AFRICA'S GROWTH EXPERIENCE
A Focus on Sources of Growth

by

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Abstract: Our task is to provide case study teams with a comparative context for the analysis of individual-country growth experience in Sub-Saharan Africa. We survey the empirical growth literature and develop a set of approaches to locating country-specific growth experience in cross-regional and cross-country perspective. Slow accumulation of capital, slow productivity growth, and a delayed demographic transition each contribute importantly to Africa's relative performance. Policy, institutions, and political stability covary with growth in ways consistent with theory. The case study teams are encouraged to explore these linkages in individual countries, mindful of the methodological caveats raised in the paper. A companion document presents country-level evidence and describes a data spreadsheet to be transmitted to country teams.

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1. Introduction[1]

Economic growth was reasonably strong in much of Sub-Saharan Africa (SSA) between 1960 and 1973. For most countries, however, the subsequent two decades were a period of stagnation or decline. Pritchett (1998) shows that there was typically a single main break in the growth trends for most African economies occurring at some point between 1973 and 1980, followed by persistent stagnation until 1992. Many countries have shown a modest recovery since about 1994, but levels of growth have tended to remain far below the early phase. For the four decades as a whole, SSA's average per capita income growth of 0.9 percent falls short by 1.5 percentage points vis-à-vis other developing countries, and approximately 3 percentage points below that of the high performing African (Botswana and Mauritius) and East Asian economies.

There is, however, a wide variation in the growth performance of individual African countries. Roughly half of the 21 economies studied by Pritchett (1998) – a group accounting for nearly 80 percent of SSA's GDP and population – exhibited reasonably robust growth before the long period of stagnation, the other half tending to show persistent stagnation at growth rates below 1.5 percent. Furthermore, the growth rates achieved by Botswana and Mauritius stand out even against those of East Asian economies. Except for these two, the rest of the 36 countries in Africa included in the study by Pritchett (1998) have either gone through steep growth roller-coasters or remained stagnant throughout the last three decades.

The consequence of the long period of stagnation in growth for a large number of African economies combined with high population growth rates has meant little or no progress in raising the standards of living in these countries**.** Between 1960 and 1994, out of 35 SSA countries for which comparable data exist, 16 suffered at least 20% loss in income per-capita measured in 1985 constant US dollars. Most of the losses were registered after 1975 (Rodrik, 1998). In contrast to the situation of SSA, Pritchett (1998) shows that overall, developed countries have sustained a remarkably steady per capita growth of approximately 2 percent for about 100 years and the newly industrializing countries have maintained income growth rates above 3% for nearly three decades enabling them to gain significant ground on the industrialized countries.

In searching for explanation of the relatively slower African growth we pursue two cross-country approaches, one based on differences in the accumulation of productive factors and the other on the differences in the policy stances influential to growth. Based on the results from studies that use a production–function approach to analyze cross-country growth experiences, Africa's slow growth is explained by relatively slow accumulation of capital, low productivity growth, and pressures from high population growth rates. The paper by Hoeffler (1999) for this project, painstakingly confirms the significance of slow accumulation and high population growth in explaining Africa's slow economic growth. The ratio of investment to GDP in SSA averaged 9.6 percent of GDP (measured in international prices) relative to nearly 15.6 percent in other developing countries. SSA's stock of human capital is well below developing countries norm and the region's relative position has deteriorated over time, particularly with respect to attainment of secondary education; but in common with much of the growth literature, we find that the impact of these differences, is much smaller than that of differences in physical capital accumulation. The relatively delayed demographic transition in SSA, in contrast, significantly depresses capital per worker and income per worker, unmitigated by technological innovation.

Results from aggregative growth accounting (e.g., Collins and Bosworth 1996) give a more prominent role to the productivity residual in explaining Africa's relatively slow growth than is usually acknowledged in the literature. Only about half of the growth difference between Africa and other developing countries is due to slower accumulation of physical and human capital; the

[1] In a companion document, "Background Information on Economic Growth," April 2000, we present country-level data and results for the 34 countries being studied in the AERC Economic Growth project.

remainder is accounted for by slower growth in the productivity residual. Factors behind slow productivity growth are thus an essential part of the story of slow African growth.

Our search for explanation also pursues the route of policy influence in explaining differences in cross-country growth performance. The main hypothesis is that the policy environment and weaknesses in governance combine to create a capital-hostile environment, limiting accumulation and undermining productivity growth by diverting investible resources to unproductive uses. This situation combines with a lack of demographic transition to depress income per capita growth.

Section 2 of this paper reviews African growth experience in light of that in other developing economies and against the benchmarks of fast growing developing economies. We use the approach of Chenery and Syrquin to characterize patterns of structural transformation of production, and an aggregative growth accounting exercise to bring out the relative contributions of accumulation and productivity. In sections 3 - 5 we present two regression-based approaches to Africa's comparative growth performance. The first uses the augmented Solow growth model of Mankiw, Romer and Weil (1992) to assess the contribution of factor accumulation, drawing directly on the careful econometric work of Hoeffler (1999). The second follows the looser tradition of Barro (1991) in order to assess the relative contributions of initial conditions, structural features, institutional characteristics, and the policy environment. Section 6 concludes and 7 draws out implications for the country case studies.

2. African growth and accumulation in cross-regional perspective

Where do African countries stand in the cross-country distribution of growth and its correlates? Before turning to regression analysis we look at the raw data. For comparative purposes we emphasize differences between Africa and a group of high-performing Asian economies, and, within Africa, between countries inside and outside the CFA franc zone. We abstract from cyclical influences by focusing on 5-year periods, beginning in 1965-69 and ending in 1990-97 (an 8-year period).

The choice of high-performing Asian economies (HPAEs) is not arbitrary: Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan, and Thailand have outperformed any other regional group in terms of economic growth. Our main purpose is to bring out some of the features of rapid growth and transformation. The experience of these countries is by no means irrelevant for Africa, however. Perkins and Roemer (1994) argue that within the high-performing group, the South Asian countries – Indonesia, Malaysia, and Thailand – share enough historical and structural features with African countries to form a useful 'benchmark' for the continent. Within Africa itself, Botswana and Mauritius achieve or surpass this benchmark for extended periods.

Within Africa, we disaggregate according to membership in the CFA franc zone. The aim here is to focus on a potentially important source of policy variation within Africa. The institutional heritage of the 13 CFA countries differs substantially from that of most other African countries. In particular, monetary policy in the CFA zone is formulated by two regional central banks, each of which issues a currency tied to the French franc. Until the early 1990s, capital movements were free vis-à-vis France. Inflation and exchange controls – two policy responses widely observed in the rest of Africa after the late 1970s – were effectively 'off the table' for the countries of the CFA zone until the maxi-devaluation of 1994. The two central banks also maintained limits on direct budgetary finance, though the banking system was often heavily tapped to finance state enterprises. If monetary and exchange rate policy make a difference for growth within Africa, membership in the zone should have observable implications in the data.

The growth regression literature is well known for its lack of robustness (e.g., Levine and Renelt (1992), Sala-i-Martin (1997)). One under-appreciated source of this fragility is inconsistencies in data availability. We use the following three criteria in constructing figures and regression samples:

- First, to be included in a country's observations for a given halfdecade, a variable must be observed in more than half of the years of the relevant halfdecade. Thus if inflation is available only starting in 1968 for a given country, we treat the full halfdecade 1965-69 as missing. We use this criterion for both charts and regressions.
- For charts, we include only those countries that satisfy the above criterion for the full set of periods represented in the chart. Intertemporal comparisons can therefore be made without worrying about the country composition, which by construction remains constant across halfdecades. For regressions we use the full set of observations satisfying the first criterion. Our panels are therefore unbalanced: not all countries have the full set of periods.
- Finally, for each chart or regression we include the full set of observations that satisfy the relevant criteria. The sample size can therefore vary dramatically from chart to chart and regression to regression.

The charts are constructed using unweighted averages across countries. In each panel, heavy lines show the evolution over time of the two main groups being compared (HPAE and SSA or CFA and nonCFA). The two lighter lines in each panel show bounds of plus and minus one standard deviation around the means for all non-African developing countries, with means and standard deviations calculated period-by-period. The vertical axis, in each panel, shows the mean over all periods for the non-African group, together with the extremes of the standard-error bounds.

2.1 Growth and investment

Figure 1a shows the growth in real GDP per capita, based on national accounts data in constant local currency from the World Bank.[2] The broad features of Figure 1a are well known, including Africa's average growth shortfall of nearly 1.5 percentage points vis-a-vis other developing countries and roughly three times that vis-a-vis the high-performing Asian group. Africa's relative performance is poorest in the 1990s; only in this period does the African mean fall further than one standard deviation below the developing-country mean.

Within Africa, the CFA group grows more rapidly than the others in the late 1970s, but its performance deteriorates more rapidly in the early 1980s and its recovery after 1985 is weaker. This is consistent with a literature that stresses the importance of the exchange rate instrument in a period of current account adjustment and trade liberalization (e.g., Corden (1989)). Outside the zone, these economic adjustments were supported beginning in the early 1980s by nominal devaluations, which promoted demand and supply switching while providing transitory protection to import-competing producers. Within the zone, current account adjustment had to be achieved through expenditure reduction alone, and trade liberalizations often produced acute short-run pressures for reversal (Oyejide, Elbadawi and Collier (1997)). These observations are corroborated below using data on real exchange rates, investment and exports.

