Attaining the International Development Targets: Will Growth Be Enough?

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During the late 1980s and early 1990s improvements in health and education and progress in poverty reduction ground to a halt, or began to be eroded, in many developing regions and in the transition countries of Eastern Europe and Central Asia. The DAC International Development Targets (IDTs) reflect the concern of development agencies and their developing country partners about these trends (see Table 1 in the Overview article in this issue). The present article considers whether these targets are attainable.

The structure of the article is as follows. The following two sections review the economic literature and examine what data from the 1980s and 1990s can tell us about the determinants of changes in poverty and human development over this period. The next two sections outline the methods of the poverty projections and give estimates of poverty in 2015 under various scenarios, followed by projections for the human development targets with estimates for infant, under-five and maternal mortality and primary school enrolment rates. The final section draws together the key conclusions regarding the attainability of the DAC targets.

Modelling poverty and human development

Earlier attempts to assess the attainability of the DAC targets (Hanmer et al., 1999; Demery and Walton, 1998) are based on the premise that poverty reduction and human development improvement can be specified as functions of income growth alone. However, this is a simplification that could produce misleading results, as research shows that other variables are also important determinants.

Poverty elasticity and income inequality

The relationship between income growth and poverty reduction is given by the poverty elasticity, namely the percentage change in the poverty headcount

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Development Policy Review Vol. 18 (2000), 11–36

incidence that results from a 1% change in per capita GDP.[1] It is impossible to predict in abstract how overall income inequality will affect the poverty elasticity, as the outcome will depend on how the income distribution varies over time, and the specific properties of the poverty measure (Ravallion, 1997). One finding to emerge as robust is that the size of the poverty elasticity varies systematically with income inequality (Ravallion and Sen, 1996; Ravallion, 1997; and Hanmer et al., 1999). Ravallion (1997) tests the hypothesis that the poverty elasticity falls as inequality rises, using a general model of the rate of poverty reduction that can be tested for the restrictions that leave growth alone, as opposed to a distribution-corrected growth rate. His results confirm that higher initial levels of inequality are associated with lower rates of poverty reduction at any given positive rate of growth.

Poverty reduction and the growth path

While growth is important for poverty reduction it has also been recognised for a long time that the type of growth, that is, the particular processes and sectors that generate growth, matters. Here we investigate the proposition that broad-based (labour-intensive) growth reduces poverty more effectively than other types of growth.

It is frequently argued that the agricultural sector is particularly important as a source of broad-based growth as it often possesses the characteristics that can stimulate the sort of growth that reduces poverty rapidly (see Lipton, 1977; Stewart, 1978; and Ranis, 1979 for early statements of these views). Recent studies of poverty reduction in India support this view (Datt and Ravallion, 1990, 1996a and b and 1998). One finding is that poverty reduction is the result of growth within agriculture — growth of agricultural output and small-scale enterprises and services related to the rural economy — and not due to a shift of labour and capital out of agriculture into large-scale industry.[2] Thorbecke and Jung (1996) come to similar conclusions for Indonesia. The significance of agriculture for poverty reduction is also confirmed by results from cross-section data sets. Timmer (1997) finds that manufacturing reduces poverty directly due to an increase in the income of employed workers, but it also worsens the distribution of income, thus reducing the overall benefits to the poor, in contrast to agricultural growth.[3] Bourgignon and Morrisson (1998), using a sample of 38

1. There are two approaches to poverty elasticity estimation – the analytic and the econometric (see Hanmer et al., 1999 for a discussion of their relative merits).

2. i.e. the effect of resource reallocation from low to high productivity sectors, the sectoral shift that is associated with Kuznets' inverted 'U' trajectory.

3. The Timmer sample of the Deininger and Squire dataset covers 3.3 billion people in 1995 or two-thirds of the population in low- and middle-income countries, with agriculture being a quarter of GDP and employing half the labour force.

small and medium-sized developing countries, find that growth in agriculture and in basic services reduces poverty more than expanding industrial output.

The conclusion that agricultural growth is best for poverty reduction is conditional, however, on equitable land distribution. Mellor (1999) argues that agricultural growth reduces poverty so effectively because, in addition to generating income for poor farmers, it generates demand for goods and services that can easily be produced by the poor. However, if land and income distribution is highly skewed, consumption patterns of landowners are skewed towards imported or capital-intensive consumer goods rather than the products of labour-intensive domestic manufacturing and services. De Janvry and Sadoulet's (1996) analysis of poverty reduction in 11 countries in Latin America and the Caribbean confirms this conclusion. They find that due to the highly unequal pattern of land ownership agricultural growth increases overall income inequality. The inequality effect is so strong that agricultural growth produced greater poverty in Latin America and the Caribbean between 1970 and 1994.

Their study has important implications for poverty elasticity estimation and projections based on estimated future growth rates. They find that the qualitative and structural features of the growth path[4] have strong effects on poverty and inequality reduction. In fact, once these variables are included in the poverty reduction model the role of income growth is very small and its total effect is often perverse, the latter resulting from the fact that late growth (in the 1980s) was usually accompanied by rising urban poverty and rising inequality, though it reduced rural poverty. Their findings suggest that simple bi-variate models of poverty reduction (e.g. Hanmer et al., 1999; Demery and Walton, 1998) may be mis-specified as they fail to control for variations in the poverty reduction capacity of different types of growth paths.

