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Aid, Pro-Poor Government Spending and Welfare

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Karuna Gomanee, Oliver Morrissey, Paul Mosley and Arjan Verschoor

Centre for Research in Economic Development and International Trade, University of Nottingham

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Abstract
Our objective is to test the hypothesis that aid can improve the welfare of the poor. Part of this effect is direct, if aid is targeted on the poor, and part is indirect, via the transmission channel of aid-financed public spending on social services – sanitation, education and health. This indirect part is represented in an index of pro-poor public expenditures (PPE). As comparative data on poverty levels are scarce, we use two indicators of the welfare of the poor, namely infant mortality and the Human Development Index (HDI). We use a residual generated regressor to obtain a coefficient on the aid variable that includes the indirect effects through public expenditure allocation induced by aid. Estimation is based on a pooled panel of 39 countries over the period 1980 to 1998. We obtain results in support of our hypothesis that 'pro-poor' public expenditure is associated with increased levels of welfare, and we find evidence that aid is associated with improved values of the welfare indicators because aid finances pro-poor spending. In this way, aid potentially benefits the poor.

Outline

1. Introduction
2. Aid and Poverty
3. Empirical Approach
4. Estimation and Results
5. Conclusions

1. INTRODUCTION

Traditionally the broad aim of and economic justification for aid was to promote increased economic growth. The conventional way to assess such economic effectiveness is to ask if aid inflows on aggregate have been associated with an improvement in economic growth. On balance, the evidence suggests that the answer is yes (despite the level of ongoing debate, but that is peripheral to this paper). The inherent difficulty in any attempt to assess how effective aid has been is that in practice a variety of aid instruments are used by many donors, for varying purposes and with different objectives that change over time. In recent years, donors attach greater importance to the objective of using aid to reduce poverty. How can one assess the effectiveness of aid against this criterion?

The purpose of this paper is to offer a method to investigate, using cross-country data, the effectiveness of aid in improving the welfare of the poor. We acknowledge how problematic such an exercise is. Measuring the welfare of the poor and identifying poverty reduction is inherently difficult. Comparative cross-country data on poverty over time is extremely scarce, and such data as exist are based on income measures of poverty. Policies and investments that are directly aimed at reducing non-income dimensions of poverty may be more important in increasing the welfare of the poor than economic growth (World Bank, 2001). Aid can finance expenditures that improve the welfare of the poor, such as universal access to primary education and health care. Benefiting the poor or improving the welfare of the poor are not equivalent to reducing (measured) poverty. Aid that promotes growth that in turn reduces income poverty has an indirect effect in reducing poverty, and presumably the welfare of the poor is increased. Aid that increases the (non-income) welfare of the poor alleviates poverty, but may not have any impact on growth or on measured income poverty.

Thus, the first problem in evaluating the effectiveness of aid in alleviating poverty is how one represents the way in which aid impacts on the welfare of the poor. Only in rare cases, such as a donor-financed rural works programme, would aid have a direct effect on the incomes of the poor. If aid contributes to growth, and such growth benefits the poor, then aid may have an indirect effect on income poverty. However, there is a more important potential effect. Most aid finances government spending, and if such expenditures enhance the welfare of the poor, then aid indirectly benefits the poor. In fact, aid to the poorest countries is increasingly in the form of budget support, much of which is targeted on addressing poverty (e.g. Poverty Action Funds under the HIPC initiative). Our general approach (discussed in section 2) is to posit that certain types of government spending are most likely to improve the welfare of the poor (Verschoor, 2002, provides a discussion). Thus, we look at the indirect effect of aid on the poor via its effect on the allocation of government spending.

The general methodological approach of this paper is cross-country regressions of aid effectiveness, where an indicator of human welfare is the dependent variable (the proxy for the welfare of the poor). As employed in 'aid-growth' studies, this approach is not without problems. World Bank (1998) and Burnside and Dollar (2000) argue for 'conditional effectiveness', i.e. aid is only effective conditional on 'good' policies being in place. This claim has been critically re-evaluated elsewhere (Hansen and Tarp, 2001), and is not the focus of this paper. However, not all aid (indeed, probably no more than a third of aid) is directed at uses that would be expected to have a medium-term observable impact on growth (Morrissey, 2001). Aid directed at financing health and education services, for example, would only affect growth in the long-term, if at all. In simple terms, the measure of aid used in most studies over-states the volume of aid available for growth-promoting uses.

These problems of testing the effectiveness of aid and growth are exacerbated in trying to evaluate effectiveness in increasing welfare, or alleviating poverty. The dependent variable (welfare or poverty) may be even more difficult to explain than growth (explanatory power is weaker and there is little theoretical guidance to identify the factors that might explain cross-country variations in poverty), and it is difficult to identify the share of aid 'targeted' on the poor. Our econometric results should therefore be interpreted with caution. However, by concentrating on the fact that aid finances government spending, we offer a means to analyse the potential impact on human welfare.

The rest of the paper is organised as follows. Section 2 discusses the various routes through which aid can affect welfare (as an indicator of poverty), and presents our welfare indicators. The empirical approach is outlined in Section 3, with a description of the construction of the index of pro-poor expenditures. Section 4 reviews some estimation issues and discusses the econometric results. Section 5 concludes with observations on directions for future research.

2. AID AND POVERTY

It is plausible to argue that growth offers the potential for reducing poverty. A focus on factors that are conducive to growth may be the right direction to take even if the objective is to alleviate poverty rather than promote growth (Dollar and Kraay, 2001). The few existing studies of a direct relationship between aid flows and poverty have adopted a standard cross-country growth regression approach, and replaced growth with an indicator of poverty as the dependent variable (Boone, 1996; Kalwij and Verschoor, 2002; Mosley *et al*, 2002). However, as aid directly finances government expenditure, concentrating on public expenditures directed towards the poor offers a more explicit transmission mechanism for the effect of aid. Our approach extends the more recent studies in this way.

A large amount of aid support for government spending is intended to reduce poverty, or at least improve the welfare and living conditions of the poor, for example through the provision of public goods (such as health and education). Such aid can contribute to development (the welfare of people) even if it does not add to economic growth. This may be one reason why we observe an improvement in social indicators in most developing countries since the 1960s. For example, life expectancy at birth (a useful overall indicator) in developing countries increased from 54.5 years in 1970 (76% of the level in industrialised countries) to 64.4 in 1997 (83% of the level in industrialised countries). A similar improvement can be observed for infant mortality (data from UNDP, 1999: 171). Achievements have been least in the poorest countries; life expectancy in the least developed countries increased from 43.4 years in 1970 (61% of the level in industrialised countries) to 51.7 in 1997 (67%). Nevertheless, there has been progress, and aid may have been a contributory factor. To assess the effect of aid in this way, one needs to identify the government expenditures most likely to benefit the poor. The precise measure of pro-poor expenditures is elaborated in the next section. First, we consider some proxy measures of the welfare of the poor.

