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Aid and Growth Accelerations: An Alternative Approach to Assess the Effectiveness of Aid

by

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Abstract:

It continues to be heavily disputed whether foreign aid promotes economic growth in developing countries. In most cross-country regressions, aid is considered effective only if it shifts recipient countries to a significantly higher and sustainable growth path. We apply an alternative approach which is less demanding, based on the concept of temporary growth accelerations suggested by Hausmann, Pritchett and Rodrik. In assessing what can reasonably be expected from the donors' modest aid efforts, we do not only employ aggregate aid data but we also differentiate between major aid categories, including grants, loans and so-called short-impact aid. It turns out that aid flows have a small but significantly positive effect on the conditional probability of growth accelerations. This result holds across different estimation methods. Short-impact aid is found to be more effective in this respect, while we reject the view that grants are superior to loans. To the contrary, we find a stronger effect of loans. Furthermore, aid has become more effective during the second half of our sample. Typically, however, the significance of results crucially depends on the criteria applied to identify growth accelerations.

Keywords: aid effectiveness, growth accelerations, grants versus loans, short-impact aid

JEL classification: F35, O11

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I. Introduction

The controversy on whether foreign aid promotes economic growth in developing countries is far from resolved. While Easterly (2006) claims that aid has done "so much ill and so little good", Sachs (2005) expects a big aid push to work wonders in stimulating growth and alleviating poverty. Even recent surveys of the literature on the aid-growth nexus come to sharply opposing conclusions. Doucouliagos and Paldam (2005a) conclude that the aid effectiveness literature has failed to establish that aid works. By contrast, McGillivray et al. (2005) and Tarp (2006) stress that practically all research published since the late 1990s has found exactly that, even though the conditions under which aid is effective have remained disputed.

What both camps tend to have in common is that, at least implicitly, they apply fairly demanding criteria in assessing the effectiveness of aid. In the cross-country or panel regressions performed, aid is typically considered a possible factor that may shift aid-recipient countries to a significantly higher and sustainable growth path. However, according to Berthélemy (2005), few developing countries have succeeded to escape poverty traps, and foreign assistance does not appear to have played a significant role in explaining these success stories. The latter finding should not come as a big surprise. Rajan and Subramanian (2005) derive a theoretical estimate of the impact of aid on growth based on the standard Solow-Swan growth model: They show that a one percentage point increase in the ratio of aid to GDP would raise the growth rate by just 0.16 percent, even under the optimistic assumption that all aid is invested rather than wasted or consumed.[1]

This is why we apply a less demanding criterion in this paper to analyse the effectiveness of aid. The alternative approach follows Hausmann, Pritchett and Rodrik (2005). Similar to Berthélemy (2005), these authors argue that few countries have experienced consistently high growth rates over longer time periods, but they identify a surprisingly large number of (temporary) growth episodes and accelerations.[2] Hence, it may be more realistic to assess whether foreign aid has contributed to growth accelerations in the past, a question not addressed by Hausmann, Pritchett and Rodrik. While such a finding would not preclude a

[1] The ratio of aid to GDP was three percent for all low-income countries in 2002 and 2003 (World Bank 2005a). According to Rajan and Subramanian, this implies that aid could at most have raised the growth rate by half a percentage point. While such an effect would be economically important in the longer run, it may easily escape econometric analysis due to cyclical fluctuation and measurement error. Tarp (2006: 16) makes the point that results tend to be biased towards zero in the context of noisy data and weak proxies.

[2] More than half of all sample countries experienced at least one growth acceleration since the 1960s (see below for the way in which growth accelerations are identified). The probability of a growth acceleration, considering all data points across countries and over time, was 2.8 percent.

future big aid push to achieve more, i.e., sustainable poverty reduction, it might inform the debate on what can reasonably be expected from the modest donor efforts of today.

In addition to employing aggregate aid data, we differentiate between major aid categories to account for the possibility that the aid-growth link is affected by the heterogeneity of aid. In particular, we consider so-called short-impact aid and separate aid in the form of grants from aid in the form of (concessional) loans. Donors have shifted from loans to grants, and it is widely believed, though still contentious, that grants are superior to loans in providing effective financial support to developing countries.[3]

We find that total aid flows have a small but significantly positive marginal effect on the probability of growth accelerations. This result holds for alternative estimation methods. Short-impact aid is found to be more effective than other types of aid, while we reject the widely held view that grants are superior to loans. However, the significance level of the estimated marginal effects of all aid categories depends on the filter applied to identify growth accelerations.

The structure of the paper is as follows. In section II, we summarize the recent debate on aid effectiveness. Section III offers some stylised facts on aid flows and growth accelerations and explains the procedure for identifying the latter. In section IV, we describe the data that we use and motivate our empirical approach. Section V presents detailed results of the econometric analysis, and section VI concludes.

II. Previous Attempts to Explain the Ambiguous Aid-Growth Link

The recent literature has dealt in several ways with the failure of earlier empirical studies to find an unambiguously positive link between foreign aid and economic growth of recipient countries. Some studies depart radically from traditional aid-growth regressions by considering more specific outcome variables which aid may help achieve. For example, Michaelowa and Weber (2006) as well as Dreher, Nunnenkamp and Thiele (2006) analyse the effects of aid targeted towards the education sector on educational outcomes. The sector-specific approach is meant to account for the critique often raised against aid-growth regressions, namely that donors pursue multiple objectives by giving aid, many of which extend beyond short-term growth effects. At the same time, replacing growth by more specific outcomes as the dependent variable is supposed to help reduce "the extremely high complexity of macro level evaluations" (Michaelowa and Weber 2006: 2). This approach is complementary to the analysis in this paper, which attempts to reduce complexity by

[3] In 2002-2004, the share of grants in total net ODA disbursements by all donors was 89 percent (OECD 2006). Outspoken proponents of grants include Lerrick and Meltzer (2002) and Radelet (2005).

considering a binary indicator for growth accelerations as the dependent variable in binary choice models.