To sum up, recent analysis of the determinants of the poverty reduction leads to the conclusion that using 'blanket' elasticities derived from a bi-variate regression model of per capita GDP growth on poverty to produce future projections is likely to be highly misleading. Estimators derived from such a model will be biased, as relevant variables such as labour productivity growth (real labour income growth), the volume of employment creation and the sectoral origin of economic growth have been omitted from the model. Furthermore, it may be important to control for initial levels of income

4. Qualitative features are: predicted growth of the Gini coefficient; length of growth or recession sequence; difference in growth of value added between agriculture and manufacturing: difference in growth of value added between agriculture and services; hyperinflation; real exchange rate growth; coefficient of variation of GDP per capita around its trend; migration rate; urban minimum wage. Structural features are: initial GDP per capita; share of agriculture in GDP; initial level of inequality; initial urban/rural poverty; natural growth rate of urban/rural poverty; initial share of urban/rural in total population (de Janvry and Sadoulet, 1996).

inequality when estimating the poverty-reducing effects of growth.

Finally, research has also established the importance of the government's policy stance in creating the environment for sustained growth and poverty reduction (e.g. Burnside and Dollar, 1998; Wade, 1990). Maintaining competitive exchange rates and an open trade regime, fostering domestic price stability and controlling balance-of-payments and budget deficits are generally considered to be important preconditions for economic growth.

Modelling HDIs

Hanmer et al. (1999) established that improvements in human development indicators are highly correlated with the rate of growth of real per capita GDP and with technological progress, which is independent of national rates of per capita GDP growth.[5] However, HDIs imperfectly correlated with per capita income and the explanatory power of models can usually be improved with the addition of further socio-economic variables (see for example, UNDP, 1996). But it is important to establish that explanatory variables included in specified models are robust, that is, their coefficients have a significant effect of approximately the same magnitude across various model specifications.[6] We therefore base our choice of explanatory variables for the infant and under-five mortality rates (IMR and U5MR) on Hanmer and White's (1999) identification of robust determinants.[7] This found that, in addition to per capita GDP, the coefficients of the following variables are robust across model specifications: the availability of health services (as measured by an output variable rather than an expenditure variable);[8] immunisation rates; education; gender inequality. In many developing countries the HIV/AIDS epidemic has had significant effects on progress in reducing infant and child mortality. In some countries in sub-Saharan Africa infant and child mortality has begun to increase again after years of steady

5. This study found that between 1970 and 1990 the intercept of the regressions of real GDP per capita on life expectancy and adult literacy respectively shifted upwards. Hence at the same level of per capita GDP life expectancy (literacy) was higher in 1990 than in it was in 1970.

6. There are a large number of empirical studies of the determinants of infant and under-five mortality rates from the perspective of various disciplines including medical science, demography and economics. The choice of independent variable is for the most part contingent on the disciplinary approach.

7. We know of no similar study that identifies robust variables for primary school enrolment rates.

8. Health sector expenditures are not necessarily representative of the quantity and availability of health services. Money can be inefficiently spent and some health care systems are more expensive than others and so the cost of the same health services varies widely between countries. An output rather than an input indicator of health services can better capture the effect of increasing health expenditures.

improvement (see for example UNICEF, 1999; Hanmer and White, 1999). Whether the HIV/AIDS virus could mean that the infant and child mortality target is unattainable is obviously an important question. New data published by UNAIDS (1998) make it possible to include its effects in our model.

Accounting for changes in the 1980s and 1990s

In order to produce projections of poverty and HDIs in the future we estimate base-run models using past observations and cross-section data for one or more points in time for individual countries. The base-run models thus show how, on average, changes in poverty and human development are related to economic growth and the other independent variables. The final model presented below shows the relationship between the dependent variable and a set of independent variables selected on the basis of the results of model specification tests, and is then used to make projections for the future value of poverty and HDIs.

Poverty

The World Bank (1999) and Chen et al. (1994) have produced estimates of the percentage of people living below a poverty line of $1 (1985 PPP) a day for 58 developing countries. We used poverty observations between 1985 and 1995 (a total of 121 observations) as the dependent variable in the poverty model. We considered the following independent variables: GDP per capita (GDP); openness (Sachs Warner dummy) (OPEN); ratio of value added per worker in modern sector to value added per worker in agriculture (VA); incremental labour:capital ratio (dL/dK) and incremental capital:output ratio (ICOR), where the latter four variables are qualitative variables that seek to capture the characteristics of the growth path. The Sachs Warner dummy gives a broad indication of the government's policy stance. It is equal to one if the black market exchange-rate premium is larger than 20% for at least ten years, and/ or there is a public sector export monopoly for crops, and/or the country is classified as socialist, and/ or more than 40% of customs import code lines are affected by some sort of quantitative restrictions. Otherwise it equals zero. Hence government policy is 'good' if the dummy equals zero and 'bad' if the dummy equals one. The VA variable is introduced to capture the sectoral origins of growth. The incremental labour: capital ratio aims to capture the employment-creating capacity of the growth path, the argument being that new investment has to keep pace with the annual increase in the labour force coming onto the market if labour-intensive growth is to be poverty-reducing. The ICOR is included as a broad proxy for labour productivity growth, on the basis that the more efficiently capital is used the more likely it is that labour productivity will grow too.

