Structural Adjustments and Standards of Living in Developing Countries

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Summary

This paper employs a number of models to examine whether the structural adjustment programmes of the World Bank have had any effect on the standards of living and human development indices in the *treated* countries. It appears that while during the adjustment period the average real per capita income has grown faster in the *treated* countries this has not been the pattern for the indicators of standards of living. Although there exists a relationship between the human development indices and income for countries considered, the income elasticity of the non-income components of the human development indices examined here are very low for the countries which have benefited for a longer period from the structural adjustment loans and similarly for the *non-treated* countries. It seems that the *physical* standards of living examined here, though depending on per capita income, were relatively more influenced by other factors. In conclusion the validity of a high concentration of adjustment programmes on income growth as the main target is questioned.

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Introduction

The World Bank's Structural Adjustment Loans (SALs) to developing countries have been the source of considerable controversy in the literature. The conditions attached to these loans were believed to correct domestic economic policies and aimed at controlling inflationary pressures and enhancing the efficiency of the supply side in the economy. They included fiscal and monetary tightness, wage control, promotion of free markets, trade liberalisation, privatisation and devaluation.

Structural adjustment policies were initially designed by the World Bank to complement the poverty alleviation programmes (Summers et al 1993, Please 1996) and reduce the economic distortions which were hampering the social profitability of investment projects (Kanbur 1991). They aim at increasing the overall real income of the country concerned which in turn is regarded as the main factor for improving the standards of living and reducing poverty. There is little disagreement on these basic objectives of the adjustment policies, however, the controversy is in relation to the adopted strategy. It is therefore logical that these programmes should be evaluated ultimately in terms of their effects on poverty and standards of living. A number of recent studies conclude that these policies have had adverse effect on the standards of living of the poor in developing countries (Cornia et al 1987, Stewart 1995, UNRISD 1995). Furthermore, it has been suggested that "…over-reliance on conditionality leads to major misallocation of resources and large-scale waste of public money." (Killick, 1996). The Bank on the other hand argued that the above policies have had little negative impact on the standards of living in the treated countries (World Bank 1992).

The effects of SALs on poverty and standards of living could conceivably be appraised from two angles: (i) whether the poor section of population has been (adversely) affected, (ii) whether the living conditions as measured by the average measures of standards of living have been affected. Investigating the first question requires individual country studies of the poor in different treated countries.[(1)]

The second line of investigation has its implicit limitations. It does not address the distributional issues which may conceal relative poverty or even give rise to absolute poverty. However with reference to the nature of the recommended adjustments the second angle of investigation seems to be more *suitable* to the appraisal of these programmes. As the structural adjustment policies have relatively little or no effective distributional policies built into them, they can hardly claim to be effective in removing relative poverty in the treated countries. On the contrary, it has been argued that they may have possible adverse distributional consequences. However, they may be assessed, perhaps partially, in terms of their effects on the average standards of living, and to some extent, regardless of their distributional aspects. This approach has been adopted by a number of studies (World Bank 1992, Stewart 1995 and Kakwani 1995) which compare the adjusting countries with the non-adjusting ones using a set of social indicators. In general there is little disagreement on the role of economic growth in increasing incomes, however, there are some concerns on whether economic growth would necessarily lead to improvements in the standards of living (Dreze and Sen 1990). Some scholars are concerned with the inconsistencies between the adjustment programmes and policies needed for the development of the countries concerned. Structural adjustments involve cuts in public expenditure which primarily affect expenditure on education, health and other social aspect needed for the development of human capabilities (Stewart 1994). Others suggest that conditionality attached to these programmes should be relevant to the ultimate objectives of poverty alleviation and human development rather than to economic instruments and, hence, their effectiveness should be assessed in these terms (Singer 1995).

Evaluation Methodology

Various approaches are proposed for the assessment of the effects of SAL programmes. Amongst them the so-called *with versus without* method has been employed frequently (for examples see Mosley et al 1991, World Bank 1992 and Kakwani 1995). In this approach we compare what has happened with the programme with what we assume would have happened without it. It relies on comparing the situation in those countries in receipt of SAL with that belonging to a group of countries, *control group*, which have not received SAL. It has been suggested that this method appears to be holding the extraneous influences on both groups constant and thereby discounting them (Mosley 1991) while it has its limitations (Summers

1993). Nevertheless it allows us to see “whether countries which have adopted the conditions are doing better than countries which have not adopted them” and has been “often adopted by the IMF and the World Bank” (both quotes from Singer 1995, p13). The addition of time dimension makes the assessment more interesting and meaningful. In effect we can compare the recipient group with the non-recipient group before and during the SAL programmes. This would allow for the possibility of detecting special circumstances in any of the groups before the receipt of SAL which may be prevailing.

Crucial to this approach is the selection of the *control group*. There are slightly different classifications for this purpose in the literature. We adopted the classification proposed by The World Bank (Massland 1992) which recognises three groups of countries. Those countries which had implemented structural adjustment policies early on and had received early-intensive adjustment lending (EIALs) - including 25 countries - those which received other adjustment lending (OALs) - 29 countries - and finally non-adjustment lending countries (NALs) - including 32 countries.(2) A full list of these countries is presented in appendix A.

We selected five social indicators for comparing the living standards in the above mentioned groups of countries before and during SAL periods. These are infant mortality rate (IMR), life expectancy (LE), adult literacy (AL), gross primary enrolment ratio (PER) and per capita calorie supply (CAL). In addition the Purchasing Power Parity (PPP$) estimates of real GDP per capita were employed to reflect the income differentials amongst the selected countries. The data were mainly obtained from various issues of the Human Development Report and the World Bank database and where necessary the annual real GDP growth rates were used to estimate the (PPP$) GDP per capita, appropriately..

The performance of the selected social indicators were studied during two periods: pre-SAL (1970-85) and SAL (1986-92) periods. These periods were selected on the grounds that most SAL agreements dated back to the early 80s.

Descriptive analysis

Preliminary descriptive analysis of data revealed remarkable differences between the three groups of countries and their sub-groups. Table 1 compares average annual growth rates for the selected indicators for the EIAL, OAL and NAL countries, as well as those for the low-income and middle-income countries in each group, for the pre-SAL and SAL periods.

Table 1. Average annual growth rates for different groups of countries

	70-85	86-92		70-85	86-92*
IMR			**PER**		
EIAL	-3.2	-2.8	EIAL	1.6	0.2
low-income	-1.8	-2.5	low-income	3.3	0.3
middle-income	-4.5	-3.0	middle-income	0.4	0.1
OAL	-2.0	-2.2	OAL	2.1	1.2
low-income	-1.5	-1.4	low-income	2.7	2.1
middle-income	-2.9	-3.6	middle-income	1.1	-0.2
NAL	-3.0	-3.7	NAL	2.5	0.1
low-income	-1.8	-2.3	low-income	2.3	-0.3
middle-income	-3.6	-4.6	middle-income	2.5	0.3
LE			**CAL**		
EIAL	0.8	0.5	EIAL	0.5	0.0
low-income	0.8	0.7	low-income	0.3	-0.8
middle-income	0.8	0.4	middle-income	0.7	0.8
OAL	0.8	0.4	OAL	0.3	0.1
low-income	0.8	0.5	low-income	0.1	0.3
middle-income	0.8	0.3	middle-income	0.6	-0.1
NAL	0.8	0.7	NAL	0.6	-0.3
low-income	0.7	0.5	low-income	0.3	-0.9
middle-income	0.8	0.8	middle-income	0.7	0.1
AL			**GDP**		
EIAL	2.5	0.9	EIAL	1.3	8.5
low-income	3.8	2.2	low-income	0.0	8.7
middle-income	1.6	-0.1	middle-income	2.5	8.3
OAL	3.0	2.6	OAL	1.9	6.3
low-income	3.9	3.3	low-income	0.1	5.9
middle-income	1.7	1.5	middle-income	2.8	6.9
NAL	2.0	1.6	NAL	1.9	5.2
low-income	2.2	2.1	low-income	1.1	2.5
middle-income	1.8	1.4	middle-income	2.4	6.8

* Data for calorie supply are for 86-90 period.