A larger number of analyses follow the lines of the World Bank (1998) study "*Assessing Aid: What Works, What Doesn't and Why."* As noted by McGillivray et al. (2005), previous research was either of the 'It Works' or 'It Doesn't' camp. Subsequently, the focus has shifted to the conditions under which aid may have positive growth effects. The World Bank's claim that aid does promote growth, but only in countries with reasonable economic policies and good governance has been disputed by various authors. Apart from questioning the robustness of the World Bank's finding that good policies and institutions render aid effective, other conditional factors have been suggested, including geographic and climatic factors, political instability, post-conflict situations, exogenous shocks and decreasing returns to aid.[4] However, the robustness of several of these alternative suggestions has remained as questionable as the original claim of the World Bank (Doucouliagos and Paldam 2005b; Rajan and Subramanian 2005).

The same applies to the approach pioneered by Clemens, Radelet and Bhavnani (2004), who account for the heterogeneity of aid by isolating so-called short-impact aid from aid categories that cannot reasonably be assumed to affect growth in the short run.[5] Clemens, Radelet and Bhavnani report a surprisingly strong effect of short-impact aid on economic growth in the recipient countries, whereas humanitarian aid and long-impact aid do not significantly affect growth. By contrast, Rajan and Subramanian (2005) do not find any evidence supporting the view that the growth effects of short-impact are stronger than the effects of other aid categories. Other studies differentiate between aid given as outright grants and aid given as concessional loans (e.g., Gupta et al. 2003; Odedokun 2004). According to Cordella and Ulku (2004), the degree of concessionality has a small, though often insignificant impact on economic growth. Cohen, Jacquet and Reisen (2006) argue that in case of capital market failures loans may be superior to grants provided that debt sustainability is maintained.

The aforementioned analyses differ in several respects, notably with regard to the aid categories considered and if (and in which way) non-linearities are taken into account. However, most of them have in common that they estimate a standard growth equation in which aid enters as an additional R-H-S variable. The question typically addressed is whether

[4] For a detailed discussion and literature overview, see McGillivray et al. (2005).

[5] In an earlier paper, Cordella and Dell'Ariccia (2003) distinguish between budget support and project aid. These authors show that budget support is less (more) effective in promoting growth than project aid in a local environment of poor (good) macroeconomic policies.

aid shifts recipient countries to a significantly higher and sustainable growth path. This appears to be a fairly demanding criterion for aid to be effective, given that "very few countries have experienced consistently high growth rates over periods of several decades" (Hausmann, Pritchett and Rodrik 2005: 304). While success cases of escaping poverty traps have been rare (Berthélemy 2005), Hausmann, Pritchett and Rodrik have identified quite a large number of temporary growth episodes (see section III for details). These authors find it surprising that the growth literature has not focussed "on what is perhaps the most telling source of variation in the underlying data" (ibid), namely countries experiencing phases of growth, stagnation and decline of varying length (Pritchett 2000).

Hausmann, Pritchett and Rodrik (2005) do not address the aid-growth nexus.[6] Nevertheless, they provide an appealing starting point for the subsequent analysis in the way they examine several determinants of growth episodes or accelerations. In addition to political changes and economic reform in developing countries, they consider exogenous factors since growth accelerations may be triggered by favourable external conditions. However, they employ just a dummy variable for favourable terms-of-trade shocks. By contrast, we focus on foreign aid as an exogenous factor that may trigger growth accelerations. Reconsidering aid effectiveness in this context may inform the ongoing debate by evaluating whether it is due to (unreasonably) high expectations that critics insist that aid has failed to deliver.

III. Growth Accelerations and Aid: Stylised Facts

The way in which we identify growth accelerations essentially follows Hausmann, Pritchett and Rodrik (2005). To estimate the timing of growth accelerations, we first obtain a measure of the average annual per-capita GDP growth rate between time t and $t+n$, denoted $g_{t,n}$, over the time horizon n from the following regression equation:

(1) $\ln(y_{t+i}) = c + g_{t,n}\, i + \varepsilon_i \;,\; i = 0,...,n$

The least squares estimate of the average growth rate, $\hat{g}_{t,n}$, is used to calculate the change in the average growth rate during n periods before t to n periods following t:

(2) $\Delta\hat{g}_t = \hat{g}_{t,n} - \hat{g}_{t-n,t-1}$

In our baseline setting, n is set equal to 8. Second, for higher growth at time t to qualify as a growth acceleration the following two conditions must be fulfilled:

a) $\Delta\hat{g}_t \geq \Delta g^*$

[6] Hausmann, Pritchett and Rodrik (2005: 318) decide against using a variable related to capital inflows; the reason is that capital inflows are supposed to be endogenous and forward-looking, rendering causal inference problematic. As we argue in section IV, this is rather unlikely to apply to foreign aid in the context of growth accelerations.

b) $y_{t+n} \geq \max\{y_i\}, i \leq t$

The first condition guarantees that the change in average economic growth exceeds a certain threshold, which we assume to be 2 percent in our baseline setting. The second condition ensures that the output level after a growth acceleration exceeds all historical peak output levels. This condition serves to exclude phases of rapid growth that are preceded by catastrophes such as wars or natural disasters, i.e., phases of growth simply resulting from economic recovery after a substantial destruction of the economy.[7]

Third, if the filter shows that both criteria are met in a particular country for a number of consecutive years, we select the start of the growth acceleration by choosing the year for which the F-statistic of a spline regression with a break at this year is maximized.[8]

To check the robustness of estimation results in the subsequent section, we modify two parameters of the filter rule described above. In one variant, the threshold for the change in growth is reduced from 2 percent to 1 percent, i.e., we apply a less demanding filter for the size of the growth acceleration. In another variant, we shorten the time window for which the average growth rates are calculated from 8 years to 5 years. In this way, we test the robustness of results against reduced standards with respect to the sustainability of growth accelerations. Finally, we combine both variants by relaxing the two filters at the same time.

