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FURTHER EMPIRICAL ANALYSIS**

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THE ECONOMIC AND SOCIAL IMPACT OF ADJUSTMENT IN AFRICA: FURTHER EMPIRICAL ANALYSIS

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ABSTRACT

The World Bank report *Adjustment in Africa* argues that correct macroeconomic policies are good for growth. Mosley *et al.* (1995) and Schatz (1995) question whether the Bank's own data support this conclusion. The data analysis in this paper finds in favour of the World Bank, but shows that they omit the significant contribution to growth of human capital. It is further shown that welfare indicators (infant mortality and calorie consumption per capita) are expected to perform better in countries adopting adjustment policies than in those which do not. The results thus demonstrate a "basic needs" multiplier: increases in human welfare promote growth and *vice versa*, so that the beneficial effect of adjustment policies on welfare reinforce the policies' direct positive impact on growth.

1. INTRODUCTION

"Do changes in policy affect growth?", asks the World Bank report *Adjustment in Africa*, immediately providing the answer, "Yes" (World Bank, 1994: 139). Many commentators have previously reached contrary conclusions - for example, "one finds no compelling evidence that countries with Bank programs did better than other SSA countries" (Mosley and Weeks, 1993: 1589). The empirical findings of *Adjustment in Africa* have also been directly challenged. Mosley *et al.* state that "the statistical evidence presented by the Bank is... neither convincing nor internally consistent" (1995: 1459) and Schatz that "the presented data [in *Adjustment in Africa*] fail to support this claim and even bolster the contrary thesis" (1995: 679). This paper is in part an examination of this dispute over what the data say.

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Also considered here is the welfare impact of adjustment policies. The World Bank report does not consider welfare indicators, but does argue that adjustment will help the poor through the link between growth and poverty reduction and growth. This paper estimates the impact of adjustment policies (in the sample of countries studied in the World Bank report) on two welfare indicators: the infant mortality rate and calorie consumption per capita.

Part 2 of the paper briefly reviews the methodological issues in the analysis of adjustment policies and then replicates and tests the regression results of the World Bank. The results are used to calculate the sources of differences in growth between three groups of countries: strong reformers, weak reformers and those with deteriorating policies. The welfare impact is analysed in a similar manner in Part 3, with simulation of a simultaneous growth-welfare model. Part 4 concludes.

2. THE MACROECONOMIC IMPACT OF ADJUSTMENT POLICIES

(a) Methodological issues

There are three empirical approaches to the analysis of the impact of adjustment policies¹: (i) before versus after; (ii) control group approach; and (iii) modelling.² The relative merits of these approaches have been extensively discussed (seminally by Goldstein and Montiel, 1986, and see also Mosley *et al.*, 1991: Chapter 6, and White and Luttik, 1994: Chapter 2). It is commonly agreed that before versus after shows what has happened but can not help explain why it happened. The weakness of before versus after - that it makes no allowance for other factors - also plagues the control group method. The modelling approach is the only one of the three that can yield the sought for with versus without perspective.

Despite this consensus, before versus after and control group analyses remain prevalent in the literature. The World Bank has used them its three reports on adjustment lending (*RALs*),

comparing non-adjusters with variously defined classifications of adjusting countries. *Adjustment in Africa* retains the approach, presenting much of the data broken down between countries which have had large improvements in macroeconomic policy, those with small improvements and those in which policies have deteriorated (in this paper these groups are called respectively strong adjusters, weak adjusters and non-adjusters). However, the report also presents the results of a regression analysis of the impact of various policies (and a single composite policy index) on the "growth turnaround" (the change in the annual GDP per capita growth between 1987-91 and 1981-86).

The, much criticised, use of a policy index is an improvement of previous analysis in an important respect. Most studies have identified adjusting countries as those in receipt of an adjustment loan³ from the World Bank. However, such a measure captures neither the breadth and depth of the policies in the adjustment package nor the extent of compliance. Some studies (e.g. Mosley *et al.*, 1991: Chapter 7, and World Bank, 1992: 28) utilise a compliance index, but the former problem - which policies are being implemented - remains. These problems have to be dealt with by measuring policy reform directly, which is what *Adjustment in Africa* does. It is also useful to separate the effects of adjustment policies to see which bits work and which bits don't. The single policy indicator does not do this, but the report also provides regression results of the effect of three policy indicators - fiscal, monetary and exchange rate policy - individually (Box 5.1 of World Bank, 1994: 140). It is these regression results on which this part of this paper focuses.

(b) Checking the World Bank's regression results

The results have been criticised by Mosley *et al.* (1995), who argue that: (i) using the World Bank's own data they find rather different results;⁴ (ii) actual values should be used rather than the arbitrary scoring system adopted in the report; and (iii) the inflation variable has the

wrong sign, contrary to the Bank's claim that "the policy variables have the right sign" (World Bank, 1994: 140). Each of these arguments is examined below.

Schatz (1995) also contests the World Bank findings, using what he labels a "contrariety test" (whether two variables move in the "right" direction) and a growth test (a control group analysis with the countries classified by growth rates rather than policy stance). Both of these approaches fail to control for the influence of other factors, and so must be considered inferior to the modelling/regression approach. Nonetheless, Schatz's findings are referred to below where relevant.

Unlike Mosley *et al.*, I was able to replicate the World Bank's results, with discrepancies sufficiently small to be due to rounding error.⁵ Equation I in Table 1 shows the results from regressing the growth turnaround on a constant, the policy index (defined below), lagged growth and income effects from transfers and the terms of trade. In equation II the policy index is disaggregated into its three component parts. In both cases my results match those of the World Bank (the difference in sign on the fiscal policy variable is discussed below). As Mosley *et al.* say the difference between their results and those of the Bank "remains a mystery" (1995: 1466) - but the mystery must be their failure to get the results which are obtainable from the Bank's data.