Figure 1b shows investment rates using national accounts data from the World Bank. African investment rates follow the world pattern of a rise in the decade after 1965, followed by a decline over the next decade. Africa's boom and bust is more dramatic, however, particularly in the CFA countries where investment rises by 7 percentage points of GDP in the first decade and then falls by an equal amount in the second. The severe decline of investment in the CFA countries suggests an expenditure-led adjustment to lower capital inflows (including lower

[2] Data are described briefly in Appendix A and more fully in Ndulu and O'Connell (2000), "Background Information on Economic Growth."

foreign assistance, which was affected by the impasse over the exchange rate). We also show evidence below of an unusual confluence of terms of trade shocks in the zone after 1985.

African investment recovers in the 1990s, to reach a level characteristic of developing countries (including the HPAEs) in the late 1960s. More remarkable in Figure 1b is the explosion of investment in the HPAEs after the late 1960s. Average investment in this group is more than a standard deviation above the developing-country mean by the early 1980s, and increases to nearly two standard deviations above the mean in the 1990s. An extensive literature, following Young (1994,1995) and including Collins and Bosworth (1996), emphasizes the dominance of physical and human capital accumulation over total factor productivity growth in the Asian growth success. Such exercises also shed light on African growth patterns, as we will see.

Before looking at growth performance by sector, we note in Appendix Table A2.1 a striking characteristic of the African investment data. When measured at constant international prices, the share of gross investment in GDP is only 10 percent in Africa, as compared with 19 percent at current national prices. Investment is much more expensive relative to GDP in African countries than it is internationally. One reason for this is that African investment has a comparatively large imported component, so that tendency for African GDP to be much cheaper at official exchange rates than at PPP-adjusted exchange rates does not operate with respect to investment.[3] But whatever their source, these discrepancies raise perplexing issues of interpretation. In what follows we rely mainly on the domestic price data. These data seem clearly appropriate for some uses, including the measurement of domestic plus foreign saving "effort" (Summers and Heston, 1991). Where measuring investment at international prices seems clearly preferable, however – as in section 4, for example, where we estimate a neoclassical growth model using international price data for GDP – we will do so.

2.2 Human capital accumulation

In the new growth theory, both the stock of human capital and the rate of implicit saving for human capital accumulation can influence a country's growth rate. ***Figure 2a*** shows the average number of years of secondary school completed by individuals 25 years of age or older. Primary school attainment appears in ***Figure 2b,*** for individuals 15 years of age or older. These measures place African stocks of human capital well below developing country norms and suggest that Africa's relative position has deteriorated over time, particularly with respect to secondary attainment. HPAE stocks, in contrast, have risen in relative terms, a factor emphasized heavily in World Bank (1993) and many other accounts of development success in these countries. In section 5.1.2 below, we emphasize Africa's rising dependency ratio, a factor that makes the continent's achievements in primary school attainment impressive. The same factor, however, raises the possibility that quality-adjusted measures of human capital would diverge more strongly, and with them the contribution of human capital accumulation to growth

Figure 3a shows secondary school enrollment, which can be interpreted at least loosely as implicit saving, in the sense of output foregone in the process of human capital accumulation. Average enrollments in Africa are low by developing country standards, particularly among the CFA zone countries. Finally, ***Figure 3b*** shows years of life expectancy at birth, which we interpret as a measure of average health capital in the population. This measure slows markedly in Africa in the 1990s, perhaps a legacy of structural adjustment and an increase in civil strife, and certainly consistent with an emerging impact of HIV/AIDS. Life expectancy plays an important role in our later regression analysis, where it may be capturing a range of unobserved factors in addition to health capital. Enrollment rates and educational attainment, in contrast, add relatively

[3] There may also be some contribution from failures of PPP in the pricing of imported capital goods. Potential sources of such failure include unusually high transport costs or inflated prices for aid-financed imports.

little to the explanation of cross-country growth differentials, consistent with much of the empirical literature.

2.3 Sectoral patterns

Lewis (1954) and others have argued that a central feature of modern economic development is a reallocation of factors of production from low-TFP (traditional) to high-TFP (modern) sectors. Lewis himself, and later Chenery and associates (1976), applied this argument to the movement of labor from agriculture to industry, observing that this intersectoral shift was one of the most systematic correlates of rising per-capita incomes. In the literature on African economic performance, sectoral biases have played an important role. In the early 1980s, a literature following the World Bank's 1981 "Berg report" and Bates (1981) argued that African governments had tended to over-tax the agricultural sector, limiting its structural transformation and therefore its ultimate contribution to long-run development. More recently Collier and Gunning (1999) have argued that problems of governance, civil strife, and geography produce a bias against the manufacturing sector in Africa.

Figures 4-6 suggest that Africa's slow growth has been accompanied by very limited structural transformation, at least at the high level of sectoral aggregation employed here. While the share of agriculture in Africa's labor force has declined over time (***Figure 4a***), there is no evidence of a convergence with the levels characteristic of developing countries in general. In the 1990s, nearly 3/4ths of African livelihoods are earned in the agricultural sector – fully a standard deviation above the level characteristic of other developing countries *in the late 1960s*. ***Figure 4b*** shows that agriculture still tends to contribute roughly a third of total GDP in African countries, a share nearly two standard deviations above the non-African-developing-country mean.[4]

Africa's share of GDP in industry (***Figure 5a***) has risen only slowly since the early 1970s, mirroring movements in the overall developing country mean. The African share therefore diverges strongly from the HPAE share, which rises very substantially over the period. The same conclusions hold for manufacturing, a sub-sector constituting roughly 58 percent of industry in developing countries (***Figure 5b***). Within Africa, the CFA countries show a systematically lower level of industrialization than the non-CFA countries, both initially and in the 1990s. This appears to be driven largely by different levels of non-manufacturing industry, as the manufacturing shares are broadly similar for the two groups. The African sub-groups show decidedly different manufacturing performance in the 1980s and 1990s, with the share of manufacturing in GDP declining in the CFA countries and rising in the non-CFA countries.

On the services front (***Figure 6a***), the African average shows a pattern of increase until the early 1980s and decrease thereafter. The HPAE average, by contrast, is more stable over time. The African boom-and-bust pattern is consistent with accounts that emphasize over-stretching of the African public sector by the mid-to-late 1970s (e.g., Ndulu and O'Connell (1999)). The decline after the early 1980s is strongest in the CFA countries, consistent with our earlier discussion of expenditure-led macroeconomic adjustment.

As a final sectoral variable, we look at differences in average labor productivity.[5] In competitive equilibrium, marginal products are equalized across sectors and a reallocation of factors from one sector to another produces only a second-order change in total GDP. A tradition dating at least from Lewis (1954), however, argues that marginal products differ substantially across sectors during the process of development, so that a reallocation of factors can produce

[4] For these sectoral GDP shares, we use value added in constant 1995 dollars, in order to abstract from relative price movements.

[5] ALP is defined as the ratio of value added in constant 1995 dollars to sectoral employment. "Non-agriculture" is the sum of industry and 'services, etc.' The sectoral employment data do not extend into the 1990s.

first-order gains in GDP. ***Figure 6b*** shows the ratio of labor's *average* product in industry and services to its average product in agriculture – surely an imperfect proxy for the ratio of marginal products, but one that may nonetheless be suggestive. We see a marked lack of convergence in Africa relative to developing countries or the global sample. Within Africa, the CFA countries show a clearly larger ratio, consistent perhaps with unusually high wages in the civil service and the urban formal sector before the devaluation of 1994.

Table 2.3.1: *Fixed effects estimates, non-SSA sample.*

In Table 2.3.1 we ask whether the patterns of sectoral transformation in African countries depart in systematic ways from what would be expected given the continent's overall growth record. We characterize the "typical" pattern of transformation by estimating Chenery-Syrquin regressions of the form[6]

$$(1) \qquad x_{it} = \beta_1 \ln(y_{it-1}) + \beta_2[\ln(y_{it-1})]^2 + \beta_3 \ln(pop_{it-1}) + \beta_2[\ln(pop_{it-1})]^2 + \gamma t + \mu_i + \varepsilon_{it},$$

where x_{it} is a variable like agriculture's share in GDP, y_{it-1} is initial real GDP per capita at international prices, pop_{it-1} is initial population, and t is a time trend. The composite disturbance includes unobserved country effects, μ_i. We condition on these by estimating a separate intercept for each country (a within-groups or fixed-country-effects model). We assume that ε_{it} is uncorrelated with the right-hand-side variables.[7]

At the bottom of Table 2.3.1 we show the results of regressing the estimated fixed effects – which average zero by construction – on a constant and an intercept dummy for SSA. The intercept dummy indicates the degree to which Africa's average level of x_{it} differs from what would be expected given the continent's income and population. Given income and population, the size of the service sector is markedly smaller in Sub-Saharan Africa, and that of industry and (its sub-sector) manufacturing markedly larger than would be predicted based on cross-country norms. Agricultural output shares are just slightly higher in Sub-Saharan Africa than predicted on the basis of income and population; the share of the labor force in agriculture, in contrast, is markedly larger. Consistent with these findings, the labor productivity differential in favor of non-agricultural activities tends to be much higher in SSA than in other regions. These effects are all estimated reasonably precisely.

In the regressions themselves, the coefficient on the SSA-specific trend term indicates the degree to which *changes* in x_{it}, given observed changes in income and population, differ from what international norms would have predicted. In columns 1 and 2, Africa's movement out of agriculture and into industry appears to have been significantly more rapid than would have been predicted given its aggregate growth performance. Columns 3 and 4 suggest a somewhat slower move into services and more rapid move into manufacturing than predicted; but these effects are not estimated precisely. In column 5 there is some suggestion of a generally slower move of labor out of agriculture than would have been predicted – the contrast with rapidly falling agricultural

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[6] Equations like (1) were used by Chenery and Syrquin (1975) to characterize thefeatures of the structural transformation. See also Syrquin and Chenery (1989).