Not surprisingly, the number of growth accelerations increases significantly when applying less demanding criteria for higher growth to qualify as an acceleration (Table 1). The baseline setting (variant 8_2) results in 93 growth accelerations in the total sample (1960-1999). This number more than doubles when both the threshold for the required change in growth rates and the time during which higher growth is to be sustained are reduced. Yet, two interesting observations are hardly affected by varying the defining characteristics of growth accelerations:

- Sub-Saharan African countries account for a fairly large share of all growth accelerations (about one third). While Asia experienced almost as much growth accelerations, the share of Latin America as well as that of the Middle East and North Africa is considerably smaller.

[7] Hausmann, Pritchett and Rodrik apply a third filter that requires the *level* of the growth rate to exceed some threshold to qualify for a growth acceleration. We do not apply this condition since we are interested in the ability of aid flows to foster growth. In our view, aid would also be effective in this respect if an aid-recipient country with an average growth rate of, say, -3 percent between *t-n* and *t* reports stagnating output between *t* and *t+n*.

[8] More specifically, for all candidate years spline regressions are performed by regressing $\ln(y_{t+i})$ on a constant and a trend "broken" at time *t* (for $i = -n,...,n$). The timing of the initiation of the growth acceleration is then selected by finding the maximum F-statistic of a test for equality of the two trend slopes.

- The number of growth accelerations declined considerably over time. About 70 percent of all growth accelerations occurred in the 1960s and 1970s. In variant 8_2, for example, we find 36 growth accelerations in the 1960s, but only 14 in the 1990s.

It is tempting to relate the pattern of growth accelerations to the trend and distribution of foreign aid. Total net aid in constant US$ (2004 prices) by all donors increased from 28.3 billion in 1960 to 62.7 billion in 1979. By contrast, total net aid granted in the late 1990s was slightly lower than 20 years before (OECD 2006). This invites the question whether the stagnation of aid in real terms, until donors revived aid efforts most recently, may be a factor that could help explain the declining number of growth accelerations. The answer to this question is far from certain, however. The aforementioned aid fatigue of donors notwithstanding, the ratio of aid to GDP of aid-recipient countries has been relatively stable since the 1960s (World Bank 2005a). This ratio fluctuated around three percent for all low-income countries; the highest aid-to-GDP ratios were actually reported in the early 1990s, when growth accelerations had become rare.

Likewise, the distribution of aid across regions bears only partial resemblance to the pattern of growth accelerations. The relatively large number of growth accelerations in Sub-Saharan Africa may be attributed to the fact that this region benefited from high aid-to-GDP ratios (Table 2). Moreover, the bulk of aid to this region took the form of outright grants rather than loans, implying that aid was extremely concessional. At the same time, both the aid-to-GDP ratio and the grants-to-GDP ratio were lowest for Latin America, a region that experienced fewer growth accelerations. However, the frequency of growth accelerations in Sub-Saharan Africa decreased substantially over time, even though total aid as well as grants became increasingly focussed on this region. Furthermore, the relatively large number of growth accelerations in Sub-Saharan Africa should not obscure that the probability of growth accelerations occurring in this region tended to be lower than elsewhere once the total number of observations is taken into account (Table 3).

Comparing the average level of aid flows recipient countries received before, during, and after the initialisation of growth accelerations may provide first hints as to whether we can expect aid flows to be an important determinant of the probability of growth accelerations. Table 4 displays these figures for our baseline setting (variant 8_2). While aid flows tend to be of average size before the initialisation of growth accelerations, they clearly exceed the average at the start of growth accelerations. The total aid-to-GDP ratio is 0.5 percentage points higher around *t* compared to “normal” times. This could indicate that aid

played a positive role in stimulating growth accelerations. The increase in the aid-to-GDP ratio is mainly due to a higher grants-to-GDP ratio rather than an extended supply of loans. Short-impact aid, too, is higher at the start of growth accelerations. However, all aid ratios tend to return to their normal levels shortly after the initialisation phase.

All in all, the stylised facts presented in this section remain inconclusive. Therefore, we turn to an econometric analysis in the following, in order to assess the effect of aid on growth acceleration in a more systematic way.

IV. Approach and Data

To assess whether growth accelerations are triggered by foreign aid we employ the econometric approach suggested by Hausmann, Pritchett and Rodrik (2005). In the base run, the ratio of total aid to GDP of aid-recipient countries is included as a R-H-S variable in a binary choice model. In additional estimations, we consider specific categories of aid, again relative to GDP, in order to account for the potentially different impact of different forms of aid on the probability of growth accelerations. The aid data we use are all drawn online from OECD (2006). In all regressions presented below, the dependent variable is a dummy variable that takes the value of one at time *t* of a growth acceleration and the two adjacent years, *t-1* and *t+1*. This window of three years is meant to deal with the uncertainty concerning the exact timing of growth accelerations.[9]

The set of controls includes several variables that Hausmann, Pritchett and Rodrik find relevant. *Econlib* accounts for the influence of economic reforms in aid-recipient countries, and takes the value of one in the five years following an economic liberalisation as defined by Wacziarg and Welch (2003). *Open* represents the ratio of exports plus imports to GDP as a proxy of the countries' openness to trade. Political changes are captured by two variables: *poschange* is set equal to one in the five years following a change towards democracy according to the data provided by Marshall and Jaggers (2002), while *negchance* is set equal to one in the five years following a change towards autocracy. In addition, we control for geographic conditions and the so-called disease ecology (Bloom and Sachs 1998). This is because unfavourable geographic and health-care conditions may reduce the probability of growth accelerations. We include *tropical*, i.e., the fraction of a country's landmass that is located in tropical areas (Doppelhofer et al. 2004). Health-care conditions are proxied by *birthmort*, the mortality rate of infants per 1000 live births.[10]

[9] See section III for a formal description of how the timing of growth accelerations is estimated.

[10] We also tried to proxy health-care conditions by using life expectancy at birth. The two proxies are highly correlated and results turned out to be qualitatively and quantitatively similar for both specifications. In the following, we present only the results when using *birthmort.*

As mentioned before, Hausmann, Pritchett and Rodrik (2005) decide against including a variable related to capital inflows to analyse whether growth accelerations are more likely if external conditions are favourable. The reason is that capital inflows are supposed to be forward-looking; if growth accelerations were anticipated by foreign capital providers, this would render causal inference problematic indeed. However, the finding by Hausmann, Pritchett and Rodrik that growth accelerations are "highly unpredictable" considerably weakens the argument for leaving variables related to capital inflows out of account. Furthermore, even if private foreign investors anticipated growth accelerations, it remains unlikely that official donors of foreign aid attempted to do the same. Nunnenkamp and Thiele (2006) show that donors have been rather hesitant to adjust the allocation of aid to the changing income status of recipient countries.