The policy variables used in the World Bank report are scores in the range -3 (worst performers) to 3 (best performers), with different scores allocated to different ranges of changes for each variable. The score for the change in fiscal policy is the sum of the scores for the change in fiscal balance and the change in total revenue. A monetary policy score is calculated as the sum of the score for inflation (a higher score the larger the fall in inflation) and the change in seigniorage (also a higher score the larger the fall). The overall monetary policy score is used to calculate the macro policy index, but the disaggregated results in equation II use only the inflation

score. Finally, an exchange rate policy score is the sum of the score for the change in the real effective exchange rate (defined so an increase is a depreciation, larger depreciations earning a higher score) and the change in the parallel market premium (the larger the fall the higher the score). For monetary and exchange rate policies missing observations are treated as zero for calculating scores, which can most generously be described as a somewhat dubious procedure.

The assigning of scores to each variable is one way of ensuring scale equivalence⁶ so as not to disturb the equal weighting when constructing an overall index.⁷ However, as argued by Mosley *et al.*, the arbitrary nature of allocating these scores mean that it would have been better to use the actual values.

Moreover the use of a composite policy index is an invalid restriction of the data. Equation I imposes the restriction on equation II that the coefficient on each of the three policy variables is identical - which seems unlikely as they do not even all have the same sign. The restriction may be formally tested with an F-test, although equation II must be first re-estimated using the overall monetary score, rather than that for inflation alone, as the former is used in constructing the policy index. The R^2 from this re-estimation (not reported - the coefficients are not greatly changed) is 0.879. The R^2 from equation I is 0.796 so the F-statistic is 6.52, which with 2,19 degrees of freedom, rejects the null hypothesis at the 1 per cent level. Hence the separate policy indicators should be used rather than the composite - in which case the actual values may as well be used, rather than the scores, as we do not need the scores.

Equation II' in Table 1 shows the regression results when values are used rather than the scores. It is the t-values that are of interest here (the coefficients cannot be interpreted unless we know the scale of the regressor in question; whether it is smaller or large than before tells us nothing of interest). These results differ from those of Mosley *et al.*, fiscal policy being

Table 1 Regression estimates of impact of policy changes on growth turnaround

Equation	Constant	Policy index	Exchange rate policy	Inflation	Fiscal policy	Transfers	Terms of trade	Lagged growth	Social indicators	Adjusted R ²
<i>World Bank (1994)</i>										
I	-1.84 (3.4)	2.11 (4.4)	-	-	-	0.45 (1.6)	-0.55 (-1.3)	-1.04 (-6.3)	-	0.75
II	-1.85 (-4.4)	-	0.59 (2.6)	-0.43 (-1.8)	-1.04 (-4.5)	0.2 (0.8)	-1.08 (-2.5)	-0.98 (-7.2)	-	0.85
<i>Mosley et al. (1995)</i>										
I	-0.90 (-1.7)	1.21 (2.4)	-	-	-	0.68 (2.5)	-0.62 (-1.5)	-0.66 (-4.1)	-	0.59
II	-0.83 (-1.6)	-	0.64 (2.5)	-0.44 (-1.5)	0.52 (1.7)	0.32 (1.1)	-0.76 (-1.8)	-0.56 (-3.5)	-	0.67
II'	-1.08 (-2.1)	-	0.01 (2.4)	0.04 (1.5)	0.15 (1.2)	0.54 (1.9)	-0.64 (-1.3)	-0.49 (-2.9)	-	0.64
<i>Own estimates</i>										
I	-1.85 (-3.5)	2.14 (4.4)	-	-	-	0.47 (1.7)	-0.56 (-1.4)	-1.04 (-6.3)	-	0.76
II	-1.85 (-4.4)	-	0.59 (2.6)	-0.43 (-1.7)	1.05 (4.5)	0.21 (0.8)	-1.08 (-2.9)	-0.99 (-7.2)	-	0.85
II'	-1.98 (-4.3)	-	0.58 (2.4)	0.04 (1.6)	0.45 (3.7)	0.55 (1.8)	-0.99 (-2.0)	-0.97 (-5.4)	-	0.77
III	-4.33 (-4.0)	-	0.01 (1.9)	0.04 (1.9)	0.46 (4.2)	0.72 (2.6)	-1.09 (-2.5)	-1.01 (-6.3)	0.06 (2.43)	0.81

Notes: Equations I and II use World Bank's scores as regressors for policy variables and equations II' and III use actual values. - indicates variable not included in regression.

Sources: World Bank (1994: 140) and Mosley et al., 1995: 1465). Own estimates from World Bank (1994) data and SOC variable described in appendix.

significant at 5 per cent in my results and not in theirs and *vice versa* for exchange rate policy.

But t-values and other statistics are only valid if an equation is correctly specified. Two forms of misspecification test were carried out on equation II': robustness and omitted variables. Regression results are not robust if changes in sample or sets of regressors can make a marked difference to coefficients and their significance. *Adjustment in Africa* conducts the latter form of robustness analysis - reporting the results for only one policy variable (and the non-policy regressors) in turn. This analysis shows the results to be robust to changes in specification with respect to all the variables included in equation II. On the other hand, no influence analysis was conducted; that is the possibility that one or two observations exert undue influence on the results. Re-running equation II excluding those observations with studentised residuals greater than two (Cameroon and Rwanda) showed the results to be robust to changes in sample.