[7] It is standard in an equation like this to assume that income and population, which are measured at the beginning of each period, are predetermined with respect to ε_{it}. But if the unobserved country effects are correlated with current income per capita, then the fact that they are time-invariant suggests that they are correlated with lagged income as well. The FE estimator is then inconsistent if the time dimension of the panel is fixed. We have estimated the equation using lagged initial income and lagged initial income squared as instruments for $\ln(y_{it-1})$ and $[\ln(y_{it-1})]^2$. This Anderson-Hsiao IV estimator is consistent provided that the ε_{it} are serially uncorrelated and that y_{it-1} is indeed predetermined with respect to the residual component ε_{it}. Results do not differ substantially from what appears in Table 2.3.1.

output is striking. Column 6 suggests that if anything there has been some tendency for productivity differentials to close more rapidly in SSA than elsewhere, given observed developments in real income and population. The last effect is surprising; given the results for sectoral output shares and employment, we expected the relative productivity variable to rise systematically in SSA relative to its predicted value. Data limitations may be important here; the relative productivity variable is not available for the 1990s and the fit of the underlying regression (column 6 in Table 2.3.1) is weak.

The sectoral patterns laid out here, together with slow growth in per-capita incomes, suggest a policy and external environment that has not been well suited to the challenge of rapid population growth (we emphasize demographic effects further in section 5.1.2). Sectoral patterns appear to have favored industry relative to agriculture, but the employment content of growth in industry has been weak. Much of this may be driven by the enclave nature of industry, which is dominated in some cases by oil and other extractive sectors. Case study authors will explore these patterns in further detail. For this purpose a companion paper (Ndulu/O'Connell (2000)) provides country-by-country fits and residuals from a set of regressions that are similar to those in Table 2.3.1 but omit the trend-interaction term for SSA. These can be used to assess the degree to which country experience departs from cross-country norms.

The recent work done by Charles Kenny and Moshe Syrquin (1999) applies a variation of this method in assessing structural transformation in East Africa. The reference point in this regard is the predicted path of the main components of economic structure along changing income levels, as computed from cross-country experience for a sample of low and middle income countries. This method uses the path of threshold values as litmus tests of expected structural transformation in a typical country, for a given movement across income levels. Kenny and Syrquin use the threshholds developed by Syrquin and Chenery (1989), which we reproduce in Appendix Table 2.3.2. For case study teams, a comparison of actual and predicted sector shares provides an indication of whether significant transformation is taking place.

2.4 Aggregative growth accounting

We turn now to growth accounting as a way of gaining further comparative perspective on Africa's aggregative growth record. We draw on the careful work of Collins and Bosworth (1996), available for 88 developing countries, 21 of which are in SSA. The basis for this growth accounting exercise is a 'benchmark' Cobb-Douglas aggregate production function in physical capital K and effective labor $h \bullet L$:

(2) $$Y = AK^{.35}(h \bullet L)^{.65},$$

or in per-worker terms,

(3) $$y = Ak^{.35}h^{.65}$$

where $y \equiv Y/L$ and $k \equiv K/L$. The unobserved variable A is an index of total factor productivity; its contribution to growth is calculated as a residual in the usual way.[8] The elasticity of output with respect to labor, at .65, is broadly consistent with international evidence.

Due to data limitations, labor input is measured by the population of labor force age rather than by the actual labor force. Capital stocks are derived by applying the perpetual inventory method to year-by-year investment data, assuming an annual depreciation rate of 0.04.

[8] Log-differencing the per-worker production function, we get $\Delta\ln(y) = .35*\Delta\ln(k) + .65*\Delta\ln(h) + \Delta\ln(A)$. Everything in this equation is observable except $\Delta\ln(A)$, which is calculated as a residual.

Initial conditions for the capital stock recursion are from Nehru and Dhareshwar (1994) who provide country-by-country estimates of the capital stock in 1950. Investment rates are from national accounts data. As emphasized earlier, African investment rates would be much lower in comparative terms if international price data were used. But initial capital stock estimates would have to be scaled down accordingly, suggesting that estimated rates of capital accumulation would not be greatly affected by this choice (Collins and Bosworth, 1996).

To calculate the labor quality index *h*, Collins and Bosworth assume, consistent with international evidence on wage premia, that each year of educational attainment, other things equal, raises labor's marginal product by 7 percent. Since the marginal product of uneducated labor is already positive, this approach limits the variation in measured human capital investment in comparison with an approach based only on average years of schooling.[9] Human capital accumulation accordingly plays a relatively small role in explaining international growth differences in these data.

Figure 7 and ***Figure 8*** show the growth decomposition by halfdecade. While factor accumulation is important, Table 2.4.1 indicates that over half of Africa's growth shortfall for the 1960-94 period is attributed to the residual. The standard interpretation of a low residual is slow technological progress.[10,11] A low or negative residual can of course have a variety of sources, particularly at the level of aggregation employed here and given the use of "benchmark" parameters. A large literature, for example, stresses the impact of tax and tax-like policies in generating an inefficient *composition* of aggregate investment in Africa. Adam and O'Connell (1999) review the key policies and motivate them using a simple political-economy model. Such distortions produce a negative residual by gradually undermining the quality of the capital stock. A general bias against private sector accumulation, emphasized by Mkandawire and Soludo (1999), would produce the same effect unless justified by an unusually high marginal product of public capital. In a Chenery framework, slow movement of factors of production out of agriculture would also produce a low or negative residual, given the presumption of a difference in sectoral marginal productivities.

Sachs and Warner (1997) and Bloom and Sachs (1998) have recently emphasized geography as an additional factor in African growth, either in undermining the health status of workers or in imposing high transaction costs that discourage market integration. Some of these effects operate on the *level* of *A* rather than on its growth rate. For example, a chronic health deficit that reduced labor quality by 15 percent would be equivalent to a reduction in *A* by $(0.15)^{.65}$, with no ongoing effect on the residual. *Changes* in average health status, in contrast – like the emergence of HIV/AIDS – can have major effects on the productivity residual. Moreover, structural features that impede the flow of information and trade, even if unchanged over time, can lower the residual by limiting the scope for agglomeration economies and the diffusion of existing technological knowledge (Barro and Sala-i-Martin (1995)).

In addition to the influences cited above, the literature suggests a variety of other potential sources of a low residual in Africa. These include falling capacity utilization, sometimes emphasized in systems of exchange control as in Tanzania between 1979 and 1985; high rates of depreciation of physical capital, associated for example with poor maintenance of public

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[9] Suppose that workers initially have 1 year of schooling on average, but that over a period of 5 years the average educational attainment rises to two years. Schooling per worker has risen by 100 percent. The Collins-Bosworth measure of human capital would rise by only 7 percent.

[10] Ndulu and O'Connell (1999) state that 2/3 of the difference is due to slow productivity growth, but Tables 1 and 2 in Ndulu and O'Connell contain errors we discovered in writing the current paper (see communication forthcoming in JEP Summer 2000, and available from authors). The correct share is just above ½.

[11] Collins and Bosworth emphasize that the implied rate of net capital accumulation is nearly uncorrelated with the investment rate across countries, the result of being far from a steady state.

infrastructure, itself sometimes attributed to a bias of aid donors against recurrent spending; climate shocks that undermine total factor productivity in agriculture; and civil strife. At shorter frequencies, the residual may also reflect fluctuations in aggregate demand, which would affect output via capacity utilization and the degree of underemployment (both of which are implicitly assumed fixed in the calculation).

Table 2.4.1 *Growth accounting decomposition by region.*

In an accompanying document (Ndulu/O'Connell (2000)) we show growth accounting results for the 21 African countries by halfdecade.

3. Regression-based decomposition: motivating two approaches

By identifying the relative contributions of factor accumulation and technical progress, growth accounting exercises provide important leverage for case analysis. For further leverage we turn to the empirical literature on cross-country growth. The standard practice in this literature to use observations for periods of 5 years or longer, in order to abstract from demand-side influences. A typical regression takes the form

(4) $$\ln y_{it} - \ln y_{it-1} = -\alpha \ln y_{it-1} + x_{it}'\beta + z_i'\gamma + e_{it},$$

where x' is a vector of time-varying growth determinants and z' a vector of time-invariant determinants. The lagged income variable allows for *conditional convergence*, a prediction of the neoclassical model in which countries further below their balanced-growth paths grow faster ($0 < \alpha < 1$). In regressions based at least loosely in this tradition (including the descendants of Barro (1991)), the remaining variables in (1) tie down the balanced growth path itself – both its *level* and the underlying rate of Hicks-neutral technological progress, which determines its rate of increase.

It is standard in the literature, given an equation like (1), to decompose cross-country or cross-regional differences in the dependent variable into the 'contributions' of the various explanatory variables, and we will use this approach below. If the right-hand side variables are orthogonal to each other and to the residual, regression-based decomposition provides an extremely powerful tool for case analysis. Estimated coefficients are unbiased and consistent, and all differences in the right-hand-side variables reflect 'ceteris paribus' (experimental) variation. In such a situation one could confidently trace (say) ¾ of Cameroon's decline in the late 1980s to a rise in its fiscal deficit: the task of the case analyst would then be to explore the reasons for this policy development. Or one could confidently say, if Botswana's residual for the 1980-84 period was +3.0, that fully 3 percentage points of Botswana's growth in the early 1980s was not readily explained by the standard determinants. The task of the case analyst, after providing an account of the systematic linkages, would be to explore the idiosyncratic determinants of Botswana's growth in that period.

