

The Economic and Social Review, Forthcoming

The Effects of Foreign Aid in Sub-Saharan Africa

ROBERT GILLANDERS*

Hanken School of Economics, Helsinki, Finland

Abstract: This paper contributes to the aid effectiveness debate by applying a vector autoregression model to a panel of Sub-Saharan African countries. This method avoids the need for instrumental variables and allows one to analyse the effect of foreign aid on human development and on economic development simultaneously. The full sample results indicate a small increase in economic growth following a fairly substantial aid shock. The size of the effect puts the result somewhere between the arguments of aid optimists and those of aid pessimists. Human development, for which I use the growth rate of life expectancy as a proxy, responds positively to aid shocks in democracies.

I INTRODUCTION

Official Development Assistance (ODA) is the main tool employed by the rich world in its attempts to promote prosperity in the developing world. Given the importance of this tool, it should not be a surprise that many scholars of development consider its effects worthy of study, particularly its effects on economic growth. Unfortunately, from a policy maker's perspective at least, the approach taken by most of these works has yielded findings across the full spectrum of potential results. Doucouliagos and Paldam (2006) point out that the literature has found aid to be "effective, ineffective or even harmful"

* Hanken School of Economics, Department of Economics, P.O. Box 479, FI-00101 Helsinki, Finland. Email: rgillanders@gmail.com Phone: 00358 505659565 This work was carried out while the author was funded by the Irish Research Council for the Humanities and Social Sciences. I am grateful to Karl Whelan, Markus Eberhardt and Anna Gumpert for helpful comments and suggestions and to Inessa Love who kindly made her PVAR Stata program available to me.

(p. 228). The objective here is to employ a different method – a method that does not require as many (often controversial) assumptions.

This paper estimates the effects of aid in a panel vector autoregression (PVAR) framework. For the most part, the existing literature estimates standard growth regressions augmented with aid terms on panel data and attempts to overcome the endogeneity problem between growth and aid with standard instrumental variables techniques. The PVAR approach avoids the need for instrumentation strategies as all variables in a PVAR are recognised to be endogenous. Each variable is regressed on its own lags and those of the other variables. Only a minimal set of assumptions is required to interpret the effect of shocks in each variable on the system. Another merit of this notoriously atheoretical approach is that, as both Easterly (2003) and Easterly *et al.* (2004) point out, much of this literature suffers from a lack of a formal theory linking aid and growth to guide applied researchers in settling on an econometric specification. As will be shown below, nothing approaching a consensus has emerged from the literature and many key findings have been found to be less than robust to changes in sample or specification.

Vector autoregressions have been used by researchers to study the effect of foreign aid in a particular country. For example, Osei *et al.* (2005) examine the fiscal effects of aid in Ghana while Morrissey *et al.* (2006) examine the effect of ODA on growth in Kenya. Hansen and Headey (2010) employ a PVAR model to examine the short-run effects of aid on net imports and spending, though they do not examine growth. Very recently, Juselius *et al.* (2014) have used a cointegrating VAR model to examine the macroeconomic effects of aid in 36 Sub-Saharan African countries. This paper's main contribution is to expand on the work of Morrissey and his co-authors and by widening the scope via methods similar to those used by Hansen and Headey (2010). It also complements the work done by Juselius *et al.* While they quite rightly point out that a panel study should only be used with great caution to inform policy advice for a particular country, the question "does aid work on average?" is still one of interest for policy makers and one that has a long academic history as I will outline presently.

The second contribution of this paper is that the PVAR approach allows one to examine another side of development simultaneously. Taken as a whole, the foreign aid effectiveness literature is vast. While most of this literature looks at aid's effects on economic development, there is a smaller, yet growing, body of work that looks at aid's effect on human development as measured by variables such as the Human Development Index (HDI) and the infant mortality rate. However, single equation techniques can only focus on one issue at a time. It makes sense to make use of the multi-equation nature of a PVAR to examine both aspects of development (very broadly defined) simultaneously,

as while GDP per capita is a good measure of the overall state of a society, it is far from perfect. Economic development is surely a large part of the concept of development but there are other elements that matter.

Interest lies specifically with the impulse response functions (IRFs) obtained from the model. These will show the response path of economic growth and human development to a one-time shock in foreign aid holding all other shocks at zero. The sample is then split into groups defined by economic policy and democracy. This allows us to see if there is any evidence that aid is more effective in certain environments.

Several important and policy relevant results emerge from the analysis. Firstly, aid shocks do seem to induce economic growth in the first few years following the shock. However, this initial response is less than 1 per cent extra growth per annum and is tempered by some later negative responses. Secondly, aid appears to have a small positive effect on human development, though the error bands do not allow us to rule out that the effect is negative or non-existent. In countries with good economic policy, the early effect of aid on economic growth jumps to about 2 per cent, though this is once again tempered by some negative responses later on. In democracies, aid has a much larger effect on human development and a less pronounced effect on economic growth than in either the full sample or in autocracies.

One of the main implications of these findings is that while aid does lead to economic growth, the effect is not transformative and to maintain even an extra 1 per cent of growth would require frequent large injections of aid. Another is that while the response of GDP per capita growth is higher in some environments, it is not so much higher that donors could justify focusing all aid monies on countries with these characteristics. This is further supported by the fact that often it is the case that when aid fails to have an effect on one of the dimensions of development in one of the sub-samples, it does affect the other.

The remainder of the paper proceeds as follows. Section II outlines the existing literature. Section III outlines the data and discusses issues of measurement. Section IV describes the econometric approach in detail. Sections V and VI present the baseline and grouped results respectively and Section VII concludes.

II THE EXISTING LITERATURE

2.1 *Aid and Economic Development*

There are many studies that have examined the effect of aid on growth. I limit myself here to the more recent work, both for brevity and because they

adequately highlight the issues that will be examined in Section 6.¹ Recent work has chiefly focused on conditional aid effectiveness.

Burnside and Dollar (2000) reignited the aid effectiveness debate when they found that while aid has no effect on growth on average, aid works in a good policy environment. They include an aid*policy interaction term and find that it is statistically significant and robust to a number of specifications. This paper launched the debate on conditional aid effectiveness. Hansen and Tarp (2001) were the first to challenge this result using the exact same dataset as Burnside and Dollar (2000). They include quadratic aid and policy terms alongside an aid*policy interaction and show that this leads to the latter becoming insignificant. Easterly *et al.* (2004) recreate the Burnside-Dollar dataset and expand on it significantly. By following the approach of Burnside and Dollar to the letter, they find that not only is the crucial aid*policy coefficient insignificant but it has the opposite sign. Easterly (2003) re-examines the issue in a different way. By employing Official Development Assistance (ODA) as the measure of aid as opposed to the measure used by Burnside and Dollar, Effective Development Assistance (EDA), Easterly finds that the aid*policy interaction term is no longer significant. He also varies the specification of good policy and again finds that the aid*policy term is insignificant. The crucial interaction term is also found to be insignificant by varying the definition of growth (Burnside and Dollar defined growth as real GDP growth over four years) to consider eight, 12 and 24 years. Tan (2009) uses an error correction estimation approach and finds that both aid and good policy have significant long-run effects on growth but that the interaction of the two is actually bad for growth.

