDP. Aid-dependent countries may experience more volatility than countries receiving lower amounts of aid, and can contribute to fiscal uncertainty, and therefore we include a five-year moving average of total *ODA per capita*. The GDP, population and aid variables are all in natural logs; the debt and trade variables are expressed as fractions of GDP; external debt as a fraction of GNI.

Given the likelihood that natural disasters can dramatically shift aid disbursements and increase instantaneous variance, we include a *Disaster* term, coded 1 if the country experienced any natural disaster (including crop failures and famines, in addition to earthquakes and weather-related disasters). Country-year data on natural disasters are taken

from the International Emergency Events Database (EM-DAT) maintained by the Centre for Research on the Epidemiology of Disasters (CRED). Humanitarian crises can affect volatility in similar ways. Therefore we also include one of several measures of domestic political instability (described in further detail below) that measure the occurrence of internal wars or other violent conflicts, or the legacy of conflict.

Additionally, we initially include four indicators of political events and political change. First, we code observations 1 if there has been a presidential or legislative *Election* in the current year, preceding year or up-coming year, on the assumption that election-year aid funding requests may be negotiated in advance but disbursements may occur right before, during or following election years. Second, we use a *Leftward* dummy, coded 1 if the ruling political party moved toward the left on the political spectrum, defined as "communist, socialist, social-democratic or left-wing," or if "rural issues [are] a key component of the party's platform, or if farmers are a key party constituency" and 0 otherwise. Data on elections and the positioning of the government on a political spectrum are taken from the updated *Database of Political Institutions* (Beck et al. 2001). Third, we use the Polity index of democracy (*Constraints*) to control for the effects of democratic processes on the volatility of aid receipts (Jaggers and Marshall 2001). Fourth, since what may matter in influencing conditional variances in aid disbursements is not merely the "level" of democracy but it's change, we include a *Democratic Withdrawal* indicator coded 1 if, based on the Polity dataset's own classification of "regime transitions," the change in the Polity score over the preceding year was less than -3 (i.e., the country became more dictatorial).

In addition to these recipient-country factors, we add additional donor-characteristics of aid flows. First we include a simple Herfindahl index of *Donor Concentration* (the sum of squared shares of ODA from all donors). Second, we include *Donor Shares* based on the portion of total disbursements made of U.S., EU and multilateral ODA. These variables are useful measures of the effect of donor coordination/fragmentation on aid volatility, as well as the effect of being relatively aid dependent on different types of donors. More importantly, they directly measure both the level of diversification in the aid portfolio (a lower Herfindahl index indicating a larger number of donors) as well as the influence of the world biggest aid donors on the uncertainty of aid flows to the recipient.

Finally, we use simple proxies for "herding" behavior among donors. Herding occurs when donors, under conditions of incomplete information, respond sequentially to publicly-observed actions of other donors in making aid allocations. As in financial markets, herding can lead to cascades of money toward or away from particular recipients or groups of recipients. To measure herding behavior among donors with regard to total aid disbursements we rely on a simplified *Donor Herding* measure used by Frot and Santiso (2009), who adapt a measure of stock-market herding defined by Lakonishok, Shleifer and Vishny (1992). The indicator is the percentage of all donors in the world that have increased their real aid allocations to recipient country i between year $t - 1$ and t, less the proportion of annual aid increases undertaken by donors that are active in country i in year t.[6] If the difference is zero, there is no herding, since donors in country i are not deviating from "average donor" behavior. If the difference is positive, more donors are increasing flows to country i when average donors are not, suggesting herding toward the recipient country. A negative value, by contrast, indicates movement away from the recipient country.

RESULTS

Our basic panel regression results are reported in Table 1. Here the dependent variable is the estimated conditional variance of total gross ODA disbursements estimated from the country-by-country ARCH(1) model.[7] We report results using both OLS with panel-corrected standard errors, and two-way, region- and year-fixed effects.

Note that in generating conditional variances, rather than imposing a country-invariant ARCH(1) term on all aid recipients, we calculate ARCH(1) terms for each country's aid flows between 1960 and 2008, and generate country- and time-specific measures of volatility. We do not use country-fixed effects because this would introduce a high degree of colinearity between the intercepts and country-specific conditional variances since the ARCH terms differ across panels. Instead, we rely on two alternative estimators when the dependent variable is continuous: an error correction of ordinary least squares (OLS) for cross-panel heteroskedasticity and contemporaneous correlation, in which we include region effects, and a two-way region- and year- fixed effects estimator. For the dichotomous shortfall/windfall indicator, however, we use a conditional logit estimator with country- and time-fixed effects.[8]

Gross disbursement volatility

Macroeconomic conditions

Aid recipients with larger populations experience greater volatility than smaller nations. But aid recipients with larger economies do not face greater volatility. Additionally, the absence of a statistically significant coefficient on the lagged GDP variable indicates that fast-growing countries, slow-growing countries, stagnant countries or countries in recession do not experience any appreciable difference in aid volatility. We also find that more indebted aid recipients, and aid recipients that are more trade-dependent, also experience greater volatility in aid flows. Moreover, recipients of large amounts of aid are also significantly more volatile than less aid-dependent countries. Overall, this evidence is similar to empirical analyses of the determinants of exchange-rate and investment fluctuations, which find that countries with larger amounts of aggregate net resource flows are exposed to greater volatility. There is one exception: aid-recipient countries that earn greater export income from fuel exports, as expected, are shielded from aid volatility.

Natural disasters and domestic instability

The incidence of a natural disaster has no effect on the conditional volatility in aid flows—a finding that appears to be consistent across a number of alternative specifications. But this should not be surprising: a jump in aid to disaster-stricken countries may occur over a period of years, as donors increase annual commitments, but this would not increase conditional volatility unless disasters prompted both increases and decreases in aid. Also, sizeable amounts of aid to mitigate the impact of disasters come from reprogramming aid allocations within a fixed country envelope.