In practice, orthogonality fails, producing two distinct problems for regression-based decompositions. We mention these briefly here in order to motivate our approach. The first is an *estimation* problem: how does one obtain consistent estimates of the 'parameters of interest'? Variables are included on the right-hand-side of an equation like (*) on the basis of causal theoretical accounts. Theory tells us, for example, that a higher fiscal deficit can reduce growth through crowding out and other channels. The parameter of interest here is the effect on growth of a marginal variation in the fiscal deficit. But if there is feedback from growth to the deficit – for example, through the effect of growth on tax revenue – estimation methods that ignore this endogeneity problem will be biased and inconsistent. Unobserved 'country effects' μ_i have similar effects if they are correlated with the included variables. Fixed effects estimation allows us obtain consistent estimates for the remaining parameters, but we give up a lot of the sample variation in the process; and as the dynamic panel literature has emphasized, consistency holds only if the time dimension of the panel increases along with the number of countries. In the face of endogeneity problems, recovering parameters of interest ultimately requires the use of an appropriate instrumental variables estimator.

The second problem is one of *attribution*. Multicollinearity produces well-known difficulties in small samples, with unstable point estimates and a tendency towards weak and non-robust significance tests for individual variables. But it also produces an attribution problem that persists in large samples. To continue the earlier example, should Cameroon's observed decline be attributed to the increased fiscal deficit, or to the terms of trade collapse that produced this increase while also exerting a direct effect on growth? The attribution problem has a 'clean' solution if the analyst is prepared to impose a recursive structure among (groups of) the right-hand-side variables. The full contribution of any recursively prior variables – like the terms of trade in the Cameroon example – would then include not only their direct effect but also any indirect effect operating through the other right-hand-side variables. The contributions of these other variables, in turn, would pertain only to the component orthogonal to the recursively prior group. In the Cameroon example, the contribution of the terms of trade would be larger, and that of the fiscal deficit smaller, under an orthogonalization that made the terms of trade recursively prior to the deficit. Endogenous regressors raise further problems of attribution, this time between the regressors and the residual.

Given these caveats, we take two rather different approaches in what follows. In section 4 we present decompositions based on Hoeffler's (1999) system-GMM estimates of the augmented Solow model for 85 countries. The augmented Solow model is parsimonious, and its parameters have structural interpretations (they are 'parameters of interest'). The system-GMM approach imposes sufficient orthogonality assumptions to deliver consistent estimates of these parameters even if investment is endogenous and/or unobserved time-invariant country effects are correlated with the observed variables. An attribution problem remains, of course, because changes in the explanatory variables are both intercorrelated and potentially endogenous. If growth and investment, for example, are jointly determined by the unobserved country effects, then one has to proceed cautiously in 'attributing' (say) 2/3 of the growth gap between Africa and East Asia to differences in investment.

In section 5, where our aim is to characterize the contribution of policy to growth, we retreat from an attempt to identify parameters of interest. Instead we use equation (1) to approximate the mean of growth conditional on a list of theoretically plausible determinants.[12] We build this up in three steps, with the intention of providing information useful to case study authors. First we estimate a "baseline" regression in which the conditioning variables are plausibly predetermined. We then incorporate policy variables one by one and examine the partial correlations between policy and growth conditional on the predetermined variables. Finally, we develop a 'full' specification that includes the predetermined variables along with a set of variables capturing different aspects of the institutional and policy environment. We use this full specification to estimate the relative contributions of the explanatory variables. In this exercise, estimated residuals suggest the presence of unusual period-and/or-country specific factors in the growth process. The contributions of individual variables or groups of variables identify growth syndromes for which we have theoretical accounts but which may involve two-way causality. As in the augmented Solow model, we do not orthogonalize among the explanatory variables in calculating the decomposition.

[12] If the variables are jointly normal, the conditional expectation is linear and OLS uncovers this conditional expectation.

4. Growth and accumulation: the augmented Solow model

In the augmented Solow model, the vector x' consists of (i) the national saving rate, proxied here by the ratio of investment to GDP, both at constant international prices; (ii) a variable measuring replacement investment requirements and dominated in practice by population growth (see Appendix Table A1); and a measure of saving for human capital accumulation. Hoeffler (1999) argues that educational attainment is more appropriate than enrollment rates for this purpose; she uses the initial average years of schooling achieved by the population aged 15 or older. Table 4.1 reproduces the results in Hoeffler (1999), Table 4.2. The sample period runs from 1960 to 1990 and covers 85 countries, of which 43 are developing and 23 are in SSA.

The system-GMM approach addresses two central econometric problems in the estimation of an equation like (1). The first is the likely presence of unobserved time-invariant determinants of the balanced-growth path that are correlated with the observed variables. The correlation between lagged income and these unobserved variables creates bias and inconsistency in the OLS parameter estimates. The convergence parameter is likely to be biased towards zero.[13] The standard approach to this problem is to condition on the unobserved effects by estimating a separate dummy variable for each country. But when the time dimension of the panel is fixed and there is a lagged dependent variable, this fixed-effects or "within-groups" (WG) estimator is also biased – this time away from zero (Nickell (1981)). The true convergence parameter is therefore likely to lie between the OLS and the WG estimates. Arellano and Bond (1991) showed that if the residuals in (1) are serially uncorrelated, then under relatively mild conditions one can use lagged levels of the right-hand side variables (including the second lag of income) as instruments in a differenced version of equation (1). The resulting GMM estimates are consistent. The "system-GMM" approach (Blundell and Bond (1998)) extends the Arellano and Bond method by identifying conditions under which lagged differences in the variables can be used as instruments in equation (1) itself. The two versions of equation (1) are then estimated jointly, delivering efficiency gains and a likely reduction in small sample bias.[14]

The second problem, particularly at frequencies as short as 5 years, is the likely endogeneity of investment. Both accelerator theory and models of agency costs, for example, imply causality from growth to investment. The system-GMM approach uses lagged values of investment and the other variables as instruments for current investment.

Table 4.1 *Hoeffler (1999) SYS-GMM results for the Augmented Solow model.*

Hoeffler emphasizes three features of the results in Table 4.1. First, the convergence parameter is indeed between the OLS and WG values and suggests a strong conditional convergence effect. Second, the feedback from growth to investment is apparently strong enough to bias the OLS

[13] The direction of bias is unambiguous only when the x_{it} are strictly exogenous.

[14] See Hoeffler (1999), on which this discussion is closely based. The Arellano/Bond approach estimates a differenced version of (1) (thereby eliminating the time-invariant effects, whether observed or unobserved), using as instruments for the differenced variables (i) twice-lagged initial income, (ii) current and lagged values of strictly exogenous regressors, (iii) lagged values of regressors that are not strictly exogenous but whose past values are uncorrelated with current shocks to growth, and (iv) twice-lagged values of endogenous regressors (i.e., those whose current values are correlated with the current shock to growth). The Blundell/Bond approach is to estimate this equation jointly with the 'levels' equation (1), using as instruments for the levels equation (i) lagged growth; (ii) current changes in predetermined or strictly exogenous regressors; and (iii) once-lagged changes in endogenous regressors. The joint estimation produces a gain in efficiency and reduces small-sample bias particularly when the series are highly persistent. The orthogonality conditions exploited by these methods rely heavily on lack of serial correlation in the residuals in (1), a property that is testable and that Hoeffler does not reject for the system GMM estimates we use in Table 4.1.

coefficient on investment towards zero: the GMM estimate is much larger and is strongly significant. Third, there is little evidence in these data, once the GMM estimates are used, of a set of slow-moving or time-invariant growth determinants that are specific to SSA. The "Africa dummy variable," so often large and statistically significant in the growth literature, is both small in magnitude and statistically insignificant here.[15]

In Tables 4.2a and 4.2b we use the system-GMM parameter estimates to decompose growth into the "contributions" of initial income, investment, education, replacement requirements, and a residual, for each African country in the sample. As mentioned above, this decomposition is straightforward to interpret if the variables are mutually uncorrelated and uncorrelated with the residual; each then makes a distinct contribution to the variance of observed growth. In our case, however, the explanatory variables are correlated both with each other and with the estimated residuals (as indicated in Appendix Table A4.3). We therefore use the decomposition as a descriptive device.

Table 4.2a *Actual and fitted growth by region, Hoeffler (1999).*
Table 4.2b *Components of fitted growth by region.*

Table 4.2a summarizes the decomposition results by region and provides an indication of what variables are likely to be important at the country level. Roughly 3/4ths of Africa's average growth deviation is associated, in these estimates, with the continent's 'location' in the space of observed right-hand-side variables. Cross-regional variation in predicted growth is driven mainly by differences in initial income and investment; comparing Africa with East Asia, these variables alone predict a growth gap of 1 ¾ percentage points per annum. Demography also makes a difference here; the replacement investment term is mainly population growth, and provides the only clue in these data regarding the differing growth performance of Africa and *South* Asia, a region that is very similar to Africa in terms of average investment, education, and initial income. Overall, growth is over-predicted on average for Africa, but by a smaller average margin than for other regions.

The bottom row of Table 4.2b reports the beta coefficients for individual right-hand side variables. These show the effect on the dependent variable (measured in standard-deviation units) of a one-standard-deviation change in each explanatory variable, holding all other explanatory variables constant. The beta coefficients give a shorthand indication of a variable's contribution to fitted growth in the "typical" country – and therefore its likely importance in case analysis.[16] As in the growth accounting exercise reported earlier, the education variable has very little leverage in these data. Not only is its *average* effect small, but its beta, at 0.03, indicates that almost none of the cross-country variation in growth around its mean is attributed to cross-country dispersion in educational attainment.