In principle, results on the growth effects of aid may be biased in two directions if aid is treated as exogenous. The effects may be biased *upwards* if donors provide more aid to lower-income countries that would grow faster than higher-income countries even in the absence of aid. Aid indeed tends to be concentrated in lower-income countries as donors favour more needy recipients. Yet, this aid allocation rule is unlikely to lead to distorted results with respect to growth accelerations as defined above. According to Hausmann, Pritchett and Rodrik (2005: 315-6), it was only in the 1970s that the probability of growth accelerations was clearly higher for lower-income countries. The opposite pattern prevailed in the 1980s, and probabilities were fairly the same across income groups in the 1990s. Hence, there is no strong evidence that lower-income countries with higher aid-to-GDP ratios experience systematically more growth accelerations.

Alternatively, the growth effects of aid would be biased *downwards* if donors provided more aid to countries underperforming in terms of growth (Rajan and Subramanian 2005: 37). However, the risk of underestimating the effects of aid appears to be fairly remote. Doucouliagos and Paldam (2005a) review the relevant literature and conclude that it does not point to growth in the recipient country having been a significant determinant of donor behaviour. Moreover, we exclude cases in which donors may have responded by granting more aid to growth-depressing events such as natural catastrophes, which may have been followed by phases of rapid economic recovery. As noted in section III, higher growth in t does not qualify for a growth acceleration unless the income level exceeds all historical peak levels achieved prior to t. This condition minimizes the risk that instances of poor growth which may have resulted in higher subsequent aid do not distort the results of the following analysis.

Finally, the meta study of Doucouliagos and Paldam (2005a) suggests that accounting for the possible endogeneity of aid has hardly affected the results of previous empirical studies. Doucouliagos and Paldam test for the impact of more advanced econometric methods - specifically, the estimation of a system with both a growth and an aid equation - on the aid-growth nexus found in the aid effectiveness literature. They show that results changed substantially in just one out of 68 contributions to this literature when applying more sophisticated estimation techniques.

All this renders it unlikely that the approach taken in this paper suffers from problems of reverse causation. Nevertheless, we performed additional estimations in which aid variables are lagged by one period in order to reduce the risk of biased results on the effect of aid on growth accelerations. As shown in section V below, results are hardly affected by lagging aid, which is in line with what Doucouliagos and Paldam (2005a: 19) conclude from their meta analysis.

Apart from reverse causation between aid and growth, the growth impact of aid may turn insignificant due to collinearity with other R-H-S variables. For instance, this could happen if donors responded by cutting aid to political changes towards autocracy (*negchance*). Even though donors claim that their aid is focussed on well governed and more democratic countries, collinearity does not appear to be a major concern. The bivariate correlation between *negchance* and aid, for example, is as low as –0.09 for the total sample covered here. Furthermore, the correlation results of Nunnenkamp and Thiele (2006) reveal that the reactions of most donors to changes in institutional and economic policy conditions in recipient countries were fairly weak. Only two out of nine bilateral donors analysed by these authors responded to changes towards democracy, as reflected in higher scores for voice and accountability (as given by Kaufmann, Kraay and Mastruzzi 2003), by granting more aid, and none of these donors reacted favourably when recipient countries strengthened the rule of law.

V. Empirical Results

The econometric analysis of the relationship between aid flows and the timing of growth accelerations is based on binary choice models along the lines described in section IV. We start with results for total aid from our preferred specification and proceed with various robustness checks regarding the estimation method, the parameters of the filter applied to identify growth accelerations, as well as the lag structure. We then turn to specific categories of aid (grants, loans, and short-impact aid) and conclude this section by re-estimating the preferred model for sub-samples.

1. Total Aid

Baseline results for total aid come from a probit regression in which growth accelerations as the dependent variable are obtained by applying the filter with n=8 and $\Delta g^* = 2\%$. Column M1 in Table 5 reports the results of a preliminary regression which includes only the set of control variables.[11] The estimated marginal effects of the control variables are very similar to what Hausmann, Pritchett and Rodrik (2005) found. Most notably, we confirm that a regime change towards autocracy has a strongly positive effect on the probability of growth accelerations[12]. We also confirm that growth accelerations are highly unpredictable even ex-post. The pseudo R^2 is equal to 0.047 (this statistic remains below 0.1 for all regressions).

Turning to the variable of principle interest in the present context, aid flows have a significantly positive effect in the baseline model. However, the economic impact tends to be small. According to column M2, a one percentage point increase in the aid-to-GDP ratio has an expected marginal effect on the conditional probability of a growth acceleration of 0.5 percent. This implies that the conditional probability would rise by about 1.5 percent if donors strengthened their aid efforts to the extent that the average aid-to-GDP ratio, which was about three percent over the total sample, would double to six percent. Such an effect appears to be modest. Yet, it would be far from irrelevant considering that the overall unconditional probability of a growth acceleration was shown above to be 3.5 percent for our preferred filter rule (variant 8_2 in Table 3). Moreover, it would have been unrealistic to expect a much larger impact. Rather, the limited impact of aid is in line with the theoretical reasoning of Rajan and Subramanian (2005).

Estimating a logit model with the same variables reveals that the choice of the estimation method has no significant impact on the results. The marginal effects of aid shown in Table 6 are virtually the same compared to the probit estimates in Table 5.

Next, we assess the robustness of results with respect to the filter applied to identify growth accelerations. We consider alternative filter rules with (i) n=8 and $\Delta g^* = 1\%$ (variant 8_1), (ii) n=5 and $\Delta g^* = 2\%$ (variant 5_2), and (iii) n=5 and $\Delta g^* = 1\%$ (variant 5_1). Results are presented in Table 7. It turns out that applying less demanding filters systematically weakens the significance of the marginal effects of aid.[13] While the coefficient is significant at the 5 percent level in the baseline setting, the coefficient is significant at the 10 percent level

[11] Note that we include time fixed effects dummies in all specifications to capture external influences that similarly affect all sample countries. The time dummies are always jointly significant at the 5 percent confidence level.