Recipients undergoing internal conflicts and political instability, however, face more volatile aid flows, suggesting that domestic political turmoil affects aid programs and projects. In our first two estimations in Table 1, we use a measure of *Political Instability* taken from the Political Instability Task Force (PITF), based on the maximum yearly score for intensity of internal wars and politically-motivated domestic violence

Table 1: Summary Statistics

		Std. Dev.						
	Mean	(overall)	(within)	Min.	Max.	Obs.	Countries	T (ave.)
Conditional Variance (ODA)[a]	9.79	2.21	0.92	3.58	18.22	1644	80	20.55
Conditional Variance (CPA)[a]	9.35	1.99	0.61	2.88	15.53	1404	70	20.06
10% Shortfall (ODA)	0.31	0.46	0.45	0.00	1.00	1997	100	19.97
10% Windfall (ODA)	0.36	0.48	0.47	0.00	1.00	1997	100	19.97
10% Shortfall (CPA)	0.45	0.50	0.48	0.00	1.00	1599	100	15.99
10% Windfall (CPA)	0.38	0.49	0.47	0.00	1.00	1599	100	15.99
GDP[a]	23.23	1.78	0.35	18.70	28.27	1997	100	19.97
Population[a]	16.34	1.55	0.23	12.34	20.99	1997	100	19.97
Trade[b]	0.65	0.36	0.15	0.06	2.29	1997	100	19.97
External Debt[c]	0.62	0.65	0.52	0.00	12.09	1997	100	19.97
Fuel Exports[b]	0.15	0.26	0.09	0.00	1.00	1997	100	19.97
Aid Dependence (ODA)[a,d]	3.59	1.05	0.37	0.53	7.00	1997	100	19.97
Aid Dependence (CPA)[a,d]	2.99	1.17	0.55	-1.66	6.94	1599	100	15.99
Disaster	0.64	0.48	0.42	0.00	1.00	1997	100	19.97
Political Instability	0.09	0.20	0.15	0.00	1.00	1997	100	19.97
Post Conflict	0.48	0.50	0.33	0.00	1.00	1825	95	19.21
Civil War	0.21	0.41	0.28	0.00	1.00	1997	100	19.97
Elections	0.57	0.49	0.46	0.00	1.00	1997	100	19.97
Leftward Shift	0.02	0.12	0.12	0.00	1.00	1704	96	17.75
Polity	0.95	6.79	4.46	-10.00	10.00	1997	100	19.97
Democratic Withdrawal	0.03	0.16	0.16	0.00	1.00	1997	100	19.97
Donor Concentration (ODA)	0.18	0.14	0.09	0.00	0.92	1997	100	19.97
Donor Concentration (CPA)	0.31	0.20	0.15	0.06	1.00	1599	100	15.99
US Share (ODA)	0.13	0.16	0.11	0.00	0.91	1997	100	19.97
EU-EC Share (ODA)	0.47	0.23	0.13	0.00	0.97	1997	100	19.97
Multilateral Share (ODA)	0.28	0.17	0.13	0.00	0.88	1997	100	19.97
US Share (CPA)	0.08	2.34	2.30	0.00	50.54	1599	100	15.99
EU Share (CPA)	0.45	3.38	3.31	0.00	101.80	1599	100	15.99
Multilateral Share (CPA)	0.43	3.92	3.88	0.00	43.78	1599	100	15.99
Donor Herding (ODA)	0.01	0.11	0.11	-0.45	0.41	1997	100	19.97
Donor Herding (CPA)	0.02	0.10	0.09	-0.28	0.36	1599	100	15.99

Notes: Aid and GDP values are in constant (2000) U.S. dollars.

a. In natural logarithms

b. As fraction of GDP

c. As fraction of GNI

d. Per capita, five-year moving average

consisting of four types of events (ethnic wars, revolution, genocide and regime instability).[9] In analyses of the effectiveness of foreign aid, internal conflicts are considered a limiting factor due to, e.g., the greater degree of rent-seeking among competing groups (Svensson 2000), or due to the heightened potential for stalemates. In models (3) and (4) we replace the PITF index with a *Civil War* dummy taken from the Armed Conflicts Database maintained by the Oslo International Peace Research Institute (PRIO), and coded 1 if an internal armed conflict is taking place in the country's territory (Gledistch, et al. 2002). We also use a *Post Conflict* dummy variable, coded 1 if countries are experiencing or have experienced in the past decade a civil war (adding inter-state wars to the coding of these variables has no consequence for the results). Civil wars, as with political instability, heighten volatility, as does the post-conflict designation.[10] Because of the larger time-span and wider country-coverage of the civil war indicator, we use this as our measure of internal conflict for the remainder of our analysis.

Elections, political institutions and regime change

We do not find that electioneering plays a significant role in aid volatility, as countries experiencing elections do not tend to experience greater volatility than those who are not. There does not appear to be evidence of aid uncertainty being linked to electoral cycles. Additionally, one could think of the potential effect that leftist or populist governments—those with stronger constituencies among working classes (urban and rural)—would have on aid agreements as similar to the claim that left-of-center governments tend to deficit spend (Powell and Whitten 1993; Perotti and Kontopoulous 2001; Alesina and Roubini 1992). We suspected that ODA (much of which may be channeled through budget support) could perform a similar function in aid-dependent countries. But we find no evidence of aid recipients that have moved left-ward on the political spectrum experiencing greater volatility than other governments.[11] In none of our subsequent estimations do elections or left-ward movement produce coefficients with statistical significance, and thus we drop them for all remaining regressions of volatility in total aid gross disbursements.

There is something of a consensus view that political institutions characterized by the universal franchise, checks and balances, multiple veto points and other formal-legal limitations on governmental discretion can yield economic benefits by enabling governments to signal their inability to engage in opportunism with other economic players. Thus democracy and constitutional checks on executive power are associated with increased investment (North and Weingast 1989, Stasavage 2003), as well as increased domestic support for economic reforms (Desai and Olofsgard 2005). We expect that similar instances of credible commitment may be forthcoming in aid transactions, especially if these political constraints on recipient-government ministries prevent these bodies from *ex post* bargaining for additional donor-funded programs and projects. Aid recipients that have democratic governments, however, do not experience less aid volatility than those with more powerful political executives or with non-democratic governments.[12]

Along with electoral cycles and movement on the political spectrum, regime type has no effect on aid volatility. The evidence, thus far, seems to support the view that there are few political characteristics of aid recipients that can shelter these countries from uncertainty in aid flows. We do find one factor, however, that increases the volatility of aid: democratic withdrawal. Aid recipients that have undergone transitions

away from democracy generally experience increases in aid uncertainty.