Given the panel structure of the data, we can decompose the residuals into a "country effect" represented by the average residual for the country, and a period-by-period deviation from this country average:

(5) $$e_{it} = e_{i.} + (e_{it} - e_{i.}).$$

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[15] This is tested by regressing the vector of average country-by-country residuals from column 3 of Table 4.1 on a constant and an SSA intercept dummy variable, and testing the size and statistical significance of the SSA intercept dummy.

[16] A variable can have a small average effect but a large beta coefficient; an example (section 6 below) is the income effect of the terms of trade, which is near zero on average but has an appreciable regression coefficient and also varies widely across countries and over time.

To get some indication of the importance of these residual components at the country level, we calculate the analogs to beta coefficients. Table 4.2c shows the ratio of the standard deviation of each component, and of the total residual, to the standard deviation of the dependent variable. Both components are roughly as variable as growth itself. This means that although the estimated country effects have little *average* effect for Africa, they tend to be appreciable for individual countries. Within Africa, the estimated country effect ranges from a high of 6.07 for Sierra Leone to a low of –6.02 for Zambia. The "within groups" component of the residual also contains a lot of variation; this is not surprising given that observed growth varies much more strongly over time than any of the explanatory variables.

Table 4.2c: *"Beta coefficients" for residual components.*

5. Growth and policy

The augmented Solow model treats technological progress as exogenous and does not model the effects of policy, if any, on saving rates or the other parameters that tie down the balanced-growth path. A wide variety of theoretical channels exist through which the policy environment can alter either the rate of accumulation or the efficiency of primary factors of production. Early empirical work exploring the impact of policy on African growth performance ("second-generation" models) includes among others Barro and Lee (1993), Easterly (1996), Ghura and Hadjimichael (1996), and Elbadawi and Ndulu (1996). A distinguishing feature of this work is that even after accounting for included determinants a large unexplained variation from the fitted regression remained (the "Africa dummy").

The next set of efforts at empirical work (third generation models) were therefore focused on getting to the bottom of the "African dummy" puzzle. Five main directions were pursued to this effect. First was to see whether *contagion effects* on growth were present. Spillover effects both negative and positive were found to be significant (Chua (1993), Easterly and Levine (1998)). Second was to include measures of the institutional environment (such as the quality of government bureaucracy or the level of bureaucratic corruption), and political stability (Knack and Keefer (1995), Aron (1997), Easterly and Levine (1998), Fosu (1992), Collier (1995 and 1997)); both proved significant. Third was to include risk and uncertainty, as well as openness to trade, as they affect investment and growth (Collier (1996), Collier and Gunning (1999), Sachs and Warner (1997), Rodrik (1997)). Fourth was inclusion of geography and ethnic diversity among the determinants, to highlight specificities of countries/regions (Sachs and Warner (1997), Easterly and Levine (1997)). Finally are the most recent efforts to incorporate dynamic effects in the growth process through use of panel data, and dealing with the problem of endogeneity of growth determinants. The African dummy seems now to have disappeared with these extensions of the original model. All along improvements in the measurement of policy variables were also pursued.

5.1 A baseline regression

We proceed now in three steps, first estimating a 'baseline' regression to characterize growth conditional on initial conditions, demography, external shocks and geography; then examining the partial correlations of growth with policy variables conditional on these baseline determinants; and finally estimating a 'full' specification with both baseline and policy variables.

Column 1 of Table 5.1.1 shows a set of pooled baseline regressions. In each of these regressions we cannot reject the hypothesis that slope and intercept coefficients are the same for African and non-African countries, and an African intercept term, when entered without other interaction terms, is small and statistically insignificant. Table 5.1.3 decomposes observed growth (deviations from the sample mean) into fit and residual, and then decomposes the fit into the contributions of each group of variables.

Table 5.1.1. Baseline pooled regressions

For initial conditions, we use real GDP per capita in international dollars and life expectancy at birth, both measured at the beginning of the relevant half-decade. Initial real GDP carries a negative coefficient, consistent with a conditional convergence effect. The coefficient on life expectancy at birth is positive and large. Results that include measures of educational attainment are not shown; these data shrink the sample, particularly among African countries, and the results tend to be weak and non-robust, consistent with much of the literature (e.g., Pritchett (1996)). The net effect of initial conditions, as indicated in Table 5.1.2, is actually slightly negative for African countries on average; very low initial life expectancies more than offset the boost implied by low initial income.

Table 5.1.2 *Decomposition from the baseline regression, by region*.

Demography is one of the dimensions along which average experience in Africa is most 'unusual' by international standards. As apparent in Figure 3b, life expectancy not only begins at an extremely low level, but also rises slowly over the sample period, so that the level in the 1990s is fully two standard deviations below the non-African *developing country* mean. Compounded with high and persistent fertility rates, the result is an unusually – and increasingly – young African population (Bloom and Canning (1999)). In the regressions the "level effect" of these trends on demograhic structure is captured in the age dependency ratio, defined as the ratio of the non-working-age to the working-age (15-65) population. Other things equal, a high age dependency ratio would be expected to lower growth by reducing national saving and perhaps by spreading educational resources more thinly and undermining the quality of human capital accumulation. ***Figure 9a*** shows developments in this variable over time. Africa's ratio begins at the developing country mean in the late 1960s and rises steadily until the early 1990s – while the rest of the developing world experiences a demographic transition. The comparison with the HPAEs is particularly striking. The two groups begin together, at the developing country mean; by the end of the sample, Africa is more than a standard deviation above the mean, and the HPAEs are more than a standard deviation below. The flip side of Africa's rising age dependency ratio is that Africa's potential labor force has grown unusually slowly relative to its population (***Figure 9b***). The "difference effect" on demographic structure is captured in the baseline regression by the difference between the growth of the potential labor force (the population of labor force age) and that of total population. Other things equal, higher values for this variable mean more rapid growth in real GDP per capita.

The demographic variables exert a powerful influence on growth in the baseline regression. Africa's average growth is reduced by 0.85 percentage points relative to the sample mean and by nearly 1.5 percentage points relative to the 'East Asia and Pacific" region.

To capture external shocks we use the income effect of changes in the terms of trade and the average growth rate of real GDP per capita among trading partners. Most African countries are undiversified exporters of a few major primary commodities, and the handling of terms of trade shocks has been a major theme in the literature on African macroeconomic policy (e.g., Bevan, Collier and Gunning (1990)). Though the average year-to-year percentage change in the barter terms of trade is widely used as a measure of terms of trade shocks in growth regressions (e.g., Collins and Bosworth (1996), Deaton (1999)), a preferable measure on theoretical grounds is the income effect of the terms of trade, which multiplies the relative price change by the share of trade in GDP. When using time-averaged data, a separate question is whether to use the average year-to-year change or a measure of cumulative income effect. We use the latter.[17] ***Figure 10a*** shows the average cumulative income effect of terms of trade changes over each half-decade. For the halfdecade starting in year *H*, this is calculated as

(6) $$ctot(H) = x(H) \bullet (1/4)\sum_{t=1}^{4}[\ln TOT(H+t) - \ln TOT(H)],$$

where *x(H-1)* is the ratio of exports to GDP in the year immediately preceding the half-decade. This gives a measure of the cumulative gain in real purchasing power due to terms of trade changes over the period.[18]

Figure10b shows the average growth in real GDP per capita on the part of trading partners, weighted by the share of each partner in a country's overall trade. Faster growth among partner countries could be a source of greater cross-border productivity spillovers, as in the work of Coe, Helpman and Hoffmaister (1997). Partner-country growth should also increase demand for the home country's exports; with imperfect substitutability and/or imperfect competition, this effect would be not be fully captured by the terms of trade variable. Effects of export expansion on growth may of course be coming from the demand side in the short run; as with the terms of trade variable, this possibility cannot be ruled out although it should be considerably weaker over a 5-year period than at higher frequencies. A long-run growth impact could operate via increased investment or via learning-by-doing externalities from expanded export production.

Climate shocks are often appealed to in explaining year-to-year variations in performance in Africa, and given the rain-fed nature of African agriculture and the large share of agriculture in GDP, they may well be important for investment and growth over horizons of 5 years or more. An example of this is the Sahel drought, widely viewed by climatologists as an outlier in worldwide historical experience (e.g., Hulme (1992a), Rasmusson and Arkin (1993)). Although we lack internationally comparable data on climate shocks, for the African countries we have constructed a variable that measures the number of "dry" years in each halfdecade. We define a dry year as one in which the total precipitation is less than one standard deviation below the average annual precipitation for the thirty-year period 1940-1969. Meteorological definitions of drought tend to focus on more complicated measures such as evapotranspiration (which combines precipitation with temperature), but extremes of these measures are likely to be highly correlated with extremes of rainfall, particularly at frequencies as long as 5 years.[19] Results for the Africa-only sample appear in Table 5.1.3. Coefficients on the other baseline variables are typically not dramatically different from those in the pooled sample, consistent with non-rejection of the pooling restrictions; not surprisingly, they are estimated with considerably less precision. The effect of dry years is dramatic. The effect of location in the Sahel region is apparent in Appendix Table 5.1.4, which shows the average proportion of dry years across halfdecades. With well over

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[17] There is a large difference between *ctot* and a measure that multiplies the average percentage change in the terms of trade over the period (the variable shown in the top panel of the chart) by the initial export share. Consider a country that experiences a 6 percent increase in the terms of trade in years *H* and *H+1*, followed by a decline of 4 percent in the remaining 3 years of the half-decade. The average percentage change in the terms of trade is zero over the half-decade. If the export share is 1/3, however, the average real income gain is *ctot = (1/3)*[(1/5)*(6+12+8+4+0)] = 2* percentage points of GDP per year.