Welfare and Poverty Indicators

Research on poverty is impeded by the paucity of cross-country time series data on poverty. Most studies rely on monetary poverty measures, such as the headcount index - the percentage of the population living on less than $1 a day (corrected for purchasing power) or the percentage of the population that lies below the national poverty line. While claimed as internationally comparable, one can question how reliable these measures are (Reddy and Pogge, 2002). Would a person earning over a dollar per day be better off than someone who earns less but has free access to efficient health, education and other social services? Income indicates the possibilities open to a person but not the use the person makes of those possibilities – the 'quality' of life that people lead is what matters most, rather than the commodities or income they possess (Anand and Sen, 1992).

Non-monetary indicators of welfare, such as the infant mortality rate, may be as good as income poverty measures to capture the material hardship aspect of being poor (Reddy and Pogge, 2002). We use the infant mortality rate as an indicator of the welfare of the poor because data availability is good. The correlation between infant mortality and the $1 a day measure is 0.78 (for a sample of 57 countries in the World Bank Poverty Monitoring Database for which both measures are available), suggesting an overlap in informational value (infant mortality may be a correlate of poverty incidence).

An alternative measure of welfare is given by the human development index (HDI), an index (between 0 and 1) of measures of different dimensions of quality of life, notably longevity, education and access to resources (UNDP, 2002). Longevity as measured by life expectancy at birth is intended to capture the capability of leading a long and healthy life. An indicator of educational attainment (adult literacy before 1991, mean years of schooling for 199194 and enrolment ratios thereafter) is a proxy of the capability of acquiring knowledge, communicating and participating in community life. Real per capita GDP in purchasing power parity dollars represents access to resources needed for a decent standard of living. The inclusion of this monetary component suggests that the HDI will be inversely correlated with income measures of poverty (to the extent that poverty is lower in countries with higher real GDP). A general merit of HDI is that it is an aggregate measure of human welfare calculated on a consistent basis for a large sample of countries every five years for 1970-2000 (UNDP, 2002: 153-56).

3. EMPIRICAL APPROACH

We now proceed to formalise the framework within which we shall investigate how aid flows may reduce poverty levels. We posit a basic relationship (subscripts designating country *i* in period *t*):

$$P_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 G_{p_{it}} + \beta_3 A_{it} + \varepsilon_{it} \tag{1}$$

where P is a measure of poverty (an indicator of the welfare of the poor).
Y is a measure of income.
G_p is an indicator of pro-poor public expenditures (PPE).
A is a measure of aid.

As discussed, aid inflows influence poverty levels by determining the composition of public expenditures. Thus, we consider that pro-poor expenditures may be a function of aid flows as well as other sources of government revenue (G_r) and income.[1]

$$G_{p_{it}} = \alpha_0 + \alpha_1 Y_{it} + \alpha_2 A_{it} + \alpha_3 G_{r_{it}} + u_{it} \tag{2}$$

One way to approach the hypothesis that public spending channels aid to alleviate poverty is to estimate (1) and examine the coefficient on aid. However, (2) reveals the problem with this approach as aid is seen to influence PPE. Consequently, we use a constructed regressor ($\widetilde{G}_p$) rather than G_p, and estimate:

$$P_{it} = \beta_0 + \beta_1 Y_{it} + \beta_2 \widetilde{G}_{p_{it}} + \beta_3 A_{it} + \varepsilon_{it} \tag{3}$$

1 We abstract from concerns of fungibility and fiscal response (see McGillivray and Morrissey, 2001). For our purposes, it is immaterial whether aid finances PPE directly or releases other revenues to finance PPE.

where $\widetilde{G}_p$ represents pro-poor public expenditures that are *not* financed by aid (how this is calculated is explained below). There are a number of different categories of public spending recognised in the literature as being pro-poor (for a review see Verschoor, 2002), although our choice of variables is dependent on data availability. Even if the incidence of spending is regressive, spending on social sectors is more likely to benefit the poor than are other types of expenditure, while health and education services are most likely to contribute to welfare indicators. 'Greater public spending on primary and secondary education has a positive impact on widely used measures of education attainment, and increased health care spending reduces child and infant mortality rates' (Gupta *et al*, 2002: 732). We therefore include public expenditure on social services, defined to include sanitation and housing amenities, education and health (see Appendix A for details).

Constructing A Pro-Poor Public Expenditure Indicator (PPE)

For each category of public expenditure of interest (in addition to 'social' categories we also consider spending on agriculture and the military), we estimate a simple regression of each welfare indicator on initial income per capita (*GDP0*) and that government expenditure. As outlined above, two proxy measures of welfare are used – the HDI and infant mortality (IM). Note that what is of prime interest in constructing a PPE index is the percentage effect on the welfare indicator of a one-percent increase in the expenditure. Stated differently, we focus our analysis on estimating the elasticity of welfare (*P*) to each type of public expenditure (G_i) which is given by $\beta_2 = \frac{\partial \ln (P)}{\partial \ln (G_i)}$. We introduce welfare indicators and each expenditure category in logarithms. The larger the absolute size of this elasticity, the more responsive is welfare to the corresponding public expenditure. Table 1 presents the estimation results.

Table 1: Poverty Regressions to determine PPE weights

	Log (Human Development Index)	**Log (Infant Mortality Rate)**
GDPO	0.0001	-0.0003
	(4.41)**	(7.51)**
Log(Public expenditure on Sanitation Services/GDP)	0.055	-0.152
	(2.60)**	(1.98)*
R^2	0.60	0.69
Observations	65	65
GDPO	0.0001	-0.0003
	(7.75)**	(7.79)**
Log(Public expenditure on Education/GNP)	0.213	-0.174
	(3.39)**	(3.04)**
R^2	0.60	0.64
Observations	186	231
GDPO	0.0002	-0.0003
	(6.88)**	(6.23)**
Log(Public expenditure on Primary Education/GDP)	0.031	-0.117
	(0.69)	(1.49)
R^2	0.59	0.63
Observations	100	130
GDPO	0.0001	-0.0002
	(7.08)**	(7.04)**
Log(Public expenditure on Health /GDP)	0.179	-0.416
	(2.84)**	(4.28)**
R^2	0.58	0.78
Observations	145	145
GDPO	0.0001	-0.0003
	(3.10)**	(5.75)**
Log(Public expenditure on Primary Health /GDP)	0.036	-0.073
	(1.37)	(2.06)**
R^2	0.65	0.78
Observations	33	43
GDPO	0.0001	-0.0003
	(7.27)**	(7.35)**
Log(Public expenditure on Agriculture/GDP)	0.052	-0.009
	(1.60)	(0.17)
R^2	0.58	0.57
Observations	125	157
GDPO	0.0001	-0.0003
	(7.81)**	(10.46)**
Log(Public expenditure on Military/GDP)	0.047	0.019
	(1.13)	(0.34)
R^2	0.53	0.63
Observations	149	150

Notes: Regional Dummies used but not reported. The absolute values of White-heteroscedastic-consistent standard errors are given in parentheses.
Significance levels indicated by ** (at least 5%) and * (10% level).