The aid portfolio

In Table 2 we add various indicators of the aid portfolio for recipient countries, in particular, the donor concentration index, separate donor shares of total aid (from the U.S., EU and multilateral donors), as well as the simplified donor herding indicator. Donor concentration is associated with increased volatility suggesting that aid-donor diversification can reduce aid unpredictability. Donors that receive shares from the U.S., however, are subject to greater volatility, followed by the multilateral donors. Based on the magnitudes of the coefficients, having equivalent shares of aid from the U.S. and multilateral donors, an aid recipient would find that the volatility inducing effect of U.S. money is between two and three times that of the multilateral donors. A larger share of EU/EC aid in the mix has no effect. Finally, we see that the donor herding measure has no effect on volatility.

Good vs. Bad Volatility: Country Programmable Aid

As mentioned above, it is imperative to separate out those aid flows for which volatility may be necessary—as in the case of humanitarian assistance, emergency relief or food aid. In addition, much of the aid included in net ODA or gross disbursements does not actually involve a cross-border transaction. For example, technical assistance typically involves a consulting contract between a donor agency and a consulting firm in its own country. The aid recipient receives a service (the consulting report), but the valuation of the service is out of its control. There are no cash flows involved. Volatility in these kinds of transactions may be less important than volatility in cash that supports development projects and programs. We develop a measure of aid called "country programmable aid" (CPA), which uses total net ODA rather than gross ODA disbursements. From this we remove the following aid components: technical assistance, debt relief, food aid, humanitarian assistance and disaster relief. We also subtract interest payments made, so as to arrive at a true figure of the net cash flow received by the recipient country.

The first graph in Figure 2 shows disbursements, worldwide, of all total ODA and CPA since 1970. Between 1960 and 2008, in constant dollars, total ODA doubled from $40 billion to $80 billion, before falling throughout the 1990s. After 2001, however, total ODA doubled again from $60 billion to approximately $145 billion in 2006. Approximately 50 percent of ODA, however, has taken the form of humanitarian assistance, emergency relief, food aid, technical assistance, and since 2000, debt relief. CPA, by contrast, has essentially fluctuated between $20 billion and $30 billion since 1970. Note that removing Iraq and Afghanistan aid since 2001 does not change the overall pattern.

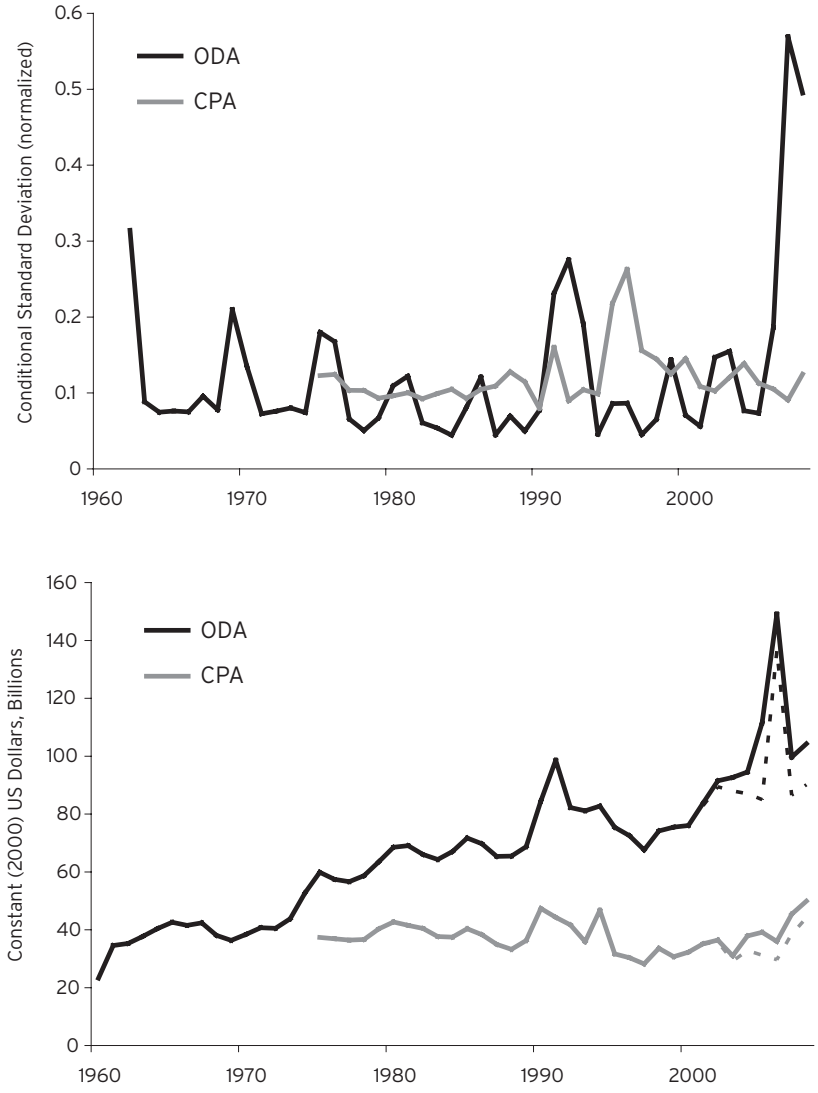
The second graph in Figure 2 shows conditional standard deviations for all ODA and CPA, divided by total annual ODA gross disbursements, and total net CPA disbursements, respectively. The result is a normalized, annual standard deviation for each aid flow. The graph shows that volatility in ODA and CPA has been basically flat from 1960 to 2000 with minor blips. In particular, CPA volatility increases during the mid 1990s, mainly due to new CPA aid to the former Soviet republics of the Commonwealth of Independent States, and to Eastern Europe. Volatility in ODA, meanwhile, spikes after the year 2000 reflecting the surge in debt relief. Note that when debt relief is excluded (as it is in the CPA measure), the rise in volatility after 2000 disappears.