One of the best examples of support for the Burnside-Dollar result comes from Collier and Dollar (2002). They expand the Burnside-Dollar dataset to include 349 aid-growth-policy episodes as opposed to the original 275. The other modification they make is to employ the World Bank's Country Policy and Institutional Assessment (CPIA) as their policy variable. Their findings agree with the Burnside-Dollar result. However, Dalgaard *et al.* (2004) question the suitability of the CPIA for growth regressions. They include a climate*aid interaction term and find that it is significant. The aid*policy term loses its significance once climate*aid enters the specification. They suggest that the climate variable may be a proxy for deep determinants such as institutions. This is a significantly different conditional effectiveness result. Rajan and Subramanian (2008) find no unconditional effect of aid on growth or investment

¹ Roodman (2007) provides an excellent overview of the entire literature and Deaton (2010) discusses the potential problems with the IV strategies commonly employed in this area.

and no conditional effect in good policy or geographical environments. The potential importance of both policy and democratic institutions will be examined in Section VI.

Svensson (1999) examines whether civil and political liberties play any role in aid effectiveness. He finds that an aid*democracy interaction term is highly significant and that an aid*policy term à la Burnside and Dollar is insignificant. It is important to note that he considers, and rejects, the possibility that democracy is simply a proxy for good policies. This suggests we should add democracy to our list of conditional results to be examined.²

This sample of the aid and economic growth literature is chiefly included to motivate the division of the sample into groups defined by economic policy, institutions and democracy in Section VI. However, it also shows that the traditional approach of running either standard cross-sectional or panel growth regressions augmented with aid and aid interaction terms leads to fragile results. Indeed, the title of Roodman (2007), “The Anarchy of Numbers: Aid, Development, and Cross-Country Empirics” sums up the literature well. Each of the papers is a fine econometric work, and it may be that these factors do indeed matter, but the fragility of the results is undeniable. Roodman examines seven leading papers in the aid-growth literature, (including Burnside and Dollar (2000), Collier and Dollar (2002) and Dalgaard *et al.* (2004)) and finds that each of them is susceptible to changes in the sample and in specification. Similarly, Clemens *et al.* (2012), a paper that makes many very important contributions, shows that changes to the identification strategy of three influential papers in the literature, including Burnside and Dollar (2000) and Rajan and Subramanian (2008), changes the results dramatically and brings their findings into broad agreement that aid has an unconditional effect on growth. The prospect of a fresh perspective is a major motivating factor in employing the PVAR methodology.

2.2 *Aid and Human Development*

While nowhere near as extensive as that which concerns itself with economic development, there is a small but growing literature that seeks to empirically assess the effect of foreign aid on human development.

Kosack (2003) finds that aid has a positive effect on HDI growth but only in democratic countries. His estimates also suggest that aid will have a negative

² While I do not examine this in what follows, it is worth noting that if aid were to encourage democratic reform then aid could be good for growth insofar as democracy and good institutions are growth promoting. The evidence on this is somewhat mixed though as Heckelman (2010) finds that more aid is associated with some types of democratic reform while Dutta *et al.* (2013) argue that aid cannot make a democracy of an autocracy but can “amplify” a state’s existing tendencies.

effect on HDI growth in autocracies. Interestingly, he finds that democracy alone has a negative effect on HDI growth. He interprets these findings as implying that “more-democratic poor countries have, on their own, lower growth in the quality of life, but that aid to these countries may reverse this negative tendency” (p. 6).

McGillivray and Noorbakhsh (2007) examine the effect of aid on the level of the HDI and allow conflict to enter the analysis. They find that aid alone has a negative effect on HDI scores but disagree with Kosack (2003) in that they do not find either a negative effect of democracy on the HDI or a positive aid*democracy interaction term. These two studies gives us a second reason to divide the sample along lines of democracy.

Using quantile regression, Gomanee *et al.* (2005b) examine aid’s effects on human development as measured by both the HDI and the infant mortality rate. They argue that while aid might not have a direct effect on welfare, it may have an indirect one via pro-public expenditures (PPE). By constructing a PPE index they find that aid has a positive effect on welfare through public expenditure and that the effect is greater in countries with lower welfare. They also argue that good economic policy is not required for aid to be effective in promoting human development. A related paper, Gomanee *et al.* (2005a), finds to the contrary that there is a direct effect of aid on human development and little evidence of an indirect effect via PPE. It is clear that there is nearly as much disagreement and tendency for conflicting results in the aid-human development literature as there is in the aid-growth literature.

There are of course more works that concern themselves with the effects of aid on economic and human development. However, the papers above provide a sufficient overview of the evidence and suggest that it may be illuminating to examine whether aid has different effects in groups of countries defined by economic policy and democracy.

III DATA

The data on yearly economic growth comes from the World Bank’s *World Development Indicators* (WDI). This paper uses the notation aid_{it} to represent total net ODA per capita. This includes flows from all donors (as measured by the OECD) to recipient i at time t . aid_{it} is measured in constant 2007 US dollars. The data come from the OECD Development Assistance Committee. EDA is an adjustment to ODA that replaces the official loans component with the grant equivalents of official loans and disregards grants that are tied to technical assistance (Chang *et al.*, 1999). Although this may seem like an important

modification, the two are hugely correlated.³ I choose to use ODA as the aim of the paper is to assess the effect of the West's efforts and ODA is the tool they employ. In addition, the ODA data is available for a longer span of time.

I consider life expectancy to be an ideologically clean proxy for human development and it has been similarly used by others (Knowles and Owen, 2010). While there are other aspects to human development, a long lifespan is essential to pursue many of them. The data, which again comes from the World Bank's WDI, is of sufficient length and covers a sufficient number of countries. The specific variable, denoted as HD_{it} , is the growth rate of total life expectancy at birth (in years).

The data allows for a balanced panel of 31 countries over the period 1973-2005. The list of countries that are used in the analysis, along with summary statistics, can be seen in Appendix A.

IV ECONOMETRIC APPROACH

The results obtained in this paper are obtained from a PVAR model of the form:

$$Z_{it} = \alpha_0 + \sum_{q=1}^p \beta_q Z_{it-q} + \varepsilon_{it} \quad (1)$$

where Z_{it} is the vector $(aid_{it}, growth_{it}, HD_{it})$, α_0 is a vector containing the constant terms, β_q is the matrix of coefficients for lag q and ε_{it} is distributed as $(0, \sigma_i^2)$ with $E(\varepsilon_{it}\varepsilon_{is}') = 0$ for all $t \neq s$. Simply put, the model is comprised of three equations in which each variable is regressed on its own lags and those of the other two variables. While it is a seemingly simple set of equations, it must be noted that a great deal of information can be accounted for with a sufficiently long lag structure.