The regressions perform rather well (note that an increase in welfare implies an increase in HDI but a reduction in IM). Higher income (*GDP0*) is consistently associated with higher welfare levels, irrespective of the indicator used. Expenditures on sanitation, education and health appear to have a significant favourable impact on welfare (although the elasticities are low). As one would expect, infant mortality rates, rather than HDI, are more responsive to public expenditure on sanitation and health (although they also appear responsive to education spending). In general, the coefficients on spending on primary education and primary health are not significant. There is no evidence that spending on agriculture or on the military (which might be expected to have a negative association with welfare) are significant, so these are not included in the index. In the light of these findings, we construct a pro-poor expenditure index (PPE) as follows:

$$PPE = P_s + P_e + P_h \qquad (4)$$

where P_s is public expenditure on sanitation and housing (share of GDP)
P_e is public expenditure on education (share of GNP)
P_h is public expenditure on health services (share of GDP)

This index has the merit of being constituted of only those expenditures that are statistically significant in Table 1. However, it tends to imply that the effect of public expenditure on welfare is uniform across the three expenditure components. This is a naïve assumption, and not supported by the evidence in Table 1, so we explore weighting systems. We are not claiming that these expenditures are targeted on the poor, rather that spending on these areas is more likely to benefit the poor, as it increases welfare levels for the country. Obviously, the extent to which particular expenditures benefit the poor will vary over time, across countries and by type of spending. Through weighting, we try to address variations in impact by type of spending, and can try to capture other sources of variation in the empirical analysis.

<u>Beta Coefficient weighted PPE</u>

Beta coefficients, which are unit-free, are a standard statistical method of assigning weights to each expenditure component according to their relative importance in increasing welfare. Beta weights are derived from a regression of each welfare indicator on sanitation, education and health expenditures to obtain two beta-weighted PPEs, PPE_{bh} and PPE_{bm}, where HDI and infant mortality are the respective dependent variables.[2]

$$PPE_{bh} = 0.1276\ P_s + 0.1084\ P_e + 0.2177\ P_h$$

$$PPE_{bm} = 0.1036\ P_s + 0.1569\ P_e + 0.2290\ P_h$$

First Principal Component Weighted PPE

An alternative 'reliable and valid' means of combining multiple indicators into a single index is principal component analysis (Putnam, 1993). This technique estimates the linear combination of correlated variables that maximises the joint variance of the components. In a sense, it extracts from a matrix of indicators the small number of variables that account for most of the variation in that matrix. The PPE_{PC} index generates the first principal component of the three categories of public expenditure (as with the unweighted *PPE*, the index is the same for HDI and IM). Table 2 shows the scoring coefficient of each component (its individual weight in the index), and the mean value of each component for the sample (of 39 countries for which data are available, see Appendix A). All three categories of spending receive high scoring coefficients, although expenditure on health is the most strongly associated with the PPE index (despite having the lowest mean value).

Table 2: Principal Component Weights for PPE_{PC}

Component	Scoring coefficients	Mean Value
Expenditure on Sanitation (share of GDP)	0.578	0.034
Expenditure on Education (share of GNP)	0.529	0.042
Expenditure on Health (share of GDP)	0.622	0.025

2 The beta coefficient of expenditure category *X* is obtained by multiplying the regression coefficient on *X* by the standard deviation of *X* and then dividing this product by the standard deviation of the dependent variable. The regressions from which the beta weights are recovered also include regional dummies (as in the main regressions below).

Having derived four PPE indices, the next step is to test whether aid is a determinant of the indices, i.e. whether aid influences the (pro-poor) allocation of spending. If PPE is the potential transmission mechanism through which aid inflows operate to influence the welfare of the poor, aid must be a determinant of PPE. This is tested by estimating (2) for a panel of 38 countries for which PPE can be calculated (in four five-year periods over 1980-97).[3] Total tax revenue as a share of GDP (*TR*) represent government revenue, period average GDP per capita (*GDPPC*) captures the income level of countries, and aid is measured as a percentage of GDP (see Appendix A for data sources and definitions).

The aim here is not to explain (cross-country variation in) PPE, but simply to test if aid is a significant determinant. A potential problem arises because most aid finances public spending, so we could anticipate a spurious correlation between the aid/GDP ratio and dependent variable that is an expenditure/GDP ratio. Although the dependent variable captures a pro-poor allocation of expenditure, which is not perfectly correlated with government spending, caution suggests the use of lagged aid (previous period in the panel) to avoid concerns regarding endogeneity given that at least some aid is targeted on social sector expenditures. Although tax revenue obviously influences the level of expenditure, we are testing if, *ceteris paribus*, countries with greater tax revenue (and higher income) allocate a greater share of expenditure to social sectors.

Table 3: Pro-Poor Public Expenditure (PPE) regressions

	PPE	PPE_{hb}	PPE_{mb}	PPE_{PC}
AID_{t-1}	0.158	0.023	0.022	0.092
	(2.59)**	(2.90)***	(2.69)***	(2.66)***
TR	0.564	0.078	0.073	0.326
	(8.94)***	(8.92)***	(8.62)***	(8.96)***
GDPPC	0.055	0.009	0.009	0.032
	(3.39)***	(3.55)***	(3.81)***	(3.39)***
Constant	-0.030	-0.004	-0.001	-0.019
	(2.18)**	(1.96)*	(0.57)	(2.32)**
Observations (N)	83	83	83	83
Adjusted R^2	0.83	0.83	0.82	0.83

Notes: Regional Dummies used but not reported. The absolute values of White-heteroscedastic-consistent standard errors are given in parentheses; *, **, and *** indicate significance at 10%, 5% and 1% levels respectively. We also ran regressions with initial GDP (value in final year of previous period); the coefficients on this variable were mostly insignificant and the significance levels on aid coefficients were lower; other estimates were not significantly affected.