Both Mosley *et al.* (1995) and Adam (1995) comment that *Adjustment in Africa* reads like a return to the early 1980s when the Bank focused on stabilisation at the expense of growth. In the interim the importance of investment in physical and human capital has been "discovered", but these factors are largely absent from the report. Indeed, the role of infrastructure in the agricultural supply response is questioned - a point which I contest below. To examine the impact of physical and human capital, additional indicators were collected for the 26 countries in the World Bank's sample (the full data set and sources are described in the statistical appendix). Indicators of physical infrastructure - road length per km² and energy consumption - were not found to be significant. However a composite of the changes in different social indicators - infant mortality, life expectancy and calories per capita - were found to exert a significant positive impact, and are reported in equation III in Table 1.⁸

A final test of the model was to examine the view that aid is more effective in reforming

economies. These effect was modelled by creating an interactive variable, which would allow the coefficient on aid to vary according to policy stance. A single interactive term (the product of transfers and the policy index) was added to Equation I but proved insignificant. Three interactive terms were added to Equation III (one for each policy indicator). The coefficients on each of these was insignificant, and the joint test of their significance showed that they may be dropped from the model ($F_{(3,15)} = 1.01$). Hence these data do not support the view that aid is more effective in reforming economies.

Two important conclusions follow from the above results: (i) social welfare is a significant contributory factor to growth that is ignored in the World Bank's analysis; and (ii) the impact of the policy variables must be taken from equation III, rather than equation II' which is shown to be misspecified. However, except for the fact, that transfers have a very significant positive impact (not so in four of the World Bank's five equations) the results are consistent with those reported in *Adjustment in Africa*. However, it is important to enter the important caveat already made: these results demonstrate that adjustment policies revive economies, but not that they lay the basis for long-run growth. One way of conceiving this point is to say that African economies were operating far inside their production possibility frontier. Improvements in macroeconomic policy help move an economy up to that frontier, but they are unlikely to be sufficient to shift the frontier out.

Although the indicators of physical infrastructure were not significant in the overall growth equation, the road variable was a significant determinant of agricultural growth (equation IV in Table 2). The World Bank report discusses the results of several authors to show the importance of price changes to agricultural supply. They also cite a study by Binswanger (1990) to argue that "lower levels of infrastructure and other factors do not pose significantly greater constraints to supply response in sub-Saharan Africa". This carefully worded down playing of the

Table 2 Regression results for agricultural growth and fiscal policy

<i>(a) Dependent variable: change in agricultural growth</i>							
	Constant	Fiscal policy	Exchange rate policy	Lagged growth	Roads (km/km ²)	Cameroon dummy	Adjusted R ²
Equation IV	-0.86 (-0.70)	0.46 (2.75)	-0.01 (-1.72)	-0.53 (-1.66)	13.85 (1.85)	-7.04 (-2.01)	0.26

<i>(b) Dependent variable: change in fiscal policy</i>						
	Constant	Transfers	Terms of trade	Lagged growth	Growth	Adjusted R ²
Equation V	2.32 (3.21)	-1.22 (-3.20)	2.00 (3.72)	1.07 (3.18)	0.90 (4.06)	0.57

importance of infrastructure contrasts with the statement by Cornia that "investment in roads, irrigation, electrification and adult literacy have been shown to trigger larger supply responses than is that case for price increases" (1994: 221) - this latter statement made with reference to the same paper by Binswanger as that cited in *Adjustment in Africa!* What light do the data in the report shed on this issue? In addition to agricultural growth data are given on the producer price of export crops and effective protection to the agricultural sector. Control group analysis shows a relation between each of these variables and agricultural growth (World Bank, 1994: 146), but simple and multiple regression fails to find a significant impact from these variables. Rather the results shown in Table 2 are the best that could be obtained. There is a significant positive effect from improved fiscal policy, and a perverse significant impact from exchange rate policy. The level of infrastructure (measured as roads per km²) exerts a significant positive impact on the agricultural supply response.

(c) Interpreting the results

We can thus finally turn to discussing the impact of the separate policy variables on growth. In doing so I look first at significance and then the frequently neglected issue of importance.

All three policy variables are significant. Real exchange rate depreciation exerts a positive impact on growth, a finding reported elsewhere (e.g. Dollar, 1992), and described by Schatz as a piece of accepted wisdom amongst development economists, rather than supporting the case for adjustment policies *per se*. But, as shown below, differences in the extent of devaluation have been an important factor behind differential growth performance.

The role of anti-inflationary policies has been more controversial. Despite the fact that the

text accompanying the results in *Adjustment in Africa* claims that all policy variables have the right sign, the coefficient on inflation suggests that more inflation, rather than less, is good for growth. Mosley *et al.* wonder if the sign of the score was reversed in entering the variable as a regressor - but the fact that I have replicated the World Bank result shows this was not the case. (The sign is reversed between the regressions using values rather than scores since the scoring is negatively related to the change in inflation). The results do indeed suggest that deflationary policies retard growth. Many economists will not be at all surprised by this result; and it may still be argued (though not proven with these data) that lower inflation is required for long-run growth.

Not noted by Mosley *et al.* (nor explicitly mentioned in the World Bank report) is the fact that the signs were reversed when entering the fiscal variable - hence explaining the difference in sign between my results and those of the World Bank in equation II. (It is also why Mosley *et al.* get a different sign those given in *Adjustment in Africa*). My results show that a better fiscal performance (a lower deficit) is associated with higher growth. However, the fiscal variable is difficult to interpret as it is surely endogenous, both with respect to each of the non-policy regressors and growth itself. The fiscal deficit is defined before grants (World Bank, 1994: 259). But higher grants result in higher expenditure and thus a higher deficit if grants are excluded on the income side. Hence, as shown by the regression results in Table 2 (equation V), transfers are a significant determinant of the fiscal deficit.⁹

Many of the World Bank's results are presented in control group fashion: showing the differences in different indicators for three groups of countries. Table 3 shows that the median growth rate of countries that strongly improved policies was 1.8 per cent compared to 0.1 per cent for those in which policies deteriorated.¹⁰ The respective values for mean growth performance are 2.0 and -1.6 per cent. Whilst the regression results reported above show policy to be a

Table 3 Mean and median growth of GDP per capita by country groups

		1981-86	1987-91	Difference between the two periods
Large improvement in macroeconomic policies	Median	-0.7	1.1	1.8
	Mean	-0.8	1.1	2.0
Small improvement in macroeconomic policies	Median	-0.9	-0.2	1.5
	Mean	-1.1	-0.1	1.0
Deterioration in macroeconomic policies	Median	-2.1	-2.0	0.1
	Mean	-1.0	-2.6	-1.6

Source: World Bank (1994: 138).

significant determinant of growth, it does not establish the importance of each factor in determining the differential growth performance. Such an analysis is shown in Table 4.

