Poverty Efficient Aid Allocations – Collier/Dollar Revisited

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Contents

Figures

Tables

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Acronyms

CPIA	Country Policy and Institutional Assessment
GDP	Gross Domestic Product
ODA	Official Development Assistance
IDA	International Development Association
ME	Marginal Efficiency
AfDF	African Development Fund
OLS	Ordinary Least Squares
TSLS	Two Stage Least Squares
EAP	East Asia and the Pacific
SSA	Sub-Saharan Africa
MDG	Millennium Development Goal
WDI	World Development Indicators
PPP	Purchasing Power Parity
IDB	Inter-American Development Bank
DAC	Development Advisory Committee
PWT	Penn World Tables
EDA	Effective Development Assistance
OECD	Organisation of Economic Cooperation and Development
LAC	Latin America and the Caribbean
IFS	International Financial Statistics
SA	South Asia
MENA	Middle East and North Africa
ECA	Europe and Central Asia
EC	European Commission
OA	Official Aid

Executive Summary

Recent World Bank research has sparked a major debate about aid effectiveness and its implications for aid allocations. The main focus of attention has been the importance of good policy as a determinant of aid effectiveness and criterion for aid allocations. This paper briefly recaps the main arguments and evidence generated by Burnside/Collier/Dollar and their critics. It then focuses on the Collier/Dollar aid allocation models, subjecting them to a wider range of sensitivity tests to assess the robustness of their results. Finally, it analyses the relative efficiency of aid allocations over time and between donors.

Aid and growth regressions

The challenges levelled at the underlying Burnside/Dollar aid-growth model are now well known, the main areas of dispute being the appropriate functional form, the identification and treatment of outliers, the choice of instruments and the method of estimation. Other analysts have found a significantly positive impact of aid on growth without recourse to an aid*policy interaction term.

The Collier/Dollar analysis, which uses the CPIA as a broader measure of the policy environment, largely confirms the Burnside/Dollar results, but finds that the overall of impact of aid is higher and its sensitivity to policy more muted: an extra one percentage point's worth of aid (as % of PPP$ GDP) would on average increase the rate of economic growth by about 0.6 percentage points in countries with good policies, 0.4% in countries with average policies, and 0.2% in countries with poor policies. Other, microeconomic evidence confirms the view that policies matter for aid effectiveness, and the simple policy message of the World Bank research – allocate more aid to poor countries pursuing good policies – has proved highly attractive and influential.

More recent research has found a range of other variables to interact significantly with aid: for example, economic vulnerability (Chauvet and Guillaumont), the actual occurrence of external shocks (Collier and Dehn), recovery from conflict (Collier and Hoeffler), and geographical factors (Dalgaard et al.). These issues, together with the extent to which aid can in fact influence the policy environment, would all affect the simple policy conclusions of the original WB research and demand further analysis. However, many donors are already responding to the earlier message by making aid allocations more performance-related.

Robustness of the Collier/Dollar aid allocation models

Earlier analysis of the Collier/Dollar aid allocation models demonstrated that poverty and per capita income criteria are actually more important than policy criteria as determinants of poverty-efficient aid allocations. But the latest Collier/Dollar paper suggests that the appropriate direction of change in aid levels for most countries is remarkably robust to a range of sensitivity tests concerning both the parameter values of the underlying aid-growth regressions and the choice of poverty measure and associated elasticity.

These are very attractive findings. However, a number of caveats can be made, concerning the limited nature of the sensitivity testing, the interpretation of the high correlation coefficients between scenario results, the variability in regional and individual country allocations under different scenarios, the validity of some of the underlying poverty and policy data, the approach to constraining allocations to India and small country bias, the comprehensiveness and currency of the dataset, and the pattern of regional progress towards the Millennium Development Goals.

This paper addresses a number of these concerns by applying a more extensive of set of sensitivity tests (25 different scenarios) to the basic Collier/Dollar model. It finds that results continue to be highly correlated with each other and with the Collier/Dollar benchmark allocation. This is encouraging. But the variation in individual and regional allocations has increased significantly: sub-Saharan Africa's poverty-efficient share ranges from 25% to 83%, the number of potential recipients varies from 15 to 29 countries, and allocations to individual countries vary by a (median) factor of 6 overall. Moreover, the desired direction of change is unambiguous for only 32 (cf. 52 in the original Collier/Dollar analysis) of the 59 countries over the full set of scenarios. The practical value of this model for aid policy-makers in redirecting allocations to specific countries is therefore somewhat diminished. The critical factors to which the Collier/Dollar model results are particularly sensitive are the extent of diminishing marginal returns, and the treatment of India and small country bias.

Changing aid efficiency – a comparison over time and across donors

The paper then explores WB claims that the marginal efficiency (ME, the number of people lifted out of poverty with an extra $1m,) of aid improved over the period 1990-97/98, with IDA aid being more efficient than ODA. This finding is being widely used to help make the case for increased aid. We first find that changes in MEs are almost entirely due to changes in aid levels and policy performance, rather than the pattern of aid allocations. Disaggregating these two effects suggests that all of the improvement in efficiency of IDA allocations and much of the apparent improvement in ODA allocations can be accounted for by falling aid volumes in the 1990s. Apparent policy improvements may also be inflated by a re-scaling of the CPIA policy score scale in 1998; adjusting for this in full would eliminate virtually all the improvement in IDA aid and half the improvement in ODA (even before adjusting for aid levels).

However, these results do need to be interpreted carefully. Maximising MEs is not the objective, and the 'loss' in improvement in MEs when adjusting for changing aid volumes is not itself a cause for concern. Moreover, there are good reasons for not adjusting the policy scale, at least not in full. This analysis simply tells us that while there has been an improvement in aid efficiency in the period 1990-97, this is primarily due to changing aid levels and policy scores rather than a change in the pattern of aid allocations. There is plenty of other evidence from both project evaluations and aid-growth regressions to show that aid effectiveness has been improving, and the case for increasing aid remains strong.

The paper then extends the analysis to assess changes over the period 1990/91-99/00 and to compare results across all donors. This confirms the findings of the earlier analysis, with MEs more than doubling overall, but, again, entirely due to falling aid volumes and rising policy scores (though the effect of rescaling the policy score is less pronounced). Multilaterals donors were and remain marginally more efficient than bilaterals, with the AfDF showing a particularly large improvement to become the most efficient, and the EC being the least efficient. Of the major bilaterals, the UK (which improved substantially over the decade), the Scandinavians, the Netherlands and Italy perform particularly well. Spain and the US are among the least efficient.

Subjecting this analysis to some sensitivity testing using different variants of the aid-growth regressions suggests that the larger the value of the aid*policy interaction term, the bigger the improvement in the 1990s. But much more substantial differences arise when the term capturing diminishing marginal returns is adjusted: the lower the degree of diminishing returns, the higher the absolute ME of aid in both 1990/91 and 1999/00, and the more modest the improvement over the decade. The relative performance of different donors is little changed by this analysis, however, with bilateral rankings generally highly correlated with the base scenario. Some further analysis is provided by comparing ratios of aid/hd going to high as against low poverty countries, and going to good as against poor policy countries.

Conclusions and policy implications

Aid clearly needs to be better focused on poor countries with large numbers of poor people. And other things being equal, more aid should go to countries with better policy and institutional environments (though this should not be overstated), to countries recovering from conflict, and to countries facing external shocks. But there remains much that we do not know, and much more research to be done, in particular on issues of functional form, diminishing marginal returns and absorptive capacity, the extent to which aid can be better used to promote policy and institutional reform, and the effectiveness of different aid instruments, and on the implications of each for aid allocations.

The Collier/Dollar aid allocation models are helpful in highlighting major anomalies in the existing pattern of aid allocations and the potential for efficiency gains, but are not as robust as hoped, they need further development to incorporate the effect of other variables with which aid appears to interact, concerns about uneven regional trends in reducing poverty, and the achievement of other MDGs.

Finally, the analysis of improvements in aid efficiency in the 1990s should be taken seriously but interpreted carefully. There is plenty of other evidence to suggest that aid effectiveness has been improving, and the case for increasing aid remains strong. But the large differentials in performance of individual donors suggest that there is substantial room for improvement in aid allocations, though our measures of efficiency need to be better informed by the further analysis suggested here.

Chapter 1: Introduction

Recent World Bank research has sparked a major debate about aid effectiveness and its implications for aid allocations. The main focus of attention has been the importance of good policy as a determinant of aid effectiveness and criterion for aid allocations. Specifically, the World Bank research suggests that aid only really works when government policies are good, and that a more selective allocation of aid to poor countries pursuing sound policies will lead to larger reductions in poverty. Many bilateral and multilateral donors are currently reassessing their own approaches to and patterns of aid allocation, with a particular emphasis on making aid more performance-based.

But the World Bank research has not gone unchallenged.[1] Areas of contention have included a range of methodological and econometric arguments concerning both the underlying World Bank growth regressions and the allocation models; the relative importance of policy and poverty as determinants of poverty-efficient aid allocations; the validity of assumptions regarding the extent of fungibility and the ineffectiveness of conditionality; non-growth benefits of aid and alternative routes by which poverty can be reduced; the implications of seeking more equal progress on reducing poverty in all regions rather than just maximising global poverty reduction, and a number of other factors. All of these imply at least some reduction in the current emphasis on good policy as the key condition of aid effectiveness and criterion for allocating aid.

This paper briefly revisits the Burnside/Collier/Dollar aid-growth model that lies behind the World Bank research and some of the recent additions to the literature (Chapter 2). The paper then focuses on the Collier/Dollar aid allocation models that have been developed from this research. Chapter 3 reviews the latest versions of the allocation model and subjects them to some further sensitivity tests. Chapter 4 uses the model to test the relative efficiency of aid allocations over time and between donors. Chapter 5 presents conclusions.

[1] See Beynon (1999, 2001a, 2002) for earlier reviews and references.

Chapter 2: Aid and growth regressions: the Burnside Collier Dollar story

Numerous studies over several decades have attempted to assess the effectiveness of aid. Many seemed to yield disappointing results, contributing to a widespread perception that aid is ineffective. But much of this early literature suffers from weak economic theory and poor econometric methodology (White, 1992a,b). A recent survey re-examines this early work and a number of more sophisticated third-generation studies, and reaches much more positive conclusions (Hansen and Tarp, 2000).

This paper focuses on the World Bank research initially undertaken by Burnside and Dollar (1997, 2000) and developed further by Collier and Dollar (1999a, 1999b, 2001, 2002). A key innovation of their analysis was to incorporate an Aid*Policy interaction term into a model that typically took the following form:

$$G = c + b_1X + b_2P + b_3A + b_4A^2 + b_5AP \qquad (1)$$

where G is per capita income growth, X is a set of initial conditions including time and regional dummies, P is a policy variable, and A is aid/GDP (see Appendix 1 for details). BD found that the A term was insignificant, while AP was significantly positive: aid can work, but only when policies (comprising inflation, the budget surplus/deficit, and a measure of openness) are good. Moreover, A^2 (interacted with P in the BD versions of the model) was negative, suggesting that aid suffers from diminishing marginal returns.[2]

These results have stimulated much debate. Hansen and Tarp (2001) and Dalgaard and Hansen (2001), for example, using the same Burnside/Dollar dataset, have argued that the BD results are very sensitive to model specification. In dispute are the appropriate functional form of the aid-growth equation, the treatment of outliers to which the BD results appear particularly sensitive, and differences in the choice of instruments and estimation techniques used to allow for the possible endogeneity of aid. Hansen/Tarp and Dalgaard/Hansen find that both A and A^2 are significant (the latter negatively), whereas the A*P term is insignificant, and they conclude that aid has a significant impact on growth *irrespective* of policy (see Beynon, 2002 for a fuller review). Dayton-Johnson and Hoddinott (2001) also find that the introduction of country-level fixed effects eliminates the statistical significance of the A*P interaction term, although the appropriateness of using fixed effects also remains disputed. Most recently, Easterly et al, (2003) find that, when the BD dataset is updated to 1997 and earlier data gaps are filled in, A*P becomes insignificant (and negative).

The subsequent Collier/Dollar analysis, drawing on a larger dataset and a broader measure of the policy environment (the World Bank's Country Policy and Institutional Assessment, CPIA), essentially confirmed the Burnside/Dollar results. But two points need highlighting, first, the overall impact of aid is higher than was suggested by the earlier BD analysis (and even more so than the highly influential Assessing Aid report (World Bank, 1998)). Second, its sensitivity to policy is more muted: an extra one percentage point's worth of aid (as % of PPP$ GDP) would on average increase the rate of economic growth by about 0.6 percentage points in countries with good policies, 0.4% in countries with average policies, and 0.2% in countries with poor policies (CD, 2002): see Fig 2.1.[3]

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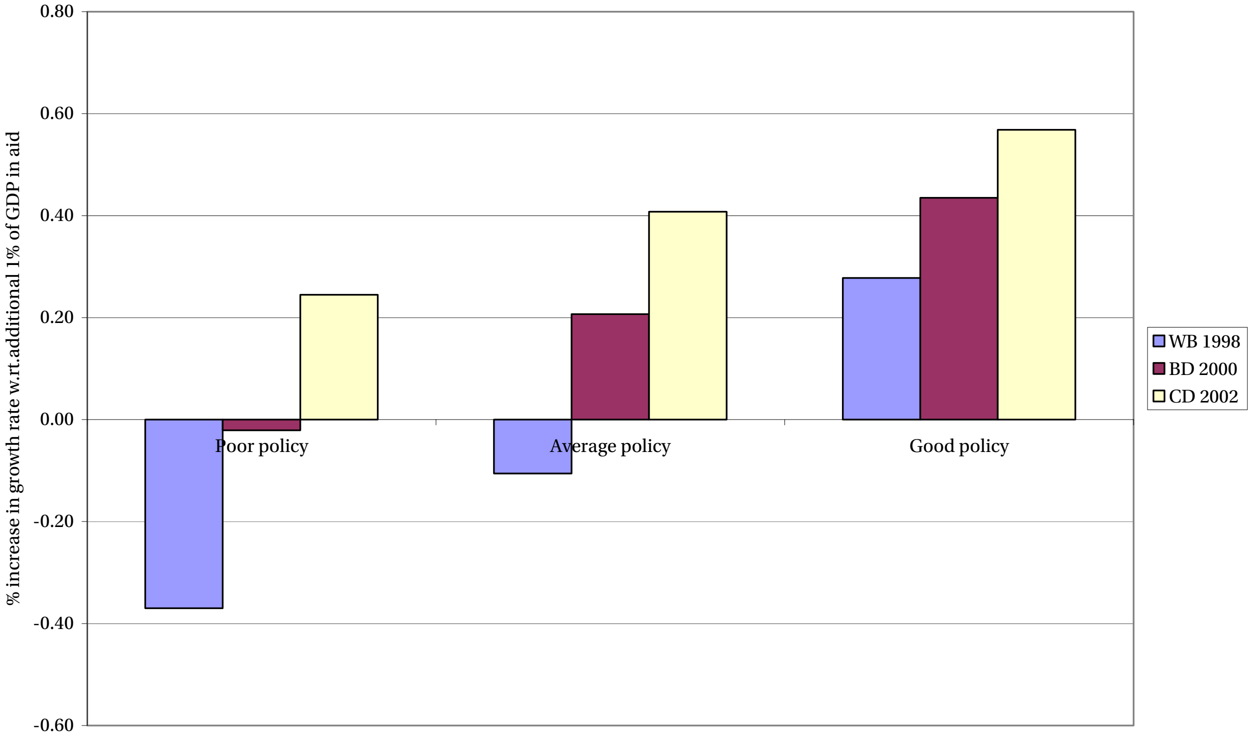
[2] Note, however, that the significance of the A2P term is dependent on 5 outliers. BD's preferred formulation excludes these outliers and the A2P term. The fragility of the A2 term may also be due to its interaction with P (it seems counter-intuitive that the better the policy environment, the faster will returns to aid turn negative).

[3] This figure compares the (preferred) second variant of the CD model (b3=0, as used also in CD 1999b and CD 2001) with the preferred BD formulation (b5=0), both covering the full sample of 56 low and middle-income countries. The chosen Assessing Aid variant – which included a measure of institutional quality in the BD policy index – is equivalent in specification to the BD equation, although prominence was given in that report to the

Figure 2.1: Marginal impact of aid on growth



Other third-generation studies have generally found a significantly positive impact of aid without recourse to an A*P interaction term, though all of them confirm the importance of good policies for growth (Hadjimichael et al., 1995; Durbarry et al., 1998; Lensink and White, 2001; Gomanee et al., 2002). Details, including estimates of the marginal impact of aid on growth from these studies and the earlier Burnside/Collier/Dollar work, are summarised in Table 2.1.

Nevertheless, there remains much micro (project-level) evidence to suggest that aid is more effective when the policy environment is good,[4] and even Burnside/Collier/Dollar's critics have generally agreed that aid works better in the presence of good policies (Robinson and Tarp, 2000). That it also accords with the experience of so many development practitioners and aid agency officials helps to explain why the simple policy message of the World Bank research – allocate more aid to poor countries pursuing good policies - has proved so attractive and influential.

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average effect of 4 alternative formulations, which suggested that an extra 1 percentage point's worth of aid (as % of PPP$ GDP) would on average increase the rate of economic growth by 0.5 percentage points in countries with sound economic management, but would have no effect in countries with average management and might even reduce growth (by -0.3%) in countries with poor economic management.

[4] For example, Isham and Kaufmann's (1999) analysis of over a thousand World Bank and IFC projects since the 1960s found economic rates of return to be significantly higher when various policy indicators are better. World Bank project evaluations show that the higher the CPIA, the higher the percentage of projects that are rated as having successful outcomes, a pattern shared by all lending instruments (emergency and rehabilitation, structural adjustment, technical assistance, investment projects and sector adjustment loans) (World Bank, 2001a). African Development Bank evaluations produce similar findings (ADB, 2002).

Table 2.1: Aid-growth regressions and the impact of aid on growth

	WB 1998 ~	BD 2000 ~	CD 2002	Hadj 1995	Dur 1998	LW 2001	HT 2001	DH 2001	Gom 2002
A	-0.37	-0.021		0.098 **	0.176 **	0.147	0.241	1.352	0.319
	(0.89)	*(0.13)*		(2.22)	(2.20)	(2.98) **	(2.34) **	*(2.55)* **	(3.31)
AP	0.24 **	0.19 **	0.185 ***						
	(2.38)	*(2.71)*	(3.06)						
A^2			-0.036 ***	-0.002 **	-0.002 **	-0.001	-0.763	-0.127	-0.004
			(3.07)	(2.57)	(2.06)	(1.82)	(2.38)	(2.59) **	(1.69)
A^2P									
Marg Effect (at avg aid):				(non-WB results independent of policy)					
poor policy (-1 s.d.)	-0.37	-0.02	0.24						
avg policy	-0.11	0.21	0.41	0.06	0.16 ^	#N/A	0.24	0.81	0.26
good policy (+1 s.d.)	0.28	0.44	0.57						
Aid/GDP turning point #				(non-WB results independent of policy)					
poor policy (-1 s.d.)	..	..	5.6						
avg policy	..	..	7.8	24.5	44.8	56.4	..	5.3	39.9
good policy (+1 s.d.)	..	..	10.0						
Measure of GDP	PPP$	PPP$	PPP$	US$	US$	US$	PPP$	PPP$	US$
Table	Tab A1.1	Tab 4	Tab 1	Tab 25	Tab 2	Tab 5	Tab 1	Tab 4	Tab 5
Equation	equ.5	equ.5	equ.2			equ.4	equ.1.2	equ.8	
Estimation	2SLS	OLS	OLS	GLS	OLS-FE	OLS	IV	IV	robust reg
No.countries	56	56	59	31 ssa	68	111	56	56	24 ssa
No.observations	268	270	349	186	238	278		223	149
Data period	1970-93	1970-93	1974-97	1986-92	1970-93	1975-92	1974-93	1970-93	1970-97
No.time periods	6	6	6	6	4	4	5	6	7
Policy scores:									
poor policy (-1 s.d.)	0	0	2.2						
avg policy	1.1	1.2	3.0						
good policy (+1 s.d.)	2.7	2.4	3.9						
avg aid (%GDP)	2.0	1.6	2.2	9.0	3.3 ^	#N/A	0	2.2	8.0
							(mean centered)		

Notes ~ BD (and WB 1998) estimate A^2P, but find it insignificant when 5 outliers are dropped
the value of A/GDP (%) at which the marginal impact of aid turns negative. Note differences in $ measure of GDP
* significant at 10%; ** significant at 5%; *** significant at 1%
^ derived from footnote 18
t-statistics in brackets (italics signfies that have been converted from standard errors reported in original source)

Sources Burnside and Dollar (2000), World Bank (1998), Collier and Dollar (2002); Hadjimichael et al (1995), Durbarry et al (1998), Lensink and White (2001), Hansen and Tarp (2001), Dalgaard and Hansen (2001), Gomanee et al (2002).

But the relationship between aid and growth as unlikely to be a simple as equation (1) suggests. A number of other variables have been shown to have a significant effect on growth when interacted with aid. For example: Guillaumont and Chauvet (2001) find that aid is more effective in countries that are economically vulnerable (measured by the instability of agricultural GDP, the terms of trade and instability of the real value of exports, and population size). Moreover, adding this new A*E variable causes A*P to become negative, significantly so using OLS but insignificantly so using TSLS techniques. They conclude that additional aid should be given to countries facing external shocks. Significantly, they also find that external factors have an impact on policy, such that countries vulnerable to external shocks find it harder to maintain sound policies. Penalising countries for having poor policies may thus unfairly deprive them of the very assistance that can be effective in helping them to adjust to shocks. Guillaumont and Chauvet therefore recommend that some allowance needs to be made for the impact of external factors when considering policy performance. These findings are confirmed in Chauvet and Guillaumont (2002), who also report a highly significant negative interaction between aid and political instability.

Collier and Dehn (2001) find that aid is particularly effective in countries actually experiencing negative external shocks (measured by extreme falls in export prices). The interaction of the shock with the initial level of aid is insignificant, but the interaction with *changes* in aid is highly significant. Moreover, the A*P term retains its significance (though both its economic importance and statistical significance are reduced), and the original Burnside/Dollar results become robust to choice of sample. Increased aid thus mitigates the adverse terms of trade shock, indeed, the enhanced effectiveness of aid on growth during severe negative shocks is approximately equal to the difference between its effectiveness in the best and worst policy environments in non-shock conditions. However, Collier and Dehn observe that, to be effective, aid must be provided coincidentally with the price shock, a feature that previous programmes such as STABEX singularly failed to achieve. Rapid increases in project aid are typically constrained by the timetables of design and implementation, while increases in programme aid are often constrained by the design of IMF programmes. Moreover, the implications for *ex-ante* aid allocations are perhaps quite limited, as the very unpredictability of price shocks makes them difficult to incorporate into any country allocation exercise. Rather, the main implications are that larger volumes of aid need to be set aside for contingency support, and that a more flexible approach to programming such support should be adopted in IMF programmes.

Collier and Hoeffler (2002) find that larger volumes of aid can be effectively utilised in countries emerging from conflict. Absorptive capacity is no greater than normal during the first three post-conflict years, but rises to approximately double its normal level in the period 4-7 years after the end of conflict. Moreover, their results suggest that the temporary spurt in growth often experienced by post-conflict countries is not due to any automatic 'bounce back', but is largely if not entirely dependent on aid. However, as they acknowledge, their results remain based on relatively few observations. Further sensitivity testing (to address some of the criticisms levelled at the original BD and CD analysis) and, in time, re-analysis from a larger dataset would be highly desirable.

Dalgaard et al (2002) interact aid with the fraction of land in the tropics, building on evidence that geography (in the form of tropical land area, tropical disease and landlockedness) has a significant impact on growth rates (Bloom and Sachs, 1998; Gallup et al, 1999), and find that aid is significantly less effective in the tropics than elsewhere. But few would seriously suggest that, *ceteris paribus*, tropical countries should be penalised by being allocated less aid (as would be required to maximise aid effectiveness).

There are several other factors which also need to be considered in assessing the policy implications of this analysis. First is the assumption (on which the World Bank policy conclusion of targeting aid at countries with good policies critically depends) that aid is ineffective in promoting policy reform, Burnside/Dollar (1997) find econometrically that, on average, aid has no impact on policy reform while acknowledging that there are cases (Ghana) where aid does induce reform, as there are others (Zambia) where aid delays reform. These results are consistent with a broader literature on aid and the political economy of reform cited in World Bank (1998) and Collier/Dollar (2002).

But the view that conditionality is ineffective is not held universally.[5] Moreover, conditionality is not the only mechanism by which aid can influence policy reform. Policies and projects *may* be better designed and implemented as a result of donor engagement. The econometric analysis of Chauvet and Guillaumont (2002) suggests that aid *does* influence policy,[6] and that the poorer the previous policy level, the stronger the improvement in policy induced by a given amount of aid (and thus the greater the impact of aid). This would suggest targeting more resources at countries with poorer policies. However, Burnside/Dollar also note that, if donors were to change their allocation rules to reward good policies, the apparent lack of any relationship between aid and policies might change and a positive incentive effect of targeting aid to good policy countries might develop.

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[5] See Beynon (2002) for a brief review of some alternative viewpoints.

[6] Policy is an index constructed from an inflation variable, a budget surplus variable and an openness policy variable (different from the Sachs-Warner index used by BD) that captures that part of observed openness not explained by structural factors.

Finally, there are major issues about absorptive capacity. Most (though not all) studies find a negative coefficient on A^2, but estimates of the turning point at which the impact of aid on growth turns negative vary enormously. Burnside/Dollar put it at about 15% of GDP (in US$ equivalents, for an *average* policy country[7]). Dalgaard/Hansen are not much higher at about 20% (their higher estimates of b_3 being offset by higher estimates of b_5). Collier/Dollar estimates are twice as high as those of Burnside/Dollar, while Hadjimichael et al. (1995), Durbarry et al. (1998), Lensink and White (2001) and Gomanee et al. (2002) estimate figures of 25%, 40-45%, at least 50%, and 40% respectively (see Table 2.1). With the notable exception of Lensink and White, who find the A^2 term to be the least robust in their regressions, this issue has been largely overlooked by the focus on the A*P interaction term. We find below, however, that it is of major importance for the Collier/Dollar aid allocation models, and for assessing changes in the efficiency of aid over time.[8]

All these issues merit further research,[9] but go beyond the scope of this paper. The fact remains that donors are already responding to the key policy recommendation that aid should be better targeted on good policy countries: in 1999 the Netherlands used the CPIA as a key criterion for reducing the target number of aid recipients from about 80 to 20 countries. The formula for allocating the World Bank's IDA13 resources was revised in early 2002 to further *increase* the weight given to policy. And the United States is currently proposing to make access to the new Millennium Challenge Account conditional on countries meeting certain policy and governance criteria (emphasising the incentive effect, noted above).