This model can be viewed as the most restrictive possible in that it imposes common slopes and common intercepts and can be estimated by Pooled Ordinary Least Squares (POLS). It is well known that POLS yields biased and inconsistent estimates if the true data generating process contains a fixed effect. To reduce such concerns, only countries in Sub-Saharan Africa are considered. All countries are of course different, but these countries should form a sufficiently homogeneous group to allow POLS estimates of the relationships

³ Dalggaard and Hansen (2001) show that the correlation between the two (as a fraction of GDP) in nominal terms is 0.98 and between real ODA and nominal ODA it is 0.89. They also suggest that difference between the two measures 'seems to be a simple transformation' (p. 26).

between ODA, economic growth and human development to be meaningful. Such concerns should be further reduced by the division of the sample into the subgroups outlined above.

A less restrictive model is a dynamic panel data model with country fixed effects. Such a model can be estimated via GMM techniques as is done by Love and Zicchino (2006).⁴ This approach will be used as a check on the main results. If the true model contains a fixed effect, then any estimation that omits such effects will be incorrect. Therefore it is very important to compare the results of the POLS and GMM estimators. As we will see, they are very similar suggesting that unobserved heterogeneity is not a serious concern in this exercise.⁵

The parameter estimates of Equation (1) are not of any particular interest. They are reduced form parameters which in many applications, including this one, have no real meaning or direct interpretation. What are of interest are the impulse response functions that can be obtained via a simple transformation of Equation (1). These functions trace out the response path of a variable over time following a one time shock to another holding all other shocks at zero. So when we are looking at the effect of foreign aid on GDP per capita growth, the IRF in question will tell us (based on a simple transformation of the PVAR model above) how much extra growth we would expect to see at each time period following a time zero shock to aid. These paths are very often represented graphically and I do so in what follows.

To obtain the exogenous shocks that we are interested in, we must make some assumptions. The most common way to obtain such orthogonalised shocks is to employ a Choleski decomposition which orders the shocks in a sensible way. The channel of influence I impose is the following:

$$aid_{it} \rightarrow growth_{it} \rightarrow HD_{it}$$

⁴ The main reason that the GMM procedure is not preferred is that it is best suited to very large N datasets (i.e firm level data). Another is the relative accessibility of POLS. As we will see, the methods give remarkably similar results. While both methods are potentially biased, it seems unlikely that the very different biases would lead to the same results.

⁵ An even less restrictive variant of Equation (1) allows for both country specific intercepts and slopes. Pesaran and Smith (1995) show that these sort of models can be estimated by applying the Mean Group Estimator (MGE). This is the method adopted by Hansen and Headey (2010). However, Rebucci (2003) shows, using Monte Carlo simulations, that 'the dispersion of the slope parameters around their mean must be high in absolute terms for the heterogeneity bias of pooled estimators to be substantial' (p. 26). In addition, the simulations indicate that for MGE to be a useful alternative, the time dimension of the panel must be longer than that which is to be found in most macroeconomic datasets.

Aid shocks can effect growth and human development contemporaneously; growth can effect human development contemporaneously but only influences aid flows with a lag; human development only operates on the other two variables with a lag. The choice of ordering is a crucial factor in any VAR exercise.⁶ The rationale behind the chosen ordering is as follows:

- Donor countries (or their bureaucrats) need time to observe and react to changes in the recipient country. Thus aid flows will only respond to changes in economic and human development with a lag.
- It takes time for increasing human development to translate into economic development. It is much more plausible that economic growth can have a contemporaneous effect on human development.

While this is only one of six possible orderings, it seems the most plausible and the results are not sensitive to alternative orderings (available on request). I follow Love and Zicchino (2006) and Hansen and Headey (2010) and construct 95 per cent confidence intervals using Monte Carlo Integration methods. I test for stationarity using the method outlined in Breitung (2000). Breitung's test, which he shows to be superior to others for the datasets of the size employed here, suggests that all three variables are stationary. Finally, to determine the appropriate number of lags to include, that is the p in Equation (1), I employ standard information criteria.

V FULL SAMPLE RESULTS

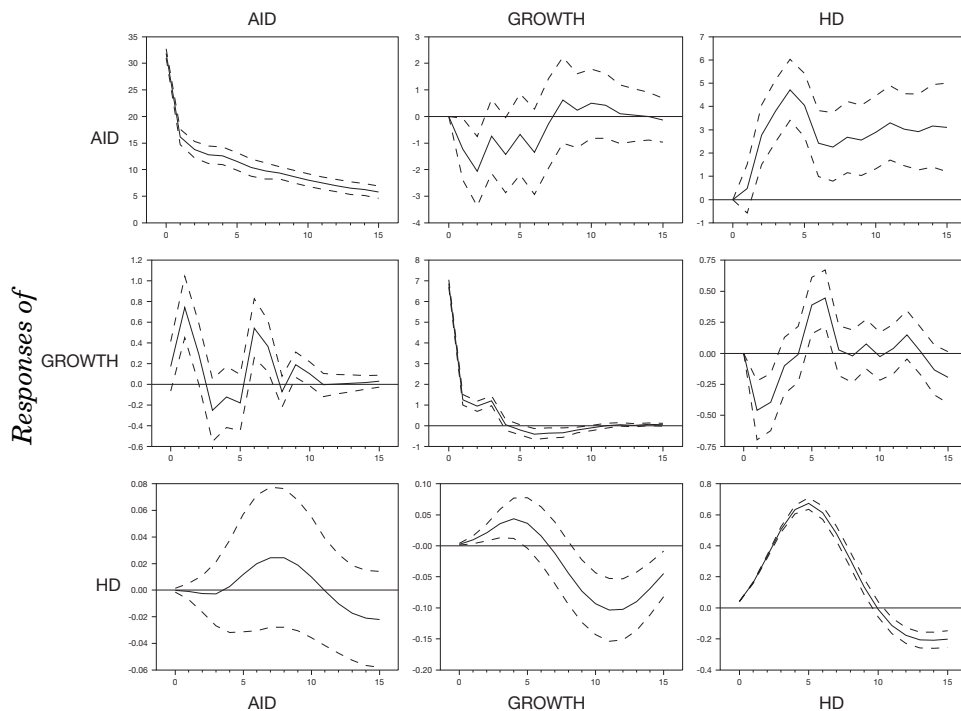
5.1 *POLS*

Both the Akaike information criterion and the Schwarz-Bayesian information criterion indicate that the model should include eight lags. The IRFs obtained from the full sample of 31 countries can be seen in Figure 1. For completeness I present all the IRFs from the system, though our particular interest lies with the responses of the growth rates of GDP per capita and life expectancy to a shock in aid. Each IRF shows the response path of the variable in question to a one time positive one standard error increase in the estimate of the shock variable holding all other shocks at zero. The values of the shocks can be read on the Y-axis of the diagonal elements of Figure 1 at time zero. The aid shock is approximately \$33 per person.