In general the regressions perform well. All explanatory variables enter with the expected sign and have high t-ratios. Irrespective of the PPE index used, tax revenue, income per capita and aid flows are significant determinants of the index of pro-poor expenditure. Specifically, for our purposes, aid is shown to be a significant determinant of all PPE indices; *ceteris paribus*, higher aid receipts are associated with more pro-poor spending. Note that whilst one might argue that higher total expenditure requires increased tax revenue (implying endogeneity), this need not be the case in respect of PPE. For a given level of tax revenue, the share allocated to PPE may vary for many reasons (not least the belief by the government that aid is available to finance PPE).

4. ESTIMATION AND RESULTS

Our data set covers a panel of four four-year and one three-year period averages over 1980 to 1998 for 38 countries (see Appendix A). The PPE indices are measured as detailed above. We also include government spending on military expenditure as a fraction of GDP (G_m); the expected sign is unclear. If it captures spending diverted from productive or pro-poor uses, and is associated with high instability in the country, we would expect a negative sign. However, it can enter positively if such spending

3 Although we had PPE values for Estonia, it is dropped from the sample as data on other variables are missing).

represents efforts to achieve or maintain security. Income, which is an important argument in poverty reduction, is measured by real GDP per capita (in constant dollars) in the year preceding the period (*GDP0*). We express total aid flows as a share of GNP (*Aid*).

We do not incorporate any other macroeconomic policies like openness and inflation because these indicators are of more direct relevance when growth rather than poverty alleviation is the objective of interest, and we want to preserve degrees of freedom. Any impact they might have on poverty would be through growth performance and this is already represented by (initial period) income per capita. Country specific characteristics are of importance in explaining variations in the level of poverty. In this respect, we include three regional dummies - Sub-Saharan Africa (SSA), Latin America and Caribbean (LAC) and Asia (North African and transition economies are the omitted category).

Endogeneity concerns arise with regard to the aid variable, as one expects that more aid resources are allocated to poorer countries. Following Hansen and Tarp (2001), we therefore include one-period lagged aid levels (on the basis that lagged aid is predetermined with respect to current poverty levels). The Breusch and Pagan (1980) Lagrange Multiplier test suggests that OLS estimates would be biased so we estimate a random effect specification, which is favoured over the alternative of fixed effects estimation (details in Appendix B).

We estimate the following model (all variables except *GDP0* in logs, regional dummies included but not specified):

$$P_{it} = \delta_0 + \delta_1 GDP0 + \delta_2 PPE_{it} + \delta_3 G_{m,it} + \delta_4 A_{it-1} + \varepsilon_{it} \tag{5}$$

The various measures of pro-poor public expenditure will be used in turn, for each of the two measures of welfare (HDI and IM). As argued above, this specification is misleading as aid potentially appears in the PPE index, since some such expenditures are financed by aid (as shown in Table 3). It follows that the potential indirect effect of aid is captured by *PPE*. To take account of this effect, we estimate the welfare regressions using *PPEres* ($\widetilde{G}_p$) rather than PPE, that is, we include only that fraction of public expenditures that is not explained by aid. The variable *PPEres* ($\widetilde{G}_p$) is generated from the residuals of a regression of each PPE index on lagged aid. This process affects only the coefficient on the aid variable; all other coefficient estimates and diagnostics are unaffected. This can easily be demonstrated in general terms. Suppose the initial regression is:

$$y = \beta_1 X + \beta_2 A + \beta_Z' z + U \qquad \text{(a)}$$

where z is the vector of other variables, *A* is aid and *X* is the variable affected by aid. Substituting $X = \kappa_1 + \kappa_2 A$ (where κ_1 is the component unexplained by aid):

$$g = \beta_1 (X - \kappa_2 A) + \beta_1 (\kappa_2 A) + \beta_2 A + \beta_Z' z + U \qquad \text{(b)}$$

or

$$g = \beta_1 \kappa_1 + (\beta_1 \kappa_2 + \beta_2) A + \beta_Z' z + U \qquad \text{(c)}$$

Thus, it is clear that only the coefficient on the aid variable is altered. Tables 4 and 5 present the results (the coefficient on aid when *PPE* is used rather than *PPEres* is given in the row 'Aid with PPE'). Consider first the influences on variations in HDI. The specification using PPE_{bh} (measured as a residual) performs best, in the sense that the coefficients on *PPEres* and *Aid* are significant, the constant is insignificant, and the explanatory power is slightly greater (column 2 in table 4). In the specifications using the unweighted *PPE* and PPE_{FC}, the coefficients on *PPEres* and *Aid* are not significant, implying that our results are sensitive to the measure of PPE (i.e. not robust). The coefficient on SSA is negative and significant, confirming that the frequently observed result that SSA countries perform especially badly in terms of growth and poverty applies also to HDI. The coefficient on military expenditure is insignificant in all regressions (although negative and consistently estimated). Note that in the specification for PPE_{bh} with *PPE* rather than *PPEres* the coefficients on *Aid* is not significant. Overall, the results suggest that HDI is higher in countries with higher income and in countries with higher PPE values. Aid contributes to higher HDI only because it contributes to PPE, i.e. aid allocated to social sectors tends to increase human development.

Table 4: HDI Regressions with Aid and PPE

Dependent variable Log(HDI)			
	RANDOM EFFECT ESTIMATES		
	Unweighted Index	Beta weight	FPC weight
GDPO	0.0001	0.0001	0.0001
	(2.41)**	(1.98)**	(2.46)**
PPEres	0.072	0.148	0.065
	(1.35)	(2.30)**	(1.28)
Aid_{t-1}	0.037	0.127	0.042
	(1.02)	(2.17)**	(1.08)
G_M	-0.072	-0.070	-0.072
	(1.40)	(1.41)	(1.39)
SSA	-0.400	-0.375	-0.399
	(3.16)***	(3.09)***	(3.15)***
ASIA	-0.078	-0.004	-0.082
	(0.62)	(0.03)	(0.66)
LAC	0.003	0.020	0.001
	(0.03)	(0.19)	(0.01)
Constant	-0.742	-0.287	-0.719
	(3.16)***	(0.88)	(2.93)***
Aid with PPE	-0.004	-0.015	-0.003
	(0.11)	(0.49)	(0.09)
N	81	81	81
R-squared	0.57	0.60	0.57
Wald χ^2_k	66.66	76.33	66.75

Notes: All variables measured in logs except for *GDP0*; FPC is first principal component. Absolute values of t-ratios in parentheses; *, **, and *** indicate significance at 10%, 5% and 1% levels respectively. 'Aid with PPE' gives the coefficient on aid when *PPE* rather than *PPEres* is used (other coefficient estimates are unaffected). Explanatory power for random effect estimates reported by R^2 rather than adjusted R^2. The Wald chi-squared statistic tests the joint significance of all coefficients (rejects the null that all coefficients are jointly zero).