In the next chapter we take another look at the latest versions of the Collier/Dollar aid allocation model, their robustness to changes in key variables, and their implications for country and regional patterns of aid allocation.

[7] Although in their favoured regression, reported in Table 2.1, their A2P term is insignificant.

[8] Some countries, such as Uganda, have recently expressed concerns about the 'Dutch disease' effects of increased aid, concerns that have been magnified by evidence that rapid increases in (aid-financed) government expenditure have led to higher unit costs (rather than higher outputs), particularly for public construction. The issue seems to be as much if not more to do with the rate of increase as with the level of aid (which rose from c.7% to 12% of GDP between 1998/99 and 2001/02), and is also affected by the composition of expenditure (too much being spent domestically in sectors with limited capacity) and the (un)predictability of aid inflows.

[9] Another area worth further research would be analysis of the effectiveness of different types of aid. Mavrotas (2002, 2003), for example, has suggested that project aid may have been more effective than programme aid in Kenya and India, but that the reverse is true in Uganda.

Chapter 3: The Collier/Dollar aid allocation model

The aid allocation model developed by Paul Collier and David Dollar is designed to maximise the number of people lifted out of poverty, and draws on the earlier World Bank research assessing the impact of aid on growth. Specifically, Collier/Dollar (CD) start with the now familiar growth model:

$$G = c + b_1X + b_2P + b_3A + b_4A^2 + b_5AP \qquad (1)$$

from which the marginal impact of aid on growth (G_a) can be presented as:

$$G_a = b_3 + 2b_4A + b_5P \qquad (2)$$

The impact of growth on poverty is captured by a measure of the elasticity of poverty with respect to mean income (α). Poverty reduction is maximised when aid is allocated between countries such that the number of people lifted out of poverty by the marginal dollar of aid (λ) is equalised across all countries[10]. The optimisation process only works if there are diminishing marginal returns to aid (b_4 is negative), otherwise all aid would be allocated to the most deserving country. Poverty-efficient aid to any country will be higher, the higher that country's policy score (P), the lower its per capita income (y) or its aggregate GDP, the higher its poverty elasticity (α), and the higher its poverty rate (h) or numbers below the poverty line. Specifically:

$$A^i = 1/(2b_4) * [\ -b_3 - b_5P^i + [(\lambda\, y^i) / (\alpha^i\, h^i)]] \qquad (3)$$

Full details are set out in Appendix 2, including notes on a variant which allows small country bias to be incorporated.

The marginal efficiency of aid in each country (λ^i) can be presented as:

$$\lambda^i = (b_3 + 2b_4A^i + b_5P^i)\, \alpha^i\, (h^i/y^i) \qquad (4)$$

Estimates of λ^i can be used to compare the efficiency of different donors' aid allocations, both between donors and over time. The World Bank has used it to show that IDA disbursements are more efficiently allocated than ODA overall, but that all aid became more efficient during the 1990s. We return to this issue in Chapter 4.

3.1 CD model results

Three versions of this particular allocation model have been published. The first two (CD1, 1999a; CD2, 1999b), using different specifications of equation (1) and applied to over 100 developing countries,[11] both concluded that a reallocation of aid to countries with high levels of poverty and good policies could more than double the number of people lifted out of poverty, as much as could be achieved by a tripling of current aid budgets if the pattern of allocations were left unchanged. These models were reviewed in Beynon, 1999 and 2002, which, *inter alia,* demonstrated that poverty criteria are actually more important than policy criteria as determinants of poverty-

[10] Or put alternatively, when the marginal cost of lifting one additional person out of poverty ($1/\lambda$) is equalised across all aid-receiving countries.

[11] The key difference between them is that equation 1 in CD1 was estimated only over the period 1990-96, and used 1997 values of the CPIA score throughout. But because it failed to find a significantly negative b4 coefficient necessary for the optimisation process to work, CD used values for both b3 and b4 from the earlier Burnside and Dollar (1997) analysis. This approach was clearly unsatisfactory and CD2 specifically addressed the problem by using a CPIA dataset (rebased to a consistent 1-5 scale) going back to 1977 and estimating equation 1 over the period 1974-97.

efficient aid allocations,[12] a point overshadowed by the dispute about the underlying econometric analysis.

The third version (CD3, 2002) differs in that it restricts the allocation model to 59 countries for which 'high quality' information on the distribution of income is available, and focuses on testing the robustness of the policy conclusions of the earlier papers to (i) variations in the estimated values of b_3 and b_5, for A and AP respectively, and (ii) alternative measures of poverty and associated poverty elasticities. As before, the model uses 1996 data for GDP, population and actual aid, and 1998 values of the CPIA. The base case scenario uses a PPP$2/day headcount poverty rate with a poverty elasticity assumed to be a constant 2 for all countries (see Appendix 1 for fuller discussion of the data). Allocations to India are again constrained to be no higher than actual (1996) values.[13]

CD3 first of all shows that their estimates of G_a are reasonably robust to a modest re-specification of equation (1), and to slight variations in the values of b_3 and b_5, at least at average levels of A and P: an extra 1% of GDP in aid accelerates per capita growth by 0.27-0.39 percentage points under the four variants tested.[14] They then show that the poverty-efficient allocations of aid under each of the variants are highly correlated (0.91 or greater, with variants II-IV each being at least 0.97 correlated with the benchmark).

Testing different poverty measures yields similar conclusions. CD3 tests for two different poverty lines ($1/day and $2/day) and three different poverty measures (the headcount poverty rate, the poverty gap and the squared poverty gap, the latter two with country-specific poverty elasticities). For each poverty line, allocations using the three poverty measures and their associated poverty elasticities are correlated between 0.89 and 0.98. For each poverty measure, allocations using the two different poverty lines are correlated 0.82-0.94.[15]

In all cases, the various poverty-efficient allocations are much more highly correlated with each other than with actual aid (CD3's benchmark allocation is allocated 0.89 or better with each of the variants discussed above, far higher than its 0.57 with actual aid), and the set of countries receiving at least some aid is very similar for each option. Moreover, poverty-efficient allocations are either entirely above or entirely below actual allocations for 52 of the 59 countries modelled under the

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[12] Specifically, this analysis highlighted that a) information on poverty accounts for 9m of the 14m people who might be lifted out of poverty through a more efficient allocation of aid (CD2), whereas policy accounts for only 3m; b) the policy threshold below which aid is ineffective is actually quite low, particularly for very poor countries; c) scatter diagrams that plot the various components of CD's aid allocation formula against aid show little if any correlation between policy and poverty-efficient aid allocations (as % of total aid). The clearest relationship is, in fact, between aid and the total number of people in poverty, *subject to* per capita income being less than a certain threshold of around PPP$2,500/hd; d) analysis of the policy-poverty quadrants clearly shows that far more aid would go to high poverty countries than to low poverty countries, or to good policy countries; e) poverty-efficient aid allocations per poor person are about three times higher in the *poor* policy/high poverty quadrant than in the *good* policy/high poverty quadrant; f) further disaggregation of countries using a 3*3 policy-poverty matrix also suggests that poverty-efficient aid would be heavily concentrated in the *medium*-policy/high poverty sector, though allocations per poor person are often higher in the poorest policy/high poverty sector (which accounts for up to 20% of poverty-efficient aid) than in the medium policy/high poverty sector; and g) these observations, and those on the scatter diagrams, are all robust to significant relaxation of the artificial Indian constraint.

[13] India would otherwise attract about two-thirds of all aid in their poverty-efficient model. The error concerning Tanzania – which caused it to receive a surprising zero allocation in CD2 (see Beynon, 2002) – has also been corrected.

[14] Their benchmark variant I follows the form of equation 1 (even though b_3 is only very marginally significant at the 16% level, but this term is retained to allow variants III and IV to be tested). Variant II drops the b_3A term, and is identical to that used in CD2. Variant III increases the importance of policy differences by reducing the value of b_3 and increasing the value of b_5 by 1 standard deviation. Variant IV does the opposite (b_3 up one 1 s.d., b_5 down 1 s.d.) and is described as the more 'egalitarian' variant by making the G_a-policy relationship relatively flat. The range of values is lower than the value of 0.47% reported in CD2 (variant II, equivalent value being 0.39% in CD3) because the average values of P (lower) and A (higher) have been taken from the entire dataset rather than from the 1994-97 period.

[15] This extends and confirms the initial assessment in CD2 (which excluded the squared poverty gap measure).

five core scenarios reported in CD3, Table 5 (benchmark I, variants III and IV, $2/day squared poverty gap and $1/day headcount), suggesting that the desirable direction of change is in most cases unambiguous.

3.2 Some caveats

These results are very attractive. Collier/Dollar acknowledge that it would be unrealistic and inappropriate to use the model as a practical allocation tool; but if it points to unambiguous directions of change in the allocation of aid, that is in itself a significant step. However, there are a number of caveats to make, with potentially significant implications for these results.

First, the reported correlation coefficients are artificially high because of the large number of zero allocations received by countries in each scenario (34 of the 59 countries get no aid in any of the scenarios reported in CD3, Table 5). Recalculating these correlation coefficients amongst the remaining 25 countries produces modest reductions between the benchmark and the other three scenarios involving the $2/day poverty line (all of which remain >0.93), but a significant decline (from 0.94 to 0.69) in the correlation coefficient with results from the $1/day poverty line. This suggests that choice of poverty line matters, even if choice of poverty measure does not.

Second, there are some substantial differences in individual allocations which are masked by these high correlation coefficients.[16] This point is readily acknowledged by Collier/Dollar, who suggest that donors need to think carefully about which concept of poverty they are targeting.

Third, the assumption that the headcount poverty elasticity is a constant 2 for all countries is too simplistic, and will favour highly unequal countries (with higher poverty rates for any given level of per capita income). In reality, such countries are likely to have lower poverty elasticities and therefore merit less aid.[17]

Fourth, the sensitivity testing remains quite limited given the dispute surrounding the specification and estimation of equation (1). More radical variations in the aid*policy interaction term, modification of the b_4 estimate capturing diminishing returns to aid (not tested at all in CD3), or incorporation of other variables believed to be important for aid effectiveness (see Chapter 2) may produce significantly different results.[18]

Fifth, the poverty data used are specific to the year in which the survey was conducted, which varies enormously across countries (from the mid-1980s to the mid-1990s). Thus though they are converted into comparable PPP$ terms using a standard poverty line, they are not strictly comparable in time.

Sixth, the growth regressions are derived from policy scores based on a 1-5 scale, whereas the Collier/Dollar allocation models use the 1998 CPIA scored on a 1-6 scale. This would allocate more aid to countries showing good performance than is warranted by the value of the b_4 coefficient estimated with the 1-5 scale (see Appendix 1).

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[16] In several cases, poverty-efficient allocations under the alternative scenarios tested differ by more than 50% from the benchmark. Moreover, the difference between a country's highest and lowest allocation exceeds 50% in more than half the countries, when comparing the results with different parameter estimates, and similarly when comparing results with different poverty measures.

[17] Bourguignon (2000) and Heltberg (2001) have demonstrated that the absolute value of the elasticity varies positively with per capita income and negatively with initial income inequality. This assumes, of course, that aid cannot be targeted at particular groups such as the poor.

[18] Lensink and White (2000a), in testing the CD allocation model with their own aid-growth regression results, had already demonstrated that, while aid allocations in their base model are 78% correlated with allocations generated by an alternative specification in which b3 (the coefficient on A) is reduced by twice its standard error and b4 (the coefficient on A2) is increased (ie. made more negative) by twice its standard error, the number of recipients rises in the alternative specification from 30 to 63 (out of the CD 1999a sample of 107 countries).

Seventh, the constraint on India remains too arbitrary. Moreover, several other countries (notably Pakistan (23%) and Vietnam (15%), but also Ethiopia, Nigeria and Uganda) attract a *higher* share of the total available aid budget of $28.4bn than India's constrained share of 6.8% in CD3's poverty efficient benchmark. These allocations must be equally infeasible.

Eighth, the small country bias that exists in aid allocations is not incorporated in the CD1-3 versions of their allocation model. While modelling aid allocations without such bias is important to establish an optimal benchmark, incorporating some degree of small country bias would be desirable in order to assess its implications for the regional distribution of aid, and to assess its costs in terms of poverty reduction forgone.[19]

Ninth, these 59 countries account for only about 70% of the aid receipts attracted by the 108 countries in the CD2 model (and about 85% of their population), and exclude some major aid recipients such as Bangladesh, Mozambique, Ghana and Malawi. Extending the dataset may have significant implications for individual and regional allocations.[20]

Tenth, the dataset on which this analysis is based is now somewhat dated. Do the conclusions still apply when poverty-efficient allocations based on the latest data are compared with the current pattern of aid allocations?

Eleventh, donors *are* interested in the regional distribution of poverty and regional progress towards reducing poverty. This concern is not captured in the present Collier/Dollar model which is designed to maximise the reduction of poverty *globally*. Modifying this objective may have significant implications for the allocation of aid, likely to favour sub-Saharan Africa.

And finally, the possibility of some countries being able to eliminate extreme poverty, unaided, by the MDG target date of 2015 would also have implications for the optimal allocation of today's aid if the chances of meeting the 2015 target are to be maximised, since aid allocated to countries that do not need it would have no ultimate impact on the 2015 target but could be used more productively elsewhere.[21]

The remainder of this chapter assesses the significance of many of these issues and their implications for the pattern of poverty-efficient aid.

3.3 Modifying the CD aid allocation model

The CD3 model: 59 countries

We first assess these issues by examining a total of 25 different scenarios using the CD3 data and allocation model. Full results, covering poverty-efficient allocations (as % of GDP) for each of the 59 countries (ranked in descending order of their benchmark aid/GDP ratios, as in CD3), regional shares of the total aid budget of $28.4bn, the number of recipient countries, details of each sensitivity test, estimates of the actual, target and optimised marginal efficiencies (MEs),[22] the

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[19] In an extension of their basic model designed to assess whether the world is likely to be able to cut poverty in half by 2015, Collier/Dollar do incorporate small country bias (CD4, 2001). But the implications for the pattern of aid allocations are not discussed in any detail.

[20] Testing the model's sensitivity to different poverty measures may be restricted by data limitations, but testing the impact of different specification and parameters in the aid-growth regression is less constrained.

[21] The key MDG is to reduce by one-half the proportion of people living in extreme poverty (<$1/day) *by the year 2015* (from a base year of 1990), which is different from the CD objective of maximising the numbers of people lifted out of poverty each year. How much importance should be attached to an arbitrary target date can, of course, be debated, and there is likely to be some trade-off between reaching the MDG goal in aggregate and achieving more equitable regional progress towards this goal.

[22] The *actual ME* is the number of people who would be lifted out of poverty if an extra $1m, of aid were allocated to countries in proportion to actual (1996) allocations. The *target ME* is the value of 'lamda' maximised through

correlation coefficients for each scenario with both the CD benchmark and actual aid (calculated for aid/GDP and aid as a percentage share of all aid, as well as correlations if the 26 countries receiving zero aid in all scenarios are excluded), and a complete correlation matrix of the aid/GDP results, are presented in Appendix Table A4.5.[23] Summary results highlighting selected countries (with poverty-efficient aid expressed as a percentage of all aid, not of GDP) and scenarios are presented in Table 3.1, and discussed below.

Parameter estimates

Scenarios 1-9 test the sensitivity of the results to the parameter estimates. S1-4 represent the four variants of equation (2) as defined in CD3 (S1 being the benchmark).[24] It is notable that, although highly correlated with each other, some individual country allocations and regional shares differ significantly, with sub-Saharan Africa (SSA) attracting between 45% (S3) and 54% (S4). Pakistan remains the largest recipient in all four cases, with 18-25% of all aid. S5 is like S4 but with b_3 and b_5 adjusted by two standard deviations instead of one, further favouring SSA.

We analyse diminishing marginal returns by reducing the estimate of b_4 by one standard deviation in S6 (and by 2 s.ds. in S7[25]), and increasing it by one s.d. in S8. S6 is the least well correlated with the benchmark (coefficient 0.55), and significantly favours SSA, as key recipients (notably Ethiopia and Uganda) are able to efficiently absorb substantially more aid, primarily at Pakistan's expense. In the opposite case (higher diminishing returns, S8), East Asia and the Pacific (EAP) benefits at SSA's expense as China and the Philippines become significant recipients (previously Vietnam was the only EAP beneficiary). In S9 we use the parameter estimates derived by Dalgaard and Hansen (2001, equation 8) in their critique of the Burnside/Dollar analysis, which produces results similar to S8 with a noticeably larger number of aid recipients. A notable feature of these latter scenarios (6 and 9) is that the optimised efficiency of aid appears to be significantly higher than in the four original Collier/Dollar scenarios.

In all cases, the results remain highly correlated with the Collier/Dollar benchmark (0.87 or better), and the direction of change is unambiguous for 46 of the 59 countries. However, the number of countries receiving at least some aid ranges from 15 to 29 (cf. 21-23 for the original Collier/Dollar scenarios 1-4), while the share to SSA ranges from 43% to 83%. Individual variations are also significantly increased: for the 15 countries receiving some aid in all 9 scenarios, the ratio between each country's highest and lowest levels of aid averages nearly 4 and goes up to 8 (Nepal). The critical factor in this increased variability in results is the size of b_4 (measuring the extent of diminishing marginal returns to aid).

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the optimisation process, (see Appendix 2). It indicates the number of people who would be lifted out of poverty if an extra \$1m of aid were given to the marginal recipient country. *Optimised ME* is the number of people that would be lifted out of poverty if an extra \$1m of aid were allocated to countries in proportion to the poverty-efficient allocations. In an unconstrained model (scenario 20), the target ME will equal the optimised ME (since 'lamda' is equalized across all aid-receiving countries), but the imposition of constraints will cause the target ME to be below the optimised ME (and may even be less than the actual ME).

[23] Note that when each country's allocation is instead expressed as a share of total aid, each scenario's correlation with both the CD benchmark and actual aid generally falls, sometimes significantly (notably for those scenarios applying less severe diminishing marginal returns (6 and 7), the three \$1/day poverty lines (15-17), and the unconstrained model (20): see Table). The possibility that constraining Indian allocations to current levels is upwardly biasing aid/gdp correlation coefficients between optimal and actual allocations (in the same way that the inclusion of many zero-aided countries upwardly biases the correlation coefficients between scenarios) was tested but found to be negligible.

[24] There are some minor discrepancies with the results reported in CD3, Table 5, which appear to be due to rounding errors.

[25] In S7, we use S.2 as the benchmark from which the 2 standard deviation adjustment in b_4 is made to avoid the b_4 estimate becoming positive.

Table 3.1: Sensitivity testing of Collier/Dollar poverty efficient aid allocations (aid as % share of total, selected scenarios)

		Parameter Estimates					Poverty Measures					Small Country Bias				
Scenario		**1**	**3**	**4**	**6**	**9**	**10**	**11**	**13**	**15**	**16**	**20**	**22**	**23**	**24**	**25**
Country	**Actual Aid 1996**	**Var I (bench-mark)**	**Var III**	**Var IV**	**Var V**	**Var DH**	**$2 H variable elasticity (pg)**	**$2 H variable elasticity (Ravaillon)**	**$2 PG**	**$1 Headcount**	**$1 PG**	**Uncon-strained**	**Max 15% share**	**S. country bias (CD 0.34)**	**Small country bias (0.20)**	**Small country bias (0.28)**
Uganda	0.0	0.1	0.1	0.1	0.2	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Ethiopia	0.0	0.1	0.1	0.1	0.3	0.0	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Zambia	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Tanzania	0.0	0.0	0.0	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.0	0.0	0.1	0.0	0.1
Vietnam	0.0	0.1	0.1	0.2	0.1	0.1	0.0	0.2	0.0	0.3	0.3	0.0	0.1	0.1	0.1	0.1
Kenya	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
Pakistan	0.0	0.2	0.3	0.2	0.0	0.2	0.4	0.3	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0
Nigeria	0.0	0.1	0.0	0.1	0.0	0.1	0.0	0.0	0.1	0.1	0.1	0.0	0.1	0.0	0.0	0.0
India	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.8	0.2	0.0	0.4	0.1
Philippines	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Regional totals (as % of all aid)																
SSA	0.3	0.5	0.4	0.5	0.8	0.4	0.3	0.4	0.5	0.6	0.5	0.2	0.5	0.6	0.4	0.6
EAP	0.2	0.1	0.2	0.2	0.1	0.2	0.0	0.2	0.0	0.3	0.3	0.0	0.1	0.1	0.1	0.1
SA	0.1	0.3	0.3	0.3	0.1	0.3	0.5	0.4	0.5	0.1	0.1	0.8	0.3	0.1	0.4	0.2
ECA	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0
LAC	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.1	0.0	0.1
MENA	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(no.recipients)	57	21	22	21	16	29	16	20	22	22	22	9	21	29	22	27
Actual ME		264.9	253.1	276.7	360.7	260.5	185.6	279.0	68.8	132.2	42.5	264.9	264.9	264.9	264.9	264.9
Optimised ME		311.4	292.2	339.3	435.1	531.5	239.1	333.9	79.6	142.7	47.0	595.0	348.7	209.8	439.9	298.2
Correlation (as % of GDP)																
- cf CD benchmark		1.00	0.98	0.98	0.91	0.87	0.67	0.98	0.93	0.93	0.96	0.81	1.00	0.87	0.96	0.92
- cf actual aid		0.57	0.52	0.60	0.49	0.64	0.28	0.25	0.44	0.57	0.55	0.39	0.58	0.62	0.64	0.64

Poverty measures

Scenarios 10-19 consider different poverty measures. We first test the assumption of a constant headcount poverty elasticity of 2 by allowing the elasticity for each country to vary in line with its poverty gap (pg) elasticity (S10). Specifically, we calculate the average $2/day poverty *gap* elasticity and the percentage deviation of each country's pg elasticity from that average, and then, for each country, apply that percentage deviation to the constant headcount elasticity of 2. For most countries, this yields a value between 1 and 4.[26] The resulting poverty-efficient aid allocations are correlated 0.68 with the Collier/Dollar benchmark, with significantly lower allocations to SSA and none to EAP. Pakistan's share almost doubles to 41%, while Egypt accounts for the entire Middle East and North Africa (MENA) allocation of 14% (one of very few scenarios in which the Middle East and North Africa would be allocated anything).

A more satisfactory approach may be to apply Ravallion's (2001) formula in which the rate of change in poverty is directly proportional to the distribution-corrected rate of growth, such that the poverty elasticity becomes γ(1-Gini), where γ is variously estimated to be 3.74 and 2.94.[27] Using Gini coefficient data from the World Development Indicators (2002),[28] we find that a value of γ=3.48 produces an average elasticity of 2, with all elasticities falling within a more compressed range of 0.90 - 2.82. These are used in S11 and yield results much closer to the benchmark, with modest increases for South Asia (notably Pakistan) at the expense of SSA (notably Nigeria).

In S12, we use estimates of the $2/day headcount poverty rate that have been converted to a standard 1999 year.[29] This is again highly correlated (0.93) with the benchmark with only modest differences in regional allocations. While the reliability of the elasticity and poverty data is uncertain and there remain some significant individual country variations, these results together suggest that the constant elasticity assumption and the differing poverty survey dates may not be all that serious.

S13 and S14 consider allocations using the $2/day poverty gap (pg) and squared poverty gap (spg) respectively. Shares to SSA *fall* modestly relative to the benchmark in both cases, contrary to expectations given perceptions that the depth of poverty is relatively more severe in SSA than elsewhere[30]. But the most striking results concern Vietnam (the only EAP recipient), whose allocation falls to zero in the former case, yet doubles to 30% in the latter (primarily to Pakistan's gain/loss). These results clearly emphasise the extreme non-linearities in the Collier/Dollar allocation model (which may be less acute with a larger sample), and the importance of the choice of poverty measure.

S15-18 focus on the $1/day poverty line. Unsurprisingly, aid shares to SSA are 5-7 percentage points higher (cf. each corresponding $2/day scenario), but again fall modestly when pg and spg measures are used. The most dramatic changes again concern Pakistan (zero allocation in each $1/day scenario except when using consistent 1999 headcount poverty data, S18), with Vietnam (and Philippines when pg is used, S16) being the main beneficiaries. For both actual and

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[26] This is an admittedly crude approximation necessitated by the lack of detailed distributional information from which headcount elasticities for each country could be calculated. The variation in pg elasticities is, however, similar to the spg elasticities (the difference between the percentage deviation from the pg and spg means is less than 10% for most countries), so the variation in headcount elasticities could reasonably be expected to be similar.

[27] With standard errors of 0.68 and 1.18 respectively. Technically these elasticities are negative, but are expressed here as positive numbers for consistency.

[28] To avoid missing data gaps, Botswana's and Lesotho's Gini coefficients are assumed to be the same as South Africa's (0.59), and Rwanda's the same as Uganda's (0.37).

[29] Unofficial World Bank data. For three countries (Vietnam, Guinea and Guinea-Bissau) for which such data were unavailable, the original CD $2/day headcount poverty data were used.

[30] These perceptions are confirmed by the data: both pg and spg poverty rates as a percentage of the headcount poverty rate are higher in SSA than elsewhere, for both $2/day and $1/day poverty lines.

optimised allocations, our efficiency measures using the $1/day poverty line are about half those generated by the $2/day scenarios.

Overall, we find that the degree of correlation with the Collier/Dollar benchmark has again been reduced, substantially in some cases. The number of aid recipients (16-22) and the pattern of regional allocations (EAP effects notwithstanding) are less variable than when varying the 'b' parameter values. But individual country variations continue to be large: for the 9 countries receiving some aid in all 10 scenarios (including the benchmark), the ratio between each country's highest and lowest levels of aid averages over 7 (median 2.4) and goes up to over 20 (Zambia and Madagascar), while the number of countries for which the direction of change is unambiguous has fallen to 41 (44 if the potentially unreliable S10 is excluded).