⁶ The importance of the ordering increases with the correlation between the reduced form innovations. See Enders (2004) page 276.

In terms of the effect of an aid shock on economic development, the error bands are generally tight enough for us to have confidence in the estimated response path. We can see that an aid shock at time zero has an immediate, but small, positive effect on GDP per capita growth. This positive effect increases to about 0.8 per cent extra growth one period after the shock and the positive effect still exists in period two. These short run increases in growth could perhaps be the result of increases in government expenditure. This interpretation is in line with the findings of Remmer (2004) that foreign aid increases recipient government expenditure and may decrease tax effort. The next three periods see growth that is lower than it would have been in the absence of the initial aid shock. This could also be seen as being in line with Remmer (2004) i.e. recipient governments treat the aid shock at time zero as a permanent increase and increase spending and decrease tax effort and are

Figure 1: *Full Sample IRFs: POLS*
Impulse responses



Notes: Each IRF depicts the response of the row variable to a one standard error shock in the estimate of the column variable. The upper and lower lines are 95 per cent error bands generated using Monte Carlo simulation with 2,500 draws.

taken by surprise when it proves to be transitory.⁷ After this, we see a return to a positive response. This would fit with government investments on infrastructure made with the initial aid shock paying off. After the 10th step the initial shock has no more influence.

The overall pattern could also be related to the composition of a recipient government's expenditure i.e. consumption versus investment. Studies such as Djankov *et al.* (2006), Franco-Rodriguez *et al.* (1998), Pack and Pack (1993) and many others have examined issues such as this (some from the stance of fiscal response modeling, others in terms of fungibility) and found different results depending on the country or countries studied. This speculation highlights the biggest drawback of the PVAR approach to studying foreign aid effectiveness (and the VAR methodology in general). While we can see outcomes very well, the mechanisms are obscured.

So do we have evidence that aid is effective in terms of generating economic growth? The positive responses seem to outweigh the periods where growth is lower than it would have been. However, there are two important points one should bear in mind:

1. The extra injection of \$33 per person is not cheap. Even at this level, the results do not fit the description of transformative.
2. Given that the effects die out by the 11th period, can we say that the induced economic growth is sustainable?

The results in terms of human development are less encouraging for aid advocates. The estimated response path is positive for the most part but small in magnitude. That said, the human life span is measured on a small scale and so an increase in its yearly growth rate of even a fraction of a percent is arguably a meaningful and desirable outcome, especially given that the response persists until the 10th period following the initial shock. However, the error bands allow for the possibility that the effect may be negative. The results in this respect are thus ambiguous.

5.2 Robustness: GMM

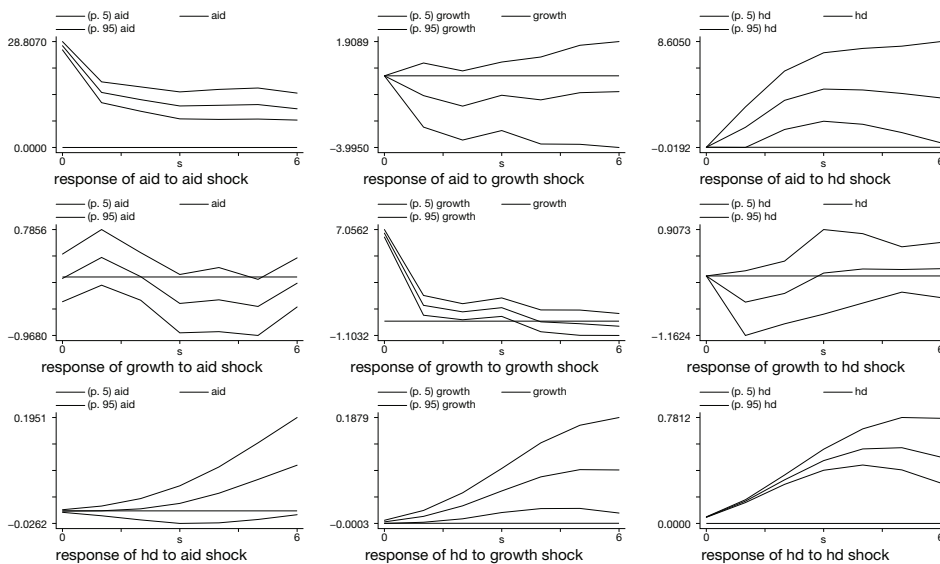
It is important to check if the baseline results are robust to allowing for country specific effects. In other words, if the POLS approach gives different results to a model that allows for fixed effects. To do this, I employ the PVAR Stata program written by Inessa Love. For specific details of the procedure, I direct the reader to Love and Zicchino (2006). Briefly, the estimator allows for

⁷They may not be entirely wrong in this as Figure 1 shows that the response of aid to its own shocks persists beyond 15 periods, though it does drop rapidly to roughly a third of the value of the shock.

country fixed effects which are removed by forward mean differencing. The model is then estimated by GMM.

Inessa Love's PVAR program will not allow me to obtain error bands for models with more than six lags. The results from the model estimated with six lags are presented in Figure 2. The results of a model with eight lags (with no error bands) are very similar and are presented in Appendix B. The IRFs only trace out the responses to six periods after the initial shock and use a slightly different value for the shocks, but we can immediately see that the pattern of responses to an aid shock are very similar to those obtained using POLS. The aid shock is smaller yet it generates a larger, though still rather small, response in the growth rate of human development and the economic growth response is roughly 50 per cent of the POLS outcome. However, the results of the eight lag GMM model show a similar level of response to that of the POLS model. The error bands are also wider in the case of the economic growth response, though the bulk of the error band lies above zero. Overall we can be confident that POLS is a satisfactory method and that the results presented in Figure 1 are valid.

Figure 2: *Full Sample IRFs: GMM*
Impulse-responses for 6 lag VAR of Aid Growth HD



Errors are 5% on each side generated by Monte-Carlo with 2500 reps

Notes: Each panel shows the response of the indicated response variable to a one standard deviation shock in the shock variable. Results obtained using the PVAR program kindly made available to me by Inessa Love.

VI CONDITIONAL RESULTS

6.1 *Good Versus Bad Economic Policy*

Given how influential the Burnside-Dollar results have been in donor circles, it makes sense to use the model to see if we can find evidence of aid working better in a good policy environment. One lesson to be taken from the literature is that often the definition of good policy is somewhat arbitrary in what is included and once it is changed the significant results disappear. With this in mind, I have chosen what is arguably the most objective measure of economic policy available. The World Bank's *Doing Business* project collects information across a wide variety of aspects of the business environment and ranks countries on the overall ease of doing business. The full methodology can be found on the project's website.⁸ Here, it is sufficient to note that the surveys are as objective as possible and cover most aspects of a country's business environment. Thus, the ranking should provide a good proxy for overall economic policy. This is quite a different measure of policy from the weighted indices of macroeconomic indicators that are commonly used in this literature.