Table 5: Infant Mortality Regressions with Aid and PPE

Dependent variable Log(IM)

	RANDOM EFFECT ESTIMATES		
	Unweighted Index	Beta weight	FPC weight
GDPO	-0.0002	-0.0002	-0.0002
	(5.68)***	(5.12)***	(5.79)***
PPEres	-0.198	-0.305	-0.186
	(3.18)***	(3.91)***	(3.14)***
Aid_{t-1}	-0.080	-0.239	-0.099
	(2.03)**	(3.46)***	(2.23)**
G_M	0.117	0.111	0.119
	(2.48)**	(2.34)**	(2.51)**
SSA	0.840	0.801	0.840
	(3.68)***	(3.81)***	(3.68)***
ASIA	0.207	0.181	0.212
	(0.88)	(0.85)	(0.90)
LAC	0.412	0.396	0.417
	(1.94)*	(2.04)**	(1.96)**
Constant	3.746	2.958	3.670
	(13.09)***	(7.60)***	(12.32)***
Aid with PPE	0.031	0.042	0.029
	(1.06)	(1.43)	(1.00)
N	80	80	80
R-squared	0.63	0.68	0.62
Wald χ^2_k	115.60	130.67	115.02

Notes: As for Table 4.

The results for infant mortality are consistently stronger; all variables are significant with the expected sign for all three PPE indices, using *PPEres* (Table 5). The specification using PPE_{bm} performs best, albeit only marginally so. We also find robust evidence that military spending is associated with higher levels of infant mortality, suggesting that the variable captures an effect of insecurity or conflict. Again, the coefficient on SSA is positive and significant, although in the case of infant mortality we also find that the LAC dummy is significant. Note that in the specifications with *PPE* rather than *PPEres* the coefficients on *Aid* are not significant. The results are quite robust in showing that infant mortality is lower in countries with higher income and in countries with higher

PPE values. Allowing for this, infant mortality is higher in SSA and LAC. Aid contributes to lower infant mortality only because it contributes to PPE, i.e. aid allocated to social sectors tends to improve this health indicator of welfare.

We can make some attempt to consider if these results are driven by the sample or the PPE weighting procedure, as we have data on spending on social sectors (*SSGDP*, equivalent to unweighted *PPE*) for a larger sample. Table A3 (Appendix A) compares the results for *PPE* to those for the larger sample using *SSGDP*. The results are broadly similar, and support the argument that the effect of aid on welfare is via public spending (the coefficient on *Aid* is only significant when a generated regressor is used). However, in the case of HDI, the coefficients on PPE and aid are significant for the *SSGDP* sample, suggesting that the significance in Table 4 is not simply due to beta-weighting. On the other hand, in the IM regressions, the coefficient on military spending is not significant for the *SSGDP* sample, implying that the significance in Table 5 is due to the sample.

There is no strong reason to favour one PPE index over another, and indeed the indices are highly correlated (all correlation ratios are at least 0.98), although the weighted indices are preferred. We can also note that there is no strong reason to favour HDI or infant mortality as indicators of the welfare of the poor. There are six alternative tests of the effect of PPE (using *PPEres*) and aid on welfare in Tables 4 and 5. In four cases (66%) we find significant evidence that higher PPE and aid are associated with higher welfare. As it is difficult to explain variations in cross-country indicators of the welfare, and there will be country variations in the effectiveness of PPE and of aid in financing PPE, these results are encouraging.

5. CONCLUSIONS

Our objective is to test the hypothesis that aid flows have an indirect effect on poverty levels. To proxy for poverty levels across countries, two indicators of welfare are considered – the Human Development Index (HDI) and infant mortality (IM). The transmission channel proposed is that aid finances pro-poor public expenditures, either directly or indirectly (by releasing other revenues to be used for such purposes), and these expenditures increase welfare, which benefits the poor. We identify public expenditure on social services (sanitation, education and health) as the relevant expenditures, based on their significance in welfare regressions. These measures are combined into four alternative PPE indices. The unweighted and principal component weighted PPE are the same for HDI and IM, while there are separate beta weighted indices for each of HDI and IM. As part, if not all, of the effect of aid is via PPE, we allow for this by calculating a generated regressor, *PPEres*, that separates the effects of aid and PPE (for each index) not financed by aid (strictly, the residual PPE index value is PPE not estimated as directly financed by aid).

Estimation is based on a pooled panel of 38 countries over the period 1980 to 1998, using a random effects method. We obtain results in support of our hypothesis: there is considerable evidence that higher PPE improves welfare indicators, and that aid contributes to welfare by financing such expenditures (indeed, *only* by financing such expenditures). We also found the standard results that the welfare is higher in countries with higher initial GDP, and that welfare is lower in SSA (and LAC using the infant mortality measure), *ceteris paribus*. Military spending is associated with higher levels of infant mortality (but had no significant effect on HDI), suggesting that the variable captures an effect of insecurity or conflict in reducing health status, but this is only true for a restricted sample.

The results suggest that the composition of public spending may hold the key to increasing levels of human welfare, thereby alleviating poverty. Attempts to increase the targeting of expenditure in areas that are more likely to benefit the poor could yield a high pay-off. Our primary objective was to offer a method to assess the potential impact of aid on the welfare of the poor. Our conclusion is that the use of aid to guide or influence the allocation of government spending offers a way to increase the leverage of aid on poverty reduction. Increasingly, aid is being used in the way we consider, to support public spending as part of a Poverty Reduction Strategy for example. While research is needed to understand how to improve the effectiveness of public spending in targeting the poor, our results show that in general sanitation, health and education spending have been associated with enhancing welfare. Through supporting such spending, aid can benefit the poor, independent of any effect of aid on growth.

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APPENDIX A: Data and Sources

We began with a data set for 57 low- and middle-income countries for the period 1980-1998 from the World Bank Poverty Monitoring Database. Period averages of data were computed for: 1980-1983 (period 1), 1984-1987 (2), 1988-1991 (3), 1992-1995 (4) and 1996-1998 (5). Restrictions on availability of PPE data restricted the final sample to 39 countries (from which Estonia was dropped for lack of other data). We here present the list of countries included in our data set, variable definitions and sources, and summary statistics. First we briefly discuss data availability for public spending on sectors that benefit the poor disproportionately.