Policy score

Scenario 19 tests the effect of converting the 1998 CPIA scores back to a 1-5 scale to be consistent with the underlying growth regressions. The resulting aid allocations are highly (0.99) correlated with the benchmark. However, most African recipients see their allocation falling by around 25% and SSA's overall share falls from 50% to 40%. This is somewhat surprising as the SSA group has the lowest average CPIA score. The major beneficiaries are the Philippines (8.2%) and China (4.5%).

India and small country bias

Regarding the arbitrariness and inconsistency of the constraint applied to India, we first see (S20) that an unconstrained model would allocate 80% of the available $28.4bn to India. This is clearly not feasible. But the high shares (in excess of the constrained Indian share) going to some other countries in the benchmark S1 are equally unrealistic and inconsistent. In S21 we therefore impose a cap on *each* country's allocation of 6.8% of the global aid budget, equivalent to India's current (1996) share. In S22 this cap is raised to 15% (for India as well). Results are highly correlated with each other (0.93) and with the benchmark (at least 0.93). Aid is spread across a larger number of recipients (28) in S21 with some shift in favour of EAP, but the pattern of regional allocations and the number of recipients are virtually unaffected in S22, in which India benefits at Pakistan's expense.

In S23 we apply a population bias parameter (β=0.34) as used in Collier and Dollar (2001)(CD4), designed to mimic the degree of bias in favour of small countries found in the pattern of actual allocations (see Appendix 2).[31] However, this leaves India with a zero allocation, and would also make the pattern of aid allocation *less* efficient than at present. S24 reduces that bias (β=0.20) to a level that leaves Indian allocations at around 40% of all aid, while S25 adopts an intermediate position (β=0.28) that leaves Indian allocations at around 14%. Results are again highly correlated with each other and with the benchmark, although regional allocations differ substantially: the larger the bias, the more the pattern of allocations favours SSA and Latin America and the Caribbean (LAC) at the expense of South Asia, and the less efficient the optimised allocation becomes.[32]

The variability of individual country allocations appears somewhat less volatile than for the other tests, with the ratio between each country's highest and lowest levels of aid averaging just under 3 for the 8 countries receiving at least some aid in all 7 scenarios (including the benchmark).

[31] CD4 found that a value of β=0.32 yielded a pattern of aid allocation that was equally correlated with the log of population as actual aid. For this smaller sample of countries, we find that this result is achieved with β=0.34.

[32] The principle of applying an exponential factor to accommodate country size bias has, however, been criticised for distorting allocations among countries of lesser size, for which there is no political need, and for which no economic (since it reduces the efficiency of aid allocations) or ethical (since size bias involves discriminating among poor people depending on the size of the country in which they happen to live) case can be made.

Excluding the implausibly unconstrained S20, the direction of change is unambiguous in 46 out of 59 cases (34 if S20 *were* included).

Summary

The results of this much more extensive range of sensitivity tests continue to be highly correlated with each other and with the Collier/Dollar benchmark allocation. This is encouraging. But the variation in individual and regional allocations has increased significantly, and the desired direction of change is unambiguous for only 32 (cf. 52 in the original CD3 analysis) of the 59 countries over the full set of scenarios (33 if the unconstrained S20 is excluded, and 36 if the potentially unreliable S10 is also excluded). Summary details are presented in Table 3.2, which lists (for both the original CD3 analysis and the extended analysis presented here) the countries that would receive unambiguously more or less aid (countries receiving zero aid under all scenarios being a separately identified sub-set of the latter), and those for which the direction of change is ambiguous. The practical value of this model for aid policy-makers in redirecting allocations to specific countries is therefore somewhat diminished.

Table 3.2a: Analysis by country of appropriate direction of change in aid allocation under 5 original CD3 scenarios

More aid (11)	Uganda, Ethiopia, Zambia, Lesotho, Senegal, Niger, Madagascar, Vietnam, Kenya, Nigeria, India
Less aid (7)	Rwanda, Guinea-Bissau, Mauritania, Nicaragua, Cote d'Ivoire, Guinea, Philippines
Zero aid (34) (also = less aid)	Algeria, Belarus, Botswana, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica*, Czech Rep, Ecuador, Egypt, Estonia, Hungary, Indonesia, Jamaica, Jordan, Kazakhstan, Lithuania, Malaysia*, Mexico, Moldova, Morocco, Panama, Poland, Romania, Russia, Slovak Rep, South Africa, Sri Lanka, Thailand, Tunisia, Turkmenistan, Venezuela
Ambiguous (7)	Tanzania, Kyrgyz Rep, Honduras, Pakistan, Nepal, Guatemala, Zimbabwe

~India constrained to be the same
* made net aid repayments in 1996, but more appropriately classified here than in the 'more aid' group.

Table 3.2b: Analysis by country of appropriate direction of change in aid allocation under extended set of 25 different scenarios

More aid (2)	Uganda, Ethiopia
Less aid (4)	Rwanda, Guinea-Bissau, Nicaragua, Panama
Zero Aid (26) (also = less aid)	Algeria, Belarus, Brazil, Bulgaria, Chile, Colombia, Costa Rica*, Czech Rep, Ecuador, Hungary, Indonesia, Jamaica, Jordan, Kazakhstan, Lithuania, Malaysia*, Mexico, Morocco, Poland, Romania, Russia, South Africa, Thailand, Tunisia, Turkmenistan, Venezuela
Ambiguous (27)	Zambia, Tanzania, Lesotho, Senegal, Niger^, Madagascar^, Kyrgyz Rep, Honduras, Vietnam, Mauritania, Kenya, Pakistan, Cote d'Ivoire, Nepal, Nigeria^, India, Botswana, China, Egypt^, Estonia, Guatemala, Guinea, Moldova, Philippines, Slovak Rep, Sri Lanka, Zimbabwe

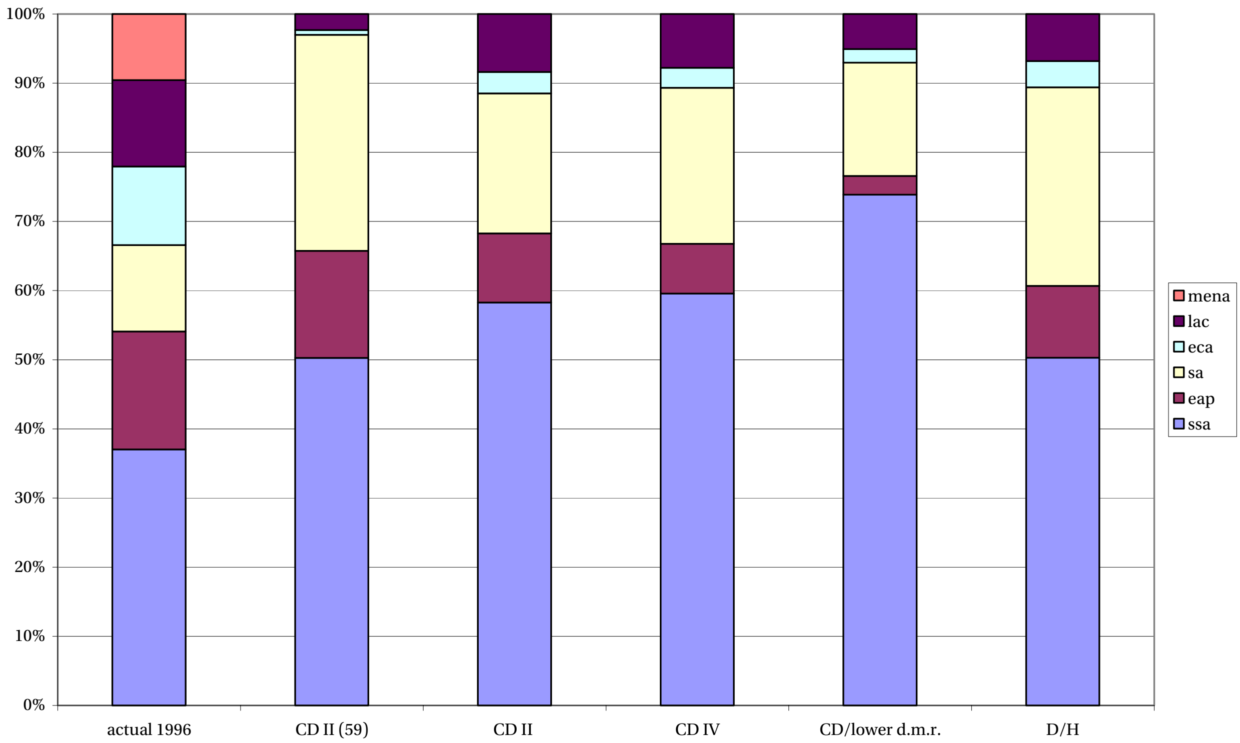
* Made net aid repayments in 1996, but more appropriately classified here than in the 'more aid' group
^ Nigeria would be in the 'more aid' category if S20 were excluded, as would Niger and Madagascar if S10 also excluded. Egypt would be in the 'less aid' category if S10 were excluded (whether S20 excluded or not).

The CD4 model: 108 countries

In this section, we briefly re-examine a few of these issues using data from the larger set of 108 countries analysed in CD4, for which 1996 aid flows amounted to $39.9bn (as opposed to the $28.4bn for the 59 country sample studied so far). Results are presented more simply in the form of the regional distribution of aid (see Fig. 3.1). The first two columns in the figure provide the basis for comparison, being the actual pattern of 1996 aid flows and the distribution of poverty-efficient aid from the smaller 59 country sample (with Collier/Dollar's preferred variant II selected as the base).[33] Our first and main finding is that extending the sample to 108 countries (column 3, CD II) significantly reduces the shares to South and East Asia (both by about one-third), with SSA and LAC being the main beneficiaries. Allowing for the change in size of the aid budget would make such shifts (particularly from East Asia to SSA) even more pronounced.[34]

A similar pattern emerges with the more egalitarian CD IV (equivalent to S4).[35] The shift towards sub-Saharan Africa is accentuated further when the estimate of b_4 is reduced by one standard deviation (less severe diminishing returns: column 5, equivalent to S6), but the Dalgaard and Hansen parameter values (S9) again allocate relatively more aid to South Asia. In every case, however, the shares to SSA and LAC are significantly higher with this larger sample of countries than with the 59 country sample. Figure 3.1 clearly illustrates the sensitivity of the regional distribution of aid, even though, at this level of aggregation, the direction of change compared with actual 1996 allocations is unambiguous. But further work is still required to explore the other sensitivity tests, and to update the data to a more recent year.

Figure 3.1: Regional poverty-efficient aid allocations (108 countries)



Summary

This analysis has not yet considered the impact of other variables that have been shown to interact significantly with aid. Nor does it address the critical question of how the desired pattern of allocations might change if the objective was to achieve a greater degree of equality in terms of

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33 This is Scenario 2 in the earlier analysis, but the regional pattern is virtually identical to variant I (=S1): see Table 3.1.

34 Recall that the efficient allocation of aid differs with the volume of aid being allocated. Efficiently allocating the larger CD4 budget to the CD3 59 country sample would result in East Asian allocations being about 8% points higher (at 24%, as China and the Philippines become significant recipients in addition to Vietnam), with SSA allocations being about 8% points lower (at 42%).

35 The unconstrained version (=S20), not displayed, produces a very similar pattern to the 59 country sample, with SA (India) now accounting for 78.5% and SSA for 21.3%.

regional progress towards the Millenium Development Goal of income poverty reduction. Or of how the achievement of other MDGs might be included in such a model, or of the implications of the MDG target date of 2015. All these issues merit further research. Nevertheless, the analysis has demonstrated the sensitivity of the model results particularly to assumptions about diminishing marginal returns to aid, and to the treatment of small country bias, suggesting that the desirable direction of change in aid allocations is not as clear as we might have hoped.

Chapter 4: Aid efficiency – a comparison over time and across donors

In this chapter, we examine recent claims derived from the Collier/Dollar model that the effectiveness of aid has improved over time, and look comparatively at how different donors have performed in terms of the changing patterns of their aid allocations.

We noted in the previous chapter that the marginal efficiency of aid (the numbers of people lifted out of poverty with an extra $1m of aid) in each country (λ^i) can be presented as:

$$\lambda^i = (b_3 + 2b_4A^i + b_5P^i)\ \alpha^i\ (h^i/y^i)$$

By taking the weighted average of these marginal effects for all countries (weighted by the amount of aid given by each donor to each country) in different years, we can compare the efficiency of aid allocations, both between donors and over time.[36] The more aid goes to poor countries (low GDP/hd, high poverty rate) with good policies, the more productive aid will be.

The World Bank has done this to show that the International Development Association (IDA) aid is more efficiently allocated than Official Development Assistance (ODA) overall, but that all aid became more productive during the 1990s. Specifically, it estimates that the number of people lifted out of poverty by an extra $1m of ODA[37] overall (the weighted average marginal effect) has nearly tripled, from 105 in 1990 to 284 in 1997/98. Comparable figures for IDA are 277 and 434 respectively (World Bank, 2001a). The Bank emphasises that these estimates should be treated with caution, but argues that the finding that the productivity of aid improved dramatically in the 1990s is quite robust. This finding is being widely used to help make the case for increased aid (World Bank, 2002, p.33).

In this chapter, we first explore the reasons for this improvement; to what extent is it due to real shifts in the pattern of donor aid allocations, to changes in the underlying characteristics of aid recipients, to falling aid volumes, or simply to changing the sample? We then update as much of the data as possible, and extend the analysis to compare the performance of individual donors, and to test these results using alternative specifications of the aid-growth model. Finally we compare aid allocations of different donors by looking more straightforwardly at aid flows to countries falling into different policy and poverty categories.

4.1 World Bank estimates of the rising efficiency of aid: a critique

A full analysis of the World Bank data, kindly made available for this study, is set out in Appendix 3, but key results are summarised in Figure 4.1.

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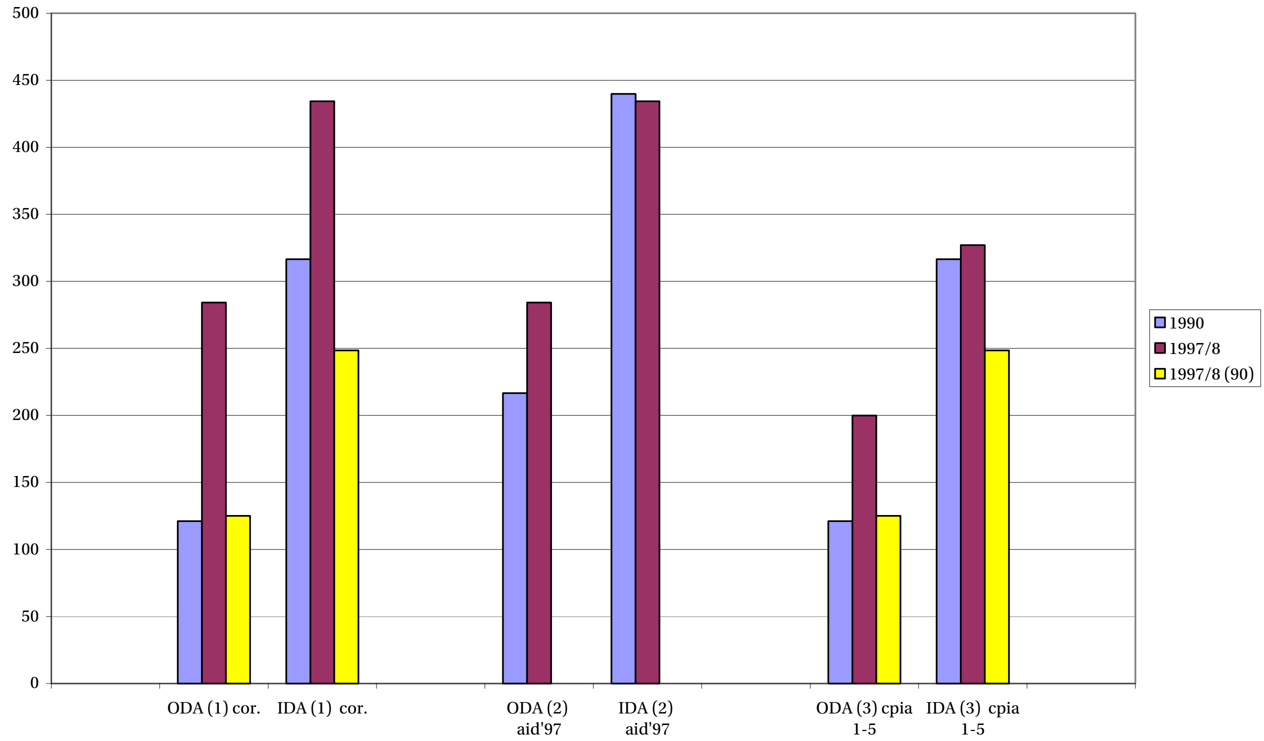
[36] Analysis of marginal (rather than average) effects enables fair comparison across donors of different size, but comparisons over time will be sensitive to the aggregate size of aid flows owing to diminishing marginal returns. We test the effects of this below.

[37] Strictly speaking, this is ODA+OA (Official Aid), as a number of countries included in the model are DAC Part II countries whose aid does not count as ODA.

Figure 4.1: Numbers lifted out of poverty ODA cf. IDA, 1990-97/98 (per extra $1m of aid, marginal effects)



We find first that changes in MEs are almost *entirely* due to changes in aid levels and policy performance, rather than in the pattern of aid allocations. This is shown by the third column of the first set of bars (ODA(1) and IDA(1) in Fig. 4.1), in which 1997/98 MEs are re-calculated using 1997/98 aid shares but with aid levels and policy scores held constant at 1990 values[38] (changes in 'h/y' are not assessed as this measure of poverty is already held constant throughout the WB analysis). In the case of IDA, changes in the pattern of aid allocations actually caused MEs to *fall* slightly (holding aid levels and policy scores constant).

Second, we find that *all* of the improvement in the efficiency of IDA allocations and much of the apparent improvement in ODA allocations can be accounted for by falling aid volumes in the 1990s (lower aid levels yield higher marginal efficiency estimates, given diminishing returns). This is shown in the second set of bars (ODA(2) and IDA(2)), in which the 1990 MEs have been re-estimated using the lower aggregate aid levels that prevailed in 1997/98.

Thirdly, we note that apparent policy improvements may be inflated by the re-scaling of the policy score from a 1-5 scale to a 1-6 scale in 1998, and find that adjusting for this in full would eliminate virtually all the improvement in IDA and half the improvement in ODA, even before adjusting for aid levels (see the third set of bars, ODA(3) and IDA(3)).

We also find that these results are little affected by changing the sample in the WB analysis, and confirm that IDA remains more efficiently allocated than ODA in all scenarios.

These results do need to be interpreted carefully. Our objective is not to maximise MEs (which would, after all, happen when total aid = $1, given the functional form of the aid-growth regressions!), and the 'loss' in improvement in MEs when adjusting for changing aid volumes is not itself a cause for concern. Moreover, there are good reasons for not adjusting the policy scale,

[38] Note that the 1990 values have increased slightly to correct an error in the original WB analysis: see Appendix 3.

at least not in full (see Appendix 2). This analysis simply tells us that, while there *has* been an improvement in aid efficiency in the period 1990-97, this is primarily due to changing aid levels and policy scores rather than a change in the pattern of aid allocations. There is plenty of other evidence to show that aid effectiveness has been improving,[39] and the case for increasing aid remains strong.

4.2 Extending the analysis

We now update as much of the data as possible to assess what further changes have occurred, and to compare the performance of individual donors.

Data

We use the latest available aid data for 1999/2000 and compare these with a 1990/91 base year (2 calendar year averages). Aid data are taken from the latest set of International Development Statistics from the OECD (2002), using a 2-year average so as to smooth out possible distortions caused by large year-end payments that happen in some years. We focus on net ODA (net OA to Part II countries), as this represents the actual net flow of aid to recipient countries and is comparable with the World Bank analysis.[40] Amounts not allocated to specific countries are excluded from the analysis, though these are often large[41].

As far as possible we adopt the same approach and data sources used by the World Bank to derive new estimates of λ^{i90} and λ^{i99}, although some ambiguities in its data make exact replication difficult.[42] Population and GDP (PPP in current $m) for 1990 and 1999 are sourced from World Development Indicators, 2002. The aid/GDP ratio is thus current aid (US$) divided by current GDP (PPP$). The CPIA score for both years has been kindly provided by the Bank. Poverty data (h) are the same as in the WB analysis, updated where available with new data from WDI 2002. We follow the WB approach and keep our poverty measure (h/y) constant throughout,[43] where y (GDP/hd) is derived from our GDP (current PPP$m) and population data.[44] The same parameter estimates (from CD3) for b_3, b_4 and b_5 are used as by the World Bank; – we later apply some sensitivity analysis to these figures.

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[39] For example, World Bank evaluations suggest that the economic rate of return on WB projects has improved from 16% in the 1980s to 23% in the period 1996-2001. The proportion of projects rated as satisfactory or better has risen from around 69% in the 1980s to 77% by 2000 (and over 80% when weighted by disbursements), while the Aggregate Project Performance Index (APPI, which combines information on outcome, sustainability and institutional development impact into a single figure), has also improved over the decade (World Bank, 2001a). Mosley and Hudson's (2000) aid-growth regressions suggest that aid effectiveness has increased since the introduction of structural reforms in the early 1980s.

[40] ODA/OA commitments, available from the OECD database, may better reflect actual allocation priorities, though some allowance may be necessary for debt relief and repayments where these are incorporated into new allocation decisions, and the underlying policy/income/poverty data would need to be lagged 2-3 years to reflect information available to donors at the time that commitments are made. This is not attempted here.

[41] Unallocated aid accounted for 16% of ODA in 1990/91 and 23% in 1999/00, being higher for bilateral than for multilateral donors.

[42] See Appendix 3 for a discussion of WB data sources and approach. We use GDP, policy, population data for the *first* year of each 2 year average period partly because we do not have a complete set of data for 2000, and partly because aid allocations are more likely to be based on prior year rather than current year information on these characteristics (in fact, a longer lag is more likely).

[43] The absence of comprehensive, year-specific poverty data means that it is not possible to test the extent to which poverty focus is responsible for aid allocations becoming more (or less) efficient. This shortcoming in the data remains a major problem.

[44] The WB has indicated it used real GDP/hd (PPP$) from the Penn World Tables 5.6, although the data reported appear closer to current GDP/hd from the WDI dataset (see Appendix 3). It would be possible (indeed preferable) to use year-specific values for 'y' even if 'h' is held constant, but doing so would require the use of constant price GDP/hd data, since rising nominal per capita income would yield falling values of ME over time, other things being equal.

The analysis is applied to the full set of 157 'developing countries' as listed in WDI 2002, for which data allow us to estimate λ^{i90} and λ^{i99} values for 93 and 115 countries respectively.

Analysis and results

We first compare the new 1990/91 estimates for IDA aid and ODA with the World Bank's 1990 figures to assess the effect of changing the data sources and sample. The new results are very close for ODA, but are significantly lower for IDA. The causes of this difference were examined by replacing each of the WB source data series in turn with the new data used here. The results are summarised in Table 4.1. Changing the sample has a modest effect, changing aid data a slightly larger effect, but the most significant factors are the GDP and GDP/hd series. It is unclear why the differences should be so much more marked for IDA than for ODA, or to what extent this will compromise our comparison across other donors, but clearly some health warning is required.

Table 4.1: Comparison of original WB and revised ME calculations

	IDA ME	ODA ME
Original WB estimates (corrected model 1)	316	121
Revised estimates	193	126
Difference	-123	5
of which:		
Aggregate ODA (for λ^{i90} values)	14	5
GDP (PPP$m)	-28	-16
Headcount poverty	-6	3
Per capita GDP (PPP$/hd)	-51	-2
ODA/IDA aid data (for weights)	-33	-3
Sample change / combined effects	-19	18

Notes: see Appendix 3 for data sources and derivation of corrected WB model

With this caveat in mind, comparative results for the major donors in 1990/91 and 1999/2000 are presented in Figure 4.2. This confirms a substantial improvement more or less across the board, with MEs more than doubling overall. Multilateral donors were and remain marginally more efficient than bilaterals, with the African Development Fund (AfDF) showing a particularly large improvement to top the table. The European Commission performs least well. Of the major bilateral donors, the UK has improved significantly to show the highest ME in 1999/2000,[45] ahead of the Scandinavians,[46] the Netherlands and Italy. Spain and the US are among the least efficient.

However, by calculating what the weighted average 1999/00 MEs would have been, holding aid levels and policy scores constant at 1990 values (i.e. using 1999/00 aid shares and λ^{i90} values), we again conclude that improvements in MEs are entirely due to changes in these factors, rather than a change in the pattern of aid allocations (see the third bar in Fig. 4.2). In fact, for many donors, changes in the pattern of aid allocations have actually caused MEs to *fall* (holding aid levels and policy scores constant).

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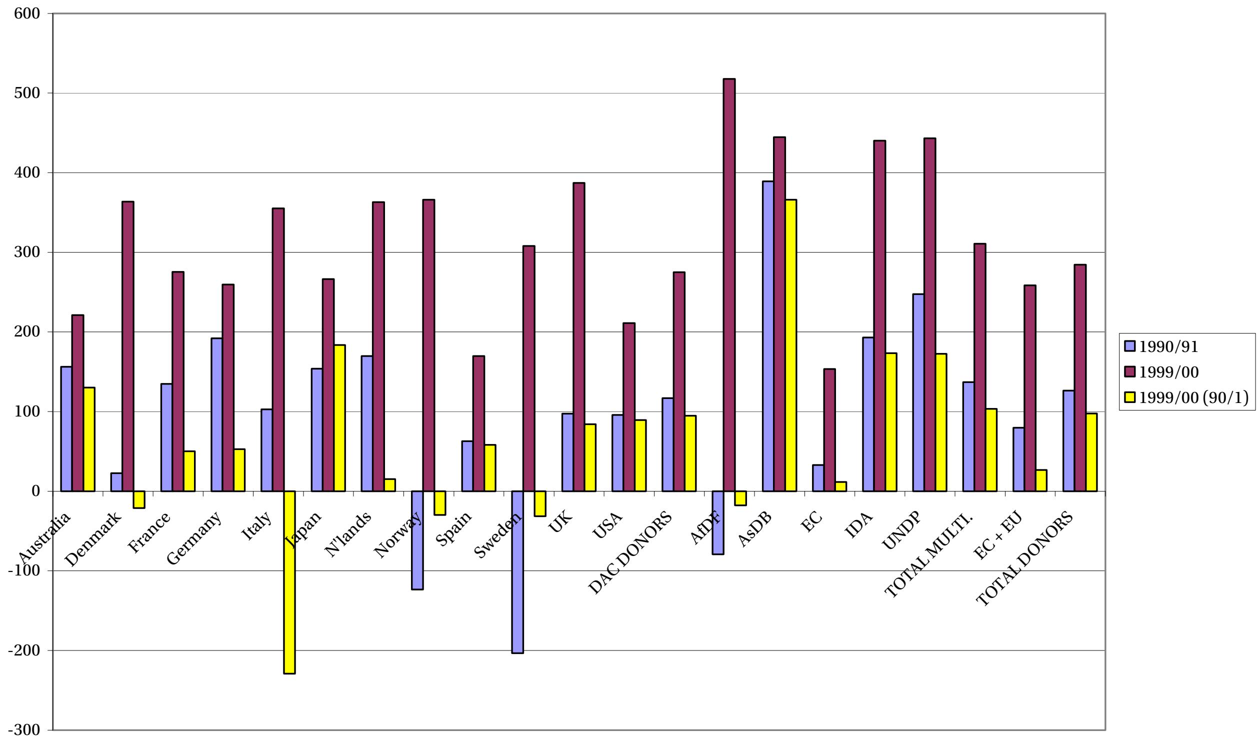
[45] Of the smaller donors, Ireland and Belgium do better still: see Appendix 4, Table A4.4.