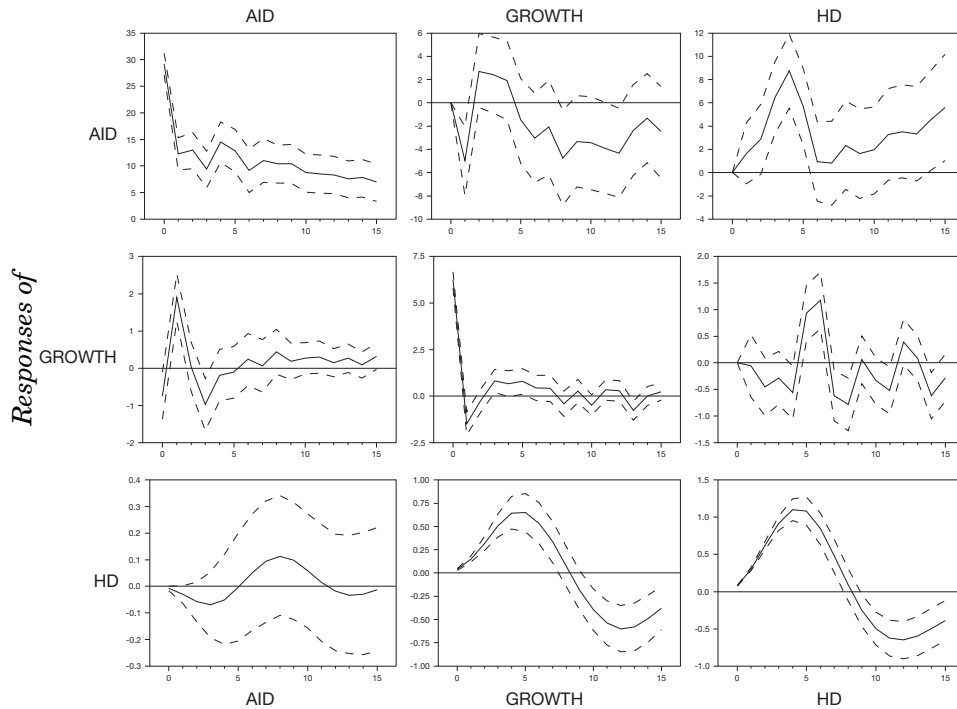
I use the 2010 rankings as my measure. While this is open to criticism, the data only goes back to 2004 and additional important variables have been added over time. I believe that the data can safely be regarded as a good measure of a country's stock of economic policies. I consider a country with a ranking in the top 100 to have good economic policy. Countries below this, admittedly arbitrary, cutoff form the bad policy sample. A benefit of dividing the sample this way is that even if we would see countries move around somewhat in the rankings over time had we the data, such broad ranges make it more likely that they remain within the bounds I have set for good and bad policy. In any event, the cutoff would have to be much more forgiving for many more countries to make into the good sample.

Figures 3 and 4 presents the IRFs obtained from running the model on each of the policy groups. Only five countries made the cut for good policy. Appendix A shows which countries are in this and each subsequent sub-sample. I continue to include eight lags in the model over all samples.

The results are not as precise as those of Section V but are striking nonetheless. It is worth noting that the magnitude of the aid shock in both cases are very similar. In the good policy group, economic growth is actually *lower* than it would have been at $t=0$ had there been no aid shock. However, by $t=1$ growth is roughly 2 per cent higher than it would have been. We see the same pattern of negative response that we saw in the full sample after $t=2$ with some small positive responses after $t=5$. While the error bands do not allow one to

⁸ <http://www.doingbusiness.org>

Figure 3: *Good Policy IRFs*
Impulse Responses



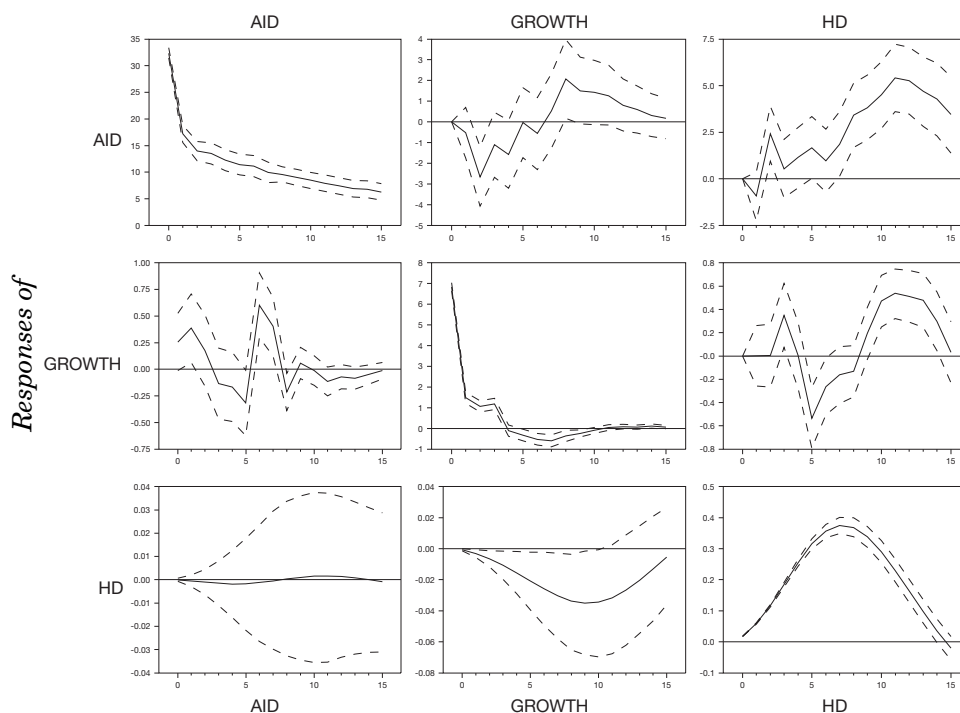
Notes: Each IRF depicts the response of the row variable to a one standard error shock in the estimate of the column variable. The upper and lower lines are 95 per cent error bands generated using Monte Carlo simulation with 2,500 draws. The sample is composed of those countries which rank in the top 100 in the World Bank's ease of doing business ranking.

discount the possibility that these long lasting effects are negative, they were not present in the full sample results. The bad policy sample responses are markedly different and (not surprisingly given that these countries form the vast majority of the full sample) are similar to the full sample results. The level of response is smaller though and we see some long lasting negative responses that were absent in the full sample.

In terms of human development, the error bands are too broad to draw much inference. In the bad policy group the estimated effect is indistinguishable from zero for the most part. In the good policy group the error bands are also too wide but we can see initial negative responses. After that we cannot say with any certainty what sign the effect takes.

These results suggest that, in terms of increasing GDP per capita growth, aid does work better in a good policy environment. On the other hand, the

Figure 4: *Bad Policy IRFs*
Impulse Responses



Notes: Each IRF depicts the response of the row variable to a one standard error shock in the estimate of the column variable. The upper and lower lines are 95 per cent error bands generated using Monte Carlo simulation with 2,500 draws. The sample is composed of those countries which rank outside of the top 100 in the World Bank's ease of doing business ranking.