Our original intention had been to include spending on those sectors that in the basic needs literature and among development practitioners have the reputation of being pro-poor. These include education (especially primary), health care (especially primary health care), water and sanitation, agricultural research and extension, and rural roads (see Verschoor, 2002). Data for all of these spending categories are not available on a sufficiently comprehensive scale. As a rule, the more disaggregated the expenditure item, the less readily information about it can be obtained. Spending data for education (including primary) and health care (including primary) can be found in UNESCO statistical yearbooks, and IMF Government Finance Statistics (GFS) yearbooks, respectively. For spending on other pro-poor sectors, we have had to use proxies. Water and sanitation is included in the World Development Report's data on spending on 'social services', but this is a very broad category including health and education. Specific data on spending on agricultural research and extension, and rural roads, are unavailable so we proxy with spending on the agriculture sector as a whole. We also include spending on the military.

PPE values

The unweighted PPE index is in effect equal to the World Development Report's category of 'social services' (*SSGDP*), which includes housing, water and sanitation (P_s), health (P_h) and education (P_e). This variable is available for a larger sample than the health and education sub-components, and thus for a larger sample than (unweighted) *PPE*. To derive weights we define $P_s = SSGDP - (P_h + P_e)$. The weighted PPE indices are averages of each of these three components, with weights determined by their relative importance for welfare, as described in the paper. The (unweighted) *PPE* used in the study applies to the sample for which weighted PPE can be calculated (see Table A2).

Country list by region (for 39 country sample)

Sub-Saharan Africa (SSA): Botswana, Cote d'Ivoire, Ethiopia (includes Eritrea), Ghana, Kenya, Lesotho, Madagascar, Zambia, Zimbabwe.

Middle East and North Africa: Jordan, Morocco, Tunisia.

Asia: China, India, Indonesia, Malaysia, Nepal, Pakistan, Philippines, Sri Lanka, Thailand.

Central and South America (LAC): Bolivia, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Ecuador, Mexico, Nicaragua, Panama, Peru, Venezuela.

Transition Economies: Bulgaria, Czech Republic, Estonia, Hungary, Poland, Romania.

Variable definitions and sources

HDI	The Human Development Index measures a country's achievements in three aspects of human development: longevity, knowledge, and a decent standard of living. Source: UNDP (2002: 153-56) for 1980, 1985, 1990, 1995 and 2000.
IM	Infant mortality rate; the number of infants who die before reaching one year of age, per 1,000 live births in a given year. Source: WDI CD-ROM (2000)
edugnp	Public expenditure on education (share of GDP). Source: Unesco Statistical Yearbook, various years
predgnp	Public expenditure on primary education (share of GDP). Source: Unesco Statistical Yearbook, various years
healgdp	Public expenditure on health (share of GDP) Source: WDI CD-ROM (2000)
prhealgdp	Public expenditure on primary health (share of GDP) Source: IMF GFS Yearbook, various years
SSGDP	Public expenditure on 'social services' includes housing, water and sanitation, education and health (share of GDP), and is therefore equivalent to the unweighted PPE (but available for a larger sample). Source: World Development Report, various years
agrgdp	Public expenditure on agriculture (share of GDP) Source: IMF GFS Yearbook, various years
milgdp	Public expenditure on the military (share of GDP) Source: WDI CD-ROM (2000)
GDP0	Real GDP per capita (PPP in current international $US) Source: WDI CD-ROM (2000)
Aid	Aid (expressed as a share of GDP) Source: WDI CD-ROM (2000)
TR	Tax revenue (expressed as a share of GDP) Source: WDI CD-ROM (2000)

Table A1. Summary Statistics

Variable	N	Mean	Std. Dev.	Min	Max
HDI	219	0.587	0.2149	0.045	0.944
IM	284	59.682	37.5211	5.700	181
edugnp	246	0.043	0.0187	0.008	0.106
predgdp	133	0.016	0.0081	0.00001	0.040
healgdp	158	0.025	0.0149	0.002	0.073
prhealgdp	44	0.002	0.0026	0.000003	0.011
SSGDP	157	0.094	0.0758	0.002	0.745
agrgdp	161	0.017	0.0144	0.001	0.088
milgdp	153	0.032	0.0276	0.005	0.156
GDP0	262	2290	1562	299	8092
Aid	255	0.060	0.077	-0.002	0.463
TR	201	0.182	0.086	0.038	0.475
PPE	85	0.101	0.063	0.002	0.272
PPE_{bh}	85	0.014	0.009	0.002	0.037
PPE_{bm}	85	0.016	0.009	0.004	0.038
PPE_{pc}	85	0.058	0.036	0.001	0.156

Note: All data refer to period averages except *GDP0* (initial value).

Table A2. Values of Alternative PPE Indices

Country	Period	*SSGDP*	*PPE*	PPE_{bh}	PPE_{bm}	PPE_{pc}
Bangladesh	1	0.0149				
Bangladesh	2	0.0190				
Bolivia	2	0.0252				
Bolivia	3	0.0646	0.0646	0.0085	0.0091	0.0365
Bolivia	4	0.0896	0.0896	0.0115	0.0137	0.0496
Bolivia	5	0.1079	0.1079	0.0138	0.0151	0.0604
Botswana	1	0.0960				
Botswana	2	0.1003				
Botswana	3	0.1190	0.1190	0.0154	0.0183	0.0660
Botswana	4	0.1384	0.1384	0.0180	0.0212	0.0770
Brazil	1	0.0896				
Brazil	2	0.1014				
Brazil	3	0.1075	0.1075	0.0151	0.0165	0.0610
Brazil	4	0.13398	0.13398	0.0184	0.0184	0.0767
Bulgaria	3	0.1536	0.1536	0.0223	0.0241	0.0878
Bulgaria	4	0.1494	0.1494	0.0221	0.0237	0.0858
Bulgaria	5	0.1379	0.1379	0.0199	0.0200	0.0796
Chile	1	0.1880				
Chile	2	0.1724				
Chile	3	0.1234	0.1234	0.0171	0.0169	0.0708
Chile	4	0.1352	0.1352	0.0189	0.0186	0.0778
Chile	5	0.1436	0.1436	0.0199	0.0198	0.0823
China	3	0.0025	0.0025	0.0018	0.0041	0.0012
China	4	0.0025	0.0025	0.0017	0.0039	0.0012
China	5	0.0019	0.0019	0.0015	0.0038	0.0007
Colombia	1	0.0506				
Colombia	3	0.0319	0.0319	0.0045	0.0059	0.0175
Colombia	4	0.0471	0.0471	0.0073	0.0093	0.0264
Colombia	5	0.0723	0.0723	0.0125	0.0154	0.0417
Costa Rica	1	0.1405				
Costa Rica	2	0.1526				
Costa Rica	3	0.1489	0.1489	0.0247	0.0270	0.0870
Costa Rica	4	0.1716	0.1716	0.0271	0.0287	0.0999
Costa Rica	5	0.1796	0.1796	0.0279	0.0299	0.1041
Cote d'Ivoire	2	0.0695				
Cote d'Ivoire	3	0.0930				
Cote d'Ivoire	4	0.1742	0.1742	0.0223	0.0235	0.0980
Czech Rep.	4	0.2209	0.2209	0.0329	0.0337	0.1278
Czech Rep.	5	0.2263	0.2263	0.0337	0.0343	0.1311
Dominican Rep.	1	0.0578				
Dominican Rep.	2	0.0487				
Dominican Rep.	3	0.0504				
Dominican Rep.	4	0.0872	0.0872	0.0123	0.0121	0.0503
Dominican Rep.	5	0.0671	0.0671	0.0096	0.0101	0.0384
Ecuador	1	0.0566				
Ecuador	2	0.0527				
Ecuador	3	0.0471	0.0471	0.0068	0.0082	0.0264
Ecuador	4	0.0514	0.0514	0.0078	0.0096	0.0291
Ethiopia	3	0.0624	0.0624	0.0080	0.0092	0.0348
Ghana	1	0.0339				