[46] The low or even negative MEs recorded by the Scandinavians in 1990/91 reflect the very large proportions of their aid going to the front-line states (notably Zambia, Mozambique and Tanzania), countries which had high aid receipts and relatively low policy scores (and hence highly negative λ^{i90} values) at that time. These results arise from the specification of the CD model, which necessarily simplifies the shape of the diminishing marginal effectiveness curve (see Appendix 2), and should not be taken too literally. We explore their sensitivity to different parameter estimates later in the chapter, but testing different functional forms lies beyond the scope of this paper.

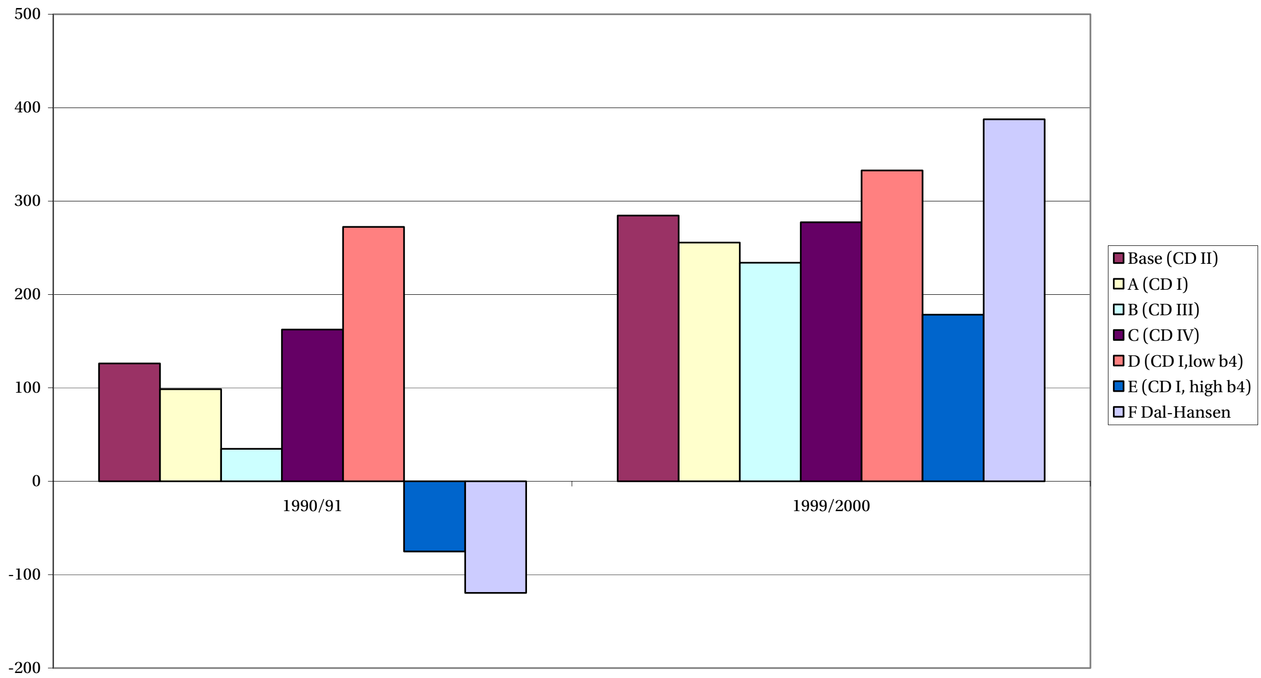
Figure 4.2: Numbers lifted out of poverty, 1990/91 – 1999/00 (per extra $1m of aid, marginal effects)



Adjusting the policy score to a 1-5 scale reduces the 1999/00 weighted average ME for all ODA by 23%, and the scale of the improvement by 41%. But this effect is less severe than in the analysis of the original World Bank data above, and still leaves MEs substantially higher than in 1990/91 (see Appendix 4, Table A4.4). Such an adjustment makes little difference to the ranking of individual donors.

Finally, we consider the sensitivity of the results to changes in the parameter estimates of the aid-growth regression (Fig 4.3). Variations in these estimates are generally of one standard deviation from the Collier-Dollar benchmark, although the final scenario (F) uses the more radically different parameter estimates from the Dalgaard and Hansen (2001) critique of the Burnside/Dollar (2000) model. Results for all donors are given in Table A4.4, including the correlation coefficient of bilateral rankings under each variant with the baseline results. A summary covering the UK, bilaterals (DAC), IDA, all multilateral and all donors is presented in Table 4.2, with details of the parameter values.

Figure 4.3: Numbers lifted out of poverty (ME, per $1m), all donors, 1990/91-1999/00, various scenarios



In terms of comparisons over time, the results show that the bigger the policy term (b_5, variants A and especially B), the greater the improvement in MEs over the decade. But this is achieved by reducing the estimated values of the 1990/91 MEs, rather than increasing those of 1999/2000, which in fact remain relatively stable. The smaller the size of the policy term, the smaller the improvement (variant C), though absolute MEs in 1999/2000 again remain fairly constant.

More substantial differences arise when the b_4 term (capturing diminishing marginal returns to aid), is altered. Specifically, a smaller (less negative) parameter estimate improves the absolute value of our estimated MEs substantially (variant D), though the extent of improvement during the decade is reduced. Vice-versa in scenario E, in which the overall ME estimates are *negative* in 1999/00 (with subsequent improvements due primarily to falling aid volumes). Estimates from the Dalgaard and Hansen model (variant F), which found a significantly *positive* effect of aid on growth but disputed the significance of the aid-policy term, are even more extreme, with the lowest results for 1990/91 (negative overall and for most individual donors) and highest results for 1999/2000. This is entirely due to this variant having the largest negative b_4 estimate.

Table 4.2: Marginal efficiencies (people/$m) for different variants of aid-growth regression

	UK					DAC DONORS			IDA			TOTAL MULTI.			TOTAL DONORS		
	1990/91	rank	1999/2000	rank	% change	1990/91	1999/2000	% change	1990/91	1999/2000	% change	1990/91	1999/2000	% change	1990/91	1999/2000	% change
Base model: CD 2002 var.II	97	11	387	3	297%	117	275	135%	193	440	128%	137	311	127%	126	285	125%
A:. CD 2002 var.I	94	9	382	2	307%	90	246	174%	187	408	118%	114	281	146%	98	256	159%
B: CD 2002 var.III	53	8	358	2	575%	29	226	685%	137	384	181%	50	257	417%	35	234	574%
C: CD 2002 var.IV	135	12	406	2	201%	151	267	77%	238	433	82%	178	304	71%	162	277	71%
D: A, with b4 1 s.d.less negative	242	13	549	2	127%	255	320	26%	386	528	37%	304	369	22%	272	333	22%
E: A, with b4 1 s.d.more negative	-54	9	216	3	..	-75	173	..	-11	288	..	-75	192	..	-75	178	..
F: DH 2001 equ.8	-170	12	296	13	..	-117	379	..	-117	566	..	-150	409	..	-120	388	..

Parameter estimates:

VARIANT:		Base	A	B	C	D	E	F
Aid	b3	0.000	-0.537	-0.921	-0.154	-0.537	-0.537	1.352
Aid squared	b4	-0.036	-0.025	-0.025	-0.025	-0.009	-0.041	-0.127
Aid*Policy	b5	0.185	0.313	0.419	0.206	0.313	0.313	0.000

In terms of comparison across donors, relative performance is little changed under the different variants and the above comments remain broadly valid. The bilateral rankings are generally highly correlated in each scenario (see Table A4.4), though much less so under variant F. The UK consistently appears as one of the most efficient bilaterals in 1999/2000, significantly improving its position since 1990/91, though again with the exception of variant F.

What these results highlight above all is their sensitivity to our estimates of diminishing marginal returns, with implications not just for our comparisons over time and across donors, but for our overall judgement about aid effectiveness and the volumes of aid that can be absorbed. It is therefore encouraging that, as highlighted in Chapter 2, a number of other analysts have estimated the turning point (in terms of aid/GDP) at which aid produces negative returns to be higher than the results used here.

4.3 Policy and poverty focus

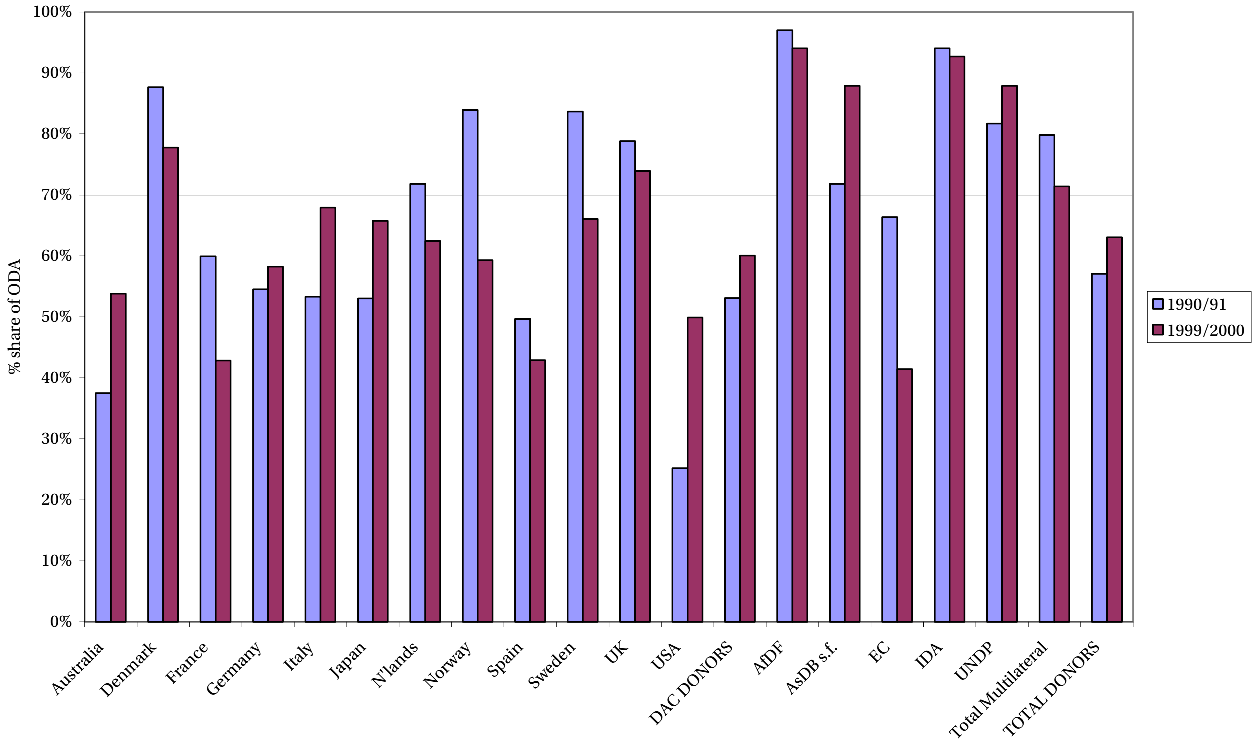
To complement the above analysis, this section assesses the percentage shares of aid given to low-income countries, and the poverty and policy focus of each donor, in both 1990/91 and 1999/2000. The analysis covers (net) ODA only. Summary charts for the major bilateral and selected multilateral donors are presented here. A fuller set of results for all bilaterals and the major multilaterals is presented in Appendix 4.[47]

Shares to low-income countries

The share of ODA going to low-income countries (Fig 4.4) increased modestly from 57% to 63% over the 1990s, rising for bilateral (DAC) donors but falling for multilaterals. The multilateral donors, however, remain significantly more focused on low-income countries (71% in 1999/00) than the bilaterals (60%).

[47] Some caution should be exercised in interpreting these results, particularly for those multilaterals with more specific TA, humanitarian, or global public good mandates.

Figure 4.4: ODA - % share to low income countries



Of the 22 DAC bilateral donors, the UK (74% in 1999/00) is the fourth most focused after Portugal, Ireland and Denmark, although this share has fallen from 79% in 1990/91 (when the UK ranked fifth).[48] The African Development Fund, IDA and IDB are the most poverty-focused of the major multilaterals (>90% in both periods).

OECD data on the proportion of bilateral aid, *including imputed multilateral ODA,* going to low-income countries reveal a slightly different picture: absolute percentages are higher, but the trend has been falling (from 68% in 1989/90 to 64% in 1999/00), and there are modest changes in the rank order of individual bilaterals. The trend in the UK is more steeply downward (from 82% to 69%), and the UK comes eighth overall in 1999/00 (from 7th in 1990/91: see Appendix 4, Table A4.3). This suggests that the UK's multilateral contributions are not well targeted at those that are themselves highly focused on low-income countries.

However, by itself this statistic is not very meaningful, as it says nothing about the numbers of people in recipient countries. This issue is addressed in the remainder of this chapter.

High:low poverty focus

Appendix 4 (Tables A4.1 and A4.2) also reports both the percentage share of ODA going to high and low poverty countries (where the threshold is 50% below the $2/day poverty line),[49] and the average ODA/hd going to each. The latter (and the ratio between them) is the more interesting

[48] Note that around 25% (higher than the DAC average in 1990/01, equal to the DAC average in 1999/00) of the UK's disbursements are unallocatable by income group and are excluded from this analysis, as for all donors. This problem is significantly less for the multilaterals.

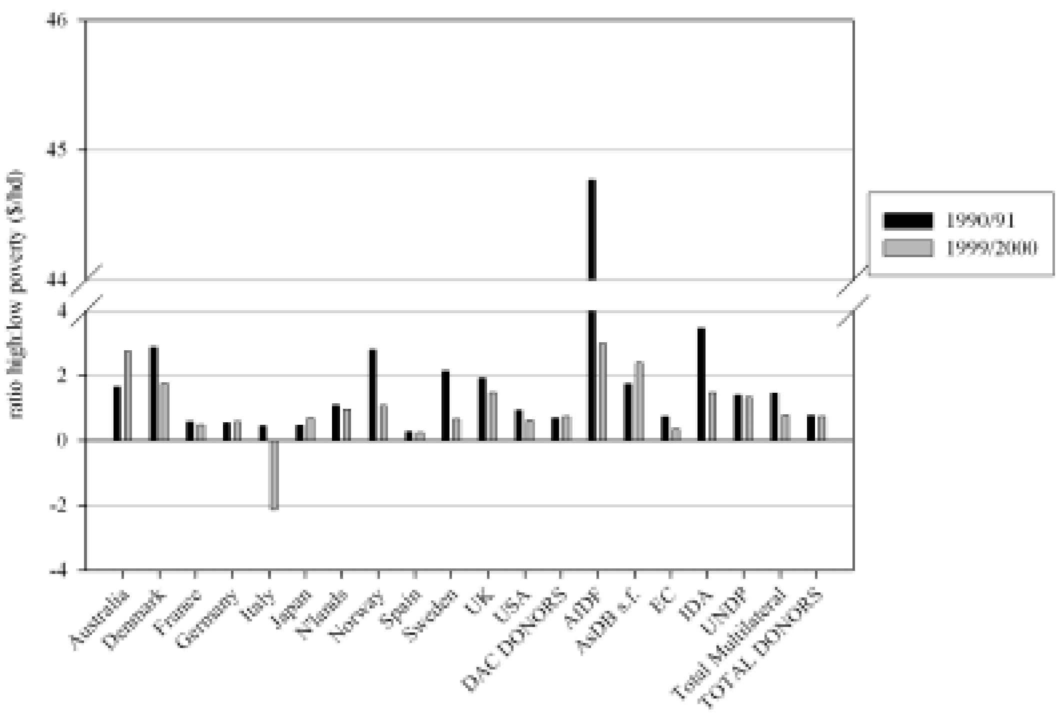
[49] This is the threshold used in the earlier Collier Dollar (1999a,b) analysis. Around 80% of the world's population in our sample for which poverty data are available (totalling 4.4bn in 1999) live in countries with headcount poverty rates above this threshold (58% of 2.2bn if India and China are excluded from the sample).

statistic, since it takes into account the proportion of the population in each group. Note, however, that the poverty data used are the *same* in both periods (see discussion in Appendix 1).

The tables report the total amount of ODA going to all countries in both high and low poverty groups, divided by the total population in each group,[50] although a substantial part of the aid (16% overall in 1990/91 and 22% in 1999/00) goes to countries with no poverty data. What we see (Fig. 4.5a) is that, overall, the ratio of ODA/hd in high poverty countries to ODA/hd in low poverty countries has remained remarkably stable at about 0.75 (in other words, high poverty countries on average received 25% *less* ODA/hd than low poverty countries). But if we exclude India and China (which both fall above the 50% threshold, with $2/day poverty rates of 86.2% and 52.6% respectively), the ratio rises to 1.94 in 1990/91 and 1.74 in 1999/00: high poverty countries received almost twice as much per head as low poverty countries (Fig. 4.5b).

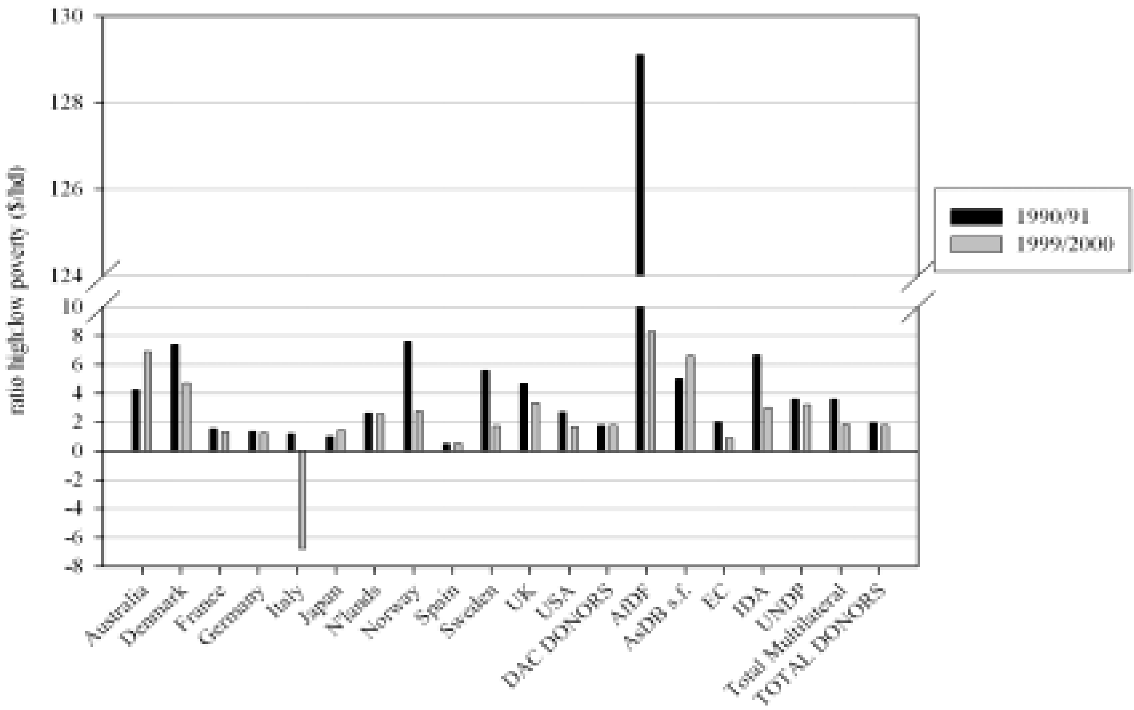
Nevertheless, the figures illustrate an enormous variation across donors, whether India and China are included or not. The ratio for multilaterals halved over this period, but they remain marginally more poverty focused than the bilaterals (whose overall ratio hardly changed). The African Development Fund remains the most poverty-focused (not surprising given its regional mandate), although its ratio has fallen amongst the furthest. The IDA is more poverty-focused than most, the EC much less so. Amongst the major bilaterals, the UK is again one of the more poverty-focused, with a ratio of 3.3 (though down from 4.6), excluding India and China. The Scandinavian donors remain highly poverty-focused in spite of their ratios halving in the 1990s. Australia has the highest ratio. Italy's has turned negative because of net repayments from low poverty countries. Spain, France, Germany, Japan and US have the lowest ratios, with little change over time.

Fig 4.5a: Ratio of ODA/hd to high:low poverty countries



[50] The analysis of individual donors is not therefore restricted just to those countries supported by that donor. This distinction makes little difference when considering aid flows in aggregate (or aggregated across bilaterals or multilaterals), since most potential recipients get some aid from some source. But it *does* make a significant difference for individual donors.

Fig 4.5b: Ratio of ODA/hd to high:low poverty countries, excl. India and China



Good:bad policy focus

Appendix 4 also reports aid shares (and ODA/hd) going to countries in the top, middle and bottom third CPIA categories (a smaller 10-15% of total ODA goes to countries for which no CPIA scores are recorded[51]). The ratio of ODA/hd in good policy countries to ODA/hd in poor policy countries for key donors is presented in Fig 4.6a. There has been an almost universal improvement across all multilaterals (with the exception of UNDP, unsurprisingly given its strong technical assistance focus, and the Asian Development Fund) and bilaterals (the only exception being Australia)[52] – evidence of the greater emphasis on performance-based. Amongst the major donors, the biggest ratios are for Japan, the UK and Germany, the IDA and the EC, which have all seen significant increases in their ratios (with the exception of the IDA, which was already relatively biased towards good policy countries in 1990/91). Overall, the ratio for bilaterals is now marginally higher than for multilaterals.

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[51] Figures have again been derived from the full set of aid recipients and their populations.
[52] Many of the other UN agencies also show falling ratios, but again this is to be expected given their respective roles. Of the other bilaterals, New Zealand, Belgium and Portugal all show falls (see Table A4.2).

Fig 4.6a: Ratio of ODA/hd to good:poor policy countries

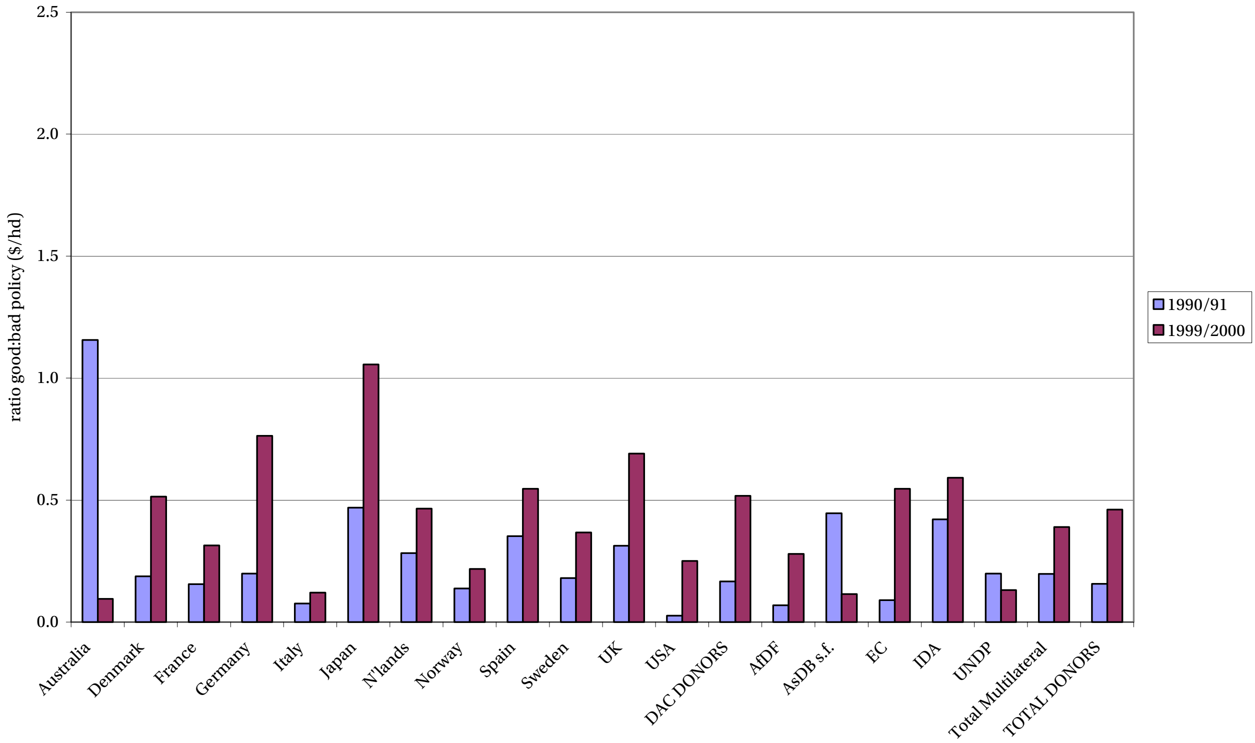
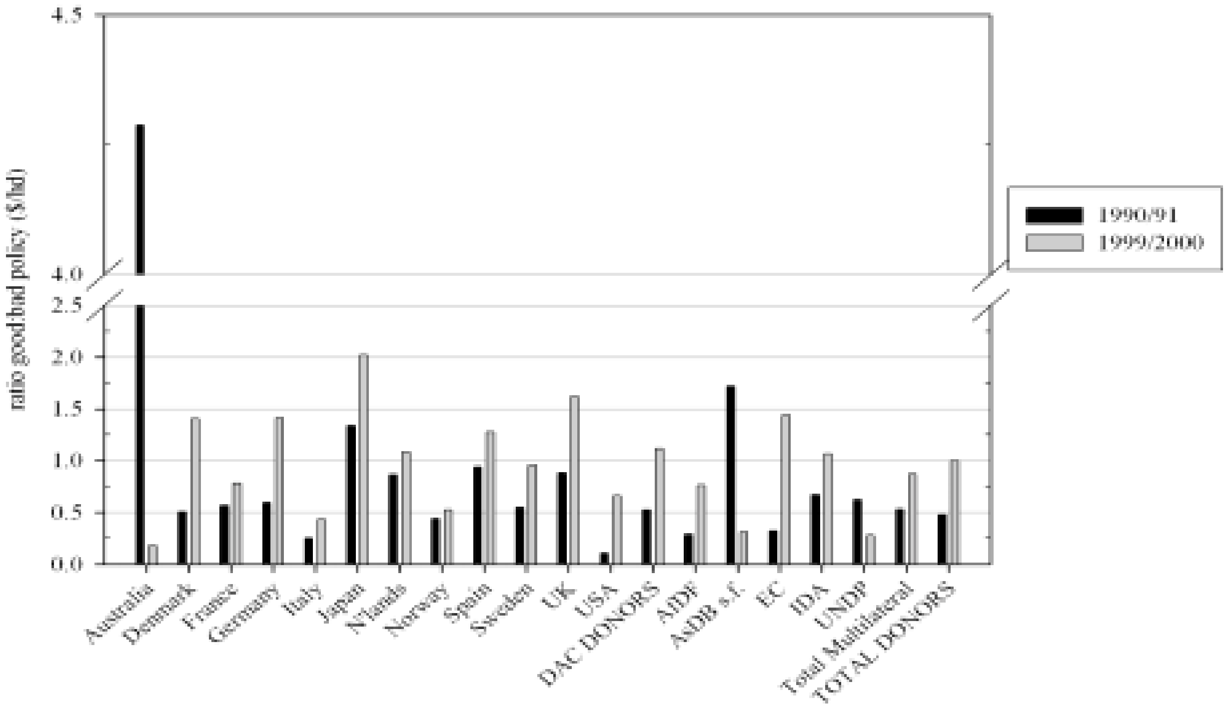


Fig 4.6b: Ratio of ODA/hd to good:poor policy countries, excl. India and China



However, it is notable that the overall ratio for all donors is less than half ($5.24/hd in the top third of countries, $11.37/hd in the bottom third), even in 1999/00. Excluding India and China[53] causes the average ratio to rise to just over 1 (there is little impact on the comparative performance of individual donors: see Fig. 4.6b).