During 70-85 the average annual rate of decline in the infant mortality rate in the EIALs was above that of the NALs with the rate of decline for OALs being the lowest. For the SAL period of 86-92 there was a remarkable change in this order. The rate of decline for NALs for this period was higher than those for the EIALs and OALs. Moreover, there was an inter-period drop in the rate of decline for the EIALs while the same for the NALs improved significantly with a marginal improvement in the rate for the OALs. With respect to the income sub-groups there were similar inter-period improvements in this rate for the EIAL and NAL low-income countries with a marginal drop in the rate of decline for the OAL low-income countries. In the case of middle-income countries the rate of decline during the SAL period dropped significantly for the EIALs as compared to the same for the pre-SAL period. In contrast the same for the NALs improved remarkably which was also the case, to a lesser extent, for the OALs. Overall, judging from the above results one cannot reject the proposition that during the SAL period the drop in the infant mortality rate for the EIAL countries slowed down significantly as compared to the same for the NAL countries. Nor can one reject the proposition that during the SAL period the NAL countries achieved better results than the other two groups in this respect.

As for the annual rate of increase in life expectancy all groups experienced a drop as we move from one period to the next. For the EIAL and OAL groups the decline was more pronounced than that of the NAL group. For the middle-income sub-groups the highest inter-period decline belonged to the EIALs while the rate for the NALs remained constant. As for the low-income sub-groups the OALs and NALs had similar performances with that of the EIALs being somewhat better. Overall, with respect to this indicator one cannot reject the proposition that the NAL countries were better off than the other two groups.

As compared to the rate for the pre-SAL period the average annual rate of increase in adult literacy during the SAL period, declined for all the SAL groups. However, the decline was much more considerable for the EIAL group. The average low-income EIAL country experienced a relatively higher inter-period decline in this rate as compared to the corresponding sub-groups of the OAL and NAL countries. As for the middle-income sub-groups while all of them experienced a drop in the rate of increase again the average country in the EIAL middle-income sub-group suffered a harsher decline during the SAL period. Once again, with respect to this indicator one cannot reject the proposition that the EIAL countries were worse off as compared to the other two groups.

As compared to the pre-SAL period the rate of increase in gross primary enrolment slowed down for all groups of countries during the SAL period. However, the drop was more steep for the NALs and EIALs. The average low-income NAL and EIAL countries were much worse off than the corresponding OAL country. As for the middle-income sub-groups the average EIAL country experienced a lower inter-period decline in this rate than the average country in the other two groups.

For the indicator of calorie supply per capita the worst inter-period performance belonged to the NAL group, though the rates for all groups dropped from an already low base. Amongst the low-income countries the OAL sub-group did better as compared to others while the performances of the EIAL and NAL sub-groups were similar. The best performance for the middle-income sub-group belonged to the EIALs with the rates for the corresponding NAL and OAL sub-groups remaining just positive and becoming just negative, respectively.

There were remarkable inter-period improvements in the annual rate of growth of GDP per capita for all groups. However, the rate for the average EIALs was superior to those belonging to the other groups with the OALs exhibiting a better performance than the NALs. Amongst the low-income sub-groups the rate for the EIAL countries was extraordinarily good. As for the middle-income sub-groups again the OAL and EIAL countries enjoyed a much better rate of growth than the NAL sub-group. Overall, with respect to this indicator, undoubtedly the performance of the EIAL countries was much better than the NAL group during the SAL period. On the basis of these results one cannot reject the proposition that the adjustment programmes have resulted in an increase in the level of income.

Effects of Adjustment Programmes

The above results have an interesting implication. While the average performance of the EIAL countries in raising their real income per capita during the SAL period has been much better than that of the NAL countries, the reverse seems to be the case for three of the selected non-income indicators of standards of living with the remaining two exhibiting intriguing results. This raises a number of questions of which the most interesting ones are: (i) Are there some relationships between these social indicators and the income indicator? (ii) Have these relationships changed between the pre-SAL and SAL periods? (iii) Are there any differences between the EIAL, OAL and NAL countries in these respects? In brief can we take for granted that an increase in the level of income would result in an increase in other aspects of welfare?

The answers to these questions may throw light on the debate on the relationship between income and social indicators and on whether the SAL policies have affected the standards of living via improving income in the *treated* countries.

To investigate the above questions we initially employed the following model :

$$\text{Welfare indicator} = a_0 + a_1 d_1 + a_2 d_2 + bAGDP + u \qquad (1)$$

Where the welfare indicator refers to the individual selected indicators of standard of living, AGDP is the real average income per capita in \$PPP, d_1 is the dummy variable for the EIAL countries (=1 for the EIAL countries and =0 for others) and d_2 is the dummy variable for the OAL countries (=1 for the OAL countries and =0 for others). The parameters a_1 and a_2 are the differential intercepts for EIAL and OAL countries from the base category of NAL countries with the intercept of a_0. If the coefficient of a dummy variable proves to be statistically significant we may then conclude that there is a significant differential intercept between the corresponding group and the base category group of countries with no structural adjustment programme (NAL).

A general problem in cross-country regression analysis is the possible presence of heteroscedasticity. As our sample includes developing countries we suspect that such likelihood may have been lessened. However, for every regression we employed two tests: (i) the Park Test and (ii) the Spearman Rank Correlation Test. The results are presented in Appendix B. Where we could not reject the presence of heteroscedastic data we used the weighted least squares method of estimation using countries' population as weights.

Table 2. Regression results for social indicators - model (1)

	1970 - 1985		1986 - 1992	
	Coefficient	t-value	Coefficient	t-value
Infant mortality rate				
AGDP	-0.024	-9.96**	-0.015	-10.56**
EIAL Dummy	-5.931	-0.77	-1.954	-0.29
OAL Dummy	3.707	0.49	8.289	1.23
Constant	142.983	19.78**	114.008	18.85**
R^2	0.57		0.63	
F	36.3**		42.9**	
Life expectancy				
AGDP	0.006	12.10**	0.003	12.06**
EIAL Dummy	0.477	0.32	-0.571	-0.38
OAL Dummy	-1.383	-0.94	-2.232	-1.50
Constant	44.822	31.87**	50.372	37.09**
R^2	0.67		0.67	
F	54.0**		55.4**	
Adult literacy				
AGDP	0.015	9.25**	0.008	7.99**
EIAL Dummy	4.345	0.86	3.563	0.73
OAL Dummy	-2.419	-0.49	-3.119	-0.64
Constant	25.878	5.57**	40.761	9.06**
R^2	0.60		0.51	
F	32.5**		25.2**	
Gross primary enrolment ratio				
AGDP	0.011	5.04**	0.006	3.51**
EIAL Dummy	-5.787	-0.95	-16.105	-2.36*
OAL Dummy	12.863	3.03**	16.023	3.06**
Constant	70.986	16.88**	86.872	18.36**
R^2	0.35		0.36	
F	12.1**		11.2**	
Per capita calorie supply #				
AGDP	0.211	9.99**	0.177	8.43**
EIAL Dummy	30.825	0.46	67.913	0.89
OAL Dummy	8.056	0.12	-11.724	-0.15
Constant	1966.250	30.92**	2010.328	27.77**
R^2	0.57		0.52	
F	34.9**		26.2**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply for SAL period are for 1986-90.