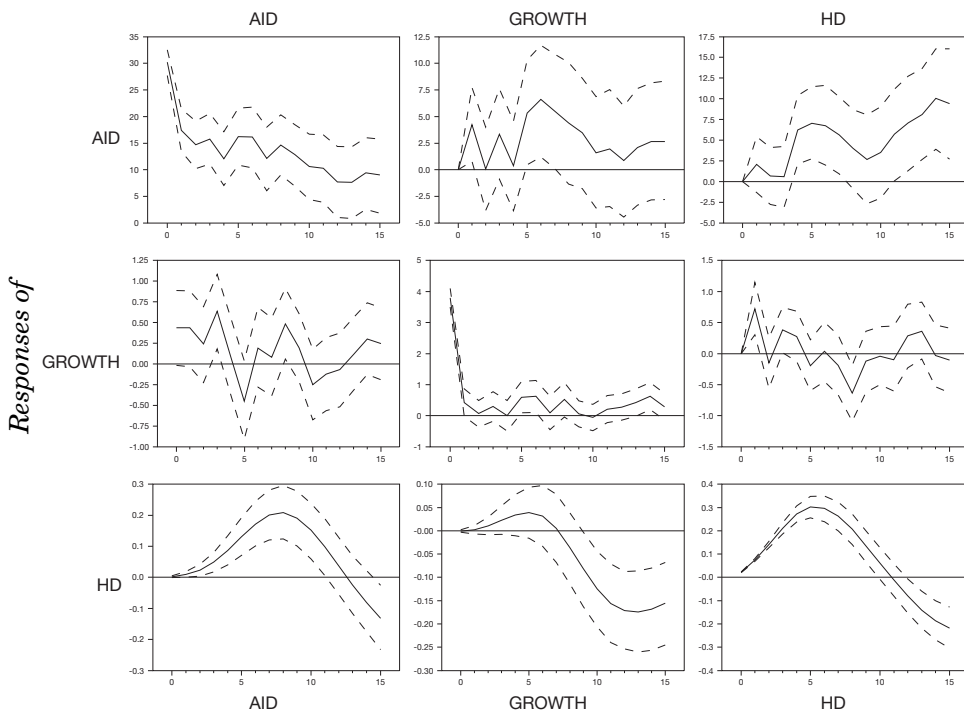
results certainly do not conform to the arguments of the most despairing of aid pessimists in that we see some beneficial effects of aid, even in countries with bad policy.

6.2 *Democracy vs. Autocracy*

We saw in Section II that there is evidence that being a democracy matters for both dimensions of aid effectiveness. To examine this issue, I utilise the measure of democracy created by the Polity IV project. This variable combines information on democratic and autocratic features of a country and places them on a scale from -10 (total autocracy) to $+10$ (full democracy). This suggests a simple division of the sample. Countries with an average Polity score (over the sample period) of less than 0 are consigned to the autocratic group. Those with a score of 0 or higher form the democratic group.

Figures 5 and 6 show the IRFs for both sub-samples. As was the case with the bad policy group, the autocratic group forms the vast majority of the full sample and it is therefore unsurprising that the IRFs are very similar to the baseline results. The big difference is that we see no appreciable positive effect of aid on human development. Turning to the democratic sample, we see a relatively large response of human development to an initial aid shock. Not only is it relatively large, it is unambiguously positive and persists to the 11th step. As the shocks are once again of very similar magnitudes, this result partially supports the findings of Kosack (2003) in that aid seems to work in terms of promoting human development only in democratic countries. However, we cannot see any clear evidence of it retarding human development in autocracies.

Figure 5: *Democratic IRFs*
Impulse Responses



Notes: Each IRF depicts the response of the row variable to a one standard error shock in the estimate of the column variable. The upper and lower lines are 95 per cent error bands generated using Monte Carlo simulation with 2,500 draws. The sample composed is of those countries with an average value of 0 or higher in the Polity IV Index of Political Regime Characteristics.

In terms of aid's effect on economic growth, as noted above, the autocratic sample's response path is very similar to that of the full sample. The major difference is the late negative responses that were absent in the full sample. The response path in the democratic sample has error bands that are too wide to draw any firm inference for the most part, though the initial responses seem to be positive. While these initial positive responses are smaller than those in the autocratic sample, they last longer. After that, it is generally not possible to make any inference about the sign of the response. These results, therefore, do not conform with Svensson (1999) in that aid does not seem to be more effective in promoting economic growth in democratic environments.

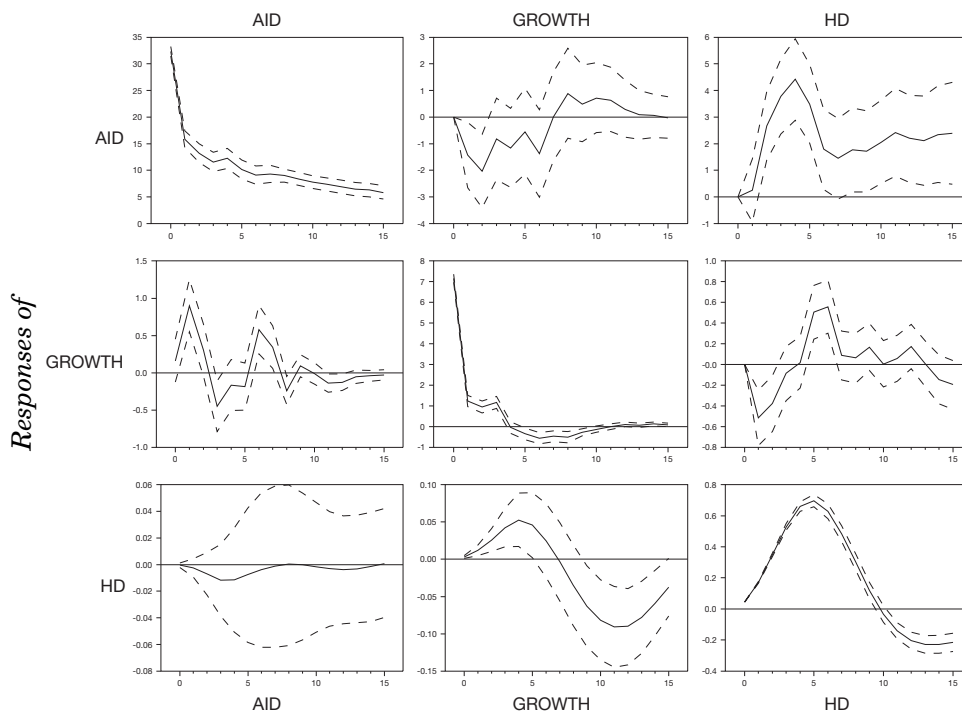
VII CONCLUSIONS

This paper has been an attempt to look at whether aid is effective using a different approach to that found in the existing literature. Given the range of contradictory findings on this question, no single work can claim to be definitive. However, the approach taken here is free from many of the difficulties encountered by the usual panel approach. In particular, the PVAR method does not rest on the oft maligned instrumentation strategies used in much of the previous work.