The importance of a variable depends both on the size of the coefficient, the units of measurement and the variation in the values of the regressor between observations. For example, although the terms of trade significantly effect growth, the mean change in the terms of trade is similar for each group, so terms of trade do not help explain much of the differential growth performance between the three groups. But the groups do differ with respect to their policy stance.

The mean increase in the fiscal balance was 2.7 per cent in strong performers, under half that for weak ones and fell by 3.1 per cent in those countries with deteriorating policies (these data are summarised in Table 4a). Multiplying each of these figures by the coefficient (0.458) shows that this factor accounts for a growth differential of 2.7 per cent (calculated as 1.3 minus -1.4) between the top and bottom group (these calculations are shown in Table 4b). Strong reformers experienced real depreciations of on average over 160 per cent, compared to around 30

Table 4 The importance of different determinants of growth

(a) Mean values and coefficients				
	Coefficient	Large improvement in policies	Small improvement in policies	Deterioration in policies
Fiscal policy	0.458	2.7	1.2	-3.1
Inflation	0.041	-5.6	0.4	9.2
Exchange rate	0.008	167.4	31.2	9.6
Terms of trade	-1.09	-0.5	-0.5	-0.8
Transfers	0.723	0.2	0.5	0.7
Lagged growth	-1.011	-0.8	-1.9	-1.0
Social	0.061	43.1	24.5	30.8
Growth		2.0	1.9	-1.6

(b) Impact of each variable on growth turnaround				
		Large improvement in policies	Small improvement in policies	Deterioration in policies
Fiscal policy		1.3	0.5	-1.4
Inflation		-0.2	0.0	0.4
Exchange rate		1.3	0.2	0.1
Terms of trade		0.5	0.5	0.9
Transfers		0.2	0.4	0.5
Lagged growth		0.8	2.0	1.0
Social		2.6	1.5	1.9
Growth		2.2	0.8	-1.0
<i>Memo items</i>				
Policy		2.4	0.8	-1.0
External		1.6	2.8	2.4

Note: impact is calculated as the product of the coefficient and the mean value of the change (shown in Table 4a) for each group.

per cent for weak reformers and only 10 per cent for non-reformers: a difference that delivered a 1.3 per cent extra growth turnaround to the strong reformers as against the non-adjusters.

A contrary effect was exerted by inflation. Higher inflation promotes growth, and the strongest reformers had the most deflationary policies (a six per cent decline in inflation compared to a 9 per cent increase for the weakest group). The result was a downward pressure on the growth of the strongest performers of 0.2 per cent (compared to a positive effect of 0.4 per cent for the weakest performers). However, the overall policy effect works strongly in favour of the strong reformers, giving them an additional 3.3 per cent growth over the non-reformers.

This growth advantage was partly offset by external factors. Transfers, terms of trade and lagged growth were positive for all three groups but worked in favour of the weak policy performers. The three impacts sum to 2.4 for the countries in which policies deteriorated, 0.8 per cent more than the value for strong performers.

The largest single positive impact on the growth of the strong adjusters comes from the composite welfare indicator. The strong performers had the best improvement in welfare indicators. This fact accounts for a growth differential between strong and weak performers of 0.7 per cent. Because of the importance of this term, the innate importance of human welfare and the finding that adjusters have had a better social performance than non-adjusters is contrary to what many believe, these differences are investigated further in the next section.

Before moving to the welfare analysis, the following summary can be given of the results here. First, external factors worked to bolster African growth performance in the 1980s. Second, these external factors favoured countries which performed weakly on policy reform rather than those with a strong reform performance. However, the differences in policy delivered a positive

impact on growth that more than offset this effect so that the strong adjusters grew fastest. Of the three measured adjustment policies only deflation harms growth, but the effect was slight and more than offset by the positive impact of the other two policies. Physical infrastructure does not seem to have played a role in growth of the economy as a whole, but has been a significant determinant of agricultural growth.¹¹ The strongest impact on growth came from changes in welfare indicators, which improved most markedly in the strong adjusters. This positive relation between growth and welfare is at odds with what many believe about adjustment,¹² and so is more fully analysed in Part 3.

3. THE IMPACT OF ADJUSTMENT POLICIES ON WELFARE INDICATORS

Countries with large improvements in reforms experienced the largest improvement in the composite social indicator. Table 5 shows the mean and median percentage changes between 1980 and 1990 of the three components of the index (life expectancy, infant mortality rate (IMR) and per capita calorific intake) for the three groups of countries used in the World Bank study. Looking at the means, in the case of the latter two indicators, the countries with the strongest reform performance have the best record, and the countries in which policies deteriorated the worst. When we take medians, this picture is preserved only for calorie intake, with little difference for the other two indicators.

How can these results be interpreted? Life expectancy is an important part of social welfare, but it is not a good indicator to use for analysing the impact of policies in the short-run as it is relatively insensitive to short-run changes.¹³ Infant mortality, by comparison, can change quickly and is a better short term monitor of social welfare. Although the mean fall in the IMR is far larger for the strong reformers, the coefficient of variation is quite large, suggesting that the median should be taken: doing so reveals no difference in performance between the countries. In the case of calorie intake the coefficient of variation is small, and both mean and median tell the

Table 5 Percentage change in welfare indicators, 1980-90

	Life expectancy	Infant mortality rate	Calorie consumption per capita
<i>Means</i>			
Large improvement in policies	9.3	-19.9	6.6
Small improvement in policies	7.8	-18.6	1.3
Deterioration in policies	8.7	-15.1	-2.6
<i>Coefficient of variation</i>			
Large improvement in policies	2.7	-1.5	0.6
Small improvement in policies	3.1	-2.2	0.1
Deterioration in policies	1.0	1.0	1.0
<i>Medians</i>			
Large improvement in policies	8.7	-15.2	9.9
Small improvement in policies	9.1	-15.0	-4.1
Deterioration in policies	8.5	-16.2	-2.4

Source: calculated from data in Pio (1994: 309-310).

same story - calorie intake has improved most in adjusting countries. But this does not help us explain the differences (and lack of differences) in welfare performance between countries. To do so we performed regression analysis for the 26 countries, using also some additional variables (described in the statistical appendix). Regressions were estimated for infant mortality¹⁴ and calorie intake. Life expectancy was excluded for the reasons given above. The results are shown in Table 6.