Ghana	2	0.0517				
Ghana	3	0.0633	0.0633	0.0086	0.0099	0.0355
Ghana	4	0.0817	0.0817	0.0109	0.0127	0.0456
Guatemala	1	0.0427				
Hungary	2	0.1761				
Hungary	3	0.2182				
Hungary	4	0.2568	0.2568	0.0364	0.0367	0.1476
Hungary	5	0.1936	0.1936	0.0277	0.0280	0.1115
India	1	0.0096				
India	2	0.0154				
India	3	0.0156	0.0156	0.0023	0.0051	0.0076
India	4	0.01517	0.01517	0.0019	0.0043	0.0073
India	5	0.0144				
Indonesia	1	0.0269				
Indonesia	2	0.0288				
Indonesia	3	0.0241	0.0241	0.0034	0.0038	0.0137
Indonesia	4	0.0444	0.0444	0.0060	0.0062	0.0252
Indonesia	5	0.0564	0.0564	0.0075	0.0074	0.0322
Jordan	1	0.1034				
Jordan	2	0.0946				
Jordan	3	0.1225	0.1225	0.0175	0.0210	0.0689
Jordan	4	0.1241	0.1241	0.0173	0.0212	0.0692
Jordan	5	0.1487				
Kenya	1	0.0759				
Kenya	2	0.0741				
Kenya	3	0.0843	0.0843	0.0110	0.0144	0.0461
Kenya	4	0.0745	0.0745	0.0101	0.0140	0.0406
Kenya	5	0.0786				
Lesotho	1	0.1291				
Lesotho	2	0.1643				
Lesotho	3	0.2030	0.2030	0.0280	0.0274	0.1166
Lesotho	4	0.2168	0.2168	0.0290	0.0305	0.1239
Madagascar	3	0.0371				
Madagascar	4	0.0538	0.0538	0.0074	0.0082	0.0305
Madagascar	5	0.0392	0.0392	0.0057	0.0066	0.0222
Malaysia	1	0.1020				
Malaysia	3	0.1072	0.1072	0.0140	0.0161	0.0598
Malaysia	4	0.1014	0.1014	0.0132	0.0150	0.0566
Malaysia	5	0.0877	0.0877	0.0114	0.0134	0.0487
Mexico	1	0.0668				
Mexico	2	0.0612				
Mexico	3	0.0477	0.0477	0.0074	0.0096	0.0268
Mexico	4	0.0731	0.0731	0.0108	0.0134	0.0410
Mexico	5	0.0793				
Morocco	1	0.0943				
Morocco	2	0.0798				
Morocco	3	0.0793	0.0793	0.0098	0.0122	0.0434
Morocco	4	0.0844	0.0844	0.0111	0.0139	0.0466
Nepal	1	0.0285				
Nepal	2	0.0414				
Nepal	3	0.0390	0.0390	0.0051	0.0061	0.0217
Nepal	4	0.0377	0.0377	0.0047	0.0063	0.0205
Nepal	5	0.0471	0.0471	0.0062	0.0078	0.0260
Nicaragua	1	0.1165				
Nicaragua	3	0.1303	0.1303	0.0180	0.0184	0.0745

Nicaragua	4	0.1623	0.1623	0.0237	0.0240	0.0937
Niger	1	0.0462				
Nigeria	2	0.0122				
Pakistan	1	0.0201				
Pakistan	2	0.0299				
Pakistan	3	0.0213	0.0213	0.0031	0.0049	0.0114
Pakistan	4	0.0126	0.0126	0.0019	0.0039	0.0063
Panama	1	0.1187				
Panama	2	0.1241				
Panama	3	0.1443	0.1443	0.0218	0.0238	0.0830
Panama	4	0.1661	0.1661	0.0246	0.0260	0.0956
Panama	5	0.1820	0.1820	0.0273	0.0288	0.1051
Peru	1	0.0452				
Peru	4	0.0216	0.0216	0.0042	0.0066	0.0120
Philippines	1	0.0351				
Philippines	2	0.0382				
Philippines	3	0.0421	0.0421	0.0061	0.0076	0.0235
Philippines	4	0.0449	0.0449	0.0065	0.0078	0.0253
Philippines	5	0.0496	0.0496	0.0071	0.0089	0.0277
Poland	5	0.2724	0.2724	0.0373	0.0377	0.1557
Romania	1	0.0800				
Romania	2	0.1019				
Romania	3	0.1578	0.1578	0.0223	0.0217	0.0911
Romania	4	0.1593	0.1593	0.0227	0.0224	0.0919
Romania	5	0.1531	0.1531	0.0214	0.0214	0.0879
Senegal	1	0.0825				
Sri Lanka	1	0.0814				
Sri Lanka	2	0.0747				
Sri Lanka	3	0.0866	0.0866	0.0118	0.0123	0.0492
Sri Lanka	4	0.1056	0.1056	0.0142	0.0145	0.0601
Sri Lanka	5	0.0846	0.0846	0.0114	0.0124	0.0478
Thailand	1	0.0574				
Thailand	2	0.0570				
Thailand	3	0.0455	0.0455	0.0060	0.0077	0.0250
Thailand	4	0.0649	0.0649	0.0086	0.0103	0.0361
Thailand	5	0.0698	0.0698	0.0093	0.0117	0.0386
Tunisia	1	0.1135				
Tunisia	2	0.1267				
Tunisia	3	0.1425	0.1425	0.0197	0.0218	0.0806
Tunisia	4	0.1389	0.1389	0.0192	0.0216	0.0784
Tunisia	5	0.1543				
Uganda	1	0.0171				
Uganda	2	0.0201				
Venezuela	1	0.0755				
Venezuela	2	0.0847				
Venezuela	3	0.0896	0.0896	0.0128	0.0145	0.0508
Zambia	1	0.0785				
Zambia	2	0.0779				
Zambia	3	0.0425	0.0425	0.0067	0.0084	0.0240
Zimbabwe	1	0.0878				
Zimbabwe	2	0.0965				
Zimbabwe	3	0.0984	0.0984	0.0127	0.0159	0.0541