Table 2 represents the regression results for the selected five welfare indicators. In all cases the significant computed F supports the proposed model. For all welfare indicators the coefficient of AGDP is significant for both pre-SAL and SAL periods. This gives support to the hypothesis that higher income would improve the standard of living and therefore endorses the policy of targeting the increase in the real income. The coefficients of both dummy variables for welfare indicators, with the exception of those for the gross primary enrolment ratio equation, are not significant. This means that for the period before the SAL there has been no significant difference between the EIAL or OAL countries and the NAL countries. More importantly the results for the 1986-92 period indicate that SALs have not resulted in any significant change in this respect. It is also notable that AGDP during the SAL period has remained significant in the case of all indicators of standard of living.

In all cases, except one, tests of heteroscedacticity resulted in rejecting the (hypothesis of) presence of heteroscedasticity. The exceptional case is the equation for the gross primary enrolment ratio. As neither of the tests employed could reject the possibility of different error variances for both periods (see Table B1 in Appendix B) the weighted least squares method was used for estimation.[(3)] The results indicate that the coefficients of the AGDP, the OAL dummy and the constant are significant for both periods. For the SAL period the coefficient of the EIAL dummy is also significant and negative. This means that the gross enrolment ratio for the EIAL countries is potentially lower than that of the NAL countries for the SAL period, an indication of a possible adverse social effect of SALs. This result is of particular significance when we consider some of the critics of adjustment programmes which refer to the likelihood of vulnerable households, facing harsher economic conditions, being forced to withdraw their children from school to undertake family labour. The OAL countries seem to be doing better than the other two groups as their significant differential intercept is positive. While the coefficients of determination for this particular indicator is less impressive than those for other welfare indicators the F statistics for all models are significant at 1% level of significance.

The Effect of Adult Literacy

The effect of literacy on other indicators of standards of living and human development has been regarded to be of fundamental importance (Human Development Report-various issues, Desai 1993, Streeten 1994 and Kakwani 1995,). In the light of these we tested the following model:

Welfare indicator = $a_0 + a_1 d_1 + a_2 d_2 + b_1 AGDP + b_2 AAL + u$ (2)

Where AAL is the average literacy rate and all other variables and parameters are as before. The results in Table 3 indicate significant improvements in the fit for the remaining indicators.

Table 3. Regression results for social indicators - model (2)

	1970 - 1985		1986 - 1992	
	Coefficient	t-value	Coefficient	t-value
Infant mortality rate				
AGDP	-0.006	-2.54**	-0.008	-5.51**
AAL	-1.114	-8.90**	-0.924	-7.70**
EIAL Dummy	1.941	0.38	4.384	0.86
OAL Dummy	9.164	1.86	7.132	1.42
Constant	163.955	28.92**	151.883	22.68**
R^2	0.84		0.81	
F	80.7**		76.4**	
Life expectancy				
AGDP	0.003	5.65**	0.002	6.85**
AAL	0.206	8.95**	0.210	8.04**
EIAL Dummy	-1.436	-1.53	-1.910	-1.74
OAL Dummy	-2.497	-2.75**	-2.002	-1.83
Constant	40.778	39.04**	41.653	28.37**
R^2	0.89		0.84	
F	126.1**		99.1**	
Gross primary enrolment ratio				
AGDP	0.001	0.23	-0.001	-0.86
AAL	0.816	7.99**	0.908	7.48**
EIAL Dummy	-5.748	-1.31	-8.729	-1.82
OAL Dummy	-9.378	-2.19*	-4.955	-0.95
Constant	41.785	8.46**	40.749	6.02**
R^2	0.77		0.68	
F	45.0**		27.8**	
Per capita calorie supply#				
AGDP	0.174	5.60**	0.172	5.62**
AAL	0.018	0.01	-0.121	-0.06
EIAL Dummy	29.841	0.47	42.003	0.52
OAL Dummy	-16.050	-0.26	-44.538	-0.56
Constant	2018.357	28.62**	2057.442	19.37**
R^2	0.56		0.50	
F	20.2**		17.1**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

For the infant mortality indicator during the 70-85 period the coefficient of adult literacy, along with that of income, is highly significant with the expected negative sign. It is interesting to note that for the 86-92 period the effect of income variable has increased and that of the adult literacy has decreased, though slightly. Nevertheless both have remained significant. Once again the differential intercepts, the coefficients of EIAL and OAL dummies, are insignificant in both periods while the constant has remained highly significant. This indicates that there are no significant changes from the base category's intercept (NAL countries) for both EIAL and OAL countries in both periods. The coefficient of determination and the value of the computed F for both periods have improved as compared with the previous model.

Similarly, for the life expectancy indicator the coefficient of adult literacy, along with that of income, is highly significant for both before and during the SAL periods. The same is true for the constant. It is interesting to note that while the coefficient of the EIAL dummy remains insignificant that of the OAL dummy for the 70-85 period is just significant with a negative sign. This means that the differential intercept for the OAL countries is now 38.281 indicating that the average life expectancy for the OAL countries for the said period has been lower than that of the NAL countries by nearly 2.5 years. However, this difference is insignificant for the SAL period. Once again both R^2 and F have improved substantially.

The inclusion of adult literacy as an explanatory variable resulted in a remarkable change in the model for the primary enrolment ratio. For both periods R^2 and F have improved notably as compared to the previous model. The coefficient of AGDP is no longer significant, however, that of the adult literacy and the constant term are highly significant. It seems that adult literacy explains variations in this indicator better than the income indicator. The coefficient of the OAL dummy is significant and negative for the 70-85 period. This differential intercept means that on average the primary enrolment ratio in these countries was lower than that of the NAL countries by just above 9%. In the after SAL period, however, this coefficient becomes insignificant. In this respect it seems that the pattern for this indicator is the same as the one for the life expectancy indicator. One is tempted to suggest that in the case of the OAL countries there seems to be some positive changes taking place for the SAL period. The coefficient of the EIAL dummy remains insignificant for both periods.

The inclusion of adult literacy as an explanatory variable in the model did not result in an improvement in the fit for the per capita calorie supply indicator. The coefficient of adult literacy is insignificant for both periods. The constant has remained significant while the coefficient of the dummies are insignificant. Once again these results support the suggestion that the EIAL and OAL countries are not significantly different to NAL countries in terms of the intercept of the regression.

Tests of heteroscedasticity concluded that there is no evidence of the presence of this problem in data (see Table B2 in Appendix B).

Slope Differentials Amongst Structural Adjustment Loan Groups

So far we have only questioned the validity of 'parallel regressions' and tested for the hypothesis of differential intercepts. In other words we implicitly assumed that the slope of the regression is common for all three groups of countries. However, it is possible that the slope and/or the intercept of the regression to be different for EIAL, OAL and NAL groups of countries. To test for differential slopes and intercepts we employed the following model.

$$\text{Welfare indicator} = a_0 + a_1 d_1 + a_2 d_2 + b_1 AGDP + b_2(d_1 AGDP) + b_3(d_2 AGDP) + u \quad (3)$$

In the above model d_1 and d_2 are the EIAL and OAL dummy variables respectively. Hence their coefficients, a_1 and a_2, reflect the differential intercepts for these countries, from the base category's intercept, a_0, accordingly. The coefficients b_2 and b_3 are the differential slope coefficients. They indicate by how much the slope of the regression for the respective groups of EIAL and OAL countries would be different to the slope for the base group of NAL countries, b_1. Variables d_i AGDP are simply the product of the dummy variables d_i and the AGDP.