Table 1 shows that, in addition to economic growth, several of the growth path

variables and the policy variable are significant determinants of the poverty headcount, showing bivariate models are indeed misspecified. Our results also show that the poverty elasticity was systematically related to income inequality, hence Table 1 presents the regression for results for two groups of countries, one with low-income inequality (average Gini = 0.34) and one with high-income inequality (average Gini = 0.55).[9]

Table 1
Poverty regression model:
Dependent variable: poverty headcount[a]

Sample	*Independent variables*[a]					R^{2b}	*n*
	Constant	*OPEN*	*dL/dK*	*ICOR*	*GDP*		
Low Gini	10.77 (7.31)*	0.25 (0.85)	0.16 (0.97)	0.016 (2.00)*	-0.93 (-2.66)*	0.61	49
High Gini	8.54 (9.74)*	0.88 (3.12)*	0.35 (2.07)*		-0.34 (-1.73)**	0.6	55

Notes: (a) Dependent variable and independent variables dL/dK and GDP in logs. (b) adjusted. T statistics in brackets: * t statistic significant at 5% confidence level or above; ** t statistic significant at 10% confidence level: n is the number of observations.

What is immediately striking is the large difference in the poverty elasticity. In low inequality countries, 10% economic growth reduces the poverty headcount by around 9%, but in high inequality countries only by about 3%.[10] In other words, low inequality countries will be more effective in reducing the poverty headcount than are high inequality countries with a given predicted rate of growth. The absolute values of the poverty elasticities are lower than those derived from the bi-variate specification used in Hanmer et al. (1999) which is consistent with de Janvry and Sadoulet's findings for Latin America.

Turning now to the effects of the qualitative variables we can identify the following effects:

- The openness variable is significant and its sign shows that, for a given level of GDP, poverty is higher if government policies fit the Sachs and Warner

9. Chow tests show that the sample should be divided into two groups containing countries with Gini coefficients of above and below 0.43 respectively. Model specification tests showed that VA could be dropped from the model.

10. The systematic difference in poverty elasticities holds at the regional level for sub-Saharan Africa, Latin America and the Caribbean. Numbers of observations limited testing for systematic differences in poverty elasticities in other regions.

definition of 'bad' policies.

- The incremental labour:capital ratio is negatively correlated[11] with the poverty headcount, implying that the higher is investment relative to the rate of growth of the labour force, the lower is the poverty headcount.

- The incremental capital:output ratio is positively correlated to the poverty headcount, meaning that poverty is lower the more efficiently capital is used.

The significance of dL/dK and ICOR is consistent with the view that investment growth can play a key role in poverty reduction if it contributes to a growth strategy characterised by growing labour productivity and increasing real wages. The values of both coefficients of the variables are lowest (most favourable) for the East Asia and Pacific region where long-run growth has been associated with these characteristics.

The ratio of modern to agricultural productivity has a significant effect in the regression models for the sub-Saharan African and South Asian country sub-samples but not for the total sample. In sub-Saharan Africa and South Asia the higher rates of productivity per worker in agriculture relative to the modern sector productivity are associated with lower poverty headcounts. In other words, the performance of the agricultural sector is critical for poverty reduction in these two regions.[12]

The total effect of the qualitative variables on poverty reduction is quite large, as we show later on. Hence, if the growth path is broad-based and policies are 'good', poverty reduction will be greater than is implied by the coefficient on the GDP term alone. This means that success in reducing poverty depends critically on the type of growth that occurs; high growth alone does not guarantee rapid poverty reduction.

Human development

Base-run models were estimated for the HDIs relating to the DAC targets for infant and child mortality, maternal mortality, primary school education and gender equality.

Infant and under-five mortality are modelled as functions of GDP per capita, education, access to health services and HIV/AIDS. All the data (apart from HIV prevalence) are drawn from the 1998 World Development Indicators CD-ROM.

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11. The logarithm of a ratio < 1 is negative and all observations for dL/dK <1.

12. For all developing countries, however, this variable was not significant and small sample size for each of the regions meant that it was better to use the parameters derived from the model using all developing countries for projections.

The mortality rates used are from the 1990s as these are based on Demographic and Health Surveys and other cited surveys and censuses. The HIV prevalence data are drawn from the UNAIDS report on the Global HIV/AIDS Epidemic (1998).

We considered the following independent variables:[13] GDP per capita (GDP); prevalence of HIV/AIDS women attending ante-natal clinics; physicians per thousand population; births attended by trained personnel; primary school enrolment ratio. Physician per capita is taken as a proxy for the quantity of health services available. Births attended by trained personnel can be expected to have a direct effect on child survival prospects and also indicate access to and availability of primary health care services.

Table 2
IMR and U5MR regression results

Dependent Variable	*Independent Variables*				*Adj* R^2	*n*
	Constant	*GDP*	*HIV*	*PHY*		
IMR	197.92	-20.42	3.49	-11.28	0.81	32
	(3.99)*	(-3.62)*	(1.64)**	(-3.5)*		
U5MR	347.48	-37.86	3.26	-26.33	0.73	32
	(2.87)*	(-2.87)*	(0.65)	(-3.59)		

Notes: all independent variables are logged; t statistics in parentheses; * t statistics significant at 0.05 confidence level or above; ** t statistics significant at 0.10 confidence level; n number of observations.

Table 2 shows the regression results. We found that HIV/AIDS is positively correlated and GDP per capita and the quantity and availability of health services are negatively correlated with infant and child mortality. In other words, high HIV/AIDS prevalence levels result in higher infant mortality rates, and higher average income levels and greater availability of health services increase the prospects for child survival. Model restriction tests showed that births attended by trained personnel and primary school enrolment could be dropped from the model with no loss of explanatory power. This challenges the commonly held belief that education in general, and female education in particular, has an effect over and above the effects of a higher standard of

13. We could not include immunisation rates and gender inequality in the model as the number of countries which had a complete set of observations for all the independent variables once these two are included is less than 20.

living.[14] Table 2 thus shows the final models that are used to make projections.[15]

Maternal mortality Data on maternal mortality rates are scarce. We use data from the 1990s and specify maternal mortality as a function of per capita GDP, access to health services, adult literacy and HIV/AIDS. The percentage of births attended by trained personnel is used as a measure of access to, and the quality of, health services.[16] We use the reported HIV prevalence rate of women attending antenatal clinics for the HIV/AIDS variable.