These figures are substantially lower than earlier estimates from the World Bank (2001b), which reported population-weighted figures of $39/hd and $44/hd for good and bad policy countries respectively in 1990 (ratio 0.9), and $28/hd and $16/hd respectively in 1997/98 (ratio 1.7), excluding China and India. These differences appear to be primarily due to differences in the sample,[54] and the central message remains valid – namely, that there has been a substantial relative shift in aid towards good policy countries more or less across the board, though significant differences between donors continue.[55]

4.4 Summary

In summary, this chapter has found that aid efficiency improved in the 1990s, though primarily due to falling aid levels and improved recipient policy performance rather than to changing patterns of aid allocations. Multilateral donors are generally better targeted than bilaterals, though that gap is narrowing. There remains substantial variation across donors, but on all measures the UK is amongst the top performers, with its relative position having improved over the decade. Conclusions based on the Collier/Dollar approach to calculating marginal efficiencies are robust to modest sensitivity testing of their underlying aid-growth model, but the extent of diminishing marginal returns to aid has emerged as at least as important an issue as the significance of the aid-policy interaction.

[53] Both countries had been ranked in the top third in 1990, though India had slipped to the middle third by 1999 (in the WB analysis – see below - both countries are in the top third in both years).

[54] The WB analysis is limited to IDA recipients with IDA/hd of at least $0.50, restricting the sample to 68 countries in 1990 and 78 in 1997/98 (cf. 112 and 124 in 1990/91 and 1999/00 respectively in the analysis above, although the actual policy classification of each country is based on the full set of 118 and 136 countries respectively for which policy scores are available). The WB analysis also shows IDA aid to be significantly more targeted towards good performers than ODA overall.

[55] This finding is also supported by econometric analysis showing that the positive relationship between ODA and the CPIA increased substantially in the 1990s (Dollar, pers.comm.).

5. Conclusions

Recent analysis of aid effectiveness and its implications for aid allocations has generated many useful insights to which donors are already responding. Aid clearly needs to be better focused on poor countries with large numbers of poor people. And other things being equal, more aid should go to countries with better policy and institutional environments (though this should not be overstated), to countries recovering from conflict, and to countries facing external shocks. But there remains much that we do not know, and much more research to be done, in particular on issues of diminishing marginal returns and absorptive capacity,[56] the extent to which aid can be better used to promote policy and institutional reform, and the effectiveness of different aid instruments, and on the implications of each for the pattern of aid allocations.

The Collier/Dollar models are helpful in highlighting major anomalies in the existing pattern of aid allocations and the potential for efficiency gains, but more comprehensive sensitivity testing reveals significantly increased variation in 'poverty-efficient' allocations at both country and regional level, and (unfortunately) much more ambiguity even in the desired direction of change for individual country allocations. Moreover, further development of the models would be needed to explore alternative functional forms of the aid growth regressions, and to incorporate the effect of other variables with which aid appears to interact significantly, the concerns about uneven regional trends in reducing poverty, the achievement of other Millennium Development Goals in addition to income poverty, and the implications of the 2015 target date for the income poverty MDG.

Finally, analysis demonstrating that virtually all of the improvements in aid efficiency in the 1990s can be ascribed to falling aid volumes and improving policy environments, rather than a change in the pattern of aid allocations, should be taken seriously but interpreted carefully. There is plenty of other evidence to suggest that aid effectiveness has been improving, and the case for increasing aid remains strong. But the large differentials in performance of individual donors suggests that there is substantial room for improvement in aid allocations, though our measures of efficiency need to be better informed by the further analysis suggested above.

[56] These may relate as much to rates of change in aid as to levels of aid. Analysis of more complex functional forms that allow for increasing returns to aid over certain ranges also needs to be explored.

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Appendix 1: Data choice and sources in the Burnside/Collier/Dollar models

Time period and sample size

The Burnside/Dollar (BD) growth regressions cover 56 countries (16 of them middle-income) over the period 1970-1993, grouped into 6 four-year periods (1970-73, 1974-77, 1978-81, 1982-85, 1986-89, 1990-93). In BD (2000), this provides a maximum of 275 observations.

The Collier/Dollar (CD) growth regressions cover 59 countries over the period 1974-97, again grouped into 6 four-year periods (1974-77 through to 1994-97). This provides a maximum of 349 observations.[57]

Aid and GDP/GNP data

Different analysts have used different measures of aid and GDP in their aid and growth regressions, with potentially significant implications.

In their original work, Burnside and Dollar (1997, 2000) use a new 'Effective Development Assistance' (EDA) measure of aid, which adds the grant component of concessional loans to outright grants, and excludes all technical assistance (Chang et al., 1999).[58] More importantly, they express this in real terms by first converting from current US$ values to constant 1985 $ (using the unit value of imports price index from the International Financial Statistics to provide a measure of aid that is constant in terms of its purchasing power over a representative bundle of world imports), and then dividing by real GDP (PPP$, constant 1985 prices, chain method) from the Summers and Heston (1991, Penn World Tables 5.6) dataset. The rationale for using such real values is to avoid the problem of potentially spurious increases in the aid/GDP ratio brought about merely by currency devaluation.

Other analysts have generally used nominal ODA (OA for Part II countries) divided by nominal GDP (both expressed in current US$). However, while acknowledging that the BD measure of aid may be conceptually superior, Dalgaard and Hansen (2001) show that this makes little difference in practice: nominal ODA/GDP is highly (98%) correlated with nominal EDA/GDP, while real EDA/GDP is correlated at least 88% with both (93% if a single outlier – Somalia 78-81 – is excluded). BD also find that the choice of ODA or EDA makes little difference, and in subsequent work Collier and Dollar (CD) use ODA but continue to deflate to constant (1985) prices using the procedure above.

The dependent variable used by BD is the growth rate of real GDP/hd, taken from the World Bank's own database rather than from the Penn World Tables (BD 1997, p18). However, the *level* of real GDP/hd included in the set of initial conditions comes from the PWT.[59] The CD aid-growth regressions switch to real growth in GNP/hd as the dependent variable, sourced from World Development Indicators (CD 2002, fn.3), although the initial GDP/hd levels data appear unchanged (even though listed as being GNP/hd in CD 2002, table 1).

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[57] Exceptionally, the first CD model (1999a) uses data for 86 countries averaged over a single period 1990-96, with each country's 1997 CPIA (see below) score used throughout. But this model yielded highly suspects results (see Beynon 1999, 2002 or Lensink and White, 2000b for a critique) and is best discounted.

[58] Contrast this with the conventional ODA measure of aid, which includes all concessional aid with a grant element of at least 25%.

[59] The practice of using different sources for data on levels and growth rates is widespread and generally favoured amongst econometricians. Note that data for initial real GDP/hd are logged in the *American Economic Review* (2000) version (not in 1997 working paper version) and in subsequent CD models to capture convergence effects.

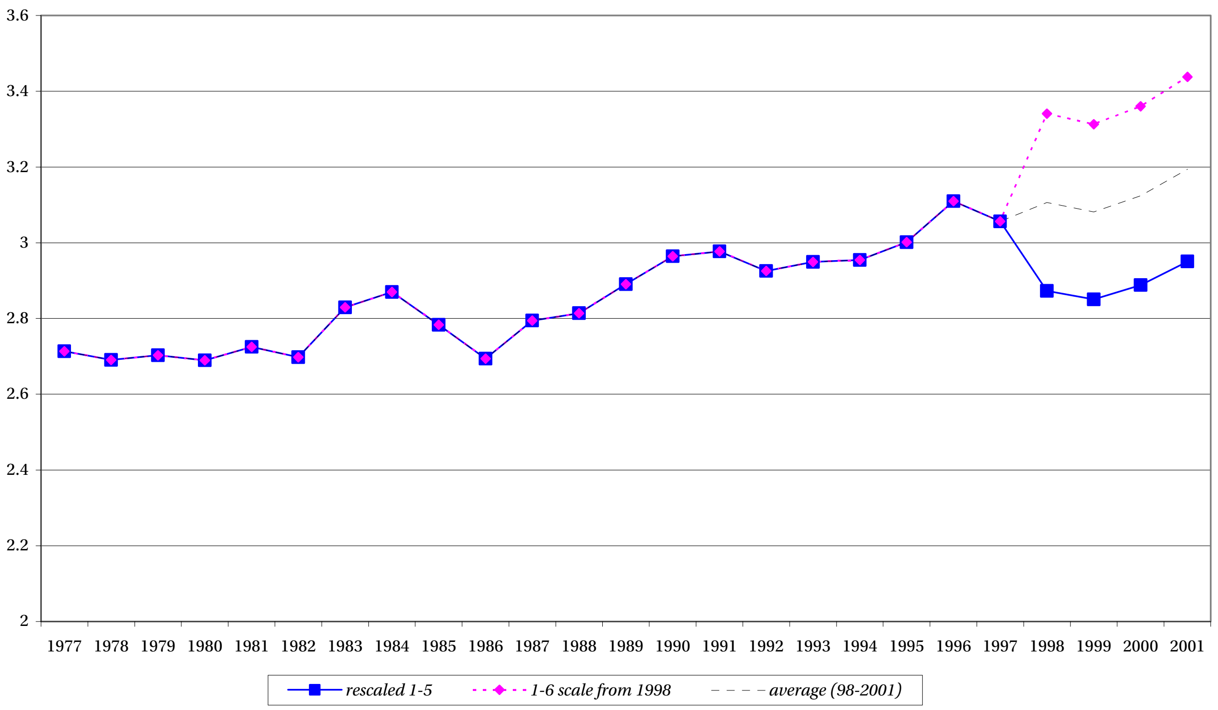
See Appendix 3 for a discussion of the aid/GDP and per capita income data used in the aid allocation and marginal efficiency models.

Policy

BD adopt a policy index constructed from the inflation index, the budget surplus/deficit, and the Sachs Warner measure of openness.[60] CD replace the BD policy index with the World Bank's CPIA (Country Policy and Institutional Assessment), which has been collected annually since at least 1977 for a growing number of countries (85 in 1977, rising to 136 in 2001[61]). Its precise composition and measurement have varied over the years. While the CPIA quintile rankings of many of these countries are now published by the World Bank, the CPIA scores themselves are not yet in the public domain.

Since 1998 the CPIA has been scored on a 1-6 scale, with each component (of 20) given equal weight. In the period 1985-97, the CPIA was measured on a 1-5 scale, and before that on a 1-10 scale. For the aid-growth regression analysis (the time period of which ended in 1997), CD rebased the dataset to a 1-5 scale[62] throughout (see Fig. A1.1). However, the 1998 values of P used in both their aid allocation model, and in the World Bank's analysis of the marginal efficiency of aid in the 1990s, are from the new 1-6 scale. This has potentially significant implications for both sets of calculations. First, it allocates more aid to countries performing well than is warranted by the value of the b_4 coefficient estimated with the 1-5 scale.[63] Second, any improvement in the efficiency of aid in the 1990s will be at least partly due to this one-off upward adjustment in the policy scale. Figure A1.1 illustrates the potential significance of this effect.

Figure A1.1: CPIA policy scores, 1977-2001



[60] See Lensink and White (2000b) for a critique of the construction and interpretation of this index.
[61] CD (1999a,b) report this as being available for 144 countries, though no specific number is mentioned in CD (2001) or (2002).
[62] Not 1-6 as was implied in CD (1999b) and erroneously reported in Beynon (2002) (fn.13).
[63] In order to retain the minimum value of one, the formula to convert from a 1-6 scale to 1-5 scale is $x_{1-5} = (x_{1-6} - 1) * 4/5 + 1$. A score of 6 is therefore reduced by 17% (to 5). A score of 2 is reduced by only 10% (to 1.8).

These problems could be removed by converting the 1998 CPIA scores back to a 1-5 scale. However, there are reasons for *not* making this adjustment. The increase in the range from 1-5 to 1-6 in 1998 was introduced primarily to allow a higher rating for those countries that had sustained good performance over at least three years, with the definitions of performance required to achieve lower marks largely unchanged (it is only since 2001 that more specific guidelines on the standards required for each grade have been established). Moreover, rescaling the 1998 (and later) values to a 1-5 scale results in a sharp dip in the average CPIA score that is not thought to reflect reality, reversing the generally upward trend of the previous decade.[64]

However, the fact remains that the unadjusted scores do show a *significant* jump after 1997, a fact that is unaffected by change in the sample. The possibility that this exaggerates the genuine improvement in the policy environment cannot be ignored. We test the effects of this on our estimates of the marginal efficiency of aid in Chapter 4 and Appendix 3.

Poverty and poverty elasticities

Poverty data in the CD aid allocation models – headcount (h), poverty gap (pg) and the squared poverty gap (spg) for both the PPP$1/day and PPP$2/day poverty lines (the spg for CD 2002 only) – are reportedly (CD 2002) taken from the World Development Indicators 1999 for the 59 countries for which 'high quality' information is available, although there are some differences;[65] CD data for India, Indonesia, Malaysia, and Philippines are all slightly higher than in WDI (1999) (and in subsequent WDI editions, from which data for the latter two were removed). Data for Tanzania and Vietnam do not appear in the WDI (1999), although Tanzanian data (significantly higher than reported in the CD models) do appear in subsequent WDI editions.

It is important to note that the poverty data used are specific to the year in which the survey was conducted, which varies enormously across countries (from the mid-1980s to the mid-1990s). Thus, although they are converted into comparable PPP$ terms using a standard international poverty line, they are not strictly comparable in time.[66] Note too that in order to expand the coverage of their allocation model (to over 100 countries in CD 1999a,b, 2001), Collier/Dollar have had to make use of additional unpublished (and by implication, less reliable) internal World Bank data for the PPP$2/day headcount poverty rate. Moreover, many of the poverty estimates used by CD have been substantially revised in subsequent years (particularly in WDI 2002).

Collier/Dollar adopt a constant elasticity of the headcount rate of poverty (with respect to mean income) of 2 (technically -2 as poverty falls as per capita incomes rise), this being the median figure from a large sample of country estimates from Ravallion and Chen (1997), though they cite Bourguignon's (2000) finding that the absolute value of the elasticity varies positively with per capita income and negatively with initial income inequality (Bourguignon's own average estimate was 1.9). Country-specific elasticities for the pg and spg are derived from formulae given in Datt and Ravallion (1993):

$\alpha_{pg} = (pg\text{-}h)/pg$
$\alpha_{spg} = 2(spg\text{-}pg)/spg$

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[64] Though there had been a fall in 1997, largely due to economic difficulties across many developing countries brought on by the Asian financial crisis. The trend over time could of course be affected by changing the sample, but analysis of the CPIA for just those 67 countries which have a complete data record over the full 25-year period reveals a very similar pattern to that in the figure.
[65] CD 2002 (fn.6) note that for a few countries they have used more recent Chen and Ravallion estimates of poverty.
[66] The WB has made estimates of such year-specific poverty rates – it is these that underlie the regional poverty estimates reported in the annual *Global Economic Prospects* publication – but these are not in the public domain.

Appendix 2: The Collier/Dollar (CD) approach to optimising aid allocations

A: The aid-growth regression

Collier/Dollar start with the familiar growth model:

$$G = c + b_1X + b_2P + b_3A + b_4A^2 + b_5AP \qquad (1)$$

where:

G is real per capita income growth (G*N*P)
X is a set of initial conditions (the log of initial GDP/hd, the log of population, a measure of institutional quality, and various regional and time dummies)
P is the World Bank's CPIA measure of the policy environment
A is aid (as % of GDP)
(see Appendix 1 for discussion of these variables)

from which the marginal impact of aid on growth (G_a) can be presented as:

$$G_a = b_3 + 2b_4A + b_5P \qquad (2)$$

B: Optimising aid allocations

i. The basic model

In their basic model (CD, 1999a, 1999b, 2002), CD then present the optimisation problem as:
Maximise Poverty Reduction = $G^i \alpha^i h^i N^i$ (3)

subject to: $A^i y^i N^i = \forall, \quad A^i \geq 0$ (4)

where:
G is real per capita income growth (GNP, derived as function of aid and policy)
α is the elasticity of poverty reduction with respect to mean income
h is a measure of poverty (eg. the headcount index)
N is population (so h*N = numbers of people below the poverty line)
A is aid (as % of GDP)
y is per capita income
$\forall$ is the total amount of aid available
the superscript 'i' refers to the i^{th} out of n countries.

The first constraint is a budget constraint: the sum of aid to all 'n' countries must equal the total aid available. It looks cumbersome because A is aid divided by GDP, and the y and N terms are necessary to cancel out unwanted terms:

A * y * N = aid/GDP * GDP/population * population = aid

The second constraint simply means that no country can receive negative amounts of aid.

Using equations (3) and (4), poverty reduction will therefore be maximised when:

$$G_a^{\,i} \alpha^i h^i N^i = \lambda y^i N^i \qquad (5)$$

where λ is the shadow value of aid (ie. the marginal effect of an additional \$ of aid on poverty reduction, to be equalised across all countries so as to maximise the objective function). Rearranging:

$$G_a^i = (\lambda\, y^i N^i) / (\alpha^i h^i N^i) \qquad = (\lambda\, y^i) / (\alpha^i h^i) \qquad (6)$$

Substituting with equation (2), this can be rewritten as follows:

$$A^i = 1/(2b_4) * [-b_3 - b_5P^i + [(\lambda\, y^i) / (\alpha^i h^i)]] \qquad (7)$$[67]

to derive the poverty-efficient level of aid for each country. Note that N (total population), and by implication the absolute number of people below the poverty line, *appears* to have dropped out. But by multiplying the top and bottom of the final term by N, the equation can alternatively be written as:

$$A^i = 1/(2b_4) * [-b_3 - b_5P^i + [(\lambda\, GDP^i) / (\alpha^i h^i N^i]] \qquad (8)$$

With b_4 being negative, poverty-efficient aid to any country will therefore be higher, the higher that country's policy score, the lower its per capita income (or aggregate GDP), the higher its poverty elasticity, and the higher its poverty rate (or numbers below the poverty line).[68] It should also be noted that poverty-efficient distributions of aid will differ with the size of the global aid budget being allocated.

ii. The marginal efficiency of aid

The marginal efficiency of aid in each country (λ^i), effectively the number of people lifted out of poverty by an extra \$1m of aid, can similarly be presented as:

$$\lambda^i = G_a^i\, \alpha^i\, (h^i/y^i) \quad = (b_3 + 2b_4A^i + b_5P^i)\, \alpha^i\, (h^i/y^i) \qquad (9)$$

The inverse of λ^i is the marginal cost of poverty reduction, i.e. the cost per person lifted out of poverty.

A weighted average marginal efficiency (ME) can be calculated for all aid, or for each donor, by taking the weighted average of these λ^i marginal effects (weighted by the amount of aid given in aggregate, or by each donor, to each country).

iii. Extending the basic model

In an extension of the basic model (CD 2001), CD incorporate small country bias into the model by re-writing the objective function as:

$$\text{Maximise Poverty Reduction} = \qquad G^i \alpha^i h^i N^i N^{i-\beta} \qquad (3')$$

where: β indicates the degree of small country bias (the value β=0.32 is selected by trial and error to produce an efficient allocation of aid that is correlated with the log of population to exactly the same extent as is actual aid).

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[67] CD actually choose to present the final expression as $[(\lambda / \alpha^i) * (h^i / y^i)^{-1}]$, so that the set of relationships linking aid, policy, and a measure of poverty (the headcount rate divided by per capita income) can be more easily illustrated.

[68] Note that two countries identical in every respect, with the exception that one has 10 times as big a population and therefore 10 times the number of poor people) would still receive the *same* A. But because A is aid *as a % of GDP*, the absolute \$ value of aid also differs by a factor of 10, such that *per capita* aid receipts in the two countries are identical: the model does *not* therefore discriminate against poor people in large countries.

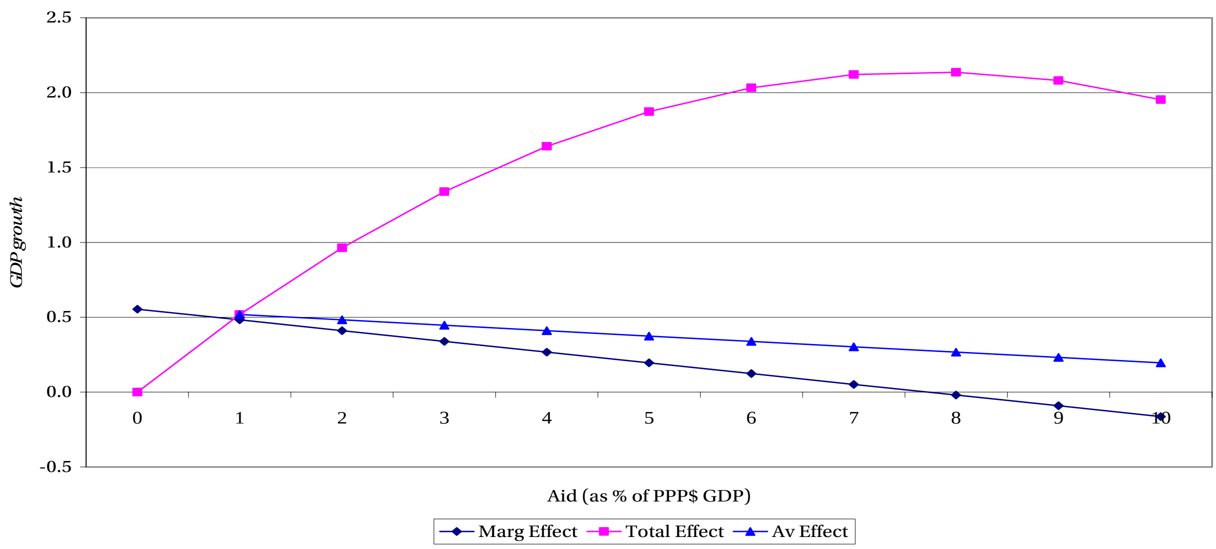
Equations (7) and (9) then become:

$$A^i = 1/(2b_4) * [-b_3 - b_5P^i + [(\lambda y^i) / (\alpha^i h^i N^{i-\beta}]] \qquad (7')$$
$$\lambda^i = (b_3 + 2b_4A^i + b_5P^i) \alpha^i (h^i/y^i) N^{i-\beta} \qquad (9')$$

C: Marginal, total and average effects of aid on growth

The relationship between the marginal, total and average effects of aid on growth at different levels of aid (expressed as a percentage of PPP$ GDP over the range 0-10%, cf. an average level of (1996) aid receipts in the CD sample of about 2%) is illustrated in Fig. A2.1, using the CD2 (1999b) version of the growth regression ($b_3 = 0$, $b_4 = -0.036$, $b_5 = 0.185$)[69] and a policy (CPIA) score of 3 (ie. average).

Fig A2.1: Marginal, total and average effects of aid on growth (CD model, policy = 3)



This clearly shows how the marginal (and hence average) effect of aid diminishes as the level of aid rises: at average aid receipts of 2%, an extra 1% of GDP in aid increases growth by about 0.4 percentage points. This marginal impact falls to zero at an aid level of about 8%, at which level aid is adding just over 2 percentage points to the growth rate. At higher levels of aid, the marginal effect is negative and the total impact of aid on growth declines.

The effect of different values of the policy score is reflected in Fig.A2.2. In poor policy environments (P=2), the marginal impact of aid turns negative at about 5% of GDP, at which level aid adds a maximum of 1 percentage point to the growth rate. In good policy environments (P=4), the marginal impact of aid turns negative at about 10% of GDP, at which level aid adds 3.8 percentage points to the growth rate.[70]

[69] These are the same as variant II in the subsequent CD3 (2002) paper.
[70] About 14% of the CD sample of 349 observations had aid receipts in excess of 5% of GDP, about 3% in excess of 8% of GDP, and about 2% in excess of 10% of GDP.