Table 4 represents the results for the above model. For infant mortality rate the coefficient of the income variable has the right expected sign and is, along with the constant, significant for the 70-85 period. For the 86-92 period, however, the coefficient of d_2 AGDP and that of OAL dummy are also significant. This means that there is a difference between the intercepts and slopes of the regressions for the OAL and NAL countries. It indicates that basically for OAL countries the level of infant mortality rate is higher (as their intercept is higher), however, the relationship between this indicator of welfare and the income indicator is stronger (as the slope is higher). There is no *structural* difference in intercept and slope between EIAL and NAL countries. The computed F indicates a significant regression model.

For life expectancy, for both pre-SAL and SAL periods, the constant and the coefficients of AGDP and d_2 AGDP and OAL dummy are significant. Again in terms of both the intercept and slope the regression results for the OAL countries seem to be different to those for the base group of NAL countries. The positive slope for both periods indicate a stronger relationship for the OAL countries, at a constant rate, with the income variable. The constant for the 70-85 period signals a systematically lower life expectancy in OAL countries (by almost six years), while for the 86-92 period despite an increase in the level of life expectancy in general, this level for OAL countries is lower by nearly seven years as compared to that of the NAL countries. This lower rate is compensated by a higher slope for the income variable. Both differentials for OAL countries are significant at a higher level for the SAL period. There is no significant difference between the EIAL and NAL countries for the life expectancy indicator. For both periods R^2 is rather high and F is highly significant.

Table 4 Regression results for social indicators - model (3)

	1970 - 1985		1986 - 1992	
	Coefficient	t-value	Coefficient	t-value
Infant mortality rate				
AGDP	-0.021	-5.63**	-0.012	-5.74**
d1AGDP	-0.001	-0.26	-0.002	-0.53
d2AGDP	-0.008	-1.39	-0.007	-2.02*
EIAL Dummy	-2.141	-0.15	2.821	0.25
OAL Dummy	17.019	1.36	23.867	2.31*
Constant	136.720	14.39**	107.376	14.09**
R^2	0.58		0.65	
F	22.2**		27.3**	
Life expectancy				
AGDP	0.004	6.31**	0.003	6.67**
d1AGDP	0.001	1.26	0.001	1.26
d2AGDP	0.002	2.25*	0.002	2.72**
EIAL Dummy	-2.508	-0.94	-3.209	-1.30
OAL Dummy	-5.688	-2.39*	-6.966	-3.10**
Constant	47.311	26.10**	52.682	32.03**
R^2	0.69		0.70	
F	34.7**		37.0**	
Adult literacy				
AGDP	0.012	4.24**	0.007	3.60**
d1AGDP	0.003	0.73	0.001	0.59
d2AGDP	0.005	1.33	0.004	1.14
EIAL Dummy	-1.537	-0.16	-0.469	-0.06
OAL Dummy	-11.160	-1.36	7.888	1.22
Constant	31.445	4.81**	41.374	10.37**
R^2	0.61		0.55	
F	19.8**		17.5**	
Gross primary enrolment ratio				
AGDP	0.008	2.28*	0.003	1.12
d1AGDP	0.006	1.29	0.004	1.18
d2AGDP	0.003	0.59	0.002	0.53
EIAL Dummy	-16.711	-1.59	-26.540	-2.35*
OAL Dummy	8.721	1.04	12.085	1.19
Constant	74.818	14.04**	90.939	15.07**
R^2	0.37		0.37	
F	7.6**		6.9**	
Per capita calorie supply #				
AGDP	0.240	7.22**	0.171	4.74**
d1AGDP	-0.104	-2.04*	0.000	0.01
d2AGDP	0.001	0.02	0.022	0.41
EIAL Dummy	230.717	1.93	66.679	0.48
OAL Dummy	27.744	0.26	-51.325	-0.40
Constant	1903.930	22.84**	2025.628	20.39**
R^2	0.60		0.52	
F	22.8**		15.4**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

As for the regression for the adult literacy indicator only the constant and the coefficient of AGDP are significant. There seems to be no significant structural difference between NAL countries and the other two groups of countries. It should be noted that the tests for heteroscedacticity could not reject the presence of this problem for this regression for the SAL period (see Table B3 in Appendix B). Hence the results presented for the 1986-92 period for adult literacy are the weighted least squares estimates. The significance of F statistics for both periods support the validity of the model.

Once again the problem of heteroscedasticity did arise in the case of regressions for the gross primary enrolment ratios for both pre-SAL and SAL periods (see Table B3). Hence we used the weighted least squares method of estimation. For the 70-85 period, the coefficient of AGDP and the constant are significant. This means that for the pre-SAL period there are no significant differences, neither in terms of slope nor the intercept, between the three groups of countries. The results for the SAL period are somewhat different. While the coefficient of the AGDP is not significant, the intercept of the regression and the differential intercept for the EIAL countries are significant. The negative sign of the latter indicates that the level of the gross primary enrolment ratio for the EIAL countries are systematically lower than those for the NAL and OAL countries - just above 64% for the EIAL countries as compared to almost 91% for the NAL and OAL countries. Despite lower R^2 the F statistics remains significant.

Regressions for the per capita calorie supply indicate significant constant and AGDP's coefficient for both periods. However, for the 70-85 period the differential slope for the EIAL countries, notably with a negative sign, is also significant.

The inter-period comparison for all indicators shows an increase in the magnitude of intercept and a lower degree of dependence on income. This may be taken as a hint that the level of the indicators of standards of living are increasingly influenced by other factors than only income.

Human Development Indices and Structural Adjustment

Some literature recommend the use of composite indices, in addition to the use of individual indicators of standard of living, for reflecting the overall state of human development in countries. One example of such indices is the Human Development

Index (HDI) which has been published by the UNDP since 1990. Another example is the Modified Human Development Index (MHDI) which is argued to be superior to the HDI with respect to the treatment of its components and its structure (Noorbakhsh 1996a). Both indices have three components reflecting longevity (presented by life expectancy), knowledge (presented by a weighted combination of adult literacy and combined enrolment ratios) and access to resources (measured by PPP$ per capita GDP). The value of each of these indices is between 0 and 1 reflecting the lowest and highest levels of human development respectively. We used these indices, both computed globally, in a modified version of our last model. As both indices are computed for 1992[(4)] we initially used the following equation.

$$HDI(MHDI) = a_0 + a_1 d_1 + a_2 d_2 + b_1 GDP + b_2 (d_1 GDP) + b_3 (d_2 GDP) + u \qquad (4)$$

The GDP data is for 1992. d1GDP and d2GDP are the new GDP per capita differential slope variables for the EIAL and OAL countries, respectively. The regression results for the above equation, presented in Appendix C (Table C1) indicate significantly meaningful relationships. However, one may argue that this would be expected as GDP per capita is itself a component of the HDI and MHDI. For this reason we replaced the dependent variable (s) in equation (4) by the non-income components of both indices (HDI# and MHDI#). The results are presented in Table 5.