Table 3
Maternal mortality regression results

Dependent Variable	*Constant*	*Independent Variables*			*Adj R^2*	*n*
		Birth Att	*Ln HIV*	*Lit*		
MatMR	8.03	-0.03	0.15	-0.008	0.88	2
	(35.00)*	(-8.79)*	(3.98)*	(-2.43)*		7

Notes: * t statistics significant at 0.05 confidence level or above; ** t statistics significant at 0.10 confidence level; n number of observations.

Table 3 shows that all signs are as expected. HIV/AIDS is strongly and positively correlated with levels of maternal mortality. Higher adult literacy and percentages of births attended by skilled health personnel (doctors, nurses and trained midwives) are associated with lower maternal mortality. The level of GDP per capita has little influence on maternal mortality once the effects of HIV/AIDS and access to health services and adult literacy are controlled for, and model restriction tests show that the variable can be dropped from the model. In other words maternal mortality rates can be explained by access to health services (and, presumably health service quality) and the HIV prevalence rates. This suggests that maternal mortality could be reduced in many countries in the absence of increases in per capita income if maternal health services were improved and HIV prevalence reduced.

Primary school enrolment rates. The education target is universal primary

14. The finding that education is insignificant in this model does not mean it is not a policy relevant variable. Eeducation is highly correlated with per capita GDP and the other independent variables and so no inferences about its effect can be drawn from the model.

15. The HIV/AIDS data are for the early, not the mid, 1990s. They therefore, represent the mortality rates towards the beginning of the epidemic, which do not yet fully reflect the impact of HIV/AIDS on mortality. A 1990 observation of U5MR would include children born in 1985 – before the epidemic had become widespread. We therefore include HIV/AIDS as an explanatory variable in the U5MR model, despite the fact that it is insignificant in the model.

16. This would probably be a better measure of access to, and the quality of, health services for the IMR model as well but it was not used as its inclusion restricted the sample size to less than 20 observations.

education by 2015. The indicator chosen to proxy this is the primary school enrolment ratio. Two key factors are likely to determine this. First, the family needs to be able to afford to send its children to school. Even if there are no school fees to be paid, money is still needed for books, other materials and uniforms. Secondly, schools have to be accessible to the whole population. We use GDP per capita and school expenditure per student as explanatory variables in our model.

Table 4
Primary school enrolment regression results

Dependent Variable	*Constant*	*Ln GDP*	*Adj R^2*	*n*
Net primary school	-36.59	14.55	0.38	48
enrolment	(-1.73)**	(5.47)*		

Notes: * t statistics significant at 0.05 confidence level or above; ** t statistics significant at 0.10 confidence level; n number of observations.

Table 4 shows that primary school enrolment is positively related to per capita income. However, overall the model's explanatory power is weak, as only 38% of the variation in the data is explained by the level of per capita GDP. School expenditure per student, on the other hand, is not a significant determinant. However, it is probably a very imperfect measure of the accessibility of schools to the whole population. Projections are therefore based only on the forecasts of future GDP per capita and we have much less confidence in these results than the projections for the other IDTs.

Gender equality in primary (PSER) and secondary (SSER) school enrolment rates. We use the ratio of female to male primary and secondary enrolment as the dependent variable and consider the relationship between gender inequality, on the one hand, and the level of GDP per capita and income inequality, on the other. Table 5 shows only a weak correlation between them. Income inequality is positively and significantly correlated with the ratio of female to male PSER; the higher the Gini the lower the level of gender inequality in SERs.[17] However, the overall explanatory power of the model is weak ($R^2 = 0.20$). No significance can therefore be attributed to the effect that income inequality or per capita income has on gender equality and hence the model cannot be used to predict whether the gender target will be met, given projected future growth.

17. The dependent variable is a ratio less than one for almost all observations; hence higher ginis are correlated with higher values of the ratio, i.e. it increasing to 1 or above. This result may be driven by East European and Central Asian economies that frequently have high levels of inequality and higher female than male SERs.

Table 5
Gender equality regression model results

Dep Var	*Constant*	*Ln GDP*	*Gini*	*Adj R^2*	*n*
Ratio of female to male PSER	46.8 (2.24)*	3.18 (1.27)	0.52 (2.86)*	0.21	29
Ratio of female to male SSER	-20.35 (-0.41)	9.26 (1.7)**	1.00 (2.5)*	0.20	29

Notes: * t statistics significant at 0.05 confidence level or above; ** t statistics significant at 0.10 confidence level; n number of observations.

This result confirms both the country studies' conclusions (see the article on Uganda in this issue) and the findings of the gender and development literature that the role of women, and hence gender equality, depends very much on local culture and customs. The country studies argue that policies to promote women's economic and political empowerment, rather than economic growth, are the critical determinants of advances in gender equality. Such policies need to address the overall position of women in society if the incentive system is to be changed so that parents want to send their girl children to school and that girls want to remain there and have the opportunity to succeed when they do.