Table 2: Conditional Variance of Official Development Aid

	(1)	(2)	(3)	(4)	(5)	(6)
Ln(GDP_t)	-0.4856	-0.6855	-0.7564	-1.0688	-0.8015	-1.0293
	(0.8176)	(0.8171)	(0.8756)	(0.8508)	(0.8216)	(0.8399)
Ln(GDP_{t-1})	0.5044	0.7290	0.7155	1.0475	0.8139	1.0643
	(0.8040)	(0.8151)	(0.8636)	(0.8483)	(0.8092)	(0.8378)
Ln(Population)	1.9451***	1.9264***	2.0113***	1.9957***	1.9505***	1.9346***
	(0.0566)	(0.0620)	(0.0576)	(0.0648)	(0.0549)	(0.0627)
Trade (% GDP)	0.7211***	0.6257***	0.9004***	0.7774***	0.6830***	0.5885***
	(0.1487)	(0.1467)	(0.1493)	(0.1541)	(0.1527)	(0.1487)
External Debt (% GNI)	0.2453***	0.2842***	0.1968***	0.2310***	0.2393***	0.2752***
	(0.0602)	(0.0488)	(0.0628)	(0.0501)	(0.0614)	(0.0508)
Fuel Exports (% GDP)	-0.1752	-0.1736	-0.0171	0.0101	-0.1012	-0.0924
	(0.1226)	(0.1378)	(0.1330)	(0.1404)	(0.1225)	(0.1392)
Ln(ODA per Capita)	1.7378***	1.7684***	1.7418***	1.7779***	1.7441***	1.7751***
	(0.0809)	(0.0612)	(0.0855)	(0.0660)	(0.0804)	(0.0620)
Disaster	-0.0545	-0.0408	-0.0784	-0.0656	-0.0574	-0.0425
	(0.0869)	(0.0887)	(0.0891)	(0.0951)	(0.0879)	(0.0894)
Political Instability	0.8407***	0.8850***				
	(0.1864)	(0.1821)				
Post Conflict			0.4182***	0.3795***		
			(0.0827)	(0.0874)		
Civil War					0.2369***	0.2376***
					(0.0872)	(0.0874)
Elections (t, t-1, t+1)	-0.0952	-0.0590	-0.0961	-0.0581	-0.0797	-0.0440
	(0.0739)	(0.0744)	(0.0815)	(0.0784)	(0.0754)	(0.0748)
Leftward Shift	0.3219	0.3308	0.2141	0.2082	0.3286	0.3412
	(0.2408)	(0.2846)	(0.2562)	(0.2488)	(0.2400)	(0.2776)
Polity	-0.0071	-0.0066	-0.0074	-0.0075	-0.0089	-0.0086
	(0.0057)	(0.0070)	(0.0060)	(0.0075)	(0.0057)	(0.0071)
Democratic Withdrawal	0.5297**	0.5198	0.8279***	0.8189**	0.8134***	0.8213**
	(0.2530)	(0.3320)	(0.2475)	(0.3251)	(0.2489)	(0.3194)
Trend	-0.0274***		-0.0255***		-0.0269***	
	(0.0043)		(0.0040)		(0.0043)	
Observations	1407	1407	1269	1269	1403	1403
Recipient Countries	83	83	81	81	82	82
R^2	0.6996	0.7062	0.6984	0.7049	0.6971	0.7035
Prob. > χ2, F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

*Notes: Dependent variable is conditional variance of total aid based on an ARCH(1) estimation. Estimation for (1), (3), and (5) is by OLS with panel-error correction; (2), (4), and (6) are estimated with region-year fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.10*

Figure 2: Official Development Aid (ODA) vs. Country Programmable Aid (CPA), 1960 – 2008



Source: DAC Tables 2a and authors' calculations

By construction, CPA is less volatile than total ODA, consisting of aid destined for programs or projects directly or through support to the budgets of recipient countries. That is what makes CPA volatility more costly, given that aid recipients plan expenditures on the basis of donor commitments. These plans, in principle, are not meant to be affected by natural or humanitarian disasters, but by donor's country assistance strategies in consultation with recipient-country authorities.

Table 4 replicates the specifications from Table 3. CPA conditional variance estimates are consistent with those for ODA in Table 2. Overall, however, the

Table 3: Effects of Portfolio Diversity and Donor Herding on Aid Volatility

	(1)	(2)	(3)	(4)
Ln(GDP_t)	-0.4419	-0.6701	-0.1382	-0.3626
	(0.8372)	(0.8371)	(0.7534)	(0.7782)
Ln(GDP_{t-1})	0.4586	0.7003	0.0473	0.2946
	(0.8205)	(0.8379)	(0.7483)	(0.7801)
Ln(Population)	1.8954***	1.8887***	1.8529***	1.8376***
	(0.0667)	(0.0808)	(0.0626)	(0.0729)
Trade (% GDP)	0.5667***	0.4877***	0.5303***	0.4445***
	(0.1638)	(0.1558)	(0.1398)	(0.1460)
External Debt (% GNI)	0.2626***	0.2923***	0.2752***	0.3114***
	(0.0637)	(0.0522)	(0.0745)	(0.0570)
Fuel Exports (% GDP)	-0.1920	-0.1790	-0.3108***	-0.2887**
	(0.1242)	(0.1457)	(0.1140)	(0.1367)
Ln(ODA per Capita)	1.6403***	1.6703***	1.4906***	1.5230***
	(0.0886)	(0.0658)	(0.0952)	(0.0618)
Disaster	-0.0324	-0.0226		
	(0.0850)	(0.0893)		
Civil War	0.1909**	0.1929**	0.2381***	0.2537***
	(0.0848)	(0.0871)	(0.0801)	(0.0823)
Elections (t, t-1, t+1)	-0.0790	-0.0468		
	(0.0718)	(0.0744)		
Leftward Shift	0.2750	0.2792		
	(0.2366)	(0.2556)		
Polity	-0.0116**	-0.0114	-0.0079	-0.0079
	(0.0056)	(0.0072)	(0.0049)	(0.0066)
Democratic Withdrawal	0.8193***	0.8265**	0.5980***	0.5978**
	(0.2517)	(0.3208)	(0.2099)	(0.2588)
Donor Concentration	1.1452***	1.0925***	1.0497***	0.9247***
	(0.3207)	(0.4038)	(0.2653)	(0.3425)
US Share	1.9532***	1.8775***	1.6546***	1.5113***
	(0.3519)	(0.4313)	(0.3299)	(0.4123)
EU Share	0.2729	0.3074	-0.0597	-0.0772
	(0.2506)	(0.2699)	(0.2431)	(0.2493)
Multilateral Share	0.7201***	0.6647**	0.1390	0.0741
	(0.2752)	(0.2908)	(0.3016)	(0.2649)
Donor Herding	0.4040	0.4510	0.3098	0.3442
	(0.3369)	(0.3216)	(0.3039)	(0.2922)
Trend	-0.0243***		-0.0260***	
	(0.0040)		(0.0036)	
Observations	1403	1403	1661	1661
Recipient Countries	82	82	86	86
R^2	0.7051	0.7105	0.6835	0.6887
Prob. > χ2, F	0.0000	0.0000	0.0000	0.0000