Table 5. Regression results for the non-income components of human development indices - model (4)

	Dependent variable HDI#		Dependent variable MHDI#	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	3.368E-05	4.71**	4.688E-05	4.74**
d1GDP	5.900E-06	0.54	9.709E-06	0.64
d2GDP	3.978E-05	3.14**	5.607E-05	3.21**
EIAL Dummy	-0.024	-0.46	-0.050	-0.69
OAL Dummy	-0.153	-3.16**	-0.232	-3.47**
Constant	0.501	14.33**	0.399	8.25**
R^2	0.58		0.59	
F	21.9**		23.1**	

** Coefficient significant at 1% level.

The results for both non-income composite indices of human development are interesting. The coefficients for the GDP, slope differential for the OAL countries, the OAL intercept and the NAL intercept itself are all significant at the 1% level. This means that there are significant differences between the OAL and NAL countries with no significant slope or intercept difference between the EIAL and NAL countries. A closer look at the magnitudes of the coefficients reveals that in the case of OAL countries the influence of the GDP on human development indices is much more pronounced (a much higher slope of ($b_1 + b_3$) 7.346E-05 for the HDI# and 10.295E-05 for the MHDI#) as compared to those for the NAL group (3.368E-05 and 4.688E-05 respectively). The differential intercepts for the OAL countries indicate lower intercepts of 0.348 and 0.167 ($a_0 + a_3$) for the HDI and MHDI respectively. The coefficients of determination are high and the F statistics are significant at the 1% level. The overall picture supports the suggestion that while the role of income is important in human development it seems that it is stronger in the case of the OAL countries, however, there are significant negative differential intercepts which affect the final outcome for this group. The overall effects, along with such effects for other models are later presented in Table 8. Tests of heteroscedasticity concluded that there is no evidence of the presence of this problem in data (see Table B4 in Appendix B).

It is often argued that in the case of low-income developing countries human development aspects, such as education and health, have an important role to play in the development process of the country concerned. A preliminary inspection of the HDI and MHDI reveals that for the EIAL and NAL groups the average values of the HDI and MHDI are above their averages for all countries in the sample (Table 6). On the other hand the average values for the low-income countries in all three groups are far below the overall averages for the sample and the world.[5]

Table 6. Average values for human development indices.

	HDI	MHDI
EIAL	0.599	0.503
Low-income	0.425	0.312
Middle-income	0.759	0.680
OAL	0.476	0.355
Low-income	0.328	0.191
Middle-income	0.718	0.624
NAL	0.609	0.519
Low-income	0.393	0.284
Middle-income	0.722	0.642
All countries	0.561	0.459
World	0.759	0.583

This raises a number of related questions. Would the relationship between the human development indices and the per capita GDP be different for various income groups? Would there be any differences between the adjustment loan groups in this respect? Is there any interaction between these income groups and the adjustment loan groups? To investigate the first two questions we employed the following model.

$$HDI(MHDI) = a_0 + a_1 d_1 + a_2 d_2 + a_3 LId + b_1 GDP + b_2(d1GDP) + b_3(d2GDP) + b_4(dLIGDP) + u \quad (5)$$

The variable LId is the low-income countries differential intercept (=1 for low-income countries, =0 for others); and dLIGDP is the slope differential for low-income countries. In this model we are allowing for the low-income intercept and slope differentials where our base group is the NAL middle-income countries. The results for this model are presented in Appedix C (Table C2). For the reason mentioned above we replaced the human development indices in equation (5) with HDI# and MHDI#. The results are presented in Table 7.

Table 7- Regression results for the non-income components of human development indices - model (5)

Variable	Dependent variable: HDI# Coefficient	t-ratio	Dependent variable: MHDI# Coefficient	t-ratio
GDP	1.635E-05	2.20*	2.178E-05	2.15*
d1GDP	4.963E-06	0.50	8.454E-06	0.63
d2GDP	2.519E-05	2.14*	3.489E-05	2.18*
dLIGDP	6.873E-05	2.39*	1.021E-04	2.61**
EIAL dummy	-0.012	-0.25	-0.033	-0.51
OAL dummy	-0.093	-2.06*	-0.145	-2.36*
LId	-0.293	-4.39**	-0.349	-4.71**
Constant	0.622	15.09**	0.573	10.21**
R^2	0.67		0.69	
F	22.6**		24.7**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.

Tests of heteroscedasticity concluded that there is no evidence of the presence of this problem in data (see Table B4 in Appendix B). For both models R^2 are relatively high and the F statistics are significant at the 1% level. In both models the coefficients of the GDP are significant while the slope differentials for the EIAL countries are not significant. The slopes for the OAL countries differ from those of the NAL countries significantly. For an average OAL country this adds, not considering other effects, 0.099 to the HDI# and 0.134 to the MHDI#(6). These should be considered next to the significant and negative differential intercepts of 0.093 and 0.145 for the HDI# and MHDI#, respectively. Furthermore, the coefficients of the low-income slope differential variable, dLIGDP, and the low-income intercept, LId, are significant, with the latter being negative, for both models. Together they demonstrate a higher slope for the low-income countries but a much lower intercept. Notably, as the magnitude of the parameters which are not significant (for which we can not reject the null hypothesis) is very small, even if they happen to be different from zero their effects would be negligible. Nevertheless, to compute the slopes and intercepts for various groups and sub-groups we dropped those variables in equations (4) and (5) whose coefficients were insignificant and re-estimated the parameters (for regression results see tables C3 and C4 in Appendix C). Table 8 presents the effects of different slopes and intercepts along with the estimated HDI# and MHDI# for average countries.

Table 8. The effects of different slopes and intercepts for the average country in the SAL/income groups

	Slope (* E-05)		Intercept		Average	Estimated	
	HDI#	MHDI#	HDI#	MHDI#	GDP p.c.	HDI#	MHDI#
EIAL	3.620	5.108	0.491	0.377	3730	0.626	0.568
OAL	7.345	10.295	0.348	0.167	2373	0.522	0.411
NAL	3.620	5.108	0.491	0.377	3872	0.631	0.575
Middle-income							
EIAL	1.844	2.520	0.616	0.560	5759	0.722	0.705
OAL	4.156	5.646	0.529	0.429	4575	0.719	0.687
NAL	1.844	2.520	0.616	0.560	5260	0.713	0.693
Low-income							
EIAL	8.667	12.502	0.378	0.212	1531	0.511	0.403
OAL	10.979	15.628	0.290	0.081	1028	0.403	0.242
NAL	8.667	12.502	0.378	0.212	1222	0.484	0.365

The effects for the SAL groups, regardless of their income groups are based on equation (4) and the results in Table C3 and the effects for the income sub-groups are obtained from equation (5) and Table C4. The difference between the slopes of the low-income and middle-income countries are strikingly high indicating that the selected indices for the low-income countries are more responsive to an improvement in income, albeit that they start from a relatively lower base (intercept). The estimated indices show that an average NAL country, regardless of which income group it belongs to, is marginally better off than an average EIAL country but much better off than an OAL average country. When the effect of income levels are taken into consideration the results are different. There is not much difference between the SAL middle-income groups, though the order now is EIAL, OAL and NAL for the HDI# and EIAL, NAL and OAL for the MHDI#. On the other hand the difference between low-income groups is much more pronounced. The average low-income EIAL country is better off, followed by the average NAL country with the average OAL country ranking last by a considerable distance. The difference between the levels of human development indices for middle-income and low-income groups is expectedly high. It is important to note that the magnitudes of the intercepts for all sub-groups and groups are relatively high indicating that HDI# and MHDI# are, to a large extent, determined by factors other than GDP per capita.

From Table 8 and the averages of HDI# and MHDI# for different groups and sub-groups we can compute the income elasticities of the non-income components of human development indices. They are presented in Table 9.

Table 9. Average HDI# and MHDI# and income elasticities

	Average		Elasticities	
	HDI#	MHDI#	HDI#	MHDI#
EIAL	0.561	0.628	0.241	0.303
OAL	0.411	0.525	0.424	0.465
NAL	0.580	0.633	0.242	0.312
Middle-income				
EIAL	0.722	0.739	0.147	0.196
OAL	0.675	0.715	0.282	0.361
NAL	0.690	0.710	0.141	0.187
Low-income				
EIAL	0.386	0.508	0.344	0.377
OAL	0.249	0.408	0.453	0.394
NAL	0.371	0.486	0.285	0.314

These elasticities indicate that in terms of human development the average members of various groups and sub-groups of countries respond differently to a change in income. While in general the OAL countries are more responsive than the rest, the EIAL and NAL responses are practically similar. The differences between the income sub-groups are relatively high. The elasticities for the low-income sub-groups are much higher than those for the middle-income sub-groups with the highest difference belonging to the EIAL sub-groups for both indices. Once again the OAL countries are more responsive in both income sub-groups. There is little difference between the elasticities for the middle-income EIAL and NAL countries, however, this difference becomes larger in the case of low-income EIAL and NAL countries.