[12] For further interpretation of the effects of control variables, see Hausmann, Pritchett and Rodrik (2005).

[13] The same pattern results when estimating the different variants with a logit model rather than a probit model. Results of the logit model are not presented here, but are available from the authors upon request.

only in variant 8_1. When lowering the qualifying criteria for growth accelerations further in variants 5_2 and 5_1, the significance of the impact of total aid flows decreases still more, though the estimated effect remains positive in all estimations. This systematic pattern is not surprising once it is taken into consideration that the increasing number of growth accelerations tends to include more episodes that may occur due to pronounced business cycle fluctuations rather than a shift in the medium-term growth potential of aid-recipient countries.

More generally, the sensitivity of results to the defining characteristics of growth accelerations underscores the importance of setting standards when analysing the impact of aid flows on economic growth. On the one hand, being too demanding, as studies estimating a standard growth equation tend to be (see section II), might neglect important though rather small consequences of aid. On the other hand, setting too low standards might cause diluted results due to short-term growth volatility or measurement errors in the data. This is why we concentrate on our preferred specification (probit estimation, variant 8_2) in what follows.

As another robustness check, we lagged the aid variables. As argued above, we do not expect endogeneity of aid to be of major relevance in the context of growth accelerations. Nevertheless, to minimize the problem of reverse causation, we re-estimated the binary choice models with the aid variables lagged by one period. The comparison of results reported in columns M5 to M7 of Table 5 with those in columns M2 to M4 shows that the results are hardly affected. As lagged aid flows are even more unlikely to be influenced by the occurrence of growth accelerations than contemporaneous flows, we are quite confident that our results are not distorted by endogeneity problems.

2. Major Aid Categories

Similar conclusions apply when replacing aggregate aid inflows by either loans or grants as the explanatory variable. According to the preferred specification (M3 and M4 in Table 5), the coefficients for loans and grants are significantly positive. It should be noted, however, that the estimated effect of a one percentage point increase in the loans-to-GDP ratio is almost four times larger than the effect of the same increase in the grants-to-GDP ratio. This is in contrast to the widely held belief that grants are superior to loans. The proponents of grants stress the detrimental effects of a debt overhang to which aid in the form of loans may contribute (Lerrick and Meltzer 2002; Radelet 2005). They tend to ignore, or at least downplay, the disciplinary effect of loans. The repayment obligations attached to loans provide stronger incentives for the governments of recipient countries to use aid resources

productively. Our results suggest that this incentive effect clearly outweighed any debt management problems to which concessional loans may give rise.

Next, we consider the influence of short-impact aid along the lines of Clemens, Radelet and Bhavnani (2004). We proxy short-impact aid on the basis of sector-specific aid commitments provided in OECD (2006). Short-impact aid is assumed to comprise aid for economic infrastructure and production sectors, commodity aid and general program assistance (which includes general budget support), and debt relief. We refer to the grant equivalent of these aid categories (rather than nominal flows) in calculating short-impact aid, relative to the recipient countries' GDP.

Column M20 of Table 8 reveals that the marginal effect of short-impact aid on growth accelerations is considerably higher than the marginal effect of total aid (M2). The coefficient of 0.0085 for short-impact aid is significant at the five percent level. This finding, which is robust to the estimation of a probit or logit model (M21), tends to support Clemens, Radelet and Bhavnani (2004) who argue that short-impact aid is more effective in promoting growth than other types of aid. However, short-impact aid resembles total aid in that its effect is highly sensitive to changes in the filter used to identify growth accelerations. The effect remains positive but becomes very small and insignificant in variants other than 8_2 (not shown in the table). This fragility is rather in line with Rajan and Subramanian (2005) who question that the growth effects of short-impact aid are more robust than the effects of other types of aid.

3. Sub-samples

As noted in section III, the pattern of growth accelerations as well as the growth and structure of aid changed remarkably during the period of observation. To analyse whether the link between aid and growth accelerations was affected by these changes, we split the overall sample into two sub-periods, 1960-1979 and 1980-1999. It turns out that grants were more effective in the latter sub-period, whereas the effectiveness of loans weakened over time (Table 9). Yet, the coefficient for loans continued to be larger than the coefficient for grants. As the share of loans in total aid became marginal in recent years, the link between total aid and growth accelerations has strengthened somewhat. This could be due to better targeted aid. Dollar and Levin (2004) argue that donors have increasingly been selective in providing aid to needy countries in which local conditions rendered it more likely that aid was absorbed productively. However, these authors found selectivity to be a new phenomenon of the 1990s, whereas in the 1980s aid was still "allocated indiscriminately." This could imply that our

estimates capture at best partly the implications of better targeted aid for aid effectiveness. Due to an insufficient number of growth accelerations, it was not possible to test this proposition by running the estimates for the 1990s only.

In order to account for the possibility that the effect of aid on growth accelerations depends on the quality of institutions in recipient countries, we replicate the estimates for two sub-groups comprising sample countries with either good or bad local institutional conditions: "Bad states" stands for countries in which the level of the Polity IV index of Marshall and Jaggers (2002) is worse than the median for all sample countries in the particular year**,** while "good states" are those with index values better than the median.

Results reported in Table 9 reveal that total aid as well as aid in the form of loans and grants has a significantly positive effect on growth accelerations in bad states, whereas the effect remains insignificant in good states. This pattern is exactly opposite to the World Bank's (1998) claim that aid is effective only in countries with favourable local conditions. As mentioned in section II above, the World Bank study as well as supportive evidence subsequently provided by Burnside and Dollar (2004) has increasingly come under attack. McGillivray et al. (2005 : 7-9) list various papers providing evidence that aid may be as effective in bad states as it is in good states, but the critics do not find aid to be more effective in bad states.