*Notes: Dependent variable is conditional variance of total aid based on an ARCH(1) estimation. Estimation for (1) and (3) is by OLS with panel-error correction; (2) and (4) are estimated with region-year fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.10.*

Table 4: Conditional Variance of Country-Programmable Aid

	(1)	(2)	(3)	(4)
Ln(GDP_t)	-0.8554	-0.9834	-0.7674	-0.9026
	(0.7156)	(0.6682)	(0.6871)	(0.6478)
Ln(GDP_{t-1})	1.0934	1.2238*	1.0329	1.1753*
	(0.7106)	(0.6672)	(0.6821)	(0.6457)
Ln(Population)	1.3386***	1.3382***	1.2879***	1.2867***
	(0.0512)	(0.0681)	(0.0475)	(0.0643)
Trade (% GDP)	0.4078***	0.3895***	0.4679***	0.4375***
	(0.1519)	(0.1233)	(0.1443)	(0.1187)
External Debt (% GNI)	0.2412***	0.2542***	0.2492***	0.2681***
	(0.0419)	(0.0638)	(0.0437)	(0.0663)
Fuel Exports (% GDP)	-0.3007**	-0.2866**	-0.2992**	-0.2804**
	(0.1445)	(0.1364)	(0.1324)	(0.1309)
Ln(CPA per Capita)	1.1078***	1.1197***	1.0690***	1.0814***
	(0.0830)	(0.0621)	(0.0812)	(0.0598)
Disaster	-0.0074	0.0065		
	(0.0761)	(0.0848)		
Civil War	-0.1021	-0.1028	-0.0250	-0.0222
	(0.0645)	(0.0764)	(0.0618)	(0.0735)
Elections (t, t-1, t+1)	-0.0809	-0.0537		
	(0.0826)	(0.0667)		
Leftward Shift	0.2243	0.2190		
	(0.2450)	(0.2650)		
Polity	0.0236***	0.0238***	0.0227***	0.0233***
	(0.0058)	(0.0071)	(0.0054)	(0.0068)
Democratic Withdrawal	0.1746	0.1651	0.2031	0.1856
	(0.2378)	(0.2374)	(0.2436)	(0.2414)
Donor Concentration	0.7663***	0.7985***	0.4606*	0.4566*
	(0.2965)	(0.2538)	(0.2729)	(0.2328)
US Share	0.0577*	0.0614**	0.0591*	0.0634**
	(0.0322)	(0.0260)	(0.0316)	(0.0257)
EU Share	0.0126	0.0129*	0.0123	0.0130*
	(0.0128)	(0.0078)	(0.0127)	(0.0078)
Multilateral Share	0.0164	0.0194	0.0174	0.0196
	(0.0254)	(0.0200)	(0.0257)	(0.0202)
Donor Herding	0.8635***	0.8706**	1.0959***	1.1032***
	(0.3190)	(0.3565)	(0.3086)	(0.3429)
Trend	-0.0543***		-0.0550***	
	(0.0046)		(0.0047)	
Observations	1221	1221	1269	1269
Recipient Countries	70	70	73	73
R^2	0.7138	0.7176	0.7138	0.7177
Prob. > χ2, F	0.0000	0.0000	0.0000	0.0000

*Notes: Dependent variable is conditional variances of CPA based on an ARCH(1) estimation. Estimation for (1) and (3), is by OLS with panel-error correction; (2) and (4) are estimated with region-year fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.10.*

magnitudes of the correlates on volatility are approximately 30 – 40 percent smaller for CPA than for ODA, consistent with the expectation that CPA should be more resistant to volatility-inducing factors. More importantly, CPA conditional variances are also less influenced by domestic instability, as the civil war indicator is no longer significant.

The volatility-inducing effects of domestic political factors, however, are different for CPA than for ODA. As with ODA volatility, electoral cycles or movements along a political spectrum due to governmental changes does not affect volatility. Moreover, adverse regime changes (becoming less democratic) do not influence CPA volatility. But democracies experience more unstable CPA flows. A key component of democracy is a system of checks and balances, which can reduce economic volatility, since the discretion of policy-makers is credibly constrained. Why would democracy lead to heightened CPA volatility in this case? Although democratic institutions might limit the ability of governments to run large deficits, increase inflation taxes or seignorage, or otherwise make unexpected changes to economic policy, there is no such constraint implied when it comes to matters such as budget support and programmatic aid. Indeed, it is possible that democratic recipients are more likely to have requests for increases in budget support approved by donors—much as public leaders in democracies are known to ratchet public spending upwards (Lindert 2004).

As with ODA, donor concentration in the CPA portfolio has a strong effect on increasing overall volatility. Meanwhile large shares of CPA provided by the U.S. increases overall CPA volatility as was the case with all aid, but the effect of other donors' shares is less consistent. Additionally, we see less consistent evidence of herding when examining CPA conditional variances. Finally, we see a large effect of donor herding on CPA volatility.