Three variables were found to play a role in the determining calorific intake (equation VI): two of the policy variables from the growth equation (fiscal policy¹⁵ and inflation) and agricultural taxation (a higher value of this variable corresponds to a higher level of real

Table 6 Regression results for welfare indicators

(a) Dependent variable: change in calorie consumption per capita

	Constant	Inflation	Fiscal policy	Agricultural tax	Adjusted R ²	Sample size
Equation VI	0.11 (0.05)	-0.18 (-1.58)	0.57 (1.05)	0.05 (1.75)	0.21	25
Equation VI'	0.01 (0.01)	-0.19 (-2.19)	0.62 (1.43)	0.05 (2.18)	0.37	23

(b) Dependent variable: change in infant mortality rate

	Constant	Roads (km/km ²)	Change in roads	Change in immunization	Growth	Fiscal policy	Access to services	Adjusted R ²	Sample size
Equation VII	1.72 (3.81)	3.00 (1.51)	-0.06 (-3.63)	0.002 (1.16)	0.12 (2.50)	-0.06 (-1.50)	0.08 (2.05)	0.33	26

Notes: the variables are scaled (see statistical appendix for details) so that an increase is an improvement; the scaling procedure does not affect the test statistics. The log of IMR is used to correct for positive skewness. Values in parentheses are t-statistics

protection for the agricultural sector).¹⁶ Two points appeared influential; but excluding these from the regression (equation VI') in fact increased the significance of each variable. All three of these variables will act so as to ensure higher calorific intake in reforming countries than non-reforming ones.

Both growth and direct investment in social services are seen as important determinants of changes in infant mortality and this view is borne out by the significance of the growth and access terms in equation VII. (The access variable is calculated from access to health, water and sanitation). The beneficial effects of growth on welfare can come directly from higher income, or as higher income is associated with expanded social services.¹⁷ Physical infrastructure and changes in immunization rates were positive, but insignificant; fiscal policy was also insignificant, but negative. Curiously the change in the road variable exerted a robustly significant negative effect.

The importance of these results can be interpreted in a similar manner to that used above to analyse the macroeconomic variables. The calculations are shown here as the comparison between an adjusting and a non-adjusting country. Values for the policy scores are taken as the mean values for the countries with large improvements in macroeconomic policy (adjusters) and those with a deterioration (non-adjusters), these values are shown in Table 7. The fitted values are calculated simply with reference to these variables alone; i.e. external factors are held constant.¹⁸ Since the welfare indicator (SOC) is a determinant of growth and growth a determinant social welfare the model simulations are simultaneous, involving a feedback process so that the long-run effects exceed the impact effects identified by the coefficient in each single equation.

The overall growth performance of adjusters is stronger than that of non-adjusters.

Table 7 The impact of adjustment on growth and welfare

	Adjusting countries	Non-adjusting countries	Difference
<i>Policy variables</i>			
Exchange rate	160.0	10.0	-
Inflation	-5.0	10.0	-
Fiscal policy	2.5	-3.0	-
Agricultural taxation	70.0	-25.0	-
<i>Growth performance</i>			
GDP growth per capita	2.2	-2.0	4.2
Agricultural growth	0.4	-0.6	1.0
<i>Welfare indicators</i>			
Infant mortality	-27.6	-23.2	-4.3
Caloric intake	5.4	-5.4	10.8
Welfare index (SOC)	47.5	29.9	-

Note: - indicates not applicable.

Derivation: policy variables are approximate mean values for strong reformers and non-reformers given in *Adjustment in Africa*. Other variables are calculated from regression results (allowing for simultaneous interaction between growth and the welfare indicator). The welfare index is calculated from the two variables shown as described in the statistical appendix.

Predicted growth for adjusting countries exceeds the actual growth performance partly as it is implicitly being assumed that external factors were the same for all countries - whereas, as seen above, adjusting countries were more disadvantaged by external factors than non-adjusting ones. (For the same reason the growth performance of non-adjusters is predicted as being worse than it actually was). The picture with respect to agricultural growth is not so good. Although adjusting countries experience a higher growth rate, the rate is dismal for both adjusters and non-adjusters. Improved GDP growth with little improvement in agricultural growth, a fact for many African

countries, casts doubt on the sustainability of the growth.¹⁹

The adjusting countries also fare better on welfare indicators. As is to be expected from the regression results, calorie intake grows in adjusting countries (by 5 per cent) but falls by 5 per cent in non-adjusting ones. The decline in infant mortality is also larger in adjusting countries, which is attributable to the growth effect.²⁰ Hence the composite social indicator (calculated here on these two variables alone) is higher for adjusting countries, feeding back into higher growth. This is an example of the "basic needs multiplier"; higher human welfare results in higher growth which increases welfare, resulting in yet more growth which again feeds back to social welfare and so on. The working out of these multiplier effects mean that the growth differential between adjusters and non-adjusters in the simultaneous growth-welfare model (4.2 per cent) exceeds that when macroeconomic variables are considered in isolation (a policy effect of 3.3 per cent).