Poverty projections

Country sample

The poverty regression models specified in Table 1 are combined with economic growth rate forecasts to produce projections of poverty incidence for 2015. The projections for high and low inequality countries are run separately and then combined in a population-weighted regional average. The projections are based on the countries which were used to produce the base-run model which, as Table 6 shows, contain 66%, 88% and 98% of the populations of sub-Saharan Africa, East Asia and the Pacific and South Asia respectively. The World Bank's estimates of $1 a day poverty at 1985 PPPs are shown in the table, with 1990 poverty incidence highest in sub-Saharan Africa and South Asia at 44 and 47% respectively, and the number of people living in poverty highest in East Asia and the Pacific and South Asia at 453 and 517 million respectively.

Table 6
Poverty regression model: sample country characteristics, 1990

	No. of countries	*Population (m.)*	*% of population in sample*	*Headcount (% of pop. under $1/day)*	*No. of people in poverty (m.)*	*Av. Gini coefficient*	*Av. GDP per capita (US$ PPP)*
Sub-Saharan Africa	19	336	66	44.1	148	43.7	1267
High inequality countries	11	129		43.0	56	56.2	2198
Low inequality countries	8	207		44.7	93	35.9	686
Middle East and North Africa	4	60	24	2.5	2	39.2	3228
High inequality countries	0						
Low inequality countries	4	60		2.5	2	39.2	3228
East Asia and Pacific	5	1449	88	31.2	453	35.9	1621
High inequality countries	2	73		4.7	3	44.9	4084
Low inequality countries	3	1376		32.7	449	35.5	1490
South Asia	5	1108	98	46.7	517	31.7	962
High inequality countries	0						
Low inequality countries	5	1108		46.7	517	31.7	962

Latin America and Caribbean	15	369	84	27.9	103	55.4	4768
High inequality countries	12	350		28.2	99	56.1	4859
Low inequality countries	3	19		22.5	4	42.5	3111
Eastern Europe and Central Asia	10	110	27	9.3	10	26.8	4023
High inequality countries	0						
Low inequality countries	10	110		9.3	10	26.8	4023
All developing countries	58	3433	78	35.9	1233	37.2	1817
High inequality countries	25	552		28.6	158	54.6	4134
Low inequality countries	33	2881		37.3	1075	33.9	1373

Notes: all data from *World Development Indicators 1999* except Gini coefficients which are from Deininger and Squire (1996) and *World Development Report 1998*; the percentage of the population covered in our sample cannot be calculated separately for the high and low inequality categories as denominators are unknown; Eastern Europe and Central Asia data are unreliable (see Mosley and Kalyuzhnova article in this issue).

Growth rates

The projections in Table 7 use two economic growth scenarios, one based on the latest forecasts available and the other on the rates of growth achieved between 1965 and 1997.

Table 7
Growth rate assumptions

Annual growth in GDP per capita	*Global Economic Prospects Projections 2001–8*	*Historic Growth Rates 1965–97*
Sub-Saharan Africa	1.4	0
Middle East and North Africa	1.4	0.1
East Asia and Pacific	5.6	5.4
South Asia	3.7	2.3
Latin America and Caribbean	3.0	1.3
Eastern Europe and Central Asia	4.8	3.2
All Developing Countries	4.0	3.0

Note: The Global Economic Prospects (World Bank, 1998) projections are for 2001-8. We assume they remain the same between 2008 and 2015.

Future scenarios

For the poverty projections we consider four scenarios:

- 'No change and high growth' combines World Bank (1998) growth forecasts with the base-run model, assuming there is no change in the qualitative features of the growth path up to 2015.[18]

- 'No change and low growth' combines economic growth at historic averages between 1965 and 1997 (World Bank, 1999) with the base-run model, on the same assumption.

- 'Broader-based and high growth' combines the optimistic growth forecasts with the base-run model, assuming that policies improve the qualitative variables having an increased poverty-reducing effect up to 2015.

18. The values of all the independent variables, apart from per capita GDP, are the same in 2015 as they were in 1990.

- 'Broader-based and low growth' combines economic growth at historic averages between 1965 and 1997 with the base-run model, on the same assumption.

The broader-based growth scenario makes the following assumptions: Sachs Warner openness dummy (OPEN): all regions become open by 2015; incremental capital output ratio (ICOR): sub-Saharan Africa, South Asia, and Latin America and Caribbean reach the East Asian and Pacific 1990 ICOR by 2015; East Asia Pacific converges to the lowest 1990 ICOR in the region by 2015; and the incremental labour capital ratio (dL/dK) improves by 25% by 2015.

These broader-based scenario assumptions have the effect of increasing the absolute value of the poverty elasticity to 1.5% for low inequality and 1.45% for high inequality developing countries.

Meeting the income poverty target

Table 8 presents our forecasts of the poverty headcount in 2015 for developing regions overall. It shows that there is a good chance that poverty will be half its present level by 2015, as long as policies are in place to induce a broader-based growth path.[19]

Table 8
Poverty incidence (%) in 1990 and 2015 in developing countries (for a range of $1 a day at 1985 PPP estimates)

Scenario	*1990*	*2015*	
		High Growth	*Low Growth*
Poverty incidence		-	
No change	36	**18**	20
Broader based	36	**13**	**14**
Poverty incidence as % of 1990 poverty			
No change		**50**	56
Broader based		**35**	**40**

Note: Bold numbers indicate the target has been attained.

Table 9 shows how income inequality affects the attainability of the income-poverty target. High inequality developing countries had *lower* levels of poverty in 1990 than low inequality countries. However, they are less likely to attain the

19. Sensitivity analysis to changes in the poverty line (to simulate measurement errors) showed the results to be robust.

poverty target than low inequality countries. Good policies and broader-based growth improve poverty reduction prospects in high and low-income inequality countries alike. However, in high-income inequality countries it is not certain that even broader-based high growth will be enough to meet the target, as poverty incidence only falls to 49% of its 1990 level by 2015.