The results lie somewhere between the findings and arguments of aid pessimists and aid optimists. Aid does seem to work in terms of generating economic growth but not to an extent that could be called transformative. This conclusion is similar in flavour to that of Doornik and Nunnenkamp (2007) who find that more aid is associated with a small but statistically significant increase in the probability of a growth acceleration event. The results for human development were generally ambiguous but suggest that aid may induce small increases in the variable used as a proxy for human development, the growth rate of life expectancy at birth.

The major failing of the PVAR method is that it offers no insight into what the underlying mechanisms generating these results might be. That said, much of this literature is based on ad hoc speculation and econometric specifications. The benefit of the approach is that, as other VAR advocates point out, it lets the data speak for itself.

Figure 6: *Autocratic IRFs*
Impulse Responses



Notes: Each IRF depicts the response of the row variable to a one standard error shock in the estimate of the column variable. The upper and lower lines are 95 per cent error bands generated using Monte Carlo simulation with 2,500 draws. The sample is composed of those countries with a negative average value in the Polity IV Index of Political Regime Characteristics.

REFERENCES

- Breitung, J., 2000. "The Local Power of Some Unit Root Tests for Panel Data" in R. Carter Hill, Badi H. Baltagi, Thomas B. Fomby, (eds.), *Advances in Econometrics, Vol. 15: Nonstationary Panels, Panel Cointegration, and Dynamic Panels*, JAI Press pp. 161-178.
- Burnside, C. and D. Dollar, 2000. "Aid, Policies, and Growth", *American Economic Review*, Vol. 90, No. 4, pp. 847-868.
- Chang, C. C., E. Fernandez-Arias and L. Serven, 1999. "Measuring Aid Flows: A New Approach", Policy Research Working Paper Series 2050, The World Bank, February.
- Clemens, M. A., S. Radelet, R. R. Bhavnani and S. Bazzi, 2012. "Counting Chickens When They Hatch: Timing and the Effects of Aid on Growth", *The Economic Journal*, Vol. 122, No. 561, pp. 590-617.

- Collier, P. and D. Dollar, 2002. "Aid Allocation and Poverty Reduction", *European Economic Review*, Vol. 46, No. 8, pp. 1475-1500.
- Dalgaard, C.-J. and H. Hansen, 2001. "On Aid, Growth and Good Policies", *The Journal of Development Studies*, Vol. 37, No. 6, pp. 17-41.
- Dalgaard, C.-J., H. Hansen and F. Tarp, 2004. "On the Empirics of Foreign Aid and Growth", *Economic Journal*, Vol. 114, No. 496, pp. F191-F216.
- Deaton, A., 2010. "Instruments, Randomization, and Learning about Development", *Journal of Economic Literature*, Vol. 48, No. 2, pp. 424-455.
- Djankov, S., J. G. Montalvo and M. Reynal-Querol, 2006. "Does Foreign Aid Help?", *Cato Journal*.
- Doucouliaqos, H. and M. Paldam, 2006. 'Aid Effectiveness on Accumulation: A Meta Study", *Kyklos*, Vol. 59, No. 2, pp. 227-254.
- Dovern, J. and P. Nunnenkamp, 2007. "Aid and Growth Accelerations: An Alternative Approach to Assessing the Effectiveness of Aid", *Kyklos*, Vol. 60, No. 3, pp. 359-383.
- Dutta, N., P. T. Leeson and C. R. Williamson, 2013. "The Amplification Effect: Foreign Aid's Impact on Political Institutions", *Kyklos*, Vol. 66, No. 2, pp. 208-228.
- Easterly, W., 2003. "Can Foreign Aid Buy Growth?", *Journal of Economic Perspectives*, Vol. 17, No. 3, pp. 23-48.
- Easterly, W., R. Levine and D. Roodman, 2004. "Aid, Policies and Growth: Comment", *The American Economic Review*, Vol. 94, No. 3, pp. 774-780.
- ENDERS, W., 2004. *Applied Econometric Time Series*, 2nd ed., Wiley.
- Franco-Rodriguez, S., O. Morrissey and M. McGillivray, 1998. "Aid and the Public Sector in Pakistan: Evidence With Endogenous Aid", *World Development*, Vol. 26, No. 7, pp. 1241-1250.
- Gomanee, K., O. Morrissey, P. Mosley and A. Verschoor, 2005a. "Aid, Government Expenditure and Aggregate Welfare", *World Development*, Vol. 33, No. 3, pp. 355-370.
- Gomanee, K., S. Girma and O. Morrissey, 2005b. "Aid, Public Spending and Human Welfare: Evidence from Quantile Regressions", *Journal of International Development*, Vol. 17, No. 3, pp. 299-309.
- Hansen, H. and F. Tarp, 2001. "Aid and Growth Regressions", *Journal of Development Economics*, Vol. 64, No. 2, pp. 547-570.
- Hansen, H. and D. D. Headey, 2010. "The Short-Run Macroeconomic Impact of Foreign Aid to Small States: An Agnostic Time Series Analysis", *The Journal of Development Studies*, Vol. 46, No. 5, pp. 877-896.
- Heckelman, J. C., 2010. "Aid and Democratization in the Transition Economies", *Kyklos*, Vol. 63, No. 4, pp. 558-579.
- Juselius, K., N. F. Møller and F. Tarp, 2014. "The Long-Run Impact of Foreign Aid in 36 African Countries: Insights from Multivariate Time Series Analysis*", *Oxford Bulletin of Economics and Statistics*, Vol. 76, No. 2, pp. 153-184.
- Knowles, S. and P. D. Owen, 2010. "Which Institutions are Good for Your Health? The Deep Determinants of Comparative Cross-country Health Status", *The Journal of Development Studies*, Vol. 46, No. 4, pp. 701-723.
- Kosack, S., 2003. "Effective Aid: How Democracy Allows Development Aid to Improve the Quality of Life", *World Development*, Vol. 31, No. 1, pp. 1-22.
- Love, I. and L. Zicchino, 2006. "Financial Development and Dynamic Investment Behavior: Evidence from Panel VAR", *The Quarterly Review of Economics and Finance*, Vol. 46, No. 2, pp. 190-210.