Interactive Effects

In equation (5) we implicitly assumed that the differential effects of the income factor is constant across the EIAL, OAL and NAL countries. At the same time we implied that the differential effects of being in any of our adjustment loan groups is constant across both income categories. That is, if the human development indices are lower for the low-income sub-group this so regardless of which group the low-income sub-group belongs to. Similarly if the HDI# or MHDI# is different for a SAL group it is so regardless of whether the members of the group are in a low-income or in a middle-income sub-group. In effect we have not allowed for interaction between these factors. In other words the results for the income sub-groups in Tables 8 and 9 based on equation (5) allow for the *additive* effects of groups and sub-groups on the HDI# and MHDI#. There may exist an interactive effect between the two factors of SAL and income. That is, the effects may be of a *multiplicative* nature. The inter-group and sub-group differences exhibited in Tables 8 and 9 hint at such a possibility, for example the extent of differences between groups vary as we move from one sub-group to another. In order to consider the possible interaction between our adjustment loan dummies and the income level dummy we employed the following model for the low-income sub-group.

$$HDI\#(MHDI\#) = a_0 + a_1(d1LId) + a_2(d2LId) + a_3(d3LId) + b_1 GDP + b_2(d1LIdGDP) + b_3(d2LIdGDP) + b_4(d3LIdGDP) + u \qquad (6)$$

Dummy variables d1LId and d2LId reflect the interactive intercepts between our two grouping criteria, that is being an EIAL and low-income country and being an OAL and low-income country, respectively.(7) The d3LId is a new dummy variable (=1 for the low-income NAL countries and =0 for others). This will allow for the differential intercepts for all sub-groups to be estimated. The differential slopes are presented by d1LIdGDP for the low-income EIAL countries, d2LIdGDP for the low-income OAL countries and d3LIdGDP for the low-income NAL countries. The base category for this equation is, therefore, the middle-income countries.

Similarly we can measure differentials for the middle-income sub-groups from the base category of low-income countries by using the following equation.

$$HDI\#(MHDI\#) = a_0 + a_1(d1MId) + a_2(d2MId) + a_3 d3MId + b_1 GDP + b_2(d1MIdGDP) + b_3(d2MIdGDP) + b_4(d3MIdGDP) + u \qquad (7)$$

All variables in equation (7) are defined in the same way as in equation (6) but for the middle-income countries. For example, variables d1MId and d2MId reflect the interactive intercepts between our two grouping criteria, that is being an EIAL and middle-income country and being an OAL and middle-income country, respectively and so on. Hence the base category for equation (7) would be the low-income countries. Table 10 presents the estimated parameters for the above equations.

Table 10- Regression results for the non-income components of human development indices - Equations (6) and (7)

	Dependent variable: HDI#		Dependent variable: MHDI#	
Low-income countries equation (6):				
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	2.139E-05	3.64**	2.946E-05	3.69**
d1LIdGDP	-1.625E-05	-0.36	-1.732E-05	-0.28
d2LIdGDP	2.252E-04	3.70**	3.229E-04	3.91**
d3LIdGDP	7.473E-05	1.79	1.114E-04	1.96
d1LId	-0.109	-1.31	-0.173	-1.53
d2LId	-0.452	-6.02**	-0.654	-6.40**
d3LId	-0.238	-3.47**	-0.342	-3.67**
Constant	0.605	17.57**	0.541	11.56**
R^2	0.70		0.72	
F	25.5**		28.1**	
Middle-income countries equation (7):				
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	1.050E-04	3.82**	1.524E-04	4.06**
d1MIdGDP	-8.108E-05	-2.73**	-1.190E-04	-2.93**
d2MIdGDP	-6.712E-05	-2.10*	-9.827E-05	-2.24*
d3MIdGDP	-8.953E-05	-3.11**	-1.326E-04	-3.37**
d1Mid	0.271	3.33**	0.393	3.53**
d2Mid	0.212	2.34*	0.293	2.36*
d3Mid	0.300	4.68**	0.451	5.14**
Constant	0.327	8.64**	0.135	2.61**
R^2	0.65		0.67	
F	21.0**		22.9**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.

Tests of heteroscedasticity concluded that there is no evidence of the presence of this problem in data (see Table B4 in Appendix B). For both models R^2 are relatively high and the F statistics are significant at the 1% level.

Looking at the results for both HDI# and MHDI# for the low-income sub-groups, as compared to the middle-income countries, there are significant interactive slope differential for the OAL low-income countries. There are also significant interactive effects in the form of interactive intercepts for the low-income OAL and also for the low-income NAL countries.

For the middle-income sub-groups, as compared to the low-income countries, all the estimated parameters are significant. That is, all the slope and interactive intercept differentials for the SAL middle-income countries are significant indicating that there are meaningful differences amongst all middle-income SAL groups of countries.

The interactive slopes and intercepts along with the estimated HDI# and MHDI# for average countries are presented in Table 11[(8)].

Table 11. The interactive effects of different slopes and intercepts for the average country in the SAL/income groups

	Slope (* E-05)		Intercept		Average	Estimated	
	HDI#	MHDI#	HDI#	MHDI#	GDP p.c.	HDI#	MHDI#
Middle-income							
EIAL	2.388	3.341	0.598	0.527	5759	0.735	0.719
OAL	3.784	5.417	0.540	0.428	4575	0.713	0.676
NAL	1.544	1.982	0.627	0.586	5260	0.708	0.690
Low-income							
EIAL	3.259	4.620	0.527	0.424	1531	0.577	0.495
OAL	24.661	35.240	0.153	-0.113	1028	0.406	0.249
NAL	3.259	4.620	0.444	0.314	1222	0.484	0.370

The non-income components of the human development indices *predicted* from the interactive models exhibit some differences with the previous results in Table 8. The interactive differential slopes for the low-income OAL countries have increased significantly while those for the low-income EIAL and NAL countries have decreased. As for the middle-income countries the slopes for the OAL and NAL countries are now lower with that of the EIAL group being higher. It should be noted that the magnitudes of the intercepts for all sub-groups and groups, except that of the OAL low-income sub-group, are relatively high indicating that HDI# and MHDI# are, to a large extent, determined by factors other than GDP per capita. In fact for the EIAL and NAL countries the intercept counts for between 81 to 92 percent of the value of the HDI# and MHDI#. On the contrary the low intercept - and negative in the case of the MHDI# - correspond to the high dependence of the index for these countries on income.

Table 12. The interactive income elasticities

	HDI#	MHDI#
Middle-income		
EIAL	0.190	0.260
OAL	0.256	0.347
NAL	0.118	0.147
Low-income		
EIAL	0.129	0.139
OAL	1.018	0.888
NAL	0.107	0.116

The elasticities for the interactive models (Table 12) as compared to those in Table 9 indicate an increase for the EIAL middle-income average country and a drop for the other middle-income countries. As for the low-income countries there are decreases for the EIAL and NAL sub-groups while the NAL sub-group experiences a significant increase.

Overall, with a minor exception, the income elasticities of the HDI# and MHDI# for the EIAL countries are somewhat higher than those for the NAL countries. However, once the magnitude of the elasticities are taken into consideration, it seems that the contribution of the income factor, relative to the effect of the non-income factors, is minimal. Hence the difference between the elasticites are trivial. In the case of the NAL countries the opposite is the case as the respective elasticities are much higher.