[18] Multiplying the cumulative terms of trade change by the export share is only strictly appropriate when trade is initially balanced. When trade is unbalanced, the appropriate measure of income effect adds up the increase in real export prices, multiplied by the export share of GDP, and the decrease in real import prices, multiplied by the import share of GDP. We have this variable for a smaller number of countries, and it produces results similar to the ones in the table.

[19] Our measure ignores the intra-annual timing of rainfall, which studies of smallholder agriculture sometimes emphasize as more important than total amounts (e.g., Rosenzsweig and Binswanger (1993)).

sixty percent of years dry by our criterion, Sénégal's predicted long-run falls a full percentage point below that of Tanzania or Burundi.

Table 5.1.3 *Baseline pooled regressions, SSA-only sample.*

World interest rate shocks are not measured directly but to the degree that they operate commonly across countries are captured in the time dummy variables.

5.2 Policy, Institutions, and political instability: partial correlations.

Pritchett (1998) identifies adequate macroeconomic policy, adequate openness and private-sector orientation, and adequate governance as three requirements for rapid growth. These admonitions accommodate much of the literature on African economic strategy and performance, where one can find well-developed theoretical and empirical accounts that give a leading role to factors in each category.[20] But they also illustrate the difficulty of developing a unified account of policy and growth.

To characterize the links of policy to growth we proceed in two steps. In this section we examine the partial correlations of growth and individual institutional and policy variables, conditional on variables already included in the baseline regression. On this basis it will be difficult to "reject" any of a long list of plausible linkages between policy and growth. Our purpose here is not to exert discipline but more nearly the opposite: to demonstrate that the cross-country evidence is broadly consistent with a wide range of stories that may appear decisive in individual cases. In the following section we develop a 'full' specification by drawing variables from each of the three categories. We then use this specification for a decomposition exercise. The intention here is to provide some discipline by showing the relative importance of individual components for individual countries and periods.

Table 5.2 summarizes the partial correlation results. We organize the variables roughly by Pritchett's classification, though it is clear that many variables fall into more than one category.[21] Definitions of the variables appear in Appendix A. The three vertical partitions of Table 5.2 shed light on three separate questions. First, what influence does each variable exert on the conditional expectation of growth given the baseline factors, and how does this differ when we control for unobserved country effects? Second, is there any evidence that the partial correlation differs for African counties? Third, what happens to the correlation when we control for investment?

Under macroeconomic policy we find strong links with all variables except the initial debt to GDP ratio (itself an indirect measure). Estimated coefficients and significance levels tend not to differ dramatically in the WG estimation, suggesting that links operate similarly both within and across countries. There is very little evidence of Africa-specific effects for these variables.

Table 5.2 *Partial correlations of growth with policy, institutions, and political stability.*

Both inflation and initial international reserves appear to exert their influence on growth in part through investment: when investment is included, the estimated coefficient is considerably smaller and is estimated less precisely. For inflation, effects on investment may be related to greater macroeconomic uncertainty at high inflation, particularly about policy interventions; and

[20] Many would add "investment in people" to this list. This dimension is reflected to some degree in the life expectancy and demographic variables in the baseline regression. As mentioned earlier, direct measures of education tend not to enter these regressions significantly.

[21] The black market premium is a good example. In the theoretical literature, it serves variously as an indicator of unsustainable macroeconomic policy, of an inward-looking trade and exchange rate regime, and of a patronage-driven governance structure.

where the banking sector plays a major role in investment finance an additional effect may operate via shrinkage in the real demand for money and therefore in bank liabilities. An investment channel for international reserves suggests that this variable may be proxying for international liquidity constraints; also, and particularly under fixed exchange rates, low reserves may be associated with policy interventions such as import controls and high domestic interest rates that discourage investment. In contrast with these variables, the fiscal deficit – which is the single strongest variable in the group, notwithstanding its limited availability (this variable is available only from the 1970s) – appears to operate mainly through the productivity of capital rather than through the standard crowding-out channel. Part of this may be explained by the fairly high correlation of the fiscal deficit with public investment (0.39 in the annual data); it may be that private investment is being crowded out with relatively little impact on aggregate investment. The overvaluation index has a decidedly negative partial correlation with growth, suggesting that the supply-side impacts of real exchange rate misalignment overwhelm the impact of shocks to aggregate demand, which in standard short-run open-economy models tend to produce a positive correlation between GDP and the real exchange rate (demand booms being associated with real appreciation). Overvaluation has a stronger and more precisely estimated link to growth when investment is included; investment may in part be capturing demand-side influences.

Openness to trade has relatively strong links with growth in these data. We enter the Sachs-Warner openness index as a time-invariant country effect: this variable gives the proportion of years 1965-90 during which the country satisfies a set of criteria for trade openness and private sector orientation. Most African countries are at zero and most industrial countries at 1; the difference in expected growth conditional on this gap is half a percentage point per year. [22] Trade shares, both overall and for manufacturing goods in particular, show a strong partial correlation with growth and one that persists after controlling for country effects; and for these variables the impact among African countries is, if anything, more powerful than among non-African countries. In columns 7 and 8 it is apparent that much of the influence of these variables comes from their correlation with investment, a finding emphasized by Levine and Renelt (1988). The exception is the ratio of exports of manufactured goods to GDP, which registers a much larger point estimate when investment is included in the regression.

The share of manufactured goods in total exports is not an openness variable per se, but rather an indirect indication of the effects of resource endowment on the structure of exports. It appears to operate mainly through the productivity of investment. It performs very poorly in the within-groups regression, perhaps an unsurprising result given that this variable does not vary nearly as much over time as across countries.

In the group of variables measuring public sector impact on growth, we see a strong impact of the Barro-Lee measure of 'unproductive' government spending. The interpretation of this variable is that all government spending must be financed by distortionary taxes that tend to reduce growth, so that the *net* effect of the government budget on growth therefore depends on the supply-side contribution of the spending. Barro and Lee assume that defense and education spending are productive in this sense, while other categories are not; 'unproductive' spending is therefore government current spending net of defense and education. This explanatory power of this variable is driven entirely by its cross-country variation. The ratio of total current government

[22] The Africa interaction on this variable has the "wrong" sign and while it is not significantly different from zero statistically, the point estimate illustrates the perils of this kind of exercise. The most "open" than other African countries on average. The fastest-growing episodes in the Africa subsample, in contrast, occur among the countries categorized as closed, including some from the first half of the 1960s when trade regimes were generally more open (Cote d'Ivoire and Gabon); moreover, four of six such episodes (those mentioned being the exceptions) are associated with oil booms. So the openness variable may well be capturing other effects. Note also that there is no openness observation for Botswana or Mauritius, two countries that would score higher than Ghana and whose growth has been very rapid.

spending to GDP, in contrast, has the negative sign familiar from the literature but its effect is estimated very imprecisely, except in the within-groups regression.

A wary or even hostile attitude towards private capital accumulation is often cited as a lingering feature of economic management in Africa (Mkandawire and Soludo (1999)). The partial correlation of growth with the public sector's share of investment is consistently negative in these data, although the effect is estimated imprecisely. As with all other variables, the estimated coefficient should be interpreted with the pooling restrictions in mind; the case evidence amassed in Easterly, Rodriguez and Schmidt-Hebbel (1996), for example, suggests that the growth impact of public sector investment depends crucially on whether such investment complements or competes with private investment. There is no evidence in the interaction term in Table 5.2, however, that the public sector's overall investment share has a stronger marginal effect on expected growth in African countries than in others.

As measures of public sector institutions we consider the ICRG indexes of government corruption, quality of bureaucracy, and rule of law. Each of these qualitative indexes runs from 1 to 6, with an increase denoting an improvement. We first enter these first as time-invariant effects, using the earliest available observations (from the 1980-84 halfdecade), and then we combine the three into a (time-varying) composite governance index that is available starting in 1980-84. As explanators of cross-country growth these variables all have the anticipated signs, though the effects are estimated imprecisely. Taken together, their net effect is appreciable; an increase from the African average to the average for the high—performing Asian economies (a group that includes Malaysia, Thailand and Indonesia, three countries whose governance scores are low by the standards of this group) would increase long-run growth by nearly a third of a percentage point per year.

While debate continues over whether financial development is a causal or merely accompanying factor in long-term growth, recent work has begun to strengthen the case for a causal impact (e.g., Levine, Loayza and Beck (1999)). In Table 5.2, financial depth makes a positive contribution to the conditional expectation of growth, given the baseline variables. The effect appears to be driven almost exclusively by cross-country variation. From columns 7 and 8, the effect of financial depth is associated primarily with the quality rather than the volume of investment, a finding well in line with the literature on financial repression and liberalization (see, e.g., Fry (1997)).

For political instability we use the number of coups per year and an instability index that is the sum of the average number of revolutions, assassinations, and strikes per year. Each of these has an appreciable impact, both in the pooled regression and in the within-groups regression. Columns 7 and 8 suggest that an important component of this impact operates through investment. There is a strong Africa interaction with the political instability variable: conditional on the baseline variables, the impact of greater instability on expected growth is more than three times as large in African countries than in others.