Fig A2.2a - Marginal effect of aid on growth (CD model, different CPIA scores)

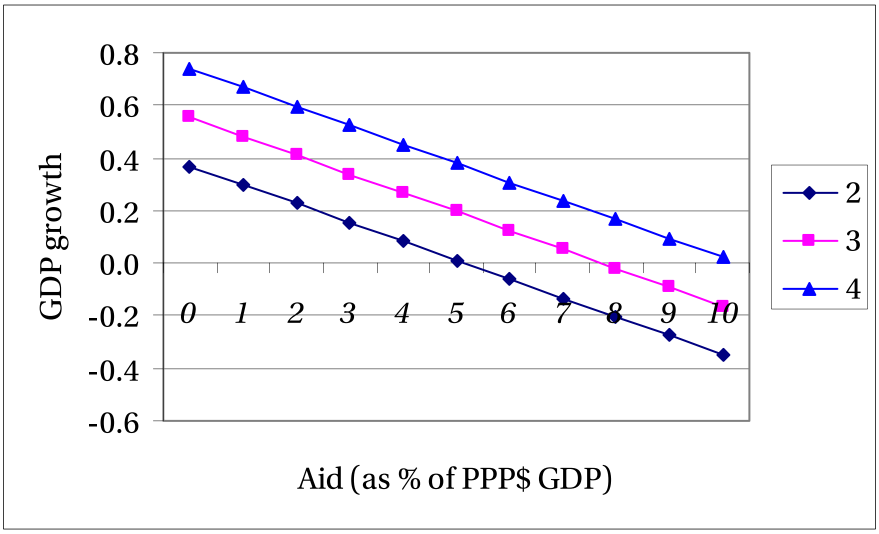


Figure A2.2b - Total effect of aid on growth (CD model, different CPIA scores)

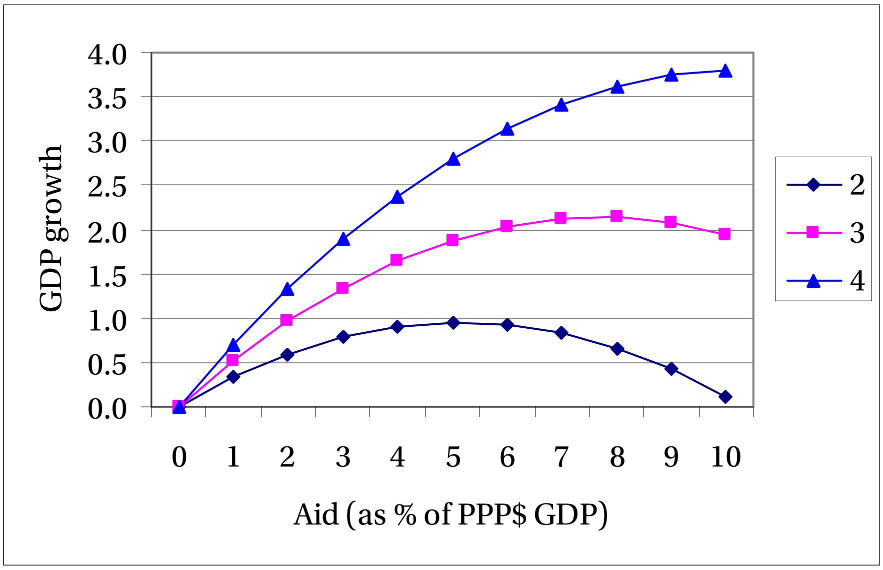
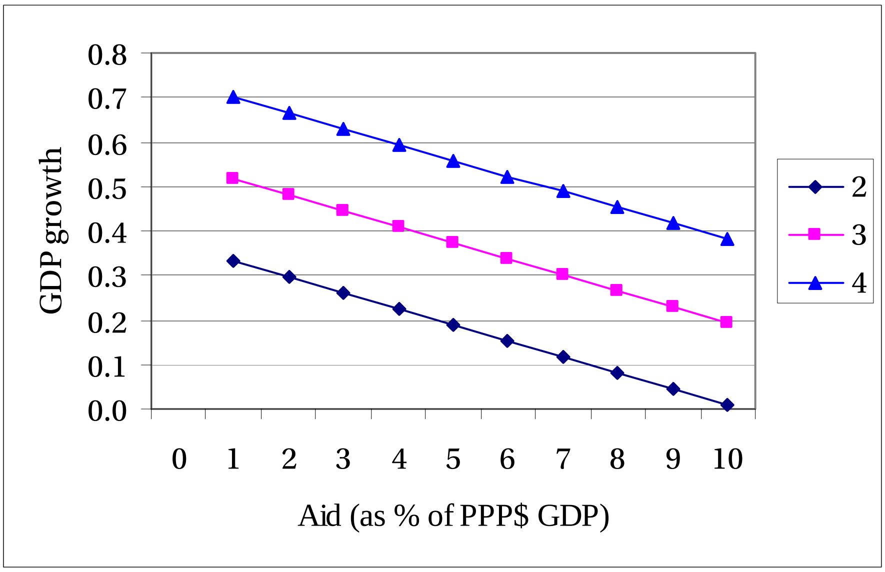


Figure A2.2c - Average effect of aid on growth (CD model, different CPIA scores)



These values are, of course, sensitive to the values of the 'b' parameters. If diminishing returns, for example, were half as severe ($b_4 = -0.018$),[71] the level at which the marginal impact of aid turns negative, and aid's total contribution to the growth rate, would double in each policy scenario.

It is also worth emphasising that the shapes of the marginal and total effects curves are dictated by the quadratic nature of the aid-growth regression, when alternative functional forms that reflect increasing returns to aid at low levels of aid may in fact be more accurate representations of reality. This area merits further research.

D. Allocations per capita

A further notable consequence of the CD formulation is that poverty-efficient aid per person initially *rises* (other things held constant) with per capita GDP, even though aid/GDP falls.[72] This can be seen by multiplying equation (7) through by per capita income ('y') to yield a formula for poverty-efficient aid per capita which we denote $A^{\sim}$:

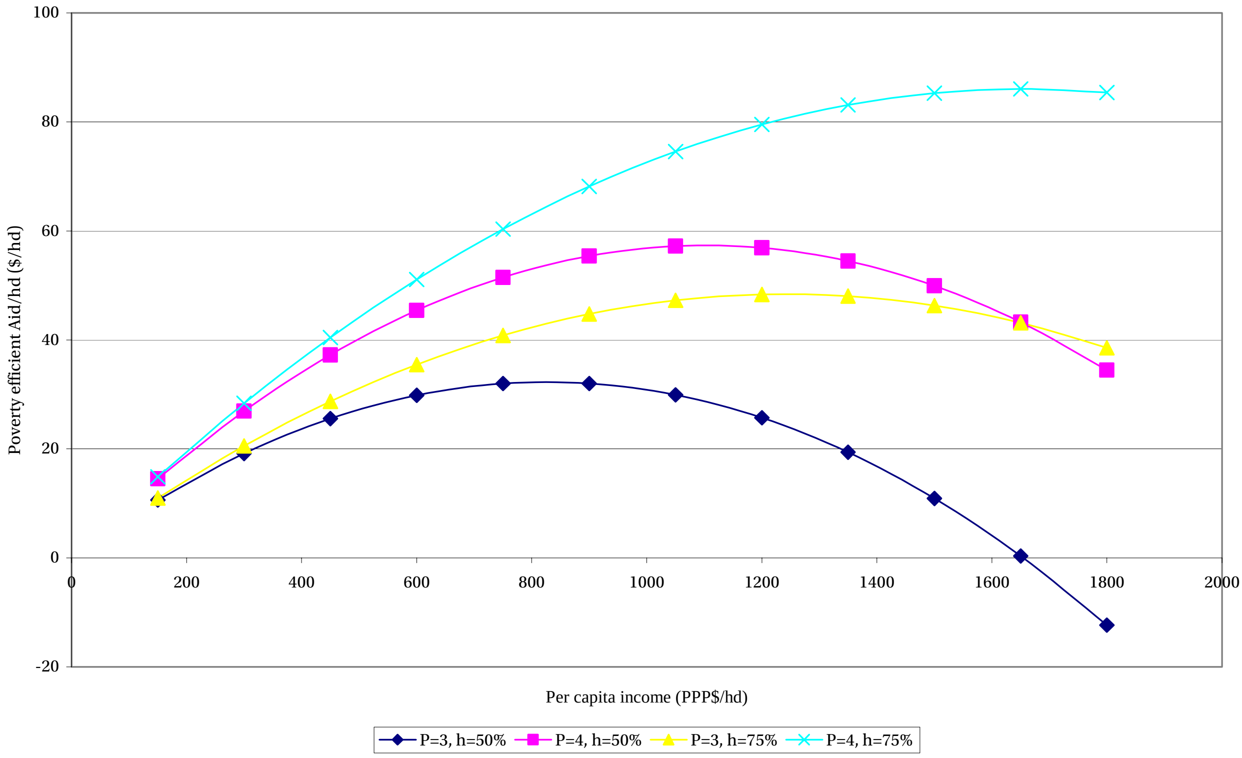
$$A^{\sim i} = A^i * y = y/(2b_4) * [\ -b_3 - b_5 P^i + [(\lambda\, y^i) / (\alpha^i\, h^i)]] \qquad (10)$$

Fig. A2.3 plots values of $A^{\sim}$ at different levels of per capita income, using $\alpha = 2$, $\lambda = 330$ (consistent with the CD results), and the same 'b' parameter estimates as above ($b_3 = 0$, $b_4 = -0.036$, $b_5 = 0.185$). The bottom line presents results using $P = 3$ and $h = 50\%$. The other lines demonstrate that the higher the policy score and the higher the poverty rate, the higher the GDP/capita turning point at which aid/head begins to fall.

[71] This parameter may be the least precisely estimated owing to the small number of observations with high aid receipts, as noted in the footnote above.

[72] I am grateful to Adrian Wood for first making this observation, which applies equally to aid per poor person.

Fig A2.3: Collier/Dollar aid/hd at different levels of per capita income and different policy scores (P) and poverty rates (h)



This feature of the model may be explained by absorptive capacity constraints - which effectively depend on the level of per capita income and the quality of institutions and policies - with the implication that aid should be phased in as absorptive capacity improves (Dollar, pers. comm..). But the pattern illustrated in Fig A2.3 is an inevitable consequence of the modelled functional form of the aid-growth relationship, emphasising the importance of further study in this area.

Appendix 3: A commentary on the World Bank estimates of the rising efficiency of aid

World Bank (WB) estimates showing the number of people lifted out of poverty by an extra $1m of aid rising from 105 to 277 for ODA, and from 284 to 434 for IDA between 1990 and 97/98, are derived as follows from equation (4) set out in Chapter 3:

$$\lambda^i = (b_3 + 2b_4A^i + b_5P^i)\ \alpha^i\ (h^i/y^i) \qquad (4)$$

This Appendix discusses these results in some detail, based on an analysis of the data kindly provided by the World Bank.

Data sources

A total of 136 developing countries are included in the model (including a number of Part II countries whose aid receipts are more correctly categorised as OA rather than ODA), though data gaps restrict the number for which the calculations can actually be performed. In both 1990 and 1997/8, estimates of λ^i are based on the CD2 (1999b) version of the growth regression ($b_3 = 0$, $b_4 = -0.036$, $b_5 = 0.185$).[73] The poverty elasticity α is a constant 2 for all countries for both years.

The 1997/98 λ^i values (covering 108 countries, and reported in CD 2001) are actually denoted λ^{i96}, and are based on 1998 CPIA policy scores (1-6 scale) and 1996 data for aid (OECD data, $m net, since revised). The aid/GDP data are reportedly derived by dividing aid/hd in constant prices by GDP/hd (PPP$) in constant prices (Dollar, pers.comm.). In practice these are virtually identical to aid (current $m) divided by (1996) GDP PPP in *current* $m reported in the WB spreadsheet.[74] Per capita income (y) data are also reportedly expressed in constant PPP$ and taken from the Penn World Tables (PWT version 5.6, updated by Aart Kraay (Dollar, pers.comm.)), but are reasonably close to those derived by dividing the GDP data (in current PPP$ as cited in the WB spreadsheet) by population.[75] Headcount poverty data 'h' (reported in CD3) are drawn from the 1999 WDI dataset for 53 countries, and other Bank sources for the remaining 55 (four of these adjusted from 1999 WDI data), but relate to various survey years going back to 1981 (see Appendix 1).

The 1990 λ^i values (covering 65 countries) are based on 1990 data for P (though these use the previous 1-5 scale, not the 1-6 scale of 1998) and A, but use the *same* values for poverty (h/y) as for 1997/98: the WB are therefore effectively only testing the effects of changing policy scores, aid levels and the pattern of aid allocations. The 1990 GDP data used to derive 1990 aid/GDP appears to be current PPP$m GDP data from the WDI.[76]

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[73] These are the same as variant II in the subsequent CD3 (2002) paper.
[74] These GDP (PPP current $m) data are cited as coming from the WDI, though they do not quite match those from either the WDI dataset (1999 CD-Rom: deviation 5% on average), or the (alternative) values available in the WB's Global Development Network Growth Database (average deviation 19%) (http://www.worldbank.org/research/growth/GDNdata.htm). Similarly the WB 1996 population data also differ slightly from the (this time consistent) data in WDI'99 and GDNG datasets. This serves to illustrate the difficulties of working with data from different sources that are often subject to revision.
[75] Differences are generally less than 10%, averaging 6% overall. In fact, per capita income (y) data differ *more* (35% on average) from the constant PPP$/hd (1985 prices) data from PWT5.6 contained in the WB's GDNG dataset.
[76] The data from which they are derived (labelled 'RGDPPC 90' (real GDP per capita) in the spreadsheet) differ by an average 0.1% from the WDI-99 data series for *current* PPP$ GDP/hd, but by an average 26% from the PWT5.6 data for real (PPP$) GDP/hd in constant prices reported in the WB's GDNG database.

The 1990 weighted average MEs are based on 1990 data for net ODA/OA (labelled ODA as shorthand) and IDA. The 1997/98 weighted average MEs are based on 1997 net ODA, and on IDA disbursements averaged over 1997 and 1998 (again, both labelled 1997/8 as shorthand). If only IDA 1997 had been used, the weighted average would have been 417 instead of 434.

Methodology and results

Having calculated MEs for each country for both time periods ($\lambda^{i90}$and λ^{i96}) using the above formula and data, the World Bank constructs weighted average MEs for ODA and IDA disbursements for 1990 and 1997/8, using as weights each recipient's share of ODA/IDA going to the *108* countries for which they have an estimate of λ^{i96} (covering around 80% of all ODA disbursements, and 90% of all IDA disbursements in both years).[77] These are the Model 0 results presented in Table A3.1 and referred to in the introduction to this Appendix.

If we analyse the WB data more carefully, we first find a minor error in the spreadsheet (incorrect cell cross-referencing) that invalidates the 1990 estimates of λ^{i}. Correcting for this increases the number of countries in our 1990 sample from 65 to 86, and raises the weighted average MEs for ODA from 105 to 121, and for IDA from 277 to 316 (see Table A3.1, model 1).

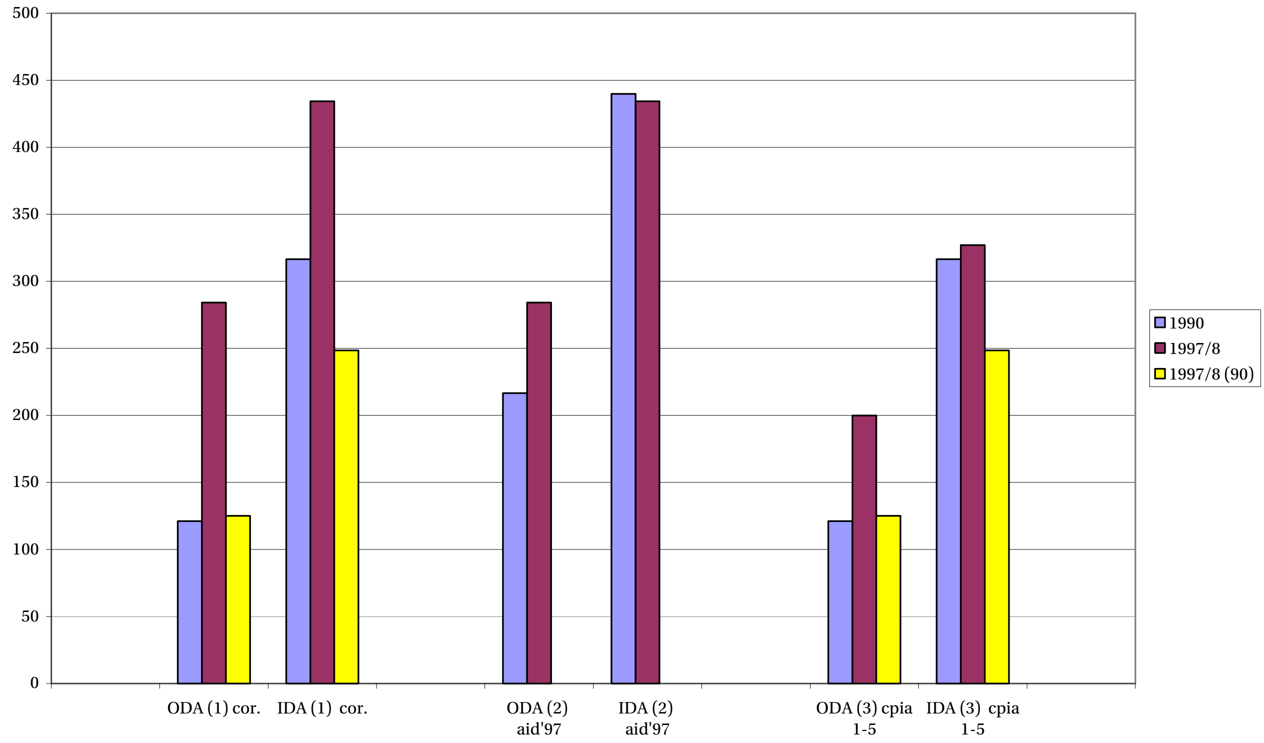
Using this corrected model, we then note that ODA figures in the two years are quite highly correlated (correlation coefficient of 0.8), and IDA figures even more so (0.9).[78] The 1990 and 1996 country ME values ($\lambda^{i90}$and λ^{i96}), however, are only 22% correlated. This immediately suggests that it is changes in aggregate *levels* of aid and the underlying *characteristics* of the countries (specifically the policy variable since the WB analysis holds h/y constant), rather than changes in the pattern of aid allocations, that are primarily responsible for the improvement in aid efficiency. We test for this by calculating what the weighted average 1997/8 MEs would have been, holding aid levels and policy scores constant at 1990 values (ie. using 1997/8 aid shares and λ^{i90} values). The results are presented in Table A3.1 and Fig.A3.1. Looking first at ODA, it is clear that changes in MEs are almost *entirely* due to changes in aid levels and policy performance, rather than the pattern of aid allocations. In the case of IDA, changes in the pattern of aid allocations have actually caused MEs to *fall* (holding aid levels and policy scores constant).[79]

[77] Arguably, the 1990 weighted average MEs should be derived from each recipient's share of ODA/IDA going to the smaller set of countries for which a λ^{i90} value is estimated. These account for 80% of ODA and 92% of IDA in 1990 (but only 70% of ODA in 1997 and 82% of IDA in 1997/98 in the corrected model 1: see below). In practice, doing so makes little difference to the results (except for the incorrect model 0), the 1990 figures being the same as those reported in version b of each model in Table A3.1.

[78] Almost identical results are obtained if we correlate over the entire set of aid recipients in the OECD database.

[79] The same conclusion is also reached if we instead calculate weighted average 1990 MEs using 1990 aid shares and λ^{i96} values (312 for ODA, 534 for IDA) and compare these with the 1997 MEs of 284 (ODA) and 434 (IDA). The IDA result seems surprising, given adjustments in the World Bank's IDA allocation formula that have sought to enhance the weight of policy. One possible interpretation is that IDA has become *excessively* focused on policy as a criterion for aid allocation. This would reinforce previous analysis (Beynon, 2001b), which, using CD poverty-efficient model results as a benchmark, concluded that the weight attached to poverty (proxied by per capita income) in the IDA allocation formula is too low relative to that attached to policy.

Figure A3.1: Numbers lifted out of poverty, ODA cf. IDA, 1990-97/98 (per extra $1m ofaid, marginal effects)



Before examining which of these two effects (changing aid levels or policy scores) is more important, we consider the possibility that changes in the country sample in the two periods are significantly affecting the results by restricting the analysis to the 86 countries for which λ^{i90} values have been calculated. Results show that there is little change, either to this or subsequent models (see Table A3.1, version b for each model).[80]

Table A3.1: Marginal effects of aid: numbers lifted out of poverty per extra $1m aid

Model		ODA 1990	ODA 1997	ODA 1997(90)	IDA 1990	IDA 1997/8	IDA 1997/8(90)
0	Original model results	105	284	57	277	434	199
0b	Original, 1990 sample	*143*	*263*	*57*	*398*	*406*	*199*
1	Corrected original	121	284	125	316	434	248
1b	Corrected (1990 sample)	*129*	*300*	*125*	*318*	*440*	*248*
2	1990 aid adj. to 1997 levels	217			440		
2b	Adjusted (1990 sample)	*231*			*442*		
3	1997/8 policy rescaled to 1-5		200	125		327	248
3b	Rescaled (1990 sample)		*209*	*125*		*329*	*248*

Source: author's calculations from original WB data.

[80] Model 0, where differences are largest, can be ignored.

Total aid fell in the 1990s, while average policy scores rose (Appendix 2). Both factors would have a positive impact on MEs (the former due to diminishing marginal returns to aid). But which is more important? We can separate out the effects of changes in aid levels and policy scores by adjusting to hold aid levels constant. We do this by multiplying the 1990 aid/GDP value for each recipient by 0.73, the ratio of total real ODA 1997:real ODA 1990 disbursements for all individual country recipients in the OECD database.[81] This causes our ME 1990 estimates to rise to 217 for ODA and 440 for IDA, effectively accounting for the *entire* improvement in the weighted average ME of IDA, and 60% of the improvement in the ODA weighted average ME (Table A3.1, model 2).

This analysis does not alter the conclusion that there was a genuine and substantial improvement in aid efficiency in the 1990s, but it does suggest that much of this was due to falling aid volumes.[82] However, the increase in policy scores that accounts for the remainder of the improvement is itself partly due to changing the CPIA from a 1-5 to a 1-6 scale in 1998. Re-scaling the policy score to a consistent 1-5 range *may materially* affect our estimates of improvements in the efficiency of aid. We test the significance of this by re-estimating λ^{i96} values, and hence the 1997/8 MEs, using 1998 P values adjusted to the same 1-5 scale used in calculating the λ^{i90} values. This has a substantial downward effect on the 1997/8 MEs, wiping out virtually all the improvement in IDA and half the improvement in ODA (before adjusting for aid levels), although IDA remains more efficiently allocated than ODA (Table A3.1, model 3). Note, however, that there are reasons for *not* rescaling the policy scores (see Appendix 2). The unadjusted and rescaled 1997/98 MEs are perhaps best interpreted as upper and lower bound estimates.

[81] The WB analysis reports total country-specific ODA/OA (i.e. excluding unallocated regional figures) falling from $53.1bn in 1990 to $43.5bn in 1997, 18% in nominal terms and 27% in real terms (using the OECD's 'total DAC deflator' values of 1990=88.93, 1997=100.14 (1999=100)). Real declines would have been even higher (38%) if the analysis were restricted to our 1990 sample of 86 countries for which λ^{i90} can be calculated.

[82] Note that we are not interested in maximising *marginal* effects (which would, after all, happen when total aid = $1!), so this does *not* imply that we should be further reducing aid volumes! Rather, we are interested in equating the marginal costs of aid-financed poverty reduction (effectively the inverse of the ME: see Appendix 1) with the marginal benefits (which might be expressed (to follow CD3 2001) as the utility to Western taxpayers of using taxes for aid as opposed to other purposes).