Aid shortfalls and windfalls

Measuring aid volatility through estimations of conditional variance provides country-year measures of expected unpredictability in aid flows, but does not tell us the direction in movements. In Table 5, therefore, we present results from the conditional logit estimation of binary aid shortfall and windfall indicators where aid flows have increased or decreased by more than 10 percent. Comparing these results with Tables 3 and 4 sheds light on the nature of the volatilities. Most of the economic conditions responsible for heightened overall volatility in ODA or CPA, for example, do not have direct effects on ODA/CPA shortfalls or windfalls. Note that the effect of democracy is to increase the likelihood of CPA and ODA windfalls, while reducing the likelihood of ODA shortfalls, even when we control for reversion of aid flows to the mean. With CPA, in particular, this supports our suggestion that democratic recipients are more likely to have requests for increases in budget support approved by donors.

Finally we see that donor concentration and donor herding both lower the chances of aid shortages, while at the same time, increase the chances of spikes in aid flows (both ODA and CPA). Meanwhile the same is the case with ODA recipients for whom the U.S. is providing a major share of aid. Having the U.S. as a "donor-patron," therefore, plays a major role in over- rather than under-disbursing total official aid.

Table 6 examines the portions of explained variance for ODA and CPA conditional volatility as well as shortfalls and windfalls that are accounted for by different groups of variables. There are two patterns of interest. First, while domestic political conditions do

Table 5: Predictability Aid Shortfalls and Windfalls

	Official Development Assistance				Country-Programmable Aid			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Shortfall/Windfall:	< –10%	< –10%	> +10%	> +10%	< –10%	< –10%	> +10%	> +10%
Real Change in GDP	-1.4258 (1.3373)	-1.9997 (1.3762)	-0.2649 (1.3848)	0.0940 (1.4004)	1.0102 (1.3629)	0.7986 (1.4036)	-1.0946 (1.3470)	-0.7053 (1.3770)
Ln(Population)	0.9805 (0.8296)	1.0561 (0.8379)	-0.3102 (0.8682)	-0.3846 (0.8744)	-0.5079 (0.8759)	-0.4342 (0.8877)	-0.4922 (0.8828)	-0.4371 (0.8989)
Trade (% GDP)	0.6971 (0.4295)	0.6851 (0.4381)	-0.5466 (0.4376)	-0.5632 (0.4404)	0.1548 (0.4233)	0.1944 (0.4288)	-0.2210 (0.4286)	-0.1904 (0.4336)
External Debt (% GNI)	-0.1775 (0.1427)	-0.2047 (0.1450)	0.2728** (0.1345)	0.2852** (0.1343)	-0.2049 (0.1330)	-0.2092 (0.1279)	0.2206* (0.1189)	0.2441** (0.1195)
Fuel Exports (% GDP)	0.0867 (0.6824)	0.0054 (0.6899)	0.2850 (0.6770)	0.2934 (0.6768)	1.3583** (0.6797)	1.4244** (0.6886)	-0.0556 (0.6930)	-0.2206 (0.7097)
Ln(ODA/CPA per Capita)	1.1769*** (0.1675)	1.3388*** (0.1730)	-1.3770*** (0.1719)	-1.5031*** (0.1756)	0.4207*** (0.1219)	0.5189*** (0.1256)	-0.5855*** (0.1237)	-0.6590*** (0.1272)
Civil War	0.2101 (0.1943)	0.2370 (0.1988)	-0.2140 (0.2004)	-0.2511 (0.2031)	-0.1874 (0.1964)	-0.1918 (0.2002)	0.0597 (0.1955)	0.0632 (0.1986)
Polity	-0.0233 (0.0161)	-0.0301* (0.0164)	0.0354** (0.0157)	0.0404** (0.0159)	-0.0162 (0.0163)	-0.0206 (0.0166)	0.0296* (0.0162)	0.0324** (0.0165)
Democratic Withdrawal	0.5605 (0.3489)	0.5378 (0.3614)	0.5780 (0.3559)	0.5877 (0.3601)	0.4586 (0.4380)	0.4087 (0.4538)	0.2128 (0.4378)	0.2931 (0.4552)
Donor Concentration	-4.3135*** (0.8151)	-4.6858*** (0.8311)	6.3424*** (0.8174)	6.5441*** (0.8271)	-2.2018*** (0.4375)	-2.3665*** (0.4470)	3.0092*** (0.4554)	3.2688*** (0.4695)
US Share	-3.4307*** (0.7997)	-3.7153*** (0.8149)	4.5912*** (0.7816)	4.7455*** (0.7908)	-0.0176 (0.0415)	-0.0154 (0.0428)	0.0026 (0.0453)	-0.0047 (0.0463)
EU Share	-0.3543 (0.5622)	-0.3579 (0.5752)	-0.0122 (0.5679)	-0.0749 (0.5754)	0.0016 (0.0311)	0.0029 (0.0315)	-0.0093 (0.0349)	-0.0153 (0.0360)
Multilateral Share	-0.7807 (0.5240)	-0.8849* (0.5370)	0.2107 (0.5271)	0.1783 (0.5352)	0.0653 (0.0443)	0.0698 (0.0445)	-0.0679 (0.0465)	-0.0723 (0.0461)
Donor Herding	-8.9395*** (0.6222)	-8.8698*** (0.6327)	9.8334*** (0.6176)	9.8161*** (0.6293)	-6.8745*** (0.6602)	-6.7735*** (0.6710)	7.3626*** (0.6794)	7.2422*** (0.6922)
Lagged Shortfall/Windfall		0.9524*** (0.1232)		0.7873*** (0.1240)		0.8221*** (0.1188)		0.8756*** (0.1199)
Observations	1997	1997	2010	2010	1676	1676	1690	1690
Recipient Countries	100	100	103	103	91	91	95	95
Log Likelihood *Prob. > χ2, F*	-829.8 (0.0000)	-799.1 (0.0000)	-835.5 (0.0000)	-815.0 (0.0000)	-835.0 (0.0000)	-810.3 (0.0000)	-813.5 (0.0000)	-785.8 (0.0000)

*Notes: Dependent variable is dichotomous depending on whether donor-specific total aid flows fell or increased by more than 10% over the previous year. Estimations are by conditional fixed-effects logistic regression with country- and year-fixed effects. *** p < 0.01, ** p < 0.05, * p < 0.10.*