Table 9
Poverty in 1990 and 2015 – the effect of income inequality under no change and broader growth paths in the high growth scenario

Scenario	*1990*	*2015*	
		No Change	*Broader based*
Poverty incidence			
High inequality countries	29	19	14
Low inequality countries	38	**18**	**13**
Poverty incidence as % of 1990 poverty			
High inequality countries		68	**49**
Low inequality countries		**47**	**33**

Note: Bold numbers indicate the target has been attained.

Table 10 shows whether the poverty incidence target is attained at the regional level. We present the upper and lower bounds of the projection results: i.e., the worst-case scenario assumes low growth and no policy change, and the best-case scenario assumes high and broader-based growth.

Low inequality East Asia and Pacific meets the target in all scenarios.[20] Eastern Europe and South Asia are likely to meet it in the best-case scenario. Reaching the target in Latin America and the Caribbean is possible but less certain even in the best-case scenario. Prospects are worst for sub-Saharan Africa; in the worst case the poverty in Africa in 2015 is almost as widespread as in 1990. Overall, the attainment of the DAC income-poverty target is strongly influenced by the performance of China and India. Their large population size drives the result of the low-income inequality sample, and that of the overall developing countries.

20. The high inequality sample for East Asia and Pacific (consisting only of Thailand and Malaysia) is too small to use for projections.

Table 10
Poverty incidence in 2015 as a % of poverty incidence in 1990

	1990 headcount	*2015 headcount as % of 1990*	
		High broader based growth Best Case	*No change, low growth Worst Case*
Sub-Saharan Africa	44	56	95
High inequality	43	57	87
Low inequality	44	56	99
Middle East and North Africa	3	51	75
High inequality			
Low inequality	3	51	75
East Asia & Pacific	31	**27**	**38**
High inequality	5		
Low inequality	33	**27**	**38**
South Asia	47	**35**	64
High inequality			
Low inequality	47	**35**	64
Latin America and Caribbean	28	**44**	68
High inequality	28	**44**	68
Low inequality	23	**44**	81
Eastern Europe and Central Asia	9	**32**	55
High inequality			
Low inequality	9	**32**	55
Developing Countries	36	**33**	56
High inequality	29	**49**	73
Low inequality	38	**33**	53

Notes: Bold numbers indicate the target has been attained. The samples for the Middle East and North Africa, South Asia and Eastern Europe and Central Asia do not contain any high inequality countries. For East Asia and Pacific see Note 20.

Growth rates required to halve poverty by 2015

Forecast growth is sufficient to halve poverty by 2015 for developing countries as a whole as long as the growth path is broad-based. Without change in the growth path, per capita growth of 7.1% in high inequality and 3.7% in low inequality countries is needed to halve poverty by 2015. For Latin America and the Caribbean the difference in the poverty-reducing capacity of the two

scenarios is particularly marked, especially for high inequality countries as Table 11 shows.

Table 11 also shows that growth of 2.4% under the broad-based growth scenario and 5.9% under the no-change scenario is needed to halve poverty in sub-Saharan Africa. The latter rate is well above the forecast rate and far in excess of growth rates achieved in the region since the 1960s.

Table 11
Forecast growth and growth required to halve poverty by 2015 (average annual real growth in GDP per capita)

	Forecast growth[a]	*Growth required to halve poverty by 2015*	
		Broader based	*No change*
Sub-Saharan Africa	1.4	2.4	5.9
High inequality		3.5	10.4
Low inequality		2.1	4.6
Latin America and Caribbean	3.0	0.6	7.0
High inequality		0.5	7.0
Low inequality		2.1	4.5

(a) Global Economic Prospects (World Bank, 1998) projections are for 2001–8

Thus, without policies in place that alter the growth path to favour the poor, the growth rates required to halve poverty are high enough to be considered unfeasible in these regions. Between 1960 and 1990 the high performing Asian economies grew at about 5.5% per annum — less than the minimum growth rates of 6 and 7% required to halve poverty in sub-Saharan Africa and Latin America and the Caribbean respectively, under the no-change scenario. The equality of income distribution also has a significant impact on the growth rate required to halve poverty. Under both scenarios high inequality developing countries need per capita income growth which is roughly twice as high as that of low inequality countries. Hence policies that reduce inequality in high inequality developing countries and stabilise it in low inequality ones are another route to ensuring that the DAC targets are achieved.

Attaining the human development targets

Meeting the infant and under-five mortality rate targets

The World Bank (1998) growth rate was combined with assumptions about changes in the other independent variables and changes in the constant term — the technology effect — to produce three future scenarios.[21]

- the Better Health scenario, keeping HIV/AIDS infection rates at their present level and assuming that the availability of health services per capita increases and technological progress continues to have effects.

- the No Health Gains scenario, keeping HIV/AIDS infection rates at their present level and assuming that the availability of health services per capita does not increase, but that technological progress continues to have effects.

- the AIDS Pandemic scenario, projecting HIV/AIDS infection rates spreading throughout all developing regions at the rate predicted by epidemiological models currently used in developing countries. All regions have adult HIV/AIDS prevalence rates of 22.5% by 2015[22] and the benefits of technological progress are assumed to be wiped out.