- Marshall, M. G. and K. Jagers, 2008. *Polity IV Project: Political Regime Characteristics and Transitions, 1800-2008*.
- McGillivray, M. and F. Noorbakhsh, 2007. "Aid, Conflict and Human Development", Working Papers 2007-03, Department of Economics, University of Glasgow.
- Morrissey, O., D. M'Amanja and T. Lloyd, 2006. "Aid and Growth in Kenya: A Time Series Approach", *Theory and Practice of Foreign Aid (Frontiers of Economics and Globalization, Volume 1)* 1, pp. 313-332.
- Osei, R., O. Morrissey, and T. Lloyd, 2005. "The Fiscal Effects of Aid in Ghana", *Journal of International Development*, Vol. 17, No. 8, pp. 1037-1053.
- Pack, H. and J. R. Pack, 1993. "Foreign Aid and the Question of Fungibility", *The Review of Economics and Statistics*, Vol. 75, No. 2, pp. 258-265.
- Pesaran, M. H. and R. Smith, 1995. "Estimating Long-Run Relationships from Dynamic Heterogeneous Panels", *Journal of Econometrics*, Vol. 68, No. 1, pp. 79-113
- Rajan, R. G. and A. Subramanian, 2008. "Aid and Growth: What Does the Cross-Country Evidence Really Show?", *The Review of Economics and Statistics*, Vol. 90, No. 4, pp. 643-665.
- Rebucci, A., 2003. "On the Heterogeneity Bias of Pooled Estimators in Stationary VAR Specifications", IMF Working Papers 03/73, International Monetary Fund, April.
- Remmer, K. L., 2004. "Does Foreign Aid Promote the Expansion of Government?", *American Journal of Political Science*, Vol. 48, No. 1, pp. 77-92.
- Roodman, D., 2007. "The Anarchy of Numbers: Aid, Development, and Cross-Country Empirics", *World Bank Economic Review*, Vol. 21, No. 2, pp. 255-277.
- Svensson, J., 1999. "Aid, Growth and Democracy", *Economics and Politics*, Vol. 11, No. 3, pp. 275-297.
- Tan, K. Y., (2009) "A Pooled Mean Group Analysis on Aid And Growth", *Applied Economics Letters*, Vol. 16, No. 16, pp. 1597-1601.
- World Bank, 2010a. *Doing Business 2010*, The International Bank for Reconstruction and Development / The World Bank.
- World Bank, 2010b. *World Development Indicators*.

APPENDIX A
SUMMARY STATISTICS AND SUB-SAMPLE ALLOCATION

Table 1: *Means of Variables Used*

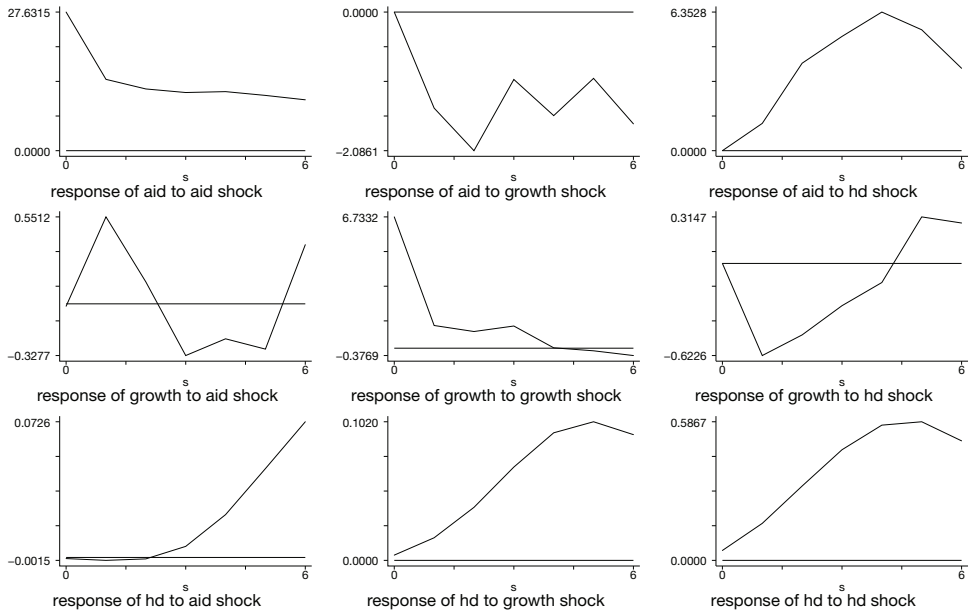
<i>Country</i>	<i>Growth Rate of Life Expectancy</i>	<i>Growth rate of GDP Per Capita</i>	<i>ODA Per Capita</i>	<i>ODA as a Percentage of GDP</i>	<i>Doing Business Rank</i>	<i>Polity Democracy Score</i>
Benin	0.777	0.466	64.527	9.782	172	-1
Botswana	-0.273	6.017	172.829	5.911	45	7
Burkina Faso	0.635	1.849	66.388	12.909	147	-4
Burundi	0.330	-0.234	56.202	18.623	176	-4
Cameroon	0.236	1.141	57.082	4.013	171	-6
Central African Republic	0.179	-1.220	78.300	12.041	183	-3
Chad	0.201	1.547	56.652	11.874	178	-4
Côte d'Ivoire	0.393	-1.497	57.644	4.103	168	-6
DR Congo	0.215	-3.783	26.721	8.449	182	-5
Gabon	0.631	0.784	167.456	1.790	158	-7
Gambia	0.849	0.567	119.769	20.230	140	3
Ghana	0.383	0.176	46.631	7.648	92	-2
Guinea-Bissau	0.663	-0.149	149.697	40.479	181	-3
Kenya	-0.052	0.292	44.148	6.366	95	-4
Lesotho	-0.317	3.016	102.086	17.163	130	-2
Liberia	0.696	-3.229	75.870	24.116	149	-3
Madagascar	0.837	-1.480	48.313	9.553	134	0
Malawi	0.630	-0.037	57.742	18.609	132	-4
Mali	0.671	1.478	79.681	16.654	156	-1
Mauritania	0.462	-0.226	223.875	22.284	166	-7
Niger	0.785	-1.421	67.676	13.665	174	-2
Nigeria	0.417	0.469	4.306	0.616	125	-2
Rep. Congo	-0.129	1.383	122.089	6.590	179	-5
Rwanda	0.247	1.562	75.300	18.995	67	-6
Senegal	0.716	-0.034	110.040	10.127	157	0
Sierra Leone	0.686	-0.226	50.235	15.077	148	-4
Sudan	0.596	1.961	47.863	4.874	154	-5
Swaziland	-0.268	2.596	94.583	4.823	115	-10
Togo	0.593	-0.414	69.909	9.487	165	-5
Zambia	-0.463	-1.498	111.299	15.371	90	-3
Zimbabwe	-0.882	-1.099	42.201	3.500	159	-2

Notes: Except in the case of Doing Business Rank, values are means over the period 1973-2005. The Doing Business data comes from the 2010 issue. To be included in the good policy sample a country must place in the top 100 in the 2010 Doing Business rankings.

The democratic sample contains countries with an average Polity democracy score of 0 or higher.

APPENDIX B
EIGHT LAG GMM ESTIMATES

Figure 7: Full Sample IRFs: GMM with Eight Lags
Impulse-Responses for 8 lag VAR of Aid Growth HD



Notes: Each panel shows the response of the indicated response variable to a one standard deviation shock in the shock variable.

Results obtained using the PVAR program kindly made available to me by Inessa Love.