The basic needs multiplier can be explored more fully through model simulations.²¹ Table 8 shows the result of an exogenous change in real GDP growth and the infant mortality rate.²² A one per cent increase in growth will decrease the IMR which will feed back into higher growth, so that the total growth effect is around 1.3 per cent. The total impact on infant mortality is a reduction of between 4 and 5 percentage points. An initial reduction in the IMR of approximately 5 per cent²³ lifts growth by around 0.5 per cent, resulting in a final reduction of about 7 per cent in infant mortality.

Table 8 Analysis of basic needs multiplier

	Growth of real GDP per capita		Change in infant mortality rate	
	Adjusters	Non-adjusters	Adjusters	Non-adjusters
<i>Increase in GDP growth</i>				
Initial increase	1.0	1.0	-	-
Long-run effect	1.4	1.3	-5.0	-3.9
<i>Decrease in IMR</i>				
Initial decrease	-	-	-5.4	-4.6
Long-run effect	0.6	0.5	-7.9	-6.2

Source: calculated from model simulation.

4. CONCLUSIONS

The conclusion drawn in *Adjustment in Africa* is supported by the data given in the report. Macroeconomic policies do appear to have promoted growth. Re-estimation and simulation in this paper show better policies to account for a growth differential of 3.3 per cent between adjusters and non-adjusters. However, the analysis in *Adjustment in Africa* ignores the role of human and physical infrastructure. The latter is shown to be a significant determinant of agricultural growth and the former of real GDP growth. It is also shown here that adjusting countries have experienced larger welfare increases, a fact which is in part explained by the implementation of these policies. Moreover, a "virtuous circle" therefore exists between welfare and growth (the basic needs multiplier), so that the beneficial effects of adjustment policies are even greater than they appear if macroeconomic aspects are considered in isolation.

The picture is not entirely positive, however. Actual and predicted agricultural performance is poor in many countries - suggesting that many may be excluded from restored growth and that that growth may not be sustained. It is too early to establish whether better

policies are indeed good for long-run growth; it seems likely that these policies move countries toward their production possibility frontier, but do not push this frontier out. Despite these caveats, the paper concludes that it is better for the inhabitants of African countries if governments adjust rather than fail to do so. Such policies are, however, only necessary for long run development, not sufficient.

NOTES

1. A fourth approach is analysis of expected effects from economic theory alone (e.g. Azam, 1994).
2. The "modified control group approach", used in World Bank (1990 and 1992 to analyse macroeconomic impact - but not social effects) is a variety of the modelling approach.
3. In World Bank terminology a loan is from the IBRD window, whereas monies through the IDA window are called credits. The word loan is used here to cover both types of flow.
4. An issue not raised in discussions of *Adjustment in Africa* is that of the quality of the data themselves. African national accounts data are notoriously shaky, and have become more so as more of the economy has become hidden and government statistical services increasingly underfunded.
5. *Adjustment in Africa* gives the data to one decimal place. It is likely that the data used contained more decimal places thus accounting for some small discrepancy.
6. Though there are better ways - such as that used in the construction of the UNDP's Human Development Index.
7. Schatz (1995: 686) claims that the weights are biased in favour of fiscal and exchange rate policies - but, since the overall score is an average of the three scores, it is difficult to understand why he claims this to be so.
8. If all three indicators are included they are jointly, but not individually, significant. The composite is a valid restriction of that more general equation.
9. The significance of the growth term suggests that a simultaneous estimation technique should be used. However, the limited number of observations and the lack of a well-defined structural model prevent pursuit of simultaneous techniques here.
10. The World Bank table states the median value for the last group to be -2.6 per cent, but this figure is a simple arithmetical error by the report's authors (rather a convenient one!, and one which is repeated in the text).
11. The apparent paradox between the fact that infrastructure matters for agricultural growth but not for overall growth (of which agriculture is a part) may be explained by the fact that in many countries agriculture has not contributed much to growth. Growth in adjusting countries has mostly been powered by the tertiary sector.
12. For example the statement that "there can be little doubt that SAPs in Africa have led to worsened conditions. Poverty has increased... The quality of life has declined..." (Riddell, 1992: 66).
13. Moreover, real data for life expectancy, rather than statistical extrapolations only become available from the decennial population census. Literacy is similarly insensitive - doubling primary enrolments would have no impact on adult literacy for some years.
14. Since life expectancy is positively skewed - the reason for the discrepancy between the results for using means and medians - the log of the indicator was used.

15. Although fiscal policy does not appear significant, it proves necessary to control for fiscal policy to pick up a clear effect from inflation.
16. This latter result concurs with Sahn's (1990) analysis of Côte d'Ivoire.
17. Sahn (1992), Gbesemete and Gerdtham (1992) and Pio (1994) all report positive income elasticities for social spending in growing economies (some negative ones are found when income is falling - indicating protection of social sectors). Several estimates are close to or greater than unity, indicating that the share of spending on social sectors may grow with income.
18. Each dependent variable was calculated using the estimated coefficient and the policy variable as shown in Table 7. A constant was then selected - representing the influence of external factors - to give an estimate of the right order of magnitude (i.e. the calibration technique used for CGEs was adopted). Following standard practice, point estimates of the coefficients are used for the simulation, even if a variable appeared insignificant.
19. Adam (1995) observes that *Adjustment with Africa* talks about policies being good for long-run growth, whereas the time span of the data means that the analysis is necessarily more short-term.
20. There is a negative impact from fiscal policy; but, as these results show, the growth effect is far more important.
21. The simulations are carried out using the estimated equations reported above.
22. The differences between adjusters and non-adjusters arise from the non-linearity of the IMR function.
23. A larger change is used for IMR to be more in line with the order of magnitude of actual changes in the model. Non-linearities mean that the same percentage change cannot be put on adjusters and non-adjusters.