Conclusions

The results of the descriptive analysis showed that the level of the real GDP per capita has grown faster in the average EIAL country, as compared to the same in the other two groups. Evaluated with respect to this target, the structural adjustment programmes may be regarded as successful. However, there is no such clear pattern emerging for other indicators of standards of living.

We examined a number of models to see if the change in the income level has enhanced other aspects of standards of living. While inter-country variations in GDP per capita explain variations in social indicators significantly, there has been little evidence of -meaningful differences between the regression intercepts for the EIAL, OAL and NAL countries, with one exception. Furthermore this picture has not changed during the SAL period. The exceptional case is that of the gross primary enrolment ratio where the OAL countries seem to be doing better than the NAL countries before and during SAL periods; however, the EIAL countries are worse than both other groups during the SAL period. In the case of the infant mortality rate and life expectancy, the model, allowing for the slope and intercept differentials, resulted in some differences between the OAL and NAL countries. Overall the results seem to support the proposition that standards of living, while depending on income, are relatively more influenced by other factors.

The relationship between the non-income components of human development indices and the income indicator provided further support for the group differences and the proposition mentioned above. Furthermore, in terms of such indices the income sub-groups of the SAL groups in our sample seem to have more in common. Allowing for the presence of two factors, the SAL group and income group, resulted in significant differences between low-income and middle-income countries, and between OAL and others. While the income slope for the OAL, and in particular for the low-income OAL countries, seems to be much higher, these countries have a lower intercept as compared to others. This indicates that for these countries income has a relatively higher influence on the selected indices than other factors. For the average country in each group the *predicted* HDI# and MHDI# revealed different orders where the NAL countries seem to be slightly better off than the EIAL, and much better off than the OAL, countries. However, when the income group differentials are taken into account the ranking order according to the MHDI# is EIAL, NAL and OAL for both middle-income and low-income countries. With respect to the HDI# the ranking order for the middle-income countries is somewhat different. Overall the income elasticities of the non-income components of human development indices examined here are higher for the low-income countries as compared to those for the middle-income countries with those for the OAL sub-groups being the highest. However, the relatively high magnitude of the intercept in almost all cases , with the exception of the OAL countries, indicates that other aspects of human development are by far more important than the income component. Allowing for the interactive effects of the SAL and income grouping resulted in more differences amongst countries. For the middle-income countries all slope and intercept differentials proved to be significant. The slope for the low-income OAL countries increased substantially demonstrating the very high income elasticity of the non-income components of human development indices for these countries. Once again, with the exception of the OAL countries, the income factor seems to have a minimal effect on the HDI# and MHDI#.

In drawing any conclusion we should bear in mind that the effects of structural adjustments are expected to take place in the long-run. The EIAL countries which have had a longer period of adjustment programmes, have not achieved an effective link between the income and the non-income components of human development. In the light of these results the inevitable question is: was the concentration of adjustment programmes on income growth as the main target the *right* policy? On the other hand the high income elasticities for the OAL countries suggest that targeting growth in income for these countries seems to be justifiable. The overall policy implication of this study has to be that the structural adjustment programmes should include components aiming at the non-income aspects of human development where the relative extent of such components may be different for various countries depending on their circumstances.

Notes

(1) For examples of such studies see OECD (1992) and Stewart (1995).

(2) We checked this list with the list provided in Corbo (1992). The primary source mentioned in both cases were the World Bank.

(3) In this case R^2 does not have the usual properties, though it is presented.

(4) See Human Development Report (1995) and Noorbakhsh (1996a).

(5) For the world averages see UNDP 1995 and Noorbakhsh (1996 b).

(6) Which are found by multiplying ($b_1 + b_3$) by the GDP per capita for the average OAL countries.

(7) They are found by multiplying the relevant dummy variables e.g. d1LId= EIAL dummy * LId.

(8) For low-income countries those variables with insignificant coefficients were dropped and the parameters for the remaining variables were estimated. For results see Table C5 in Appendix C.

Appendix A

Country classification - SAL and income groups.

EIAL Countries

Low-income:

Bolivia, Ghana, Kenya, Madagascar, Malawi, Mauritania, Nigeria, Pakistan, Senegal, Tanzania, Togo, Zambia.

Middle-income:

Brazil, Chile, Colombia, Costa Rica, Cote d'Ivoire, Jamaica, Korea, Mauritius, Mexico, Morocco, Philippines, Thailand, Turkey.

OAL Countries

Low-income:

Bangladesh, Burkina Faso, Burundi, Central African Republic, Chad, China, Gambia, Guinea, Guinea-Bissau, Guyana, Mali, Nepal, Niger, Sierra Leone, Somalia, Sudan, Uganda, Zaire.

Middle-income:

Argentina, Congo People's Republic, Ecuador, Gabon, Honduras, Hungary, Indonesia, Panama, Tunisia, Uruguay, Zimbabwe.

NAL Countries

Low-income:

Benin, Ethiopia, Haiti, India, Lesotho, Liberia, Mozambique, Myanmar, Rwanda, Sri Lanka, Yemen.

Middle-income:

Algeria, Botswana, Cameroon, Dominican Republic, Egypt, El Salvador, Greece, Guatemala, Jordan, Malaysia, Nicaragua, Oman, Papua New Guinea, Paraguay, Peru, Poland, Portugal, South Africa, Syrian Arab Republic, Trinidad and Tobago, Venezuela.

Source: World Bank (1992).

Note: Yugoslavia included in the original World Bank list has been excluded.

Appendix B

Tests of heteroscedasticity - We used the Park test for investigating the presence of this problem which is suspected in the case of cross-country regressions. The tables in this appendix are the results of the following regressions.

$$\ln(\hat{u}_i^2) = a + b \ln AGDP_i + v_i$$

where the logarithm of the square of the estimated error term of the original regression is regressed on the logarithm of the explanatory variable (shown as LAGDP in the tables) of the original regression. If b turns out to be significant then we have an evidence of heteroscedastic data. The Spearman rank correlation test was also used as a supportive test. In this test the rank correlation between $|\hat{u}_i|$ and the explanatory variable of the original regression is computed. If this coefficient is significant the evidence of heteroscedastic data would not be rejected.

In the following tables, corresponding to the models in the text, if the Park test suggested the presence of this problem and this was supported by the Spearman test we concluded that the error term was heteroscedastic. In such a case the weighted least squares method of estimation was employed.

Table B1. Tests of heteroscedasticity for models in Table 2 in the text

	1970 - 1985 Coefficient	t-value	Spearman rank correlation	1986 - 1992 Coefficient	t-value	Spearman rank correlation
Infant mortality rate						
LAGDP	0.158	0.48	0.054	-0.008	-0.03	-0.014
Constant	4.230	1.75		5.161	2.34*	
	R^2 = 0.00	F = 0.23		R^2 = 0.00	F = 0.14	
Life expectancy						
LAGDP	0.192	0.78	0.116	-1.207	-1.89	-0.040
Constant	0.885	0.49		2.688	7.44**	
	R^2 = 0.01	F = 0.61		R^2 = 0.04	F =3.58	
Adult literacy						
LAGDP	-0.628	-0.44	-0.047	-1.220	-1.84	0.236
Constant	18.280	1.78		5.205	13.52**	
	R^2 = 0.00	F = 0.20		R^2 = 0.04	F = 3.39*	
Gross primary enrolment ratio						
LAGDP	-0.808	-2.71**	-0.299*	-0.645	-2.28*	0.310*
Constant	10.802	4.98**		9.784	4.53**	
	R^2 = 0.10	F = 7.35**		R^2 = 0.08	F = 5.22*	
Per capita calorie supply #						
LAGDP	0.719	2.37	0.261*	0.085	0.11	0.146
Constant	4.271	1.94		9.635	21.71**	
	R^2 = 0.06	F = 5.63*		R^2 = 0.00	F = 0.01	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