Table 6: Variance Decomposition

	(1)	(2)	(3)	(4)	(5)	(6)
	ODA	CPA	< –10% ODA	> +10% ODA	< –10% CPA	> +10% CPA
Recipient-country economic conditions	0.7035	0.6656	0.1625	0.1818	0.0000	0.0994
Aid dependence	0.2127	0.2508	0.0883	0.1000	0.1657	0.1428
Recipient-country political conditions	0.0067	0.0000	0.0000	0.0152	0.0000	0.0000
Portfolio characteristics and donor herding	0.0101	0.0080	0.4700	0.5121	0.4867	0.4583
Fixed effects	0.0670	0.0756	0.1767	0.1364	0.1937	0.1367
Mean reversion			0.1025	0.0545	0.1811	0.1633
R^2/Pseudo R^2	0.6887	0.7562	0.2345	0.2634	0.1405	0.1559

Notes: Figures above last row are marginal fractions of total explained variance (R^2/Pseudo R^2) without effects of variable collinearity. Variance components are estimated from hierarchical regressions in which the marginal contribution of different variables or groups of variables is calculated. For binary regressions (3) – (4), variance components are calculated from the overall pseudo R2 less pseudo R2 when that variable or group of variables is removed. Variables are grouped as follows. Recipient-country economic conditions = log of GDP (and lagged GDP), population, trade, debt, and fuel exports; Aid dependence = ODA or CPA per capita (5-year moving average); Recipient-country political conditions = civil war, Polity score, democratic withdrawal; Portfolio characteristics = donor concentration, major-donor shares, donor herding; Fixed effects = year and region fixed effects; Mean Reversion = lagged aid shortfall or windfall.

have effects on both the level of aid variability and on its direction, they explain only a negligible portion of the overall variance in these outcomes. Second, most of the general volatility for ODA and CPA is explained by recipient-country economic conditions while characteristics of the aid portfolio matter less. The situation is reversed for shortfalls and windfalls where the portfolio characteristics account for approximately half of the total explained variance. Thus smaller changes (and general volatility) seem to be driven by in-country economic events while donors seem to be driving the larger big changes—a potentially troubling aid arrangement if this means that large swings in aid are truly arbitrary (e.g., not associated with rewarding democracy). Moreover, changes of this magnitude necessarily imply large inefficiencies however good donor intentions are.

Quantile regressions

Our basic results highlight the role of particular recipient-country factors in influencing program and project aid volatility from bilateral and multilateral donors. An important question for understanding the determinants of aid uncertainty is whether there is greater variation in the effects of these determinants at higher or lower levels of conditional variances. For example, if between lower and higher levels of aid volatilities if there is greater variation in population, it would suggest that some large nations have found alternative methods of addressing aid volatility—for example, by establishing reserve funds to smooth out shortfalls in aid.

Table 7 presents quantile regressions that estimate slope parameters at the 25th, 50th and 75th percen-

Table 7: Conditional Variance of ODA and CPA, Quantile Regressions

	Official Development Aid			Country Programmable Aid		
	(1)	(2)	(3)	(4)	(5)	(6)
Quantile:	**25th**	**50th**	**75th**	**25th**	**50th**	**75th**
Ln(GDP_t)	-0.2283	-0.2004	-1.0596	-0.6749	-0.5965	-0.2274
	(0.7934)	(1.0129)	(1.1969)	(0.9187)	(1.0489)	(0.7712)
Ln(GDP_{t-1})	0.3049	0.1418	0.8895	0.7882	0.7511	0.3385
	(0.7991)	(1.0076)	(1.1980)	(0.8879)	(1.0454)	(0.7727)
Ln(Population)	1.6105***	1.8419***	1.8053***	1.4969***	1.3873***	1.2403***
	(0.0772)	(0.0938)	(0.1099)	(0.0920)	(0.0934)	(0.0989)
Trade (% GDP)	0.5221***	0.7826***	0.4504*	0.5642***	0.4795***	0.2700
	(0.1835)	(0.2197)	(0.2682)	(0.1401)	(0.1312)	(0.1696)
External Debt (% GNI)	0.2680***	0.2291*	0.3004**	0.1992**	0.3099***	0.3680***
	(0.0372)	(0.1271)	(0.1424)	(0.0849)	(0.1080)	(0.1349)
Fuel Exports (% GDP)	-0.4805***	-0.5890***	-0.4525**	0.0759	-0.0876	-0.5345***
	(0.1663)	(0.1469)	(0.1989)	(0.1766)	(0.1508)	(0.1691)
Ln(ODA/CPA per Capita)	1.3556***	1.4470***	1.3254***	1.0959***	1.0060***	0.7685***
	(0.0710)	(0.0875)	(0.0884)	(0.0870)	(0.0650)	(0.0582)
Civil War	0.4699***	0.3041***	0.0732	-0.0365	-0.0581	0.0503
	(0.1107)	(0.1122)	(0.1183)	(0.0714)	(0.0915)	(0.1038)
Polity	-0.0152**	-0.0116	-0.0062	0.0178***	0.0381***	0.0265***
	(0.0072)	(0.0091)	(0.0082)	(0.0059)	(0.0063)	(0.0092)
Democratic Withdrawal	0.3919	0.7027**	0.4039	0.2324	0.5969**	0.4367*
	(0.2791)	(0.2826)	(0.3081)	(0.2615)	(0.2585)	(0.2641)
Donor Concentration	0.8777**	0.9599**	1.2474**	0.5016**	0.5608**	0.5664*
	(0.4097)	(0.3880)	(0.5963)	(0.2058)	(0.2568)	(0.3032)
US Share	2.0355***	2.1157***	1.7462***	0.0476	0.0487	0.0427
	(0.4679)	(0.4876)	(0.5529)	(0.0677)	(0.0416)	(0.0373)
EU Share	0.1864	0.1699	-0.0860	0.0115	0.0080	-0.0018
	(0.2841)	(0.3086)	(0.3497)	(0.0311)	(0.0171)	(0.0206)
Multilateral Share	0.3062	0.4939	0.5051	0.0256	0.0288	0.0283
	(0.3259)	(0.4200)	(0.3572)	(0.0331)	(0.0258)	(0.0300)
Donor Herding	-0.2606	-0.1199	-0.0505	0.0403	0.0749	0.1507
	(0.2779)	(0.3658)	(0.3278)	(0.3202)	(0.3661)	(0.4518)
Trend	-0.0282***	-0.0281***	-0.0196***	-0.0480***	-0.0620***	-0.0543***
	(0.0054)	(0.0054)	(0.0062)	(0.0042)	(0.0054)	(0.0051)
Observations	1661	1661	1661	1391	1391	1391
Pseudo R^2	0.4844	0.4463	0.4415	0.4962	0.4745	0.4757