5.3 Growth, policy and institutions: a full specification

Table 5.3.1 shows a set of 'full' regressions incorporating a set of policy, institutional, and political instability measures from the previous section, along with the baseline variables. The non-robustness of regressions of this type is well known: policy variables are highly intercorrelated and institutional variables often covary very tightly with initial conditions and demographic variables across countries. But while individual policy variables rarely perform consistently across alternative specifications, Levine and Renelt (1993) note that it is rare for a set of policy variables to be jointly insignificant in a growth regression.[23] The regressions in Table 5.3.1 can therefore be viewed as indicating the joint contribution of policy variables while giving

[23] Thanks to Bill Easterly for reminding us of this.

a somewhat less robust indication of the relative importance of particular linkages. We show four specifications. All include political instability and exclude the governance indicator variable, which shrinks the sample considerably and tends to perform poorly in the presence of political instability and policy. Inflation, the black market premium, and the Barro-Lee government consumption variable are included in all specifications, with the exception of specification 2 which substitutes financial depth for inflation (with considerable loss of observations). Specification 3 adds the share of manufacturing trade in GDP, which shrinks the sample relative to specification 1. In our decompositions, we include this variable among the policy variables, although care should be taken as the variable may capture economic *structure* as much as economic policy. Specification 3 incorporates the fiscal deficit as well; this variable performs strongly whenever included, but its limited availability shrinks the sample further. In all specifications the baseline variables continue to predict growth, with the exception of the terms of trade shock whose influence appears to be indirect, via the policy variables. An intercept dummy variable for Africa has a coefficient of roughly –0.5 in these regressions and is statistically insignificant; we exclude it in the reported regressions.[24]

Table 5.3.1 *Growth, policy and institutions: pooled sample.*

Aid does not enter these regressions significantly once policy variables are included. Burnside and Dollar (1997) report a similar finding, in a regression using 4-year periods and omitting all baseline determinants except initial income. They get much stronger results when aid is interacted with the macroeconomic management variables: their well-known result is that aid strongly promotes growth where the policy environment is strong and may even reduce growth where the policy environment is poor. Our results are less clear-cut. Recall that in Table 5.1.1, aid made a clear contribution to the conditional mean of growth when policy variables were excluded. Including these variables allows a Dollar-Burnside effect to emerge if one is present, but it also shrinks the sample very considerably (from 468 observations to 296). The latter effect is important. If we restrict attention to the sample that is relevant when policy variables are included, the statistical contribution of aid nearly disappears, even though the point estimate is not much changed (as compared with column 5 of Table 5.1.1, the coefficient on aid shrinks from .046 to .041; the *t*-statistic shrinks from 1.88 to 0.065). Moreover, a strong interaction terms emerges only if we remove Zambia in the late 1980s – an outlying country/period observation with very modest growth and very weak policy indicators – from the regression sample. We find that better policy enhances the predicted effect of aid, but in contrast to Burnside and Dollar, that the net marginal contribution of aid is positive even when policy is poor. Since our focus here is on linear effects, we omit aid from the full regressions.[25]

Table 5.3.2 *Decompositions based on full pooled regression.*

In Table 5.3.2 we show the contributions of alternative variables by region for the four

[24] When an Africa intercept dummy is included in specifications 1, 2 and 3 respectively, the estimated coefficients and *t*-statistics are (-0.453,-0.943), (-0.737,-1.412), and (-0.490,-0.769).

[25] There are a number of other potentially important nonlinearities in the relationship of our explanatory variable to growth. Barro (1997), for example, interacts human capital with initial income on the argument that greater human capital increases the speed of convergence to the balanced-growth path. Rodrik (1998) constructs the variable TOT*CONFLICT/INST, where TOT is a variable measuring terms of trade shocks, CONFLICT measures latent political conflict within a country, and INST measures the quality of institutions for mediating conflict. He finds that this variable powerfully predicts the difference between pre-1974 and post-1974 growth across countries. Our regressions may perhaps be thought of as first-order approximations to nonlinear models, though one loses any presumption that the variables are jointly normal.

specifications. Holding the baseline determinants constant, variation in policy exerts a nontrivial influence on predicted African growth. In specification 1, policy differences generate an expected growth differential of more than a full percentage point vis-à-vis the East Asia and Pacific region; by comparison, the baseline variables contribute a differential of nearly two percentage points. The relative contribution of policy is very slightly higher in specification 2 (which includes financial depth among the 'policy' variables). With the successive inclusion of the manufacturing trade share and the fiscal deficit, however, the relative contribution of 'policy' gradually increases, so that in specification 3 the policy variables contribute fully half of the predictedgrowth deviation, the remainder being attributed to the baseline variables and political instability. Appendix Table A5.3 gives a full decomposition for African countries, based on specification 1.

6. Guidelines for case study teams

At the heart of any country-specific study of growth performance is an account of the main drivers of growth or decline over time, whether internal or external. Our aim in this paper has been to provide a framework for case analysis by enabling case study teams to readily 'locate' the experience their country in cross-country and intertemporal perspective. For this purpose we will supply each team with a spreadsheet containing the data for their country, both annually and in the halfdecade observations used in this paper. The spreadsheet will contain the regression coefficients and halfdecade full-sample means used in all decompositions. Finally we will supply the halfdecade means for the East Asia and Pacific subsample; this may perhaps represent a kind of policy/growth frontier.

We suggest that case teams proceed as follows. First, use the annual or halfdecadal data to identify and/or corroborate a broad periodization for the case study, identifying (say) between 2 and 4 sub-periods during which the main drivers of growth appear to have differed or to have behaved differently. The breaks may or may not line up with the halfdecade breaks, but the overall story should be consistent with the observed evolution of the variables across halfdecades. This periodization should rely mainly on aggregate growth, but there may be crucial stories to tell at a more disaggregated sectoral level.

Next use the growth accounting results, if available, to assess the relative importance of accumulation and productivity growth by episode. Where the educational data are not available, little is lost by forcing this term into the residual, since as we have shown, the contribution of education in the Collins/Bosworth accounting is extremely small and accounts for hardly any of the intertemporal or inter-country variation in growth rates. Where initial capital stock data and national investment rates are available, therefore, we encourage the case study teams to construct a capital stock series; this can be combined with labor force data to compute a simplified version of the Collins/Bosworth growth accounting decomposition.[26]

Next use the 'fits and residuals' from the augmented Solow model and the full policy regression to help target the case study, keeping the caveats in mind. Here countries are likely to fall into one of three categories, with implications for how the case study might be organized. Some countries (case 1) will be well characterized by the regression equation, in the sense of remaining fairly close to the regression line throughout. For these countries, the main challenge is to explain why the explanatory variables evolved as they did. Others (case 2) will be well characterized on average but will have one or more large residuals. For these countries the periods with large residuals hold a particular interest; in these periods, growth departs dramatically from what would be expected given the observed determinants, and the question is

[26] In logs, $\Delta ln(y) = 0.35*\Delta ln(k) + 0.65*\Delta ln(h) + \Delta ln(A)$. So if $\Delta ln(h)$ is unobservable, growth can be decomposed into $0.35*\Delta ln(k)$ and a composite residual $\Delta ln(y) - 0.35*\Delta ln(k)$, which is an estimate of $0.65*\Delta ln(h) + \Delta ln(A)$.

why. Missing variables like drought or civil conflict provide obvious possibilities. Failures of the pooling restrictions may also be important: the typical effect of a terms of trade shock may be small, but countries can differ in regard to their management of these shocks so that a shock of given magnitude may produce a disproportionate effect in certain circumstances. Finally, some countries (case 3) will tend to lie either far above or far below the regression line throughout. For these countries, the regression model provides a kind of ‘negative’ guidance: the standard determinants do not operate in the typical way. This suggests, perhaps, a search for factors that are slow-moving and not well proxied by the included variables.

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Appendix Table 2.1: *Investment at national and international prices, 1970-89*

Region	Number of countries	Investment share of GDP		Ratio of (2) to (3)	Correlation of (2) and (3)
		International prices	National prices		
	(1)	(2)	(3)	(4)	(5)
SSA	29	10.14	18.91	0.52	0.75
LAC	23	15.79	21.17	0.74	0.68
SASI	3	9.28	17.49	0.53	0.34
EAP	11	19.81	25.64	0.76	0.89
MENAT	11	17.31	25.49	0.67	0.60
INDU	20	26.59	24.33	1.10	0.81
All		16.76	22.03	0.74	0.70

Notes: The table uses countries with data available for all halfdecades between 1970-74 and 1985-89.
Sources: PWT5.6 for column (2), World Bank for column (3).

Table 2.3.1: *Fixed effects estimates, non-SSA sample.*

Explanatory variables	Dependent variable					
	Share of sector in GDP				Employ ment share of agri culture	Ratio of APL in non-agri to APL in agri
	Agri culture	Industry	Services etc	Manufac turing		
	(1)	(2)	(3)	(4)	(5)	(6)
ln(initial income)	-63.616	47.246	16.370	11.753	5.324	12.835
	(-8.153)	(6.048)	(2.154)	(1.754)	(1.179)	(3.473)
[ln(initial income)] squared	3.503	-2.379	-1.124	-0.415	-0.725	-0.695
	(6.842)	(-4.641)	(-2.255)	(-0.962)	(-2.493)	(-2.824)
ln(initial population)	10.970	-8.458	-2.512	-5.339	-11.942	6.206
	(1.091)	(-0.840)	(-0.256)	(-0.637)	(-2.004)	(1.297)
[ln(initial population)] squared	-0.291	0.319	-0.028	0.402	-0.006	-0.249
	(-0.954)	(1.044)	(-0.094)	(1.575)	(-0.031)	(-1.734)
centered trend	-0.757	-0.845	1.602	-0.854	-0.923	-0.276
	(-2.143)	(-2.390)	(4.656)	(-3.050)	(-4.222)	(-1.475)
SSA*(centered trend)	-0.872	1.160	-0.288	0.109	0.174	-0.124
	(-3.436)	(4.567)	(-1.167)	(0.479)	(1.046)	(-0.998)
constant	201.136	-137.615	36.479	-67.642	237.112	-85.229
	(2.171)	(-1.484)	(0.404)	(-0.863)	(4.827)	(-1.918)
R^2-within	0.530	0.354	0.220	0.260	0.739	0.220
# of observations	490	490	490	383	761	365
# of countries	85	85	85	69	134	71
Average # halfdecades	5.76	5.76	5.76	5.55	5.68	5.14
Estimated effect of doubling *y*, calculated at the African mean for *ln(y)*	-15.75	14.75	1.01	6.00	-4.52	3.33
	Cross-country regressions of estimated fixed effects on a constant and SSA intercept					
SSA intercept	4.075	8.428	-12.503	9.013	23.578	5.682
	(4.702)	(10.257)	(-12.851)	(6.786)	(11.012)	(8.737)
# of countries	85	85	85	69	134	71

Notes: *t*-statistics are in parentheses. The variables are defined in Appendix 1. The regressions are restricted to countries with 4 or more halfdecadal observations. In column 6 we have excluded observations for Saudi Arabia, an extreme outlier.