In the paper, to facilitate comparison, we used *PPE*, the unweighted index restricted to the sample for which weighted indices could be calculated. Table A3 compares the results for *PPE* to those for the larger sample using *SSGDP*. The results are broadly similar, notably that the coefficient on *Aid* is only significant when a generated regressor is used and the results are 'stronger' for infant mortality. Two differences deserve comment. In the case of HDI, the coefficients on *PPEres* (strictly, *SSGDPres*) and *Aid* (weakly) are significant for the *SSGDP* sample, but insignificant for the *PPE* sample. This adds support to the argument of the paper as the significance in Table 4 is not simply due to beta-weighting. On the other hand, in the IM regressions, the coefficient on military spending is not significant for the *SSGDP* sample, implying that the significance in Table 5 is due to the sample.

Table A3: Welfare Regressions with SSGDP and PPE Samples

	Log(HDI)		Log (IM)	
	SSGDP	*PPE*	*SSGDP*	*PPE*
GDPO	0.0001	0.0001	-0.0002	-0.0002
	(2.54)**	(2.41)**	(5.61)***	(5.68)***
PPEres	0.110	0.072	-0.234	-0.198
	(2.27)**	(1.35)	(3.91)***	(3.18)***
Aid_{t-1}	0.057	0.037	-0.109	-0.080
	(1.81)*	(1.02)	(2.68)**	(2.03)**
G_M	-0.067	-0.072	0.055	0.117
	(1.43)	(1.40)	(1.11)	(2.48)**
Constant	-0.643	-0.742	3.526	3.746
	(2.94)***	(3.16)***	(12.21)***	(13.09)***
Aid with PPE	-0.006	-0.004	0.026	0.031
	(0.23)	(0.11)	(0.89)	(1.06)
N	113	81	112	80
R-squared	0.58	0.57	0.62	0.63
Wald χ^2_k	79.29	66.66	122.04	115.60

Notes: All variables measured in logs except for *GDP0*. Random Effects estimates including regional dummies; absolute values of t-ratios in parentheses; *, **, and *** indicate significance at 10%, 5% and 1% levels respectively. 'Aid with PPE' gives the coefficient on aid when *PPE* rather than *PPEres* is used, similarly for *SSGDP* (other coefficient estimates are unaffected). Explanatory power for random effect estimates reported by R^2 rather than adjusted R^2. The Wald chi-squared statistic tests the joint significance of all coefficients (rejects the null that all coefficients are jointly zero).

APPENDIX B: Econometric Details and Tests

Table B1 (below) reports the OLS welfare regressions. The Breusch Pagan (1980) Lagrange Multiplier tests the null hypothesis that the country-specific disturbance term (v_i) is always zero. Acceptance of the null implies the absence of omitted fixed effects, and OLS is appropriate. We take the 1% critical value from the chi-squared distribution with one degree of freedom (equal to 6.63). In all regressions, the test statistic rejects the null implying the inappropriateness of OLS (in one case the test very marginally accepts, but we treat this a rejection for consistency). One must then decide whether fixed or random effects methods are most appropriate.

Hausman(1978) tests the validity of random-effects estimator based on the difference between random and fixed effect estimators. Under the null, there is no correlation between the country-specific disturbance (v_i) and the regressors. Both random effect and fixed effect estimates would be consistent although the former would be more efficient (hence preferable). If this hypothesis does not hold, then a random effect model would produce biased estimates whilst a fixed effect model (which eliminates country-specific effects through data transformation) would still give consistent estimates. In other words, the coefficient estimates across these two models will be systematically different. The 1% critical value with 4 degrees of freedom is equal to 13.28. The Hausman test statistic falls in the acceptance region for all six regressions. Hence, we report random effect estimators to analyse effects of aid on welfare indicators. Although not reported in Table B1, comparable results were obtained for the *SSGDP* sample.

Table B1: OLS Poverty Regressions

	Log(HDI) regressions		
	Unweighted Index	Beta weight	FPC weights
GDPO	0.0001	0.0001	0.0001
	(3.53)***	(3.23)***	(3.52)***
PPE	0.052	0.149	0.049
	(1.25)	(3.41)***	(1.22)
AID_{t-1}	-0.028	-0.045	-0.028
	(1.09)	(1.86)*	(1.09)
G_m	-0.024	-0.026	-0.024
	(0.37)	(0.42)	(0.37)
Constant	-0.749	-0.250	-0.725
	(3.60)***	(1.09)	(3.34)***
Observations	81	81	81
R-squared	0.59	0.62	0.59
Wald-Stat	12.94	13.99	12.94
Breusch-Pagan χ^2_k	8.46	6.60	8.37
Hausman χ^2_k	5.19	4.54	4.94

	Log(IM) regressions		
	Unweighted Index	Beta weight	FPC weights
GDPO	-0.0002	-0.0002	-0.0002
	(3.98)***	(2.98)***	(3.98)***
PPE	-0.254	-0.694	-0.240
	(1.93)*	(5.20)***	(1.87)*
AID_{t-1}	0.043	0.081	0.042
	(0.71)	(1.53)	(0.69)
G_m	0.004	0.022	0.003
	(0.06)	(0.32)	(0.04)
Constant	3.544	1.331	3.433
	(7.96)***	(2.11)**	(6.91)***
Observations	80	80	80
R-squared	0.66	0.74	0.66
Wald-Stat	33.38	36.33	33.37
Breusch-Pagan χ^2_k	44.90	38.29	44.86
Hausman χ^2_k	1.92	10.41	1.96

Notes: All variables in logs except *GDP0*. Regional dummies included in all OLS regressions. Absolute values of White-heteroscedastic-consistent standard errors are given in parentheses. The critical value for the Breusch-pagan test is 6.63, and we treat the one very marginal case (6.60) as also being a rejection.

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