Yet, our finding may be less surprising than appears at first sight. One possible explanation relates to the earlier observation that changes in the Polity IV index towards autocracy are positively correlated with the likelihood of growth accelerations, a finding by Hausmann, Pritchett and Rodrik (2005) which is reproduced here. If more autocratic regimes tend to be more successful in initiating temporary growth accelerations, such regimes may also be more inclined to use aid to this effect, e.g., by investing aid inflows rather than consuming them. Moreover, even though our finding is in conflict with most contributions to the aid effectiveness literature, at least one recent study points into the same direction. Cordella and Ulku (2004) focus on the incentive effects of concessional capital inflows. Along the lines of the earlier sovereign debt literature, they argue that less concessional capital inflows may weaken local adjustment efforts in bad states, e.g., in recipient countries with weak institutions.[14] From the theoretical model, Cordella and Ulku derive the hypothesis that the impact of concessionality on economic growth should be positive in bad states. The authors test this hypothesis only with regard to the concessionality of aid flows, finding that grants are indeed superior to loans in bad states. But their theoretical reasoning would also

imply that aid is superior to non-concessional capital inflows (e.g., debt-related inflows from private sources) in bad states.[15]

VI. Summary and Conclusions

It continues to be heavily disputed whether foreign aid promotes economic growth in developing countries. In most cross-country regressions, aid is considered effective only if it shifts recipient countries to a significantly higher and sustainable growth path. This appears to be a fairly demanding criterion, considering that few countries have experienced consistently high growth rates over longer time periods. By contrast, many countries have experienced temporary growth episodes. This is why we apply less demanding criteria to assess the effectiveness of aid, following the concept of growth accelerations suggested by Hausmann, Pritchett and Rodrik (2005). Arguably, the concept of growth accelerations is better aligned with what one can realistically expect from the modest aid efforts of donor countries. Furthermore, the approach taken in this paper is less likely to suffer from problems of reverse causation than conventional cross-section analyses.

In addition to employing aggregate aid data, we differentiate between major aid categories to account for the heterogeneity of aid. This allows us to assess the widely held belief that grants are superior to loans and that so-called short-impact aid is most effective in promoting growth in developing countries. Major empirical results of the binary choice models applied are as follows:

- Total aid flows have a significantly positive effect in the preferred specification of the model, even though the economic impact tends to be small. The modest impact of aid on the probability of growth accelerations is in line with theoretical predictions (Rajan and Subramanian 2005).
- Empirical results are in conflict with the widely perceived superiority of grants. To the contrary, the estimated effect of an increase in the loans-to-GDP ratio is considerably larger than the effect of an increase in the grants-to-GDP ratio.

[14] Note that this reasoning is in some conflict with the argument that autocratic regimes may be more inclined to invest aid resources.

[15] The difference in concessionality between grants and ODA loans is relatively small, compared to the difference in concessionality between capital inflows from official and private sources. For instance, new official loans extended to low-income countries in 2003 had an average grant element of almost 70 percent (World Bank 2005b). This may explain that, in contrast to Cordella and Ulku (2004), our results reported in Table 9 suggest that both grants and loans are more effective in bad states.

- Our findings tend to support Clemens, Radelet and Bhavnani (2004) since the marginal effect of short-impact aid on growth accelerations turns out to be stronger than the marginal effect of total aid.
- Performing the estimates for sub-samples, the most striking result is that aid appears to be more effective in badly governed recipient countries. This is in sharp contrast to conventional wisdom. However, the earlier sovereign debt literature, which stresses the varying incentive effects of concessional and non-concessional capital inflows in good and bad states, does suggest that focussing aid on well governed countries may involve trade-offs with respect to a productive use of capital inflows (Cordella and Ulku 2004).
- Finally, we find that aid has become more effective over time.

These results are robust to the estimation model applied and the use of contemporaneous or lagged aid data. However, the significance of results crucially depends on the filters used to identify growth accelerations. The marginal effects turn insignificant for all aid variables when relaxing the defining characteristics of growth accelerations. This underscores the importance of setting reasonable standards when analysing the impact of aid flows on economic growth. On the one hand, being too demanding, as studies estimating a standard growth equation tend to be, might neglect important though rather small consequences of aid. On the other hand, setting too low standards might cause diluted results due to short-term growth fluctuations.

Our findings are in conflict with Easterly's (2006) verdict that aid has done "so much ill and so little good." At the same time, it is questionable that aid can work wonders in stimulating growth and alleviating poverty. As Tarp (2006: 23) has put it, "aid has been of much too limited a size relative to the size of the problem to turn the wheels of history." A big aid push might achieve more than to be expected from the still modest donor efforts of today, but raising unreasonably high expectations runs the risk of a backlash if higher aid fails to deliver.

Furthermore, the current debate tends to neglect that it is not only the overall amount of aid that matters. Our results suggest that aid effectiveness could also be improved by changes in the composition of aid. To the extent that aid is supposed to promote growth in the short to medium run, donors may be well advised to reconsider the recent trend of reducing short-impact aid such as general program assistance and aid for economic infrastructure, relative to aid aiming at longer-term social objectives such as education and health. Likewise, the shift of many donors towards grants, and away from concessional loans appears to be

unwarranted from an economic growth point of view. In contrast to what proponents of grants make us believe, it seems that repayment obligations attached to loans provide stronger incentives for the governments of recipient countries to use aid resources productively.