Appendix 4: Data

Poverty and Policy Focus of Donor Aid, 1990/91 – 1999/2000

Table A4.1 Bilateral ODA/OA

1999/2000	AUSTRALIA	AUSTRIA	BELGIUM	CANADA	DENMARK	FINLAND	FRANCE	GERMANY	GREECE	IRELAND	ITALY	JAPAN	LUX'BG	N'LANDS	NEW Z.	NORWAY	PORTUGAL	SPAIN	SWEDEN	SWITZ.	UK	USA	DAC DONORS
ODA ($m) (#)	743.9	300.3	456.8	1166.1	1024.6	228.9	3478.2	2982.1	89	151.8	413.7	10121.9	90.8	2202.2	93.1	970.2	193	774.8	1194	673.3	2479.1	7126.2	36954
OA ($m) (#)	1.9	137	5.6	164.8	123.2	34.8	710.2	232.6	9.1	-	110.4	-32.6	2.2	114.4	0.2	27.3	0.3	12.3	106.5	60.7	93	2952.4	4866.1
OA as % of ODA	0.3%	45.6%	1.2%	14.1%	12.0%	15.2%	20.4%	7.8%	10.2%	#VALUE!	26.7%	-0.3%	2.4%	5.2%	0.2%	2.8%	0.2%	1.6%	8.9%	9.0%	3.8%	41.4%	13.2%
ODA - low income % shares (**)																							
LLDCS	16.6%	20.4%	45.0%	35.0%	54.0%	40.1%	21.8%	29.9%	1.4%	76.3%	53.3%	13.6%	36.3%	39.5%	35.5%	46.0%	62.3%	11.7%	42.0%	38.1%	44.1%	26.3%	26.4%
Other Low Income	37.2%	47.6%	25.1%	33.8%	23.8%	24.4%	21.0%	28.3%	4.5%	10.1%	14.6%	52.1%	25.0%	22.9%	16.6%	13.3%	34.7%	31.2%	24.1%	20.6%	29.9%	23.6%	33.7%
ODA - poverty focus (%)																							
no poverty data	29.2%	42.4%	15.7%	19.9%	12.5%	36.1%	36.0%	18.0%	88.3%	17.1%	53.5%	7.1%	18.0%	31.5%	54.5%	40.2%	47.3%	25.7%	28.0%	34.5%	16.6%	39.1%	22.7%
of remainder:																							
$2/day pov >= 50%	91.4%	121.5%	76.4%	76.2%	87.3%	89.9%	65.2%	69.3%	23.3%	90.7%	113.7%	72.9%	75.5%	78.8%	81.8%	80.6%	98.6%	47.6%	71.9%	76.2%	85.1%	70.7%	74.2%
$2/day pov < 50%	8.6%	-21.5%	23.6%	23.8%	12.7%	10.1%	34.8%	30.7%	76.7%	9.3%	-13.7%	27.1%	24.5%	21.2%	18.2%	19.4%	1.4%	52.4%	28.1%	23.8%	14.9%	29.3%	25.8%
ODA - poverty focus ($/hd)																							
no poverty data	0.58	0.35	0.14	0.34	0.28	0.18	3.40	1.28	0.23	0.06	0.59	1.81	0.05	1.19	0.14	0.87	0.26	0.48	0.67	0.48	0.93	5.84	19.09
$2/day pov >= 50%	0.13	0.06	0.06	0.10	0.17	0.03	0.39	0.39	0.00	0.03	0.06	1.69	0.02	0.20	0.01	0.10	0.03	0.06	0.12	0.07	0.39	0.63	4.71
$2/day pov < 50%	0.05	-0.04	0.07	0.12	0.10	0.01	0.80	0.68	0.01	0.01	-0.03	2.45	0.02	0.21	0.01	0.10	0.00	0.28	0.18	0.08	0.26	1.02	6.38
ratio high:low poverty	**2.74**	**-1.45**	**0.83**	**0.82**	**1.76**	**2.29**	**0.48**	**0.58**	**0.08**	**2.51**	**-2.13**	**0.69**	**0.79**	**0.96**	**1.15**	**1.06**	**17.74**	**0.23**	**0.66**	**0.82**	**1.47**	**0.62**	**0.74**
ODA - policy focus (%)																							
no policy data	22.8%	24.5%	11.4%	16.2%	8.2%	27.8%	30.3%	11.7%	56.5%	12.5%	18.7%	4.7%	13.5%	21.6%	39.3%	28.1%	39.1%	18.8%	19.2%	23.9%	13.7%	29.1%	16.2%
of remainder:																							
top third	19.4%	15.7%	19.2%	30.0%	25.4%	23.3%	23.2%	38.1%	62.4%	20.9%	15.3%	40.6%	38.8%	20.7%	24.5%	20.7%	20.3%	45.5%	26.6%	21.5%	31.2%	18.3%	30.7%
middle third	34.3%	98.0%	54.4%	55.4%	63.4%	59.3%	60.2%	50.6%	35.5%	67.9%	56.2%	50.8%	48.4%	69.2%	35.1%	57.9%	41.1%	35.7%	57.1%	58.9%	58.6%	65.1%	55.9%
bottom third	46.3%	-13.7%	26.4%	14.7%	11.2%	17.4%	16.7%	11.3%	2.1%	11.2%	28.5%	8.7%	12.8%	10.1%	40.4%	21.4%	38.6%	18.8%	16.3%	19.6%	10.2%	16.6%	13.4%
ODA - policy focus ($/hd)																							
no policy data	0.57	0.25	0.13	0.35	0.24	0.18	3.63	1.05	0.19	0.06	0.26	1.53	0.04	1.03	0.13	0.78	0.27	0.45	0.58	0.42	0.97	5.52	17.30
top third	0.05	0.02	0.03	0.07	0.09	0.01	0.26	0.41	0.01	0.01	0.02	1.71	0.02	0.11	0.01	0.06	0.01	0.12	0.09	0.04	0.26	0.34	3.75
middle third	0.09	0.10	0.07	0.13	0.22	0.04	0.66	0.53	0.01	0.04	0.08	2.05	0.02	0.34	0.01	0.15	0.02	0.09	0.18	0.10	0.47	1.15	6.56
bottom third	0.54	-0.06	0.16	0.16	0.18	0.05	0.84	0.54	0.00	0.03	0.20	1.62	0.02	0.23	0.05	0.26	0.10	0.22	0.24	0.16	0.38	1.34	7.24
ratio top:bottom policy	**0.09**	**-0.26**	**0.16**	**0.46**	**0.51**	**0.30**	**0.31**	**0.76**	**6.75**	**0.42**	**0.12**	**1.06**	**0.69**	**0.47**	**0.14**	**0.22**	**0.12**	**0.55**	**0.37**	**0.25**	**0.69**	**0.25**	**0.52**

Notes:

(#) Total ODA/OA includes unallocated amounts

(**) Low income % shares exclude unallocated amounts. For analysis of poverty and policy focus, unallocated amounts are included in "no poverty data" or "no policy data" categories.

Sources:

OECD International Development Statistics 2002 CD-Rom (Net ODA, Net OA data)

World Bank World Development Indicators (population data, for 1990 and 1999; poverty data)

World Bank Development Research Group (unpublished poverty and CPIA data)

Table A4.2 Multilateral (selected) and total ODA/OA

1990/91	DAC DONORS	AFRICAN DEV. FUND	AS. D B SPECIAL FUNDS	CARDB	EC	GEF	IDA	IDB SPECIAL OPER. FUND	IFAD	OTHER UN	SAF & PRGF	UNDP	UNFPA	UNHCR	UNICEF	UNRWA	UNTA	WFP	TOTAL MULTILAT.	Other Donors	EC + EU Members	TOTAL DONORS
ODA ($m) (#)	40967.1	615.1	1079.8	31.8	3020.5	-	4117.5	120.6	181.3	670.8	646.6	923	174.6	626	586.2	300.3	256.7	1133.7	14598.5	4253.9	23348.1	59819.4
OA ($m) (#)	3420.5	-	-	-	979.2	-	-	-	-	4	-	2.4	0.9	3.4	1.5	-	3.8	13.4	1008.5	39.5	3151.4	4468.4
OA as % of ODA	8.3%	..	..	..	32.4%	..	..	..	..	0.6%	..	0.3%	0.5%	0.5%	0.3%	..	1.5%	1.2%	6.9%	0.9%	13.5%	7.5%
ODA - low income % shares (**)																						
LLDCS	26.9%	89.0%	40.2%	..	46.1%	..	47.4%	17.9%	48.2%	39.4%	58.8%	54.1%	37.0%	42.4%	48.8%	..	38.9%	56.9%	49.2%	15.6%	37.6%	31.6%
Other Low Income	26.2%	8.0%	31.7%	..	20.3%	..	46.7%	73.7%	34.2%	21.9%	24.5%	27.6%	38.4%	21.4%	32.1%	..	23.4%	19.7%	30.6%	2.0%	26.2%	25.4%
ODA - poverty focus (%)																						
no poverty data	16.0%	17.3%	2.4%	22.9%	11.2%	..	4.5%	0.4%	5.0%	25.8%	-0.2%	13.3%	7.8%	38.5%	15.2%	100.0%	18.6%	22.4%	12.6%	31.1%	17.2%	16.3%
of remainder:						..																
$2/day pov >= 50%	72.7%	99.4%	87.1%	16.7%	74.1%	..	93.0%	108.4%	83.6%	77.2%	87.7%	84.4%	80.9%	76.7%	86.2%	..	69.6%	78.3%	84.9%	56.2%	73.1%	74.8%
$2/day pov < 50%	27.3%	0.6%	12.9%	83.3%	25.9%	..	7.0%	-8.4%	16.4%	22.8%	12.3%	15.6%	19.1%	23.3%	13.8%	..	30.4%	21.7%	15.1%	43.8%	26.9%	25.2%
ODA - poverty focus ($/hd)																						
no poverty data	19.33	0.37	0.09	0.03	1.02	..	0.64	0.00	0.03	0.23	-0.01	0.33	0.03	0.79	0.26	1.04	0.11	0.89	5.73	4.70	11.93	29.50
$2/day pov >= 50%	7.03	0.17	0.30	0.00	0.57	..	1.22	0.02	0.04	0.05	0.19	0.17	0.03	0.09	0.12	0.00	0.03	0.23	3.21	0.56	4.01	10.80
$2/day pov < 50%	10.18	0.00	0.17	0.03	0.77	..	0.35	-0.01	0.03	0.06	0.10	0.12	0.03	0.11	0.07	0.00	0.05	0.25	2.21	1.68	5.69	14.07
ratio high:low poverty	**0.69**	**44.77**	**1.75**	**0.05**	**0.74**	**..**	**3.45**	**-3.35**	**1.32**	**0.88**	**1.84**	**1.40**	**1.10**	**0.85**	**1.62**	**..**	**0.59**	**0.94**	**1.46**	**0.33**	**0.70**	**0.77**
ODA - policy focus (%)																						
no policy data	13.1%	0.0%	0.1%	11.6%	6.1%	..	0.0%	0.0%	0.5%	19.8%	0.0%	6.3%	3.8%	27.0%	5.3%	100.0%	10.0%	7.3%	6.3%	20.1%	14.0%	11.8%
of remainder:																						
top third	35.7%	19.3%	13.6%	66.3%	24.6%	..	47.9%	23.6%	39.7%	34.5%	21.8%	36.2%	45.2%	33.4%	33.0%	..	38.1%	25.0%	33.9%	15.3%	34.7%	33.7%
middle third	32.6%	39.2%	81.8%	7.1%	34.8%	..	35.3%	36.1%	34.8%	34.1%	72.1%	36.7%	34.9%	26.5%	39.6%	..	34.2%	30.8%	40.8%	28.5%	34.2%	34.5%
bottom third	31.7%	41.4%	4.5%	26.6%	40.6%	..	16.8%	40.3%	25.5%	31.3%	6.0%	27.0%	20.0%	40.1%	27.4%	..	27.7%	44.2%	25.4%	56.2%	31.2%	31.9%
ODA - policy focus ($/hd)																						
no policy data	15.55	0.00	0.00	0.01	0.55	0.00	0.00	0.00	0.00	0.17	0.00	0.15	0.01	0.54	0.09	1.02	0.06	0.28	2.84	3.00	9.58	21.13
top third	4.15	0.05	0.06	0.01	0.23	0.00	0.77	0.01	0.03	0.03	0.06	0.09	0.02	0.06	0.06	0.00	0.02	0.10	1.60	0.20	2.30	5.96
middle third	12.05	0.29	1.06	0.00	1.04	0.00	1.79	0.03	0.07	0.09	0.58	0.30	0.05	0.14	0.22	0.00	0.06	0.40	6.11	1.21	7.19	19.37
bottom third	24.93	0.65	0.12	0.02	2.58	0.00	1.82	0.07	0.11	0.17	0.10	0.46	0.06	0.45	0.33	0.00	0.11	1.21	8.09	5.07	13.94	38.08
ratio top:bottom policy	**0.17**	**0.07**	**0.45**	**0.37**	**0.09**	**..**	**0.42**	**0.09**	**0.23**	**0.16**	**0.54**	**0.20**	**0.33**	**0.12**	**0.18**	**..**	**0.20**	**0.08**	**0.20**	**0.04**	**0.16**	**0.16**

1999/2000	DAC DONORS	AFRICAN DEV. FUND	AS. D B SPECIAL FUNDS	CARDB	EC	GEF	IDA	IDB SPECIAL OPER. FUND	IFAD	OTHER UN	SAF & PRGF	UNDP	UNFPA	UNHCR	UNICEF	UNRWA	UNTA	WFP	TOTAL MULTILAT.	Other Donors	EC + EU Members	TOTAL DONORS
ODA ($m) (#)	36954	379.5	931.6	15.8	4662.5	75.7	4348.7	188.2	137.2	364.4	54.3	449.3	159	372.7	570.4	293.4	441.4	356.5	13932.6	655.6	20721.6	51542.2
OA ($m) (#)	4866.1	-	-	-0.3	2809.6	28.2	-3.5	0.1	2.6	11.7	-	6.4	1.6	19.7	3.8	-	13.4	-	2915.8	247.1	4501.2	8029
OA as % of ODA	13.2%	-	-	-1.9%	60.3%	37.3%	-0.1%	0.1%	1.9%	3.2%	-	1.4%	1.0%	5.3%	0.7%	-	3.0%	-	20.9%	37.7%	21.7%	15.6%
ODA - low income % shares (**)																						
LLDCS	26.4%	72.1%	39.6%	..	29.1%	11.2%	41.5%	22.1%	46.5%	15.6%	49.4%	61.1%	43.5%	42.4%	49.0%	..	41.2%	58.6%	37.8%	23.9%	32.9%	29.8%
Other Low Income	33.7%	21.9%	48.3%	..	12.3%	55.0%	51.2%	71.9%	36.7%	18.1%	197.1%	26.8%	33.6%	19.8%	34.4%	..	22.1%	26.9%	33.6%	10.8%	22.3%	33.2%
ODA - poverty focus (%)																						
no poverty data	22.7%	5.0%	6.3%	23.9%	36.2%	1.0%	5.3%	9.1%	15.5%	22.7%	20.0%	17.9%	18.3%	41.0%	15.8%	72.3%	44.6%	16.5%	19.0%	46.0%	28.2%	22.0%
of remainder:																						
$2/day pov >= 50%	74.2%	92.1%	90.3%	28.8%	57.6%	73.2%	85.1%	82.9%	82.6%	33.7%	-19.3%	83.7%	80.1%	71.8%	85.3%	0.0%	68.5%	84.0%	75.5%	47.2%	71.2%	74.3%
$2/day pov < 50%	25.8%	7.9%	9.7%	71.2%	42.4%	26.8%	14.9%	17.1%	17.4%	66.3%	119.3%	16.3%	19.9%	28.2%	14.7%	100.0%	31.5%	16.0%	24.5%	52.8%	28.8%	25.7%
ODA - poverty focus ($/hd)																						
no poverty data	19.09	0.06	0.17	0.01	4.45	0.00	0.68	0.05	0.06	0.16	0.09	0.20	0.07	0.47	0.16	0.62	0.48	0.17	7.04	1.04	13.72	27.16
$2/day pov >= 50%	4.71	0.09	0.23	0.00	0.44	0.01	1.00	0.04	0.03	0.02	-0.01	0.07	0.03	0.05	0.07	0.00	0.04	0.07	2.21	0.06	2.43	6.97
$2/day pov < 50%	6.38	0.03	0.09	0.01	1.26	0.02	0.68	0.03	0.02	0.14	0.16	0.06	0.03	0.07	0.05	0.09	0.07	0.05	2.79	0.25	3.82	9.42
ratio high:low poverty	**0.74**	**2.99**	**2.39**	**0.10**	**0.35**	**0.70**	**1.47**	**1.25**	**1.22**	**0.13**	**-0.04**	**1.32**	**1.03**	**0.65**	**1.49**	**0.00**	**0.56**	**1.35**	**0.79**	**0.23**	**0.64**	**0.74**
ODA - policy focus (%)																						
no policy data	16.2%	3.0%	0.4%	18.1%	23.4%	0.2%	0.0%	9.1%	7.2%	18.5%	0.0%	7.6%	9.9%	25.9%	9.1%	57.0%	37.3%	5.9%	10.1%	27.0%	19.4%	14.6%
of remainder:																						
top third	30.7%	20.1%	10.1%	79.5%	32.4%	56.3%	24.6%	5.7%	21.7%	63.8%	-62.9%	18.1%	22.9%	17.8%	18.6%	64.3%	28.9%	10.6%	25.1%	18.2%	29.5%	28.7%
middle third	55.9%	63.6%	69.9%	-9.4%	54.2%	35.1%	66.0%	72.6%	64.0%	22.0%	167.9%	50.8%	51.0%	58.6%	52.0%	35.7%	41.7%	57.4%	60.4%	47.3%	56.9%	57.2%
bottom third	13.4%	16.3%	20.0%	29.9%	13.4%	8.6%	9.4%	21.7%	14.3%	14.3%	-5.0%	31.1%	26.1%	23.6%	29.4%	0.0%	29.4%	32.0%	14.5%	34.4%	13.6%	14.1%
ODA - policy focus ($/hd)																						
no policy data	17.30	0.04	0.01	0.01	3.65	0.00	-0.01	0.06	0.04	0.17	0.00	0.10	0.05	0.38	0.12	0.62	0.51	0.08	4.76	0.77	11.96	22.82
top third	3.75	0.04	0.05	0.01	0.53	0.02	0.54	0.00	0.01	0.06	-0.05	0.03	0.01	0.03	0.03	0.04	0.03	0.02	1.44	0.05	2.01	5.24
middle third	6.56	0.11	0.32	0.00	0.85	0.01	1.40	0.06	0.04	0.02	0.12	0.09	0.03	0.08	0.08	0.02	0.05	0.09	3.34	0.13	3.72	10.03
bottom third	7.24	0.13	0.42	0.01	0.97	0.01	0.92	0.08	0.04	0.06	-0.02	0.24	0.07	0.15	0.20	0.00	0.15	0.24	3.70	0.44	4.08	11.37
ratio top:bottom policy	**0.52**	**0.28**	**0.11**	**0.60**	**0.55**	**1.47**	**0.59**	**0.06**	**0.34**	**1.01**	**2.82**	**0.13**	**0.20**	**0.17**	**0.14**	**..**	**0.22**	**0.08**	**0.39**	**0.12**	**0.49**	**0.46**

Notes:

(#) Total ODA/OA includes unallocated amounts.
Low income % shares exclude unallocated amounts. For analysis of poverty and policy focus, unallocated amounts are included in "no
(**) poverty data" or "no policy data" categories.

Sources:

OECD International Development Statistics 2002 CD-Rom (Net ODA, Net OA data)
World Bank World Development Indicators (population data, for 1990 and 1999; poverty data)
World Bank Development Research Group (unpublished poverty and CPIA data)

Table A4.3 Bilateral shares to low income countries (incl. imputed multilateral shares)

		Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Japan	Lux.	N'lands	New.Z.	Norway	Portugal	Spain	Sweden	Switz.	UK	USA	DAC DONORS
Low income % share	1990/91	37.5%	65.5%	74.7%	69.9%	87.7%	75.8%	59.9%	54.5%	..	81.3%	53.3%	53.0%	70.6%	71.8%	32.2%	83.9%	..	49.6%	83.7%	75.9%	78.8%	25.2%	53.1%
	1999/2000	53.8%	68.0%	70.1%	68.7%	77.8%	64.5%	42.8%	58.2%	5.9%	86.3%	67.9%	65.7%	61.3%	62.5%	52.1%	59.3%	97.1%	42.9%	66.1%	58.6%	74.0%	49.9%	60.0%
Low income % share (*)	1989/90 (m	49.4%	74.8%	84.6%	75.4%	86.5%	80.0%	75.6%	65.0%	-	89.7%	75.0%	66.1%	73.3%	78.3%	39.5%	84.2%	99.8%	61.4%	87.1%	81.3%	81.6%	46.4%	68.4%
	1999/00 (m	60.3%	66.7%	66.9%	72.3%	75.6%	66.8%	56.8%	60.2%	16.5%	78.7%	62.4%	69.1%	60.1%	70.5%	57.1%	63.6%	90.3%	45.4%	68.6%	66.4%	68.5%	57.6%	64.5%
RANKS																								**TOTAL**
Low income % share	1990/91	18	12	8	11	1	7	13	14	..	4	15	16	10	9	19	2	..	17	3	6	5	20	20
	1999/2000	17	7	5	6	3	11	21	16	22	2	8	10	13	12	18	14	1	20	9	15	4	19	22
Low income % share (*)	1989/90 (m	19	14	5	12	4	9	11	17	..	2	13	16	15	10	21	6	1	18	3	8	7	20	21
	1999/00 (m	15	11	9	4	3	10	20	16	22	2	14	6	17	5	19	13	1	21	7	12	8	18	22

* ODA, including imputed multilateral share (OECD 2002 CD-Rom, DCR Stats Table 26)
Source: OECD International Development Statistics 2002 CD-Rom

Aid Efficiency: Comparing over time and across donors

Table A4.4 Analysis of marginal efficiencies by donor, 1990/91 and 1999/2000

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Japan	Lux.	N'lands	New.Z.	Norway	Portugal	Spain	Sweden	Switz.	UK	USA	DAC DONORS
BACKGROUND DATA																							
percentage of total (ODA+OA) aid programme covered by countries for which ME data available																							
1990/91 (%)	83%	78%	71%	56%	67%	60%	70%	62%	..	78%	70%	88%	71%	64%	25%	72%	86%	78%	62%	69%	66%	65%	70%
1999/00 (%)	64%	65%	57%	47%	67%	51%	56%	70%	17%	69%	53%	80%	80%	38%	44%	47%	51%	61%	50%	48%	65%	47%	60%
correlation coefficient of 1990/91 and 1999/2000 aid allocations for 157 countries in sample	0.96	0.53	0.43	0.63	0.72	0.61	0.72	0.49	..	0.43	0.27	0.81	0.45	0.71	0.83	0.81	0.94	0.30	0.80	0.66	0.78	0.82	0.72
MARGINAL EFFECTS																							
Marginal Effects (people/$m)																							
1990/91	156	187	329	186	23	-79	135	192	0	-23	103	154	28	170	43	-124	-913	63	-203	139	97	96	117
bilateral rank	6	3	1	4	16	19	9	2	17	18	10	7	15	5	14	20	22	13	21	8	11	12	
1999/00	221	220	396	263	364	300	276	260	142	571	355	267	297	363	191	366	177	170	308	343	387	211	275
bilateral rank	16	17	2	14	5	10	12	15	22	1	7	13	11	6	19	4	20	21	9	8	3	18	
% improvement in MEs	42%	18%	20%	42%	1510%	..	104%	35%	..	..	245%	73%	955%	114%	344%	..	..	171%	..	147%	297%	120%	135%
Marginal Effects holding aid levels/country characteristics constant																							
1999/00 (90/1)	130	139	113	97	-21	-79	50	53	66	-72	-229	184	45	15	69	-30	-678	58	-32	70	84	90	95
1990/91 (99/00)	271	271	573	547	268	982	561	500	0	61	1807	210	75	497	68	459	287	194	541	509	289	300	355
Marginal Effects 1999/2000 (people/$m), policy adjusted to 1-5 scale																							
1999/00	181	177	306	205	262	217	216	195	118	417	254	218	227	265	146	259	71	135	223	264	278	167	213
bilateral rank	16	17	2	14	6	12	13	15	21	1	8	11	9	4	19	7	22	20	10	5	3	18	
% improvement in MEs	16%	-6%	-7%	10%	1062%	..	60%	1%	..	..	147%	41%	705%	56%	241%	..	..	115%	..	90%	185%	74%	82%
% reduction cf. unadjusted MEs	-18%	-20%	-23%	-22%	-28%	-28%	-22%	-25%	-17%	-27%	-28%	-18%	-24%	-27%	-23%	-29%	-60%	-20%	-28%	-23%	-28%	-21%	-23%
% reduction in improvement cf. unadjusted MEs	-62%	-133%	-134%	-75%	-30%	-22%	-42%	-96%	..	-26%	-40%	-43%	-26%	-51%	-30%	-22%	-10%	-32%	-17%	-39%	-38%	-39%	-39%

	AfDF	AsDB	CarDB	EC	IDA	IDB	IFAD	SAF/PRGF	UNDP	UNICEF	TOTAL MULTI.	EC + EU	TOTAL DONORS
BACKGROUND DATA													
percentage of total (ODA+OA) aid programme covered by countries for which ME data available													
1990/91 (%)	82%	96%	..	73%	97%	57%	90%	104%	63%	68%	77%	67%	72%
1999/00 (%)	95%	94%	52%	64%	95%	91%	85%	220%	68%	50%	74%	60%	64%
correlation coefficient of 1990/91 and 1999/2000 aid allocations for 157 countries in sample	0.28	0.92	0.59	0.62	0.91	0.69	0.55	-0.63	0.84	0.87	0.72	0.82	0.72
MARGINAL EFFECTS													
Marginal Effects (people/$m)													
1990/91	-79	389	107	33	193	30	228	1032	247	296	137	80	126
bilateral rank													
1999/00	518	445	85	154	440	206	415	-201	443	472	311	259	285
bilateral rank													
% improvement in MEs	..	14%	-20%	366%	128%	594%	82%	-119%	79%	59%	127%	225%	125%
Marginal Effects holding aid levels/country characteristics constant													
1999/00 (90/1)	-18	366	16	11	173	32	116	3445	173	215	103	27	98
1990/91 (99/00)	709	510	224	186	445	99	530	3076	832	688	412	384	381
Marginal Effects 1999/2000 (people/$m), policy adjusted to 1-5 scale													
1999/00	370	373	67	115	339	149	319	-326	349	377	239	192	220
bilateral rank													
% improvement in MEs	..	-4%	-38%	248%	75%	403%	40%	-132%	41%	27%	74%	142%	74%
% reduction cf. unadjusted MEs	-29%	-16%	-22%	-25%	-23%	-28%	-23%	62%	-21%	-20%	-23%	-26%	-23%
% reduction in improvement cf. unadjusted MEs	-25%	-130%	85%	-32%	-41%	-32%	-52%	10%	-48%	-54%	-41%	-37%	-41%

	Australia	Austria	Belgium	Canada	Denmark	Finland	France	Germany	Greece	Ireland	Italy	Japan	Lux.	N'lands	New.Z.	Norway	Portugal	Spain	Sweden	Switz.	UK	USA	DAC DONORS
MARGINAL EFFECTS - modifying parameter estimates																							
A: CD 2002 var.I																							
1990/91	157	183	226	142	35	-60	84	143	0	-24	-265	135	26	163	41	-88	-618	59	-147	143	94	50	90
bilateral rank (**)	4	2	1	7	14	18	10	5	16	17	21	8	15	3	13	19	22	11	20	6	9	12	**0.903**
1999/00	163	188	294	230	369	282	237	240	118	571	284	233	259	348	153	351	165	145	292	294	382	182	246
bilateral rank (**)	19	16	7	15	3	10	13	12	22	1	9	14	11	5	20	4	18	21	8	6	2	17	**0.962**
% improvement in MEs	4%	3%	30%	62%	951%	..	182%	67%	..	..	..	73%	915%	113%	271%	..	..	147%	..	106%	307%	263%	174%
B: CD 2002 var.III																							
1990/91	133	168	91	49	-12	-282	-37	56	0	-47	-850	120	14	94	35	-210	-743	32	-287	72	53	-6	29
bilateral rank (**)	2	1	5	9	15	19	16	7	13	17	22	3	12	4	10	18	21	11	20	6	8	14	**0.793**
1999/00	129	170	216	206	356	254	210	220	108	547	208	220	227	321	124	316	88	131	266	256	358	164	226
bilateral rank (**)	19	16	12	15	3	8	13	11	21	1	14	10	9	4	20	5	22	18	6	7	2	17	**0.870**
% improvement in MEs	-3%	1%	138%	319%	..	..	..	295%	..	..	..	83%	1534%	240%	254%	..	..	307%	..	255%	575%	..	685%
C: CD 2002 var.IV																							
1990/91	180	197	362	234	82	162	205	231	0	-1	319	150	37	232	48	35	-493	86	-7	214	135	107	151
bilateral rank (**)	9	8	1	3	15	10	7	5	19	20	2	11	17	4	16	18	22	14	21	6	12	13	**0.866**
1999/00	198	206	372	254	383	310	263	261	127	594	359	246	291	375	183	385	241	160	319	332	406	201	267
bilateral rank (**)	19	17	6	14	4	10	12	13	22	1	7	15	11	5	20	3	16	21	9	8	2	18	**0.970**
% improvement in MEs	10%	4%	3%	8%	365%	92%	28%	13%	..	..	13%	65%	683%	62%	283%	1012%	..	86%	..	55%	201%	88%	77%
D: A, with b4 1 s.d. less negative																							
1990/91	273	267	513	386	220	673	390	364	0	41	791	179	64	412	69	354	218	152	376	416	242	152	255
bilateral rank (**)	11	12	3	7	14	2	6	9	22	21	1	16	20	5	19	10	15	17	8	4	13	18	**0.375**
1999/00	199	229	413	298	520	411	304	329	131	793	455	269	351	494	213	522	428	180	422	394	549	230	320
bilateral rank (**)	20	18	9	15	4	10	14	13	22	1	6	16	12	5	19	3	7	21	8	11	2	17	**0.848**
% improvement in MEs	-27%	-14%	-19%	-23%	136%	-39%	-22%	-10%	..	1827%	-42%	50%	448%	20%	206%	48%	96%	18%	12%	-5%	127%	51%	26%
E: A, with b4 1 s.d. more negative																							
1990/91	40	98	-60	-102	-150	-793	-222	-77	0	-89	-1322	91	-13	-86	13	-529	-1454	-34	-670	-130	-54	-52	-75
bilateral rank (**)	3	1	10	14	16	20	17	11	5	13	21	2	6	12	4	18	22	7	19	15	9	8	**0.436**
1999/00	128	147	174	162	218	154	169	151	105	348	112	198	167	201	94	179	-98	111	163	194	216	135	173
bilateral rank (**)	17	15	8	12	2	13	9	14	20	1	18	5	10	4	21	7	22	19	11	6	3	16	**0.831**
% improvement in MEs	219%	49%	..	..	..	..	..	..	..	..	..	118%	..	..	602%	..	..	..	..	..	..	..	..
F: DH 2001 equ.8																							
1990/91	-4	140	156	-141	-430	-1916	-358	-62	0	-191	-1388	212	-35	-274	13	-1348	-4309	-102	-1731	-412	-170	42	-117
bilateral rank (**)	7	3	2	11	17	21	15	9	6	13	19	1	8	14	5	18	22	10	20	16	12	4	**0.572**
1999/00	447	370	665	383	265	264	420	293	278	475	395	466	398	327	288	273	-282	275	272	487	296	329	379
bilateral rank (**)	5	10	1	9	20	21	6	14	16	3	8	4	7	12	15	18	22	17	19	2	13	11	**0.283**
% improvement in MEs	..	164%	327%	..	..	..	..	..	..	..	..	120%	..	..	2134%	..	..	..	..	..	..	692%	..