REFERENCES

- Adam, Christopher "Review Article: *Adjustment in Africa: Reforms, Results and the Road Ahead*," *World Economy*, Vol. 18, No. 5 (1995), pp. 729-735.
- Azam, Jean Paul "The Uncertain Distributional Impact of Structural Adjustment in Sub-Saharan Africa" in van der Hoeven and van der Kraaij (1994).
- Binswanger, H. "The Policy Response of Agriculture," *Proceedings of the World Bank Annual Conference on Development Economics*, [Washington D.C.: World Bank, 1990].
- Cornia, Giovanni Andrea "Neglected Issues in the Decline of Africa's Agriculture: Land Tenure, Land Distribution and R&D Constraints," in Cornia and Helleiner (1994), pp. 217-247.
- Cornia, Giovanni Andrea and Gerald K. Helleiner *From Adjustment to Development in Africa: Conflict, Controversy, Convergence, Consensus?* [London and Basingstoke: MacMillan and New York: St. Martin's Press, 1994].
- Dollar, David "Outward-Oriented Developing Economies Really Do Grow More Rapidly: Evidence from 95 LDCs, 1976-85," *Economic Development and Cultural Change*, Vol. 40 (1992), pp. 523-44.
- Gbesemete, Kwame P. and Ulf-G. Gerdtham "Determinants of Health Care Expenditure in Africa: a Cross-Sectional Study," *World Development*, Vol. 20, No. (1992), pp. 303-308.
- Goldstein, Morris and Peter Montiel "Evaluating Fund Stabilization Programs with Multicountry Data: some methodological pitfalls," *IMF Staff Papers*, Vol. 42 (1986) pp. 304-344.
- van der Hoeven, Ralph and Fred van der Kraaij *Structural Adjustment and Beyond in Sub-Saharan Africa*, [London: James Currey and Portsmouth, USA: Heinemann, 1994]
- Mosley, Paul, Jane Harrigan and John Toye *Aid and power: the World Bank and Policy-Based Lending*, Volume I, [London: Routledge, 1991].
- Mosley, Paul, Turan Subasat and John Weeks "Assessing *Adjustment in Africa*," *World Development*, Vol. 23, No. 9 (1995), pp. 1459-1473.
- Mosley, Paul and John Weeks "Has Recovery Begun? 'Africa's Adjustment in the 1980s' Revisited," *World Development*, Vol. 21, No. 10 (1993), pp. 1583-1599.
- Pio, Alessandro "The Social Impact of Adjustment in Africa" in Cornia and Helleiner (1994), pp. 298-314.
- Riddell, J. Barry "Things Fall Apart Again: Structural Adjustment Programmes in Sub-Saharan Africa," *Journal of Modern African Studies*, Vol. 30, 1992, pp. 53-68.
- Sahn, David E. "Public Expenditures in Sub-Saharan Africa During a Period of Economic Reforms," *World Development*, Vol. 20, No. 5 (1992), pp. 673-693.
- Sahn, David E. "The Impact of Export Crop Production on Nutritional Status in Côte d'Ivoire," *World Development*, Vol. 18 (1990), pp. 1635-1653.

Schatz, Sayre P. "Structural Adjustment in Africa: a Failing Grade So Far," *Journal of Modern African Studies*, Vol. 32, No. 4 (1995), pp. 679-692.

White, Howard and Joke Luttik "The Country-Wide Effects of Aid," *Policy Research Paper 1337*, (Washington D.C.: World Bank, 1994).

World Bank *Adjustment in Africa: Reforms, Results and the Road Ahead* (Washington D.C.: World Bank, 1994).

World Bank *Adjustment Lending and Mobilization of Private and Public Resources for Growth* Country Economics Department (Washington D.C.: World Bank, 1992).

World Bank *Adjustment Lending Policies for Sustainable Growth* Country Economics Department (Washington D.C.: World Bank, 1990).

Statistical Appendix

Definition of variables: Most variables are defined as changes, and, unless otherwise stated, are the difference in average values for the periods 1987-91 and 1981-86. Values only (not scores) are listed for the policy variables.

GROW	Growth turnaround (difference in average growth of real GDP per capita between 1987-91 and 1981-86).
AGGRO	Turnaround in agricultural growth.
POL	Policy stance index (defined from scores for fiscal, monetary and exchange rate policy - see text).
FISCAL	Change in budget surplus (defined excluding grants).
INF	Inflation turnaround.
RER	Change in real exchange rate.
LGROW	Lagged growth (average growth rate from 1981-86).
TOT	Percentage change in terms of trade.
TRAN	Percentage change in transfers.
LE	Scaled percentage increase in life expectancy, 1980-90. ²
IMR	Scaled percentage decrease in infant mortality rate, 1980-90.
CAL	Scaled percentage increase in calorie intake per capita, 1980-90.
SOC	Simple average of LE, IMR and CAL.
PROD	Change in real producer price for agricultural exports.
AFTAX	Change in effective agricultural protection.
RARE	Road length per surface area (km/km ² , late 1980s).
DROAD	Change in road length.
IMM	Change in immunization coverage for measles and DPT
ACCESS	Access to health, water and sanitation (simple average based on available data for each).

Data sources: World Bank (1994); World Bank *Social Indicators of Development*; and UNDP *Human Development Report*.

²Scaling is done by dividing the variable's deviation from its minimum (maximum for IMR) by its range.