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Table 1 – Number of growth accelerations across regions and decades

		Decade				
	Region	60s	70s	80s	90s	
Variant 8_2	Africa	9	13	4	5	**33.3%**
	MiddleEast/North Africa	6	4	1	1	**12.9%**
	Asia	13	7	4	7	**33.3%**
	America/Caribbean	8	4	6	1	**20.4%**
		38.7%	**30.1%**	**16.1%**	**15.1%**	**100.0%**
Variant 8_1	Africa	16	17	5	6	**31.0%**
	MiddleEast/North Africa	6	6	4	1	**12.0%**
	Asia	23	10	5	8	**32.4%**
	America/Caribbean	10	8	10	7	**24.6%**
		38.7%	**28.9%**	**16.9%**	**15.5%**	**100.0%**
Variant 5_2	Africa	23	27	9	8	**36.2%**
	MiddleEast/North Africa	7	7	2	2	**9.7%**
	Asia	24	16	5	10	**29.7%**
	America/Caribbean	17	10	12	6	**24.3%**
		38.4%	**32.4%**	**15.1%**	**14.1%**	**100.0%**
Variant 5_1	Africa	29	25	10	9	**34.0%**
	MiddleEast/North Africa	10	8	3	6	**12.6%**
	Asia	31	19	5	11	**30.7%**
	America/Caribbean	17	14	12	6	**22.8%**
		40.5%	**30.7%**	**14.0%**	**14.9%**	**100.0%**

Notes: Numbers indicate the absolute number of growth accelerations per region and decade.
Source: Penn World Table Version 6.1; own calculations.

Table 2 – Average aid-to-GDP ratios across regions and decades

Mean Aid-to-GDP-Ratio per Decade and Region				
	Decade			
Region	60s	70s	80s	90s
Africa	0.019	0.033	0.049	0.060
MiddleEast/North Africa	0.029	0.049	0.031	0.020
Asia	0.008	0.007	0.016	0.017
America/Caribbean	0.010	0.006	0.005	0.005
Mean Grant-to-GDP-Ratio per Decade and Region				
	Decade			
Region	60s	70s	80s	90s
Africa	0.015	0.026	0.035	0.045
MiddleEast/North Africa	0.024	0.037	0.026	0.015
Asia	0.004	0.003	0.010	0.014
America/Caribbean	0.007	0.003	0.003	0.003
Mean Loan-to-GDP-Ratio per Decade and Region				
	Decade			
Region	60s	70s	80s	90s
Africa	0.004	0.007	0.014	0.014
MiddleEast/North Africa	0.005	0.012	0.005	0.005
Asia	0.003	0.004	0.006	0.003
America/Caribbean	0.003	0.003	0.002	0.002

Notes: Numbers are the mean across all countries and years for every region/decade combination. The ratios are computed as the relevant aid flow to a country divided by the country's Gross Domestic Product.
Source: Penn World Table Version 6.1; OECD (2006); own calculations.

Table 3 – Unconditional probability of growth accelerations across regions and decades, in percent

		Decade				
	Region	60s	70s	80s	90s	Total
Variant 8_2	Africa	4.2	3.3	1.0	3.4	**2.7**
	MiddleEast/North Africa	10.2	5.7	1.4	3.6	**5.3**
	Asia	4.9	3.2	1.8	7.8	**3.9**
	America/Caribbean	6.1	2.7	4.0	1.8	**3.9**
		5.3	**3.3**	**1.8**	4.4	**3.5**
Variant 8_1	Africa	7.4	4.3	1.3	4.1	**3.8**
	MiddleEast/North Africa	10.2	8.6	5.7	3.6	**7.5**
	Asia	8.6	4.6	2.3	8.8	**5.8**
	America/Caribbean	7.5	5.3	6.7	12.1	**7.1**
		8.1	**4.9**	**2.9**	**6.8**	**5.3**
Variant 5_2	Africa	6.8	6.8	2.3	3.0	**4.8**
	MiddleEast/North Africa	9.0	10.0	2.9	4.1	**6.7**
	Asia	7.2	7.3	2.3	6.5	**5.9**
	America/Caribbean	9.7	6.7	8.0	5.6	**7.7**
		7.7	**7.2**	**3.3**	**4.5**	**5.8**
Variant 5_1	Africa	8.5	6.3	2.5	3.4	**5.2**
	MiddleEast/North Africa	12.8	11.4	4.3	12.2	**10.1**
	Asia	9.3	8.7	2.3	7.1	**7.1**
	America/Caribbean	9.7	9.3	8.0	5.6	**8.4**
		9.4	**7.9**	**3.6**	**5.5**	**6.8**

Notes: Probabilities are computed by dividing the number of growth accelerations for each region/decade combination by the number of sample points for the same sub sample.

Source: Penn World Table Version 6.1; own calculations.

Table 4 – Average aid-to-GDP ratios around the date of growth accelerations

	Aid-to-GDP	Grants-to-GDP	Loans-to-GDP	Short-imp. aid-to-GDP
"Normal" periods	0.024	0.018	0.007	0.015
pre growth accel. start	0.024	0.017	0.006	0.015
growth accel. start	0.029	0.022	0.007	0.018
post growth accel. start	0.027	0.019	0.008	0.014

Notes: Growth accelerations defined according to variant 8_2. If *t* is the date of a growth acceleration, *Pre growth accel. start* refers to the time period *t-4* to *t-2*; *growth accel. start* refers to the period *t-1* to *t+1*; and *post growth accel. start* refers to the period *t+2* to *t+4*. All other sample points are denoted as *"normal" periods*.

Source: OECD (2006); Penn World Table Version 6.1; own calculations.

Table 5 – Probit results for baseline specification (variant 8_2)

	M1	M2	M3	M4	M5	M6	M7
		Contemporaneous Aid				Aid lagged one period	
econlib	0.012	0.033	0.044	0.040	0.035	0.047*	0.046
-	(0.58)	(1.20)	(1.56)	(1.45)	(1.28)	(1.66)	(1.62)
open	0.000***	0.000	0.000*	0.000	0.000**	0.000**	0.000**
-	(3.33)	(1.60)	(1.70)	(1.52)	(2.06)	(2.15)	(2.03)
poschange	0.010	-0.001	-0.001	-0.004	0.000	-0.000	-0.002
-	(0.58)	(-0.06)	(-0.04)	(-0.22)	(0.00)	(-0.01)	(-0.11)
negchange	0.096***	0.087***	0.086***	0.083***	0.095***	0.093***	0.090***
-	(3.92)	(3.51)	(3.47)	(3.39)	(3.71)	(3.65)	(3.56)
birthmort	0.000	-0.000***	-0.000***	-0.001***	-0.000***	-0.000***	-0.001***
-	(0.08)	(-2.79)	(-2.75)	(-3.14)	(-2.72)	(-2.71)	(-3.06)
tropical	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**	-0.001**
-	(-2.45)	(-2.45)	(-2.61)	(-2.46)	(-2.34)	(-2.49)	(-2.35)
Aid	.	0.005***	.	.	0.005***	.	.
-	.	(2.70)	.	.	(2.71)	.	.
Grants	.	.	0.005**	.	.	0.005**	.
-	.	.	(2.16)	.	.	(2.14)	.
Loans	.	.	.	0.018***	.	.	0.017**
-	.	.	.	(2.60)	.	.	(2.44)
pseudo R^2	0.05	0.07	0.07	0.06	0.07	0.07	0.07
obs.	3134	2300	2319	2327	2222	2238	2246

Notes: The table shows marginal effects. Numbers in parentheses denote the corresponding t-statistics. *,**,*** denote significance at the 10%,5%,1% level. Number of observations differs due to data availability.