Table 12 shows that, for developing countries as a whole, attaining a reduction of two-thirds the 1990 level of infant mortality is possible in the better health scenario. However, without improvements in health services and greater access to them the target is unlikely to be met. The course of the HIV/AIDS epidemic is a crucial factor, as IMR remains at 76% of its 1990 level in the AIDS pandemic scenario. The corresponding rate of 42 per 1000 live births is more than twice as high as the projection for the better health scenario.

The regional breakdown shows that, even with the AIDS pandemic, infant mortality is expected to fall in all regions apart from Middle East and North Africa. East Asia and Pacific is the only region that is likely to reduce it by two-thirds under any circumstances. Latin America and Eastern Europe need to control the spread of AIDS to meet the target, while the Middle East and South Asia, in addition, have to improve health services.

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21. Hanmer et al. (1999) found that some improvements in infant and child mortality over time could be attributed to autonomous effects of improved technology and knowledge. We incorporate this finding in our model.

22. Epidemiological models (e.g. Stover, 1997) plot the course of the AIDS epidemic as a 'S' shaped curve. Infection spreads very slowly in the initial years and then, after prevalence levels of about 5% are reached, the epidemic spreads rapidly, stabilising after about 15 years at a maximum value of 22.5%. This may, of course, not actually happen. In Western Europe and North America the rapid spread of AIDS has to date only affected particular high risk sub-sets of the population.

Table 12
Infant mortality rates (IMR) per thousand in 1990 and in 2015 as % of 1990 levels

		IMR in 2015 as % of 1990 level		
	1990 IMR ('000)	*Better Health*	*No Health Gains*	*AIDS Pandemic*
Sub-Saharan Africa	93	56	65	94
Middle East and North Africa	51	**18**	34	110
East Asia and Pacific	36	**14**	**14**	**29**
South Asia	83	34	44	79
Latin America and Caribbean	43	**12**	**12**	74
Eastern Europe and Central Asia	21	**24**	**24**	89
All developing countries	56	**33**	40	76

Note: Bold figures indicate that target (reducing by 2/3, which is 33% of the 1990 level) is met. The constant figures for East Asia, Latin America and Eastern Europe in the better health and no health gain scenarios reflect the lower bound of five per thousand imposed by the projection model.

Table 13
Under-five mortality rates (U5MR) in 1990 and in 2015 as % of 1990 levels

		U5MR as a percentage of its 1990 level		
	U5MR 1990	*Better Health*	*No Health Gains*	*AIDS Pandemic*
Sub-Saharan Africa	149	64	77	96
Middle East and North Africa	62	**15**	41	107
East Asia and Pacific	42	**12**	**12**	**30**
South Asia	105	**33**	46	79
Latin America and Caribbean	49	**10**	**10**	70
Eastern Europe and Central Asia	26	**29**	**19**	**26**
All developing countries	72	36	47	77

Note: Bold figures indicate that target (reducing by 2/3, which is 33% of the 1990 level) is met. The constant figures for East Asia, Latin America and Eastern Europe in the better health and no health gain scenarios reflect the lower bound of 5 per thousand imposed by the projection model.

Table 13 shows that, for developing countries as a whole, under-five mortality is likely to fall to 36% of its 1990 level (72 per thousand) if better health policies increase access to health services and contain the spread of HIV/AIDS. In the AIDS pandemic scenario it decreases slowly compared to past trends, falling by less than 20 per thousand over the fifteen-year period and remaining at about three-quarters of its 1990 level. Although developing countries overall do not reach the target , all regions, apart from sub-Saharan Africa, do so under the better health scenario.

Meeting the maternal mortality rate target

The estimated rates of growth of adult literacy[23] are combined with the assumptions about access to reproductive health care and the spread of HIV/AIDS to create three scenarios:

- the Better Health Services scenario, keeping HIV/AIDS infection rates at their present level and assuming that the 80% of births in 2015 are attended by skilled health personnel;[24]

- the Slower Health Gains scenario, keeping HIV/AIDS infection rates at their present level and assuming that improvements in births attended by skilled health personnel take place at only half the rate necessary to meet the births target (and that around 70% of births are attended in 2015);

- the High AIDS scenario, making the same births attended assumption as the Slower Health Gains scenario, but also assuming that HIV/AIDS infection rates spread throughout all developing regions at the rate predicted by epidemiological models. All regions have adult HIV/AIDS prevalence of 22.5% by 2015.

Maternal mortality data are available for very few countries. Table 14 therefore shows the country that has the largest weight in the result for each region, in the case where the regional country sample is small.

None of the regions (or countries) under any of the scenarios reaches the target of reducing maternal mortality rates by three-quarters by 2015, which would imply a value of 25% in 2015. Starting from a very high level sub-Saharan Africa gets close to reaching the target, but that is contingent on achieving a level of 80% births attended by skilled personnel and on halting the

23. A model of adult literacy as a function of GDP per capita is used to estimate future adult literacy rates given the growth rates predicted by the World Bank.

24. A subsidiary IDT is that 80% of births are attended by trained personnel by 2015.

spread of HIV/AIDS at current rates of infection. In terms of percentage change the best-case outlook for Africa is better than for other regions, as currently the ratio of births attended is very low and hence there are bigger potential improvements to be made. If the health gains take place at only half the rate necessary to hit the attended births target, sub-Saharan African maternal mortality in 2015 falls only to 60% of its 1990 level.