*Notes: Results generated using quantile regression based on table 3 (1) and table 4 (1). Bootstrapped standard errors (100 replications) are in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.*

tiles of the conditional distributions of the dependent variable. Most of the coefficients are relatively stable across percentiles. We do find that the effects of civil wars and regime type are primarily found among the lower percentiles of volatility (note that democracy actually reduces ODA volatility at the 25th quantile). Meanwhile the volatility-inducing effects of donor concentration, in both total ODA and net CPA, increases at higher quantiles.

CONCLUSIONS

We have presented some preliminary evidence that a combination of donor characteristics and recipient-country factors are responsible for volatility in aid flows. We found that in general, populous, aid-dependent countries suffer from greater volatility of program and project aid. We also found that certain events—internal political violence and adverse regime change can also increase aid volatility. Aid recipients governed by left-of-center governments, or that are experiencing domestic political instability, similarly face greater volatility. We found that natural disasters can actually ameliorate volatility by stabilizing aid flows from donors. To separate volatility that should respond to recipient-country contingencies and volatility that is a function of recipient characteristics, the diversity of the aid portfolio, and herding behavior, we generated a country-programmable aid variable, which we found to be less susceptible to volatility.

We find that, all in all, there are relatively few recipient-country traits that influence volatility in a consistent manner. Regime type, elections and positioning on the political spectrum, for example, do not affect volatility. By contrast, characteristics of the aid portfolio have powerful effects on volatility. The U.S., in our analysis, emerges as the most volatile aid giver. But we also find that volatility in U.S. aid is mainly due to unexpected increases in aid that the U.S. tends to give allies and countries that are dependent on U.S. aid. This donor-patron effect on volatility is less pronounced with the EU, and practically non-existent for multilateral donors.

The idea that policy measures to reduce volatility should be a priority for development is now common. The most evident example of this is the growing use of "fiscal rules" for large commodity exporters. Countries such as Chile and Nigeria have established off-shore funds and budget rules to smooth government spending in the face of large government revenue fluctuations coming from copper and oil price fluctuations respectively. These measures enjoy universal support among development policy advisers.[13] So it seems incongruous that rules for smoothing aid, which is even more volatile that exports in developing countries, are not given more attention.

If policymakers should choose to respond, there are a number of technical proposals that could be implemented to help limit volatility. Cohen *et al*. (2008) suggests automatically linking repayment on soft credits with an export shock, using a countercyclical loan instrument, implicitly targeting net foreign exchange at some level. Berg (2007) proposes that the IMF should permit countries to draw down foreign exchange reserves when there are aid shortfalls and that this should be built into financial programming models. That would reduce the aggregate losses from aid volatility. Others have argued that the size of budget support should be adjusted to target net ODA, by having one donor act as a "donor of last resort."[14] Countries may also make more use of Special Accounts.[15]

Donors more prone to volatility in their aid flows may want to consider institutional arrangements that would make aid less volatile. Scandinavian countries, for example, have parliamentary approval of priority countries for aid allocations and an explicit discussion on aid strategies, which serves to put in place longer-term commitments. Donors could also coordinate aid better to smooth aggregate volatility. The current system of proliferating donors and projects with lumpy shifts in aid is too clumsy to achieve smooth resource transfers. Donors are unwilling to make individual long-term commitments to aid recipient countries because of their domestic budget procedures. But they could perhaps do considerably better in indicating amounts they would support as a collective over the medium term.

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ENDNOTES

1. See Cassen, et al. (1994) for a complete summary.
2. Agenor and Aizenmann (2007) model this formally in terms of an optimal contingency fund to counteract aid volatility.
3. An IMF review of African borrowing countries found an average absorption rate of only 23 percent for aid surges, i.e., 77 percent of aid increases between the late 1990s and early 2000s was saved as reserves (IMF 2005). However, much of the aid was spent by government, resulting in an offsetting reduction in spending by the private sector.
4. Khamfula, Mlachila and Chirwa (2006), DESA (2005).
5. In Peru and Mexico, antipoverty programs partially funded by donors were often targeted to swing districts (rather than the poorest areas) during election years. See Schady (2001); Diaz-Cayeros and Magaloni (2007).
6. In Frot and Santiso's notation, $p_{it} - \pi_{it}$, where p_{it} is the proportion of all donors increasing aid to country i and π_{it}, is the proportion of donors active in country i increasing aid, at time t. Unlike Frot and Santiso, we do not take the absolute value of the difference since we are interested in the direction of herding, not simply whether herding is present.
7. Note that removing the lagged dependent variable in (1) implies that we are estimating the variation around the mean over the entire time period, with adjustment for recent innovations. Therefore we estimate both this ARCH(1) model as well as an ARCH constant-only model for each aid recipient country (not reported) in the sample, with no difference in results.
8. For aid shortfalls and windfalls the country-fixed effects estimator is not inefficient since these drops or spikes in aid are not estimated using country-specific processes.
9. We also included the components individually. When we decompose instability into its four components, only the presence of ethnic wars is significant, highlighting the specific role of ethno-linguistic tensions in aid volatility.
10. Alternatively, we used a "fragile states" dummy variable based on the OECD-DAC's classification; there is no difference in the results.
11. Nor does inclusion of a "Left" level indicator (as opposed to change in the degree of "leftism") alter results.
12. We also used an alternative index drawing on the components of the Polity score that only measure institutional constraints—leaving out the indices on participation—with no appreciable effects on our benchmark results.
13. Flyvholm (2007), IMF (2007), Ter-Minassian (2007).
14. Eifert and Gelb (2006).
15. Special Accounts are revolving funds that reduce the time for processing reimbursable expenses on a project and help borrowers overcome cash flow problems.

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