	AfDF	AsDB	CarDB	EC	IDA	IDB	IFAD	SAF/PRGF	UNDP	UNICEF	TOTAL MULTI.	EC + EU	TOTAL DONORS
MARGINAL EFFECTS - modifying parameter estimates													
A: CD 2002 var.I													
1990/91	-78	291	100	17	187	7	191	1149	210	219	114	55	98
bilateral rank (**)													
1999/00	507	372	91	141	408	176	380	6	356	375	281	239	256
bilateral rank (**)													
% improvement in MEs	..	28%	-9%	716%	118%	2556%	98%	-99%	69%	71%	146%	335%	159%
B: CD 2002 var.III													
1990/91	-269	237	84	-22	137	-26	108	880	72	108	50	-24	35
bilateral rank (**)													
1999/00	470	347	96	127	384	144	351	-9	295	314	257	217	234
bilateral rank (**)													
% improvement in MEs	..	47%	15%	..	181%	..	225%	-101%	310%	190%	417%	..	574%
C: CD 2002 var.IV													
1990/91	113	345	116	57	238	39	275	1418	348	329	178	133	162
bilateral rank (**)													
1999/00	544	397	86	154	433	209	409	21	416	436	304	261	277
bilateral rank (**)													
% improvement in MEs	380%	15%	-26%	172%	82%	433%	49%	-99%	19%	32%	71%	96%	71%
D: A, with b4 1 s.d. less negative													
1990/91	517	342	163	117	386	66	433	2547	632	472	304	271	272
bilateral rank (**)													
1999/00	738	403	108	195	528	267	499	474	465	472	369	332	333
bilateral rank (**)													
% improvement in MEs	43%	18%	-34%	67%	37%	304%	15%	-81%	-26%	0%	22%	23%	22%
E: A, with b4 1 s.d. more negative													
1990/91	-673	240	37	-82	-11	-53	-51	-249	-212	-35	-75	-161	-75
bilateral rank (**)													
1999/00	277	342	73	86	288	86	260	-462	247	278	192	145	178
bilateral rank (**)													
% improvement in MEs	..	43%	98%	..	..	..	..	..	..	..	..	..	..
F: DH 2001 equ.8													
1990/91	-1545	806	57	-137	-117	-30	-80	-1791	-470	113	-150	-308	-120
bilateral rank (**)													
1999/00	387	886	94	173	566	220	534	-1975	738	838	409	281	388
bilateral rank (**)													
% improvement in MEs	..	10%	65%	..	..	..	..	..	..	640%	..	..	..

(**) figure in total DAC donors column represents correlation of bilateral ranking with base case.

Sensitivity Tests of Collier/Dollar Poverty Efficient Aid Allocations

Table A4.5 Sensitivity testing of CD poverty efficient aid allocations, based on different parameter estimates, poverty and policy measures, and treatment of small country bias (aid as % of GDP)

		Parameter Estimates									Poverty Measures									P scale	Small Country Bias					
	Aid as % of GDP	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
Country ~	Actual Aid 1996	Var I (bench-mark)	Var II	Var III	Var IV	Var IV b	Var V	Var V b	Var VI	Var DH	$2 H var el (pg)	$2 H var el (Rav.)	$2 H99	$2 PG	$2 SPG	$1 Headcount	$1 PG	$1 SPG	$1 H99	Pol 1-5	Uncon-strained	Max 6.8% share (as India)	Max 15% share	S. country bias (CD 0.34)	Small country bias (0.20)	Small country bias (0.28)
Uganda	3.34	11.42	7.96	12.63	10.11	8.79	26.52	17.86	7.37	4.30	7.33	11.49	11.04	10.34	11.20	12.77	12.56	12.78	12.64	8.85	7.92	9.45	11.39	12.40	11.36	12.13
Ethiopia	2.90	10.67	8.22	10.95	10.33	9.99	26.50	21.09	6.74	4.81	10.15	10.63	10.03	10.68	10.69	10.92	11.08	10.64	9.48	7.94	8.91	6.60	10.65	10.64	10.23	10.57
Zambia	7.53	8.77	7.10	8.80	8.64	8.52	20.23	16.38	5.67	4.50	0.40	7.97	7.97	6.06	7.54	10.04	9.03	9.83	9.14	6.60	5.97	9.46	8.74	9.95	9.09	9.72
Tanzania	4.46	6.98	5.72	7.15	6.66	6.35	13.22	9.68	4.76	3.93	8.18	7.01	8.09	7.95	6.40	3.10	4.68	0.00	9.00	5.51	2.23	8.16	6.94	7.81	6.49	7.50
Lesotho	3.09	6.15	4.58	6.96	5.11	4.07	8.21	2.93	4.49	3.21	0.00	2.83	4.18	4.49	4.96	8.39	7.24	8.13	6.62	5.27	0.00	7.93	6.09	10.61	8.46	10.02
Rwanda	15.75	6.00	6.15	4.87	7.06	8.11	13.48	14.48	3.91	4.67	5.38	6.05	5.84	6.03	6.06	6.32	6.56	5.95	6.72	4.29	3.77	6.55	5.98	7.02	6.33	6.83
Senegal	4.03	5.58	4.54	5.98	4.97	4.36	7.36	3.63	4.09	3.38	0.00	5.31	2.47	3.94	4.60	7.76	6.88	7.59	0.00	4.72	0.00	7.22	5.52	8.46	6.41	7.90
Niger	2.97	4.99	5.43	3.88	6.01	7.03	9.74	11.11	3.38	4.40	2.55	4.25	4.25	4.46	4.93	6.00	5.98	5.90	5.50	3.64	1.84	5.78	4.97	6.33	5.35	6.07
Guinea-Bissau	15.67	4.95	5.34	3.90	5.89	6.83	9.37	10.54	3.38	4.33	0.00	3.71	4.43	0.34	3.02	6.57	5.11	6.17	6.16	3.65	1.58	5.79	4.92	7.23	6.27	6.97
Madagascar	2.84	4.71	5.33	3.48	5.83	6.96	9.01	10.84	3.21	4.41	0.29	4.73	3.83	3.46	4.39	5.97	5.65	5.96	4.55	3.41	1.58	5.48	4.68	5.80	4.85	5.55
Kyrgyz Rep.	2.45	3.96	2.24	5.73	1.85	0.00	0.00	0.00	3.59	1.92	5.01	4.53	0.00	5.65	2.88	1.04	2.68	0.00	0.00	4.30	0.00	6.85	3.87	10.00	6.41	9.01
Honduras	2.82	3.76	3.09	4.36	2.89	2.01	0.04	0.00	3.18	2.75	0.00	0.54	0.00	2.50	2.84	6.15	5.33	5.99	0.00	3.64	0.00	5.94	3.69	8.04	5.32	7.30
Vietnam	0.78	3.50	3.73	3.15	3.65	3.80	1.94	1.48	2.80	3.42	0.00	3.73	2.50	0.00	7.18	6.46	6.12	8.01	5.64	3.03	0.00	1.64	3.45	2.84	1.47	2.65
Mauritania	6.15	3.37	2.96	3.81	2.67	1.96	0.00	0.00	2.94	2.78	0.72	3.55	1.70	3.39	1.53	3.78	1.86	1.32	0.00	3.31	0.00	5.53	3.30	8.64	6.03	7.92
Kenya	1.91	3.33	4.27	2.20	4.30	5.28	3.60	5.67	2.51	3.96	0.00	2.82	1.43	2.49	2.84	4.70	4.24	4.57	0.80	2.57	0.00	4.48	3.29	4.25	2.94	3.94
Pakistan	0.41	2.98	2.77	3.32	2.38	1.77	0.00	0.00	2.70	2.75	5.46	3.85	4.60	4.86	1.79	0.00	0.00	0.00	2.05	3.01	0.00	0.90	1.99	0.25	0.00	0.30
Nicaragua	10.21	2.91	2.77	3.19	2.37	1.83	0.00	0.00	2.65	2.78	0.00	0.00	3.54	2.07	2.12	4.98	4.40	4.74	6.88	2.94	0.00	5.07	2.84	7.51	4.84	6.77
Cote D'Ivoire	3.91	2.82	2.37	3.50	1.85	0.87	0.00	0.00	2.71	2.45	4.19	3.03	0.00	4.42	1.87	0.00	1.45	0.00	0.00	3.06	0.00	5.25	2.74	6.18	3.21	5.40
Nepal	1.70	2.47	4.17	0.76	4.06	5.65	2.20	6.49	1.90	4.19	0.65	2.55	1.22	2.24	2.45	3.35	3.47	3.16	0.40	1.75	0.00	3.43	2.44	3.44	2.31	3.16
Nigeria	0.19	2.37	3.87	0.93	3.67	4.96	1.03	4.51	1.92	3.96	0.60	1.28	3.35	2.25	1.86	3.06	2.68	2.86	4.62	1.81	0.00	1.89	2.33	1.22	0.45	1.19
India	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	0.13	1.50	0.13	0.28	0.00	0.78	0.26
Botswana	0.71	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	6.54	0.00	3.37
China	0.06	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.01	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.03	0.00	0.05	0.00	0.00	0.00	0.00
Egypt	1.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.31	2.43	0.00	0.00	0.31	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.35	0.00	0.00	0.00	0.00
Estonia	0.91	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	4.83	0.00	1.19
Guatemala	0.51	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.72	0.00	0.00	0.00	0.00	0.00	2.45	0.00	1.37	0.00	0.00	0.00	0.97	0.00	3.26	0.00	1.96
Guinea	2.45	0.00	0.23	0.00	0.00	0.00	0.00	0.00	0.27	2.07	0.00	0.00	0.00	0.00	0.00	0.37	0.00	0.00	0.00	0.00	0.00	1.41	0.00	3.88	0.44	2.94
Moldova	0.59	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.95	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	1.22	0.00	0.00
Panama	0.46	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.09	0.00	0.00
Philippines	0.36	0.00	0.00	0.54	0.00	0.00	0.00	0.00	0.85	0.49	0.00	0.00	0.00	0.00	0.00	0.00	0.69	0.00	0.00	0.95	0.00	0.79	0.00	0.00	0.00	0.00
Slovak Repub	0.35	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	..	0.00	0.00	0.00	0.00	1.82	0.00	0.00
Sri Lanka	1.16	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.18	4.21	0.00	0.00	1.24	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.84	0.00	1.44	0.00	0.12
Zimbabwe	1.45	0.00	0.72	0.00	0.00	0.00	0.00	0.00	0.65	2.25	0.00	0.00	0.00	0.00	0.00	2.01	2.06	1.91	0.69	0.41	0.00	1.96	0.00	3.40	0.18	2.54
Regional totals (as % of all aid)																										
ssa	29.3%	50.1%	50.2%	44.8%	54.0%	57.8%	83.3%	81.6%	36.2%	42.6%	29.1%	44.8%	45.9%	47.3%	44.8%	55.1%	54.1%	50.9%	51.7%	39.7%	20.0%	51.7%	49.7%	62.8%	44.1%	58.0%
eap	20.8%	14.6%	15.5%	17.8%	15.2%	15.8%	8.1%	6.2%	31.5%	20.2%	0.0%	15.5%	10.4%	0.0%	29.9%	26.9%	31.5%	33.3%	23.5%	25.3%	0.0%	20.4%	14.3%	11.8%	6.1%	11.0%
sa	13.0%	31.3%	31.2%	32.5%	28.1%	24.8%	8.6%	12.2%	28.8%	31.3%	54.8%	37.9%	42.5%	47.2%	22.3%	9.6%	9.7%	9.4%	22.6%	31.0%	80.0%	17.7%	32.0%	6.9%	43.6%	19.2%
eca	12.4%	1.3%	0.7%	1.9%	0.6%	0.0%	0.0%	0.0%	1.2%	0.8%	1.7%	1.5%	0.0%	1.9%	1.0%	0.3%	0.9%	0.0%	0.0%	1.4%	0.0%	2.3%	1.3%	7.3%	2.1%	3.3%
lac	11.0%	2.7%	2.3%	3.0%	2.1%	1.5%	0.0%	0.0%	2.3%	3.2%	0.0%	0.2%	1.2%	1.8%	2.0%	8.1%	3.9%	6.3%	2.3%	2.6%	0.0%	5.8%	2.6%	11.1%	4.0%	8.5%
mena	13.4%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.8%	14.4%	0.0%	0.0%	1.8%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.1%	0.0%	0.0%	0.0%	0.0%
Africa	29.3%	50.1%	50.2%	44.8%	54.0%	57.8%	83.3%	81.6%	36.2%	42.6%	29.1%	44.8%	45.9%	47.3%	44.8%	55.1%	54.1%	50.9%	51.7%	39.7%	20.0%	51.7%	49.7%	62.8%	44.1%	58.0%
Asia	33.8%	45.9%	46.7%	50.2%	43.3%	40.7%	16.7%	18.4%	60.3%	51.5%	54.8%	53.4%	52.9%	47.2%	52.2%	36.5%	41.2%	42.8%	46.1%	56.3%	80.0%	38.2%	46.4%	18.8%	49.7%	30.2%
EMAD	36.9%	4.0%	3.1%	4.9%	2.7%	1.5%	0.0%	0.0%	3.5%	5.9%	16.1%	1.8%	1.2%	5.5%	3.0%	8.4%	4.8%	6.3%	2.3%	4.1%	0.0%	10.2%	3.9%	18.4%	6.2%	11.8%
Total	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%
(no.recipients)	57 (excl 2 negative)	21	23	22	21	20	16	15	25	29	16	20	18	22	21	22	22	19	17	24	9	28	21	29	22	27

Parameter estimates																										
A		-0.537	0.000	-0.921	-0.154	0.229	-0.537	0.000	-0.537	1.352	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537	-0.537
A*P		0.313	0.185	0.419	0.206	0.100	0.313	0.185	0.313	0.000	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313	0.313
A^2		-0.025	-0.036	-0.025	-0.025	-0.025	-0.009	-0.013	-0.041	-0.127	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025
Poverty data																										
Poverty line		$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$1/day	$1/day	$1/day	$1/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day	$2/day
Poverty measure		h	h	h	h	h	h	h	h	h	h	h	h99	pg	spg	h	pg	spg	h99	h	h	h	h	h	h	h
Poverty elasticity		2	2	2	2	2	2	2	2	2	pg var	Ravallion	2	specific	specific	2	specific	specific	2	2	2	2	2	2	2	2
CPIA scale		1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-6	1-5	1-6	1-6	1-6	1-6	1-6	1-6
Country constraints																										
Small country bias		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0.34	0.20	0.28
India constrained? ^		yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	no	no	no
Max. % share		100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	6.8%	15.0%	100.0%	100.0%	100.0%
Actual ME *		264.9	270.5	253.1	276.7	288.6	360.7	413.9	169.1	260.5	185.6	279.0	242.0	68.8	56.1	132.2	42.5	26.2	105.6	146.8	264.9	264.9	264.9	264.9	264.9	264.9
Target ME *		285.1	314.6	263.9	315.8	346.6	417.6	535.6	235.0	463.6	230.5	305.4	332.9	73.6	59.8	124.2	40.2	24.8	158.1	174.0	595.0	208.0	287.7	162.6	258.1	188.2
Optimised ME *		311.4	343.6	292.2	339.3	367.4	435.1	550.0	264.4	531.5	239.1	333.9	353.7	79.6	65.5	142.7	47.0	28.0	168.0	195.3	595.0	344.3	348.7	209.8	439.9	298.2
Correlation (as % of GDP)																										
- cf CD benchmark		1.00	0.97	0.98	0.98	0.92	0.91	0.88	0.99	0.87	0.67	0.96	0.93	0.93	0.97	0.93	0.96	0.88	0.88	0.99	0.81	0.93	1.00	0.87	0.96	0.92
- cf actual aid		0.57	0.62	0.52	0.60	0.60	0.49	0.55	0.58	0.64	0.28	0.50	0.54	0.44	0.49	0.57	0.55	0.50	0.56	0.57	0.39	0.66	0.58	0.62	0.64	0.64
Correlation (as % of all aid)																										
- cf CD benchmark		1.00	0.97	0.97	0.97	0.89	0.55	0.57	0.85	0.92	0.75	0.98	0.95	0.85	0.86	0.64	0.64	0.61	0.90	0.94	0.22	0.73	0.93	0.62	0.36	0.67
- cf actual aid		0.25	0.22	0.28	0.23	0.20	0.21	0.16	0.49	0.28	0.32	0.25	0.20	0.21	0.24	0.19	0.22	0.20	0.21	0.36	0.37	0.55	0.35	0.13	0.40	0.35
Correl. (as % of GDP): excl. all zeros																										
- cf CD benchmark		1.00	0.96	0.98	0.97	0.92	0.91	0.88	0.99	0.82	0.60	0.96	0.92	0.91	0.96	0.90	0.94	0.84	0.85	0.99	0.81	0.90	1.00	0.81	0.94	0.88
- cf actual aid		0.45	0.51	0.39	0.49	0.60	0.39	0.55	0.46	0.53	0.14	0.50	0.43	0.29	0.35	0.45	0.43	0.40	0.47	0.44	0.31	0.57	0.46	0.50	0.55	0.53
Correlation Coefficients																										
	Actual Aid 1996	**Var I (bench-mark)**	**Var II**	**Var III**	**Var IV**	**Var IV b**	**Var V**	**Var V b**	**Var VI**	**Var DH**	**$2 H var el (pg)**	**$2 H var el (Rav.)**	**$2 H99**	**$2 PG**	**$2 SPG**	**$1 Headcount**	**$1 PG**	**$1 SPG**	**$1 H99**	**Pol 1-5**	**Uncon-strained**	**Max 6.8% share (as India)**	**Max 15% share**	**S. country bias (CD 0.34)**	**Small country bias (0.20)**	**Small country bias (0.28)**
Actual Aid 1996	1.00																									
Var I (benchmark)	0.57	1.00																								
Var II	0.62	0.97	1.00																							
Var III	0.52	0.98	0.91	1.00																						
Var IV	0.60	0.98	0.99	0.92	1.00																					
Var IV b	0.60	0.92	0.97	0.83	0.98	1.00																				
Var V	0.49	0.91	0.87	0.88	0.92	0.89	1.00																			
Var V b	0.55	0.88	0.90	0.81	0.93	0.95	0.96	1.00																		
Var VI	0.58	0.99	0.96	0.98	0.96	0.89	0.85	0.82	1.00																	
Var DH	0.64	0.87	0.95	0.79	0.91	0.92	0.71	0.78	0.89	1.00																
$2 H var el (pg)	0.28	0.67	0.60	0.69	0.62	0.55	0.66	0.62	0.66	0.50	1.00															
$2 H var el (Rav.)	0.50	0.96	0.93	0.95	0.95	0.89	0.92	0.89	0.95	0.82	0.75	1.00														
$2 H99	0.54	0.93	0.91	0.90	0.94	0.90	0.93	0.91	0.90	0.80	0.70	0.92	1.00													
$2 PG	0.44	0.93	0.88	0.94	0.89	0.81	0.85	0.80	0.93	0.78	0.84	0.94	0.88	1.00												
$2 SPG	0.49	0.97	0.94	0.94	0.96	0.91	0.91	0.88	0.95	0.84	0.66	0.95	0.92	0.89	1.00											
$1 Headcount	0.57	0.93	0.93	0.89	0.93	0.90	0.86	0.83	0.91	0.86	0.42	0.85	0.85	0.77	0.92	1.00										
$1 PG	0.55	0.96	0.95	0.93	0.96	0.91	0.89	0.86	0.95	0.87	0.52	0.89	0.88	0.83	0.96	0.98	1.00									
$1 SPG	0.50	0.88	0.88	0.83	0.89	0.86	0.82	0.80	0.86	0.81	0.34	0.79	0.79	0.69	0.90	0.98	0.96	1.00								
$1 H99	0.56	0.88	0.87	0.84	0.89	0.86	0.88	0.85	0.85	0.76	0.59	0.82	0.95	0.78	0.89	0.84	0.87	0.80	1.00							
Pol 1-5	0.57	0.99	0.95	0.99	0.95	0.87	0.86	0.82	1.00	0.87	0.67	0.95	0.90	0.94	0.95	0.91	0.94	0.85	0.84	1.00						
Unconstrained	0.39	0.81	0.74	0.79	0.80	0.77	0.94	0.90	0.74	0.57	0.68	0.84	0.86	0.78	0.82	0.74	0.78	0.71	0.80	0.75	1.00					
Max 6.8% share (as I	0.66	0.93	0.91	0.92	0.89	0.83	0.77	0.75	0.95	0.88	0.55	0.86	0.79	0.86	0.85	0.87	0.89	0.79	0.75	0.94	0.61	1.00				
Max 15% share	0.58	1.00	0.97	0.98	0.98	0.92	0.92	0.89	0.99	0.87	0.66	0.96	0.93	0.93	0.97	0.93	0.97	0.88	0.88	0.99	0.82	0.93	1.00			
S. country bias (CD (	0.62	0.87	0.83	0.88	0.81	0.73	0.71	0.67	0.89	0.79	0.51	0.79	0.72	0.81	0.80	0.84	0.84	0.76	0.69	0.89	0.59	0.93	0.87	1.00		
Small country bias ((	0.64	0.96	0.91	0.96	0.92	0.84	0.85	0.80	0.96	0.82	0.58	0.89	0.84	0.88	0.90	0.91	0.93	0.84	0.80	0.96	0.74	0.97	0.96	0.93	1.00	
Small country bias ((	0.64	0.92	0.88	0.93	0.87	0.78	0.76	0.72	0.94	0.83	0.54	0.84	0.77	0.85	0.85	0.88	0.89	0.80	0.74	0.94	0.64	0.97	0.92	0.98	0.97	1.00

Note ^ 'No' means that no India specific constraint is imposed, but India may still be constrained by the more general size constraint captured in the row below.

Note * Actual ME (marginal efficiency) is the number of people that would be lifted out of poverty if an extra $1m of aid were allocated to countries in proportion to actual (1996) allocations.
Target ME is the value of 'lamda' maximised through the optimisation process (see Appendix 2). It indicates the number of people that would be lifted out of poverty if an extra $1m of aid were given to the marginal recipient country.
Optimised ME is the number of people that would be lifted out of poverty if an extra $1m of aid were allocated to countries in proportion to the poverty efficient allocations.
In an unconstrained model (scenario 20), the target ME will equal the optimised ME (since 'lamda' is equalized across all aid receiving countries), but otherwise will be less (and may even be less than the actual ME).

Note ~ 26 countries, not listed above, receive zero allocations in ALL scenarios (actual 1996 Aid/GDP receipts in brackets): Algeria (0.22), Belarus (0.16), Brazil (0.04), Bulgaria (0.46), Chile (0.12), Colombia (0.10), Costa Rica (-0.03), Czech Rep. (0.11), Ecuador (0.44), Hungary (0.26), Indonesia (0.16), Jamaica (0.66), Jordan (3.26), Kazakhstan (0.23), Lithuania (0.54), Malaysia (-0.20), Mexico (0.04), Morocco (0.70), Poland (0.36), Romania (0.21), Russia (0.00), South Africa (0.13), Thailand (0.20), Tunisia (0.29), Turkmenistan (0.26), Venezuela (0.02).