Table 14
Maternal mortality rates (MMR) per 100,000 in 1990 and in 2015 as % of 1990 levels

		2015 MMR as a percentage of 1990 levels		
	1990 MMR (per 100,000)	*Better Health Services*	*Slower Health Gains*	*High AIDS*
Sub-Saharan Africa	768	30	60	68
Middle East and North Africa	221	50	72	153
Vietnam[a]	1356	45	65	101
Pakistan[b]	263	60	75	96
Latin America and Caribbean	98	45	68	86
Poland[c]	109	72	73	129
All developing countries	694	44	65	94

Note: Vietnam, Pakistan and Poland represent more than 75% of the population in their regions for which data are available. (a) plus Mongolia, Cambodia and some Pacific Islands; (b)plus Afghanistan, Bhutan, Maldives and Nepal; (c) plus Moldova and Georgia.

Comparing the Slower Health Gains and the High AIDS scenarios, Table 14 shows that for Africa the effect of AIDS on maternal mortality is smaller than the effect due to births being attended. This is because HIV/AIDS infection rates in the region are already very high, nearing the epidemiological maximum. The situation is reversed for a region like the Middle East and North Africa, which currently has low HIV/AIDS infection rates but higher attended births statistics. Though the relative importance of the births-attended and the AIDS effects differs by region, it is clear that to improve maternal mortality rates in developing countries it is crucial to enhance health services and contain the spread of the AIDS epidemic.

Universal primary education

Table 15 shows the 1990 levels and 2015 projections of the net primary school enrolment rate for the high and low growth scenarios by region.

Table 15
Net primary school enrolment rates in 2015, by region

	1990	*2015*	
		High growth	*Low growth*
Sub-Saharan Africa	54	68	65
Middle East and North Africa	84	98	96
East Asia & Pacific	99	100*	100*
South Asia	62	83	79
Latin America and Caribbean	90	100*	100*
Eastern Europe and Central Asia	96	100*	100*
Developing Countries	**82**	**100***	**98**

Note: '100*' indicates full net primary school enrolment.

Only three regions, East Asia and Pacific, Latin America and Caribbean and Eastern Europe and Central Asia will have universal enrolment by 2015. The other regions are unlikely to reach the target. The Middle East and North Africa gets very close, and South Asia is projected to reach around 80% at least. Forecasts for sub-Saharan Africa suggest that even in 2015 more than three out of ten children will not attend primary school.

In the efforts to improve education an important caveat must be kept in mind. Enrolment does not ensure education. Our country case study, Uganda, shows that quality concerns can be critical. Teacher pupil ratios have soared to 70:1 in government schools with the Universal Primary Education policy, and the challenge facing the government is to ensure that all pupils leave primary school literate and numerate and that the overall standard of education does not fall. The Tanzania study shows that deteriorating standards of education can lead to education becoming highly price-elastic. The recent imposition of a charge of TSh1000 per year (about £1) led to falling enrolments as parents would not pay 'something for nothing' (see the article on Tanzania in this issue).

Conclusions

This article set out to examine whether the DAC targets are achievable. It sought to improve on models that predicted their achievability on the basis of growth alone. It found that, although economic growth is an important determinant of both poverty and human development, other independent variables also play an important role in determining poverty reduction and human development improvements.

Halving income poverty by 2015 is possible, so long as policies are in place to induce broader-based growth paths. And growth does not have to be as high as forecast if the growth path becomes broader-based; developing countries overall will meet the target if they achieve the 3% per capita real average growth rates that they had between 1965 and 1997. Growth is important but attaining the poverty targets depends crucially on action being taken by developing country governments and donor agencies to influence the qualitative nature of the growth path, including policies to ensure that growth is rooted in sectors of the economy in which the poor are able to participate, in order to create conditions for rising labour productivity by increasing the rate and efficient use of investment and policies to improve openness. Our results also point to the critical role of income inequality. The prospects for reducing poverty are much better in low-income inequality countries than high inequality countries. The latter are unlikely to attain the target even if growth is rapid and broad-based; they need growth rates about twice as high as low inequality countries to meet the income-poverty target.

Despite the good prospects for reducing poverty in developing countries overall there are some sobering findings. Sub-Saharan Africa is unlikely to reach the target, given the forecast rates of growth. If the growth path were broader-based, then growth of about 2.5 per capita per annum would be needed. Other regions have achieved sustained growth of this magnitude, but it will take a major effort by the international community and African governments alike to launch sub-Saharan Africa on such a growth path. Contrary to widespread assumptions, it contains a large number of high inequality countries, and there is therefore scope for increasing the rate of poverty reduction for a given growth rate if policies that induce high growth and falling income inequality are devised. Further research is needed to establish exactly what these policies should be but, if the experience of Latin America is anything to go by, ensuring that land tenure reforms have the net effect of increasing equality — including gender equality — seems likely to be a critical ingredient in many African countries (see Killick et al., 1999).

There are good prospects for meeting the human development targets too, as long as policies are in place that support the gains that higher income levels can bring. Reducing infant and under-five mortality rates by two-thirds will depend on policy interventions that can: halt the spread of HIV/AIDS; increase the capacity of health sectors to deliver more health services; and ensure that technological progress spills over to benefit the developing world. Making maximum progress towards the maternal mortality rate target requires investment in health services that increase women's access to maternal health services and halting the spread of HIV/AIDS. In developing regions as a whole primary school enrolment can become universal. However, South Asia and particularly sub-Saharan Africa are unlikely to reach the enrolment target. Moreover, attaining universal primary education is conditional on maintaining

the quality of teaching. Finally, we find no evidence that gender equality in enrolment in primary and secondary education increases automatically as development proceeds. This suggests that the achievement of this target depends critically on pro-active policy measures that promote the cultural, political and economic empowerment of women.

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