Table B2. Tests of heteroscedasticity for models in Table 3 in the text

	1970 - 1985 Coefficient	t-value	Spearman rank correlation	1986 - 1992 Coefficient	t-value	Spearman rank correlation
Infant mortality rate						
LAGDP	-0.314	-0.60	0.011	-1.346	-1.81	-0.112
Constant	5.827	1.54		5.089	11.77**	
	R^2 = 0.00	F = 0.36		R^2 = 0.04	F = 3.30	
Life expectancy						
LAGDP	0.310	0.93	0.148	-0.034	-0.11	-0.059
Constant	-1.332	-0.55		1.611	0.67	
	R^2 = 0.01	F = 0.87		R^2 = 0.00	F =0.01	
Gross primary enrolment ratio						
LAGDP	-0.903	-1.05	-0.213	-0.067	-0.30	-0.089
Constant	4.085	12.85**		5.022	2.95**	
	R^2 = 0.02	F = 1.10		R^2 = 0.00	F = 0.09	
Per capita calorie supply #						
LAGDP	0.432	1.30	0.204	0.557	1.47	0.197
Constant	6.086	2.52*		5.509	1.92	
	R^2 = 0.02	F = 1.68		R^2 = 0.03	F = 2.16	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

Table B3. Tests of heteroscedasticity for models in Table 4 in the text

	1970 - 1985 Coefficient	t-value	Spearman rank correlation	1986 - 1992 Coefficient	t-value	Spearman rank correlation
Infant mortality rate						
LAGDP	0.156	0.43	0.089	-0.113	-0.37	-0.070
Constant	4.185	1.57		5.697	2.46*	
	R^2 = 0.00	F = 0.18		R^2 = 0.00	F = 0.14	
Life expectancy						
LAGDP	0.490	1.55	0.213	-0.029	-0.11	-0.034
Constant	-1.495	-0.65		2.223	1.11	
	R^2 = 0.03	F = 2.39		R^2 = 0.00	F = 0.01	
Adult literacy						
LAGDP	-0.041	-0.15	-0.016	-0.855	-2.49*	0.248*
Constant	5.026	2.49*		10.707	4.10**	
	R^2 = 0.00	F = 0.02		R^2 = 0.07	F = 6.19*	
Gross primary enrolment ratio						
LAGDP	-1.018	-2.91**	-0.238*	-0.555	-1.81	0.281*
Constant	12.025	4.71**		8.962	3.81**	
	R^2 = 0.11	F = 8.45**		R^2 = 0.05	F = 3.26*	
Per capita calorie supply #						
LAGDP	0.593	1.78	0.262*	0.168	0.500	0.120
Constant	5.010	2.07*		8.484	3.34**	
	R^2 = 0.04	F = 3.16		R^2 = 0.00	F = 0.25	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

Table B4. Tests of heteroscedasticity for models in Tables 5, 6 and 7 in the text

	HDI# Coefficient	t-value	Spearman rank correlation	MHDI# Coefficient	t-value	Spearman rank correlation
Equations (4) - Table 5						
LGDP	-0.559	-1.70	-0.115	-0.343	-0.83	-0.106
Constant	-1.501	-0.59		-2.741	-0.85	
	R^2 = 0.03	F = 2.90		R^2 = 0.01	F = 0.69	
Equations (5) - Table 7						
LGDP	-0.016	-0.05	-0.062	-0.286	-1.11	-0.118
Constant	-5.863	-2.44*		-3.016	-1.50	
	R^2 = 0.00	F = 0.00		R^2 = 0.01	F =1.22	
Equations (6) - Table 10						
LGDP	0.149	0.49	0.014	0.025	0.08	-0.064
Constant	-7.186	-3.00**		-5.771	-2.25*	
	R^2 = 0.00	F = 0.24		R^2 = 0.00	F = 0.01	
Equations (7) - Table 10						
LGDP	-0.154	-0.55	-0.125	-0.446	-1.30	-0.153
Constant	-4.626	-2.10*		-2.032	-0.76	
	R^2 = 0.00	F = 0.30		R^2 = 0.02	F = 1.68	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.
# Data for calorie supply are for 1986-90.

Appendix C

Table C1. Regression results for the human development indices - model (4)

	Dependent variable HDI		Dependent variable MHDI	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	5.358E-05	8.36**	5.911E-05	7.82**
d1GDP	6.377E-06	0.65	8.724E-06	0.75
d2GDP	4.189E-05	3.69**	4.848E-05	3.63**
EIAL Dummy	-0.026	-0.54	-0.040	-0.72
OAL Dummy	-0.152	-3.50**	-0.190	-3.72**
Constant	0.401	12.80**	0.290	7.84**
R^2	0.77		0.75	
F	53.3**		49.1**	

** Coefficient significant at 1% level.

Table C2- Regression results for the human development indices - model (5)

	Dependent variable: HDI		Dependent variable: MHDI	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	3.222E-05	5.56**	3.747E-05	5.04**
d1GDP	5.127E-06	0.67	7.337E-06	0.74
d2GDP	2.394E-05	2.62**	3.034E-05	2.58*
dLIGDP	8.241E-05	3.68**	8.054E-05	2.80**
EIAL dummy	-0.010	-0.27	-0.023	-0.48
OAL dummy	-0.078	-2.23*	-0.116	-2.56*
LI dummy	-0.293	-6.90**	-0.294	-5.40**
Constant	0.550	17.15**	0.441	10.71**
R^2	0.86		0.83	
F	70.6**		53.7**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.

Table C3. Regression results for the non-income components of the human development indices - model (4) - with significant coefficients only

	Dependent variable HDI#		Dependent variable MHDI#	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	3.620E-05	6.76**	5.108E-05	6.89**
d2GDP	3.725E-05	3.20**	5.187E-05	3.22**
OAL Dummy	-0.142	-3.39**	-0.210	-3.62**
Constant	0.491	18.99**	0.377	10.54**
R^2	0.58		0.59	
F	37.1**		39.1**	

** Coefficient significant at 1% level.

Table C4. Regression results for the non-income components of the human development indices - model (5) - with significant coefficients only

	Dependent variable: HDI#		Dependent variable: MHDI#	
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	1.844E-05	2.98**	2.520E-05	2.98**
d2GDP	2.311E-05	2.13*	3.126E-05	2.11*
dLIGDP	6.823E-05	2.42*	9.982E-05	2.60*
OAL dummy	-0.088	-2.22*	-0.131	-2.43*
LI dummy	-0.239	-4.43**	-0.348	-4.74**
Constant	0.616	16.76**	0.560	11.17**
R^2	0.67		0.69	
F	32.2**		35.3**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.

Table C5- Regression results for the non-income components of human development indices for low-income countries - equations (6)

	Dependent variable: HDI#		Dependent variable: MHDI#	
Low-income countries:				
Variable	Coefficient	t-ratio	Coefficient	t-ratio
GDP	3.259E-05	6.28**	4.620E-05	6.46**
d2LIdGDP	2.140E-04	3.31**	3.062E-04	3.44**
d2LId	-0.374	-4.91**	-0.537	-5.12**
d3LId	-0.083	-2.06*	-0.110	-1.99*
Constant	0.527	19.25**	0.424	11.25**
R^2	0.64		0.66	
F	36.3**		38.7**	

** Coefficient significant at 1% level. * Coefficient significant at 5% level.

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