Table A.1 Data for regression analysis

COUNTRY	GROW	AGGRO	POL	FISCAL	INF	RER	LGROW	TOT	TRAN
Benin	-3.1	-0.1	-0.2	4.0	-2.7	-12.2	1.1	-0.1	0.4
Burkina Faso	-1.7	-2.30	1.0	6.8	-5.2	-5.7	2.2	-0.1	-0.3
Burundi	-0.9	-1.60	0.5	0.1	0.2	56.7	2.1	-0.6	0.7
Cameroon	-12.5	-4.70	-1.5	-8.3	-7.1	-27.1	4.6	-1.2	0.5
CAR	-2.6	-2.9	-0.2	-5.9	-11.6	1.4	-0.1	-0.1	0.5
Congo	-4.9	1.9	-0.8	-4.2	-7.9	-6.7	4.1	-3.6	-1.7
Cote d'Ivoire	-2.6	8.2	-1.3	-6.5	-3.8	-20.8	-4.2	-1.0	-0.3
Gabon	0.9	1.50	-1.5	-6.3	-7.9	-19.2	-2.8	-3.2	0.5
Gambia	-0.8	-10.00	1.2	4.5	-7.9	16.7	1.2	-0.2	-1
Ghana	3.7	2.20	2.2	2.8	-25.7	283.7	-2.4	-0.2	0.5
Kenya	1.5	-0.3	0.5	0.2	-1.9	42.7	-0.5	-0.6	0.8
Madagascar	1.6	0.9	0.8	0.3	-6.7	99.2	-3.7	0.0	0.8
Malawi	2.2	2.3	0.8	4.4	5.9	8.4	-1.4	-0.7	1.5
Mali	-1.6	2.5	0.5	2.5	-3.8	-9.2	0.4	0.0	-1.2
Mauritania	-0.1	0	0.5	2.6	-3.0	31.7	-0.9	0.0	-2.3
Mozambique	7.6	5.2	-0.7	-9.2	47.1	86.9	-5.9	0.0	6.6
Niger	2.5	0	0.3	-2.4	-10.0	4.3	-4.9	-1.3	-0.1
Nigeria	7.0	2.7	1.0	-1.0	9.9	404.4	-4.6	-2.3	-0.6
Rwanda	-5.5	-0.1	-0.2	-3.1	1.1	8.1	0.4	-0.3	0.3

COUNTRY	GROW	AGGRO	POL	FISCAL	INF	RER	LGROW	TOT	TRAN
Senegal	-0.6	-2.2	0.5	4.1	-12.4	-14.0	0.4	0.0	-0.8
Sierra Leone	2.9	1.4	-0.2	2.0	40.7	34.6	-2.1	0.4	0.5
Tanzania	2.9	1.9	1.5	4.1	-4.8	255.4	-1.7	-0.1	3.3
Togo	1.4	-1.8	-0.2	0.6	-6.5	-4.7	-2.8	-1.3	-0.1
Uganda	4.3	6.4	0.2	0.3	27.6	46.5	-1.5	-0.2	0.8
Zambia	0.9	-1.6	-0.3	2.4	60.3	65.0	-3.2	1.5	0.1
Zimbabwe	0.7	-4.7	1.0	-0.8	-0.1	49.9	0.3	-0.1	-0.5

Table A.2 Data for regression analysis (ctd.)

COUNTRY	LE	IMR	CAL	SOC	PROD	AFTAX	RARE	DROAD	DIM	ACCESS
Benin	45.3	4.0	51.5	33.6	21.7	-27.6	0.075	12.5	29.7	10.7
Burkina Faso	49.4	11.9	69.7	43.7	30.6	17.9	0.041	8.4	31.3	11.7
Burundi	63.4	78.9	32.6	58.3	-18.1	15.0	0.226	51.4	40.6	14.0
Cameroon	38.6	20.3	34.2	31.0	-44.3	-34.7	0.129	0.8	-56.5	4.0
CAR	45.3	18.5	30.7	31.5	-1.8	31.5	0.039	15.5	53.4	2.7
Congo	41.8	0.0	45.5	29.1	-31.0	4.5	0.027	-4.6	19.0	3.0
Cote d'Ivoire	42.9	19.2	24.1	28.7	-49.6	-23.2	0.152	3.4	113.0	15.0
Gabon	58.6	21.0	51.2	43.6	-29.4	10.7	0.031	9.1	46.0	21.0
Gambia	55.7	14.0	74.8	48.2	-25.0	-10.3	0.283	16.6	-2.5	22.0

COUNTRY	LE	IMR	CAL	SOC	PROD	AFTAX	RARE	DROAD	DIM	ACCESS
Ghana	26.2	17.9	70.9	38.3	96.5	341.0	0.152	14.1	25.8	14.0
Kenya	36.7	29.1	18.2	28.0	-26.1	8.9	0.116	11.8	-6.3	9.5
Madagascar	0.0	17.7	8.5	8.7	5.3	117.1	0.085	0.2	12.1	10.0
Malawi	49.4	11.9	17.0	26.1	-8.8	78.3	0.109	4.3	8.3	15.5
Mali	49.4	2.3	99.8	50.5	5.8	9.4	0.011	5.0	80.0	9.5
Mauritania	50.8	14.8	100.0	55.2	0.0	0.0	0.007	-1.4	-1.4	11.5
Mozambique	48.0	11.5	15.6	25.0	16.2	-2.0	0.035	-7.3	5.4	4.3
Niger	52.4	14.5	46.3	37.7	2.6	1.1	0.015	3.2	68.8	8.0
Nigeria	44.1	20.2	15.1	26.5	46.5	1.3	0.122	4.1	101.9	8.0
Rwanda	31.5	13.0	13.6	19.4	-23.3	15.2	0.475	10.0	42.6	18.0
Senegal	32.5	33.7	0.0	22.1	-11.7	-28.3	0.076	10.0	15.0	11.0
Sierra Leone	59.4	14.4	11.7	28.5	-62.0	-33.4	0.120	-4.8	117.4	9.3
Tanzania	30.5	2.4	26.8	19.9	8.3	30.6	0.087	21.8	27.1	17.3
Togo	57.1	27.9	34.1	39.7	15.8	10.9	0.133	5.1	246.9	15.5
Uganda	31.5	15.5	27.0	24.6	-36.8	33.9	0.122	5.1	239.6	6.7
Zambia	41.8	22.3	20.8	28.3	-42.7	-76.0	0.051	4.3	25.5	15.7
Zimbabwe	100.0	100.0	46.4	82.1	-4.8	-3.1	0.201	-3.8	22.7	9.0