Table 6 – Logit results for baseline specification (variant 8_2)

	M8	M9	M10
Aid	0.005***	.	.
-	(2.84)	.	.
Grants	.	0.005**	.
-	.	(2.34)	.
Loans	.	.	0.020***
-	.	.	(3.03)
pseudo R^2	0.07	0.07	0.07
obs.	2300	2319	2327

Notes: The table shows marginal effects. Numbers in parentheses are the corresponding t-statistics. *,**,*** denote significance at the 10%,5%,1% level. Number of observations differs due to data availability.

Table 7 – Probit results based on alternative filter rules

	M11	M12 variant 8_1	M13	M14	M15 variant 5_2	M16	M17	M18 variant 5_1	M19
econlib	0.078**	0.080**	0.079**	0.005	0.005	0.006	0.003	0.003	0.003
-	(2.30)	(2.39)	(2.35)	(0.16)	(0.19)	(0.20)	(0.08)	(0.09)	(0.09)
open	0.000	0.000	0.000	0.000***	0.000***	0.000***	0.000**	0.000**	0.000**
-	(0.82)	(0.85)	(0.84)	(2.96)	(2.97)	(3.06)	(2.45)	(2.45)	(2.48)
poschange	0.007	0.007	0.002	-0.034*	-0.036*	-0.035*	-0.042**	-0.043**	-0.042**
-	(0.34)	(0.31)	(0.11)	(-1.80)	(-1.90)	(-1.84)	(-2.08)	(-2.16)	(-2.09)
negchange	0.054**	0.053**	0.051**	0.037	0.037	0.037	0.017	0.02	0.016
-	(2.12)	(2.08)	(1.98)	(1.56)	(1.53)	(1.53)	(0.68)	(0.66)	(0.67)
birthmort	-0.001***	-0.001***	-0.001***	-0.000**	-0.000**	-0.000**	-0.001***	-0.001***	-0.001***
-	(-3.24)	(-3.38)	(-3.41)	(-2.35)	(-2.26)	(-2.19)	(-3.24)	(-3.24)	(-3.25)
tropical	-0.000	-0.000	-0.000	-0.001**	-0.001**	-0.001**	-0.001***	-0.001***	-0.001***
-	(-0.57)	(-0.61)	(-0.59)	(-2.18)	(-2.25)	(-2.27)	(-2.55)	(-2.60)	(-2.58)
Aid	0.004*	.	.	0.002	.	.	0.000	.	.
-	(1.74)	.	.	(0.83)	.	.	(0.15)	.	.
Grants	.	0.005	.	.	0.002	.	.	0.001	.
-	.	(1.53)	.	.	(0.85)	.	.	(0.16)	.
Loans	.	.	0.009	.	.	0.002	.	.	0.000
-	.	.	(1.09)	.	.	(0.31)	.	.	(0.03)
pseudo R^2	0.06	0.06	0.05	0.05	0.05	0.05	0.05	0.05	0.05
obs.	2301	2320	2328	2636	2629	2636	2637	2630	2637

Notes: The table shows marginal effects. Numbers in parentheses are the corresponding t-statistics. *,**,*** denote significance at the 10%,5%,1% level. Number of observations differs due to data availability and choice of filter rule parameters.

Table 8 – The effect of short-impact aid

	M20 probit	M21 logit
econlib	0.011	0.001
-	(0.45)	(0.36)
open	-0.000*	-0.000*
-	(-1.71)	(-1.77)
poschange	-0.029*	-0.028*
-	(-1.75)	(-1.72)
negchange	0.038	0.040
-	(1.32)	(1.37)
birthmort	-0.001***	-0.001***
-	(-3.51)	(-3.42)
tropical	-0.000	-0.001*
-	(-1.53)	(-1.65)
Short-impact aid	0.009**	0.009**
-	(2.15)	(2.32)
pseudo R^2	0.06	0.06
obs.	1585	1585

Notes: The table shows marginal effects. Numbers in parentheses are the corresponding t-statistics. *,**,*** denote significance at the 10%,5%,1% level. Number of observations differs due to data availability.

Table 9 – Sub-sample results

	M22	M23	M24	M25	M26	M27	M28	M29	M30	M31	M32	M33
	pre 1980			post 1980			Good states			Bad states		
Aid	0.007**	.	.	0.008***	.	.	0.005	.	.	0.007***	.	.
-	(2.35)	.	.	(2.89)	.	.	(0.96)	.	.	(2.75)	.	.
Grants	.	0.006*	.	.	0.009***	.	.	0.004	.	.	0.007**	.
-	.	(1.75)	.	.	(2.66)	.	.	(0.60)	.	.	(2.32)	.
Loans	.	.	0.033**	.	.	0.021**	.	.	0.008	.	.	0.034***
-	.	.	(2.71)	.	.	(2.43)	.	.	(0.63)	.	.	(3.34)
pseudo R^2	0.06	0.06	0.06	0.08	0.09	0.08	0.05	0.06	0.07	0.10	0.09	0.10
obs	1247	1247	1252	1053	1072	1075	960	1011	1077	994	995	996

Notes: The table shows marginal effects. Numbers in parentheses are the corresponding t-statistics. *,**,*** denote significance at the 10%,5%,1% level. Number of observations differs due to data availability.