Appendix Table A2.3.2: *Predicted shares of economic structure (percent) at selected levels of income per capita.*

Component of economic structure	Actual average share for	Share predicted for per-capita income level (at official exchange rates):		
	y<300	*y=300*	*y=500*	*y=1000*
	(1)	(2)	(3)	(4)
Final demand				
Private consumption	79	73.3	70.2	66.4
Gov't consumption	12	13.6	13.5	13.7
Investment	14	18.4	20.8	23.3
Exports	16	19.3	20.7	22.6
Imports	21	24.6	25.2	26.0
Food consumption	39	0.15	34.5	29.1
Trade				
Merchandise exports	14	15.2	16.9	18.8
Primary	13	13.9	14.9	15.2
Manufacturing	1	1.3	2.0	3.7
Production (value-added)				
Agriculture	48	39.4	31.7	22.8
Mining	1	5	6.6	7.7
Manufacturing	10	12.1	14.8	18.1
Construction	4	4.4	4.9	5.5
Utilities	6	6.7	7.4	8.1
Services	31	32.4	34.6	37.8
Labor force				
Agriculture	81	74.9	65.1	51.7
Industry	7	9.2	13.2	19.2
Services	12	15.9	21.7	29.1

Source: Syrquin and Chenery (1989).

Table 2.4.1 *Growth accounting decomposition by region.*

Region or halfdecade	Number of countries	Observed growth	Contribution of:		
			Physical capital	Education	Residual
		(1)	(2)	(3)	(4)
Growth decomposition by region, 1960-94:					
SSA	21	0.41	0.61	0.23	-0.42
LAC	22	0.91	0.67	0.35	-0.11
SASI	4	2.33	1.17	0.3	0.86
EAP	9	3.86	2.2	0.5	1.15
MENAT	11	2.82	1.5	0.41	0.91
INDU	21	2.7	1.29	0.33	1.08
All countries	88	1.82	1.08	0.34	0.4
Deviations from sample means by region, 1960-94:					
SSA	21	-1.41	-0.48	-0.11	-0.82
LAC	22	-0.91	-0.42	0.02	-0.51
SASI	4	0.50	0.08	-0.03	0.46
EAP	9	2.04	1.12	0.17	0.75
MENAT	11	0.99	0.41	0.07	0.51
INDU	21	0.87	0.20	-0.01	0.68
All countries	88	0	0	0	0
Sub-Saharan Africa, deviations from halfdecade full-sample means:					
1960-64	21	-1.66	-0.53	-0.08	-1.05
1965-69	21	-1.47	-0.47	-0.10	-0.90
1970-74	21	-0.55	-0.24	-0.19	-0.13
1975-79	21	-1.97	-0.56	-0.20	-1.20
1980-84	21	-1.55	-0.50	-0.10	-0.95
1985-89	21	-0.24	-0.35	-0.07	0.17
1990-97	21	-2.44	-0.70	-0.04	-1.71
All periods		-1.41	-0.48	-0.11	-0.82

Source: Data from Collins and Bosworth (1996).

Table 4.1 *Hoeffler (1999) SYS-GMM results for the Augmented Solow model.*

Dependent variable: growth in real GDP per capita	(1) OLS	(2) WG	(3) SYS-GMM
ln(initial income)	-0.048	-0.236	-0.151
	(-4.194)	(-7.451)	(-2.874)
ln(investment rate)	0.100	0.187	0.249
	(7.987)	(7.987)	(6.408)
ln(n + g + δ)	-0.170	-0.326	-0.419
	(-3.283)	(-3.345)	(-2.897)
ln(schooling)	0.019	-0.017	0.011
	(1.553)	(-0.549)	(0.310)
# of observations	489	489	404
# of countries	85	85	85
avg # halfdecades per country		5.8	
R^2	0.314		
R^2 within		0.354	
(TSS-RSS)/TSS			0.105

Notes: *t*-statistics are in parentheses. Columns 1 and 3 from Hoeffler (1999), revised April 2000, Table 4.2. The WG specification in column 2 differs from Hoeffler's because we use all 489 observations from the OLS sample, rather than the restricted sys-GMM sample of 404; the results are very similar. All regressions contain a full set of halfdecade dummy variables. Variables defined in Appendix Table A1.

Table 4.2a: Actual and fitted growth by region

Region	Actual growth rate of real GDP per capita	Deviation of growth from mean		
		Actual	Fit	Residual
	(1)	(2)	(3)	(4)
SSA	0.59	-1.34	-0.98	-0.36
LAC	1.18	-0.75	-0.51	-0.24
SASI	1.77	-0.16	-1.00	0.84
EAP	4.12	2.19	1.64	0.55
MENAT	3.16	1.22	0.42	0.80
INDU	2.80	0.86	1.00	-0.14
All countries	1.93	0.00	0.00	0.00

Source: Table 4.1, column 3.

Table 4.2b: *Components of fitted growth by region, Hoeffler (1999).*

Region	Initial income	Investment	Education	Replace-ment investment	Fixed period effects
	(1)	(2)	(3)	(4)	(5)
Contributions to fitted growth deviation					
SSA	3.08	-2.99	-0.17	-0.86	-0.03
LAC	-0.2	0.02	0.03	-0.37	0.01
SASI	2.74	-3.13	-0.19	-0.44	0.01
EAP	0.71	1.2	0.03	-0.32	0.01
MENAT	-0.38	1.1	-0.02	-0.28	-0.01
INDU	-3.92	3.01	0.2	1.71	0.01
All countries	0.00	0.00	0.00	0.00	0.00
Beta coefficients					
All countries	-1.01	1.14	0.06	-0.44	--

Notes: The beta coefficient for variable x_i is calculated as $b_i*[sd(x_i)/sd(growth)]$, where b_i is the estimated coefficient and *sd* denotes a standard deviation. The standard deviation of annualized growth in real GDP per capita in the sample is 3.00.
Source: Table 4.1, column 3.

Table 4.2c: *"Beta coefficients" for residual components.*

Residual component	Ratio of s.d. of component to s.d. of dependent variable
Overall residual	0.98
Between groups component	0.71
Within groups component	0.67

Source: Table 4.1, column 3.

Appendix Table A4.3: *Correlations from system-GMM estimation.*

Region	Correlation between:					
	Growth and Fit	Growth and e(i,.)	Growth and [Fit + e(i,.)]	Fit and e(i,t)	Fit and e(i,.)	[Fit + e(i,.)] and [e(i,t)-e(i,.)]
	(1)	(2)	(3)	(4)	(5)	(6)
SSA	0.42	-0.04	0.66	-0.68	-0.80	-0.14
LAC	0.50	0.02	0.67	-0.29	-0.63	0.10
SASI	0.36	-0.06	0.60	-0.67	-0.85	-0.05
EAP	0.41	0.61	0.81	-0.08	-0.19	0.06
MENAT	0.44	-0.02	0.64	-0.48	-0.75	0.02
INDU	0.68	-0.05	0.76	-0.54	-0.51	-0.32
ALL	0.51	0.10	0.74	-0.48	-0.63	-0.04

Notes: Using the system-GMM parameter estimates, we can write *Growth(i,t) = Fit(i,t) + e(i,t)*, where *Growth* is observed growth, *Fit* is predicted growth given the estimated parameters and observed values for the explanatory variables, and *e(i,t)* is a residual that balances the equation. The notation *e(i,.)* refers to the average value of *e(i,t)* over all periods for country *i*. It can be thought of as an estimated 'country effect.' Note that if we estimated the equation by OLS, the correlation between fit and overall residual (column (4)) would be zero by construction. In the current model, the only (near-)orthogonality we have in the sample is between the *sum of* the fit and the country effects and the idiosyncratic residuals e(i,t) – e(i,.). This is indicated in the bottom right entry of the table.
Source: Calculated using Table 4.1, column 3.

Table 5.1.1 *Baseline pooled regressions.*

Dependent variable: growth in real GDP per capita	Full sample				Developing countries only				
	(1)		(2)		(3)	(4)	(5)	(6)	
	Coef.	Beta	Coef.	Beta	Coef.	Coef.	Coef.	Coef.	Beta
Initial conditions									
ln(initial income)	-1.356	-0.46	-1.479	-0.50	-1.064	-1.574	-0.949	-1.580	-0.39
	-5.326		*-6.022*		-3.438	-5.340	-2.842	-5.082	
initial life expectancy	0.103	0.42	0.093	0.37	0.102	0.102	0.108	0.104	0.34
	4.392		*3.777*		4.132	4.008	4.201	3.808	
Demographics									
age dependency	-0.057	-0.34	-0.046	-0.27	-0.058	-0.045	-0.060	-0.048	-0.22
	-5.470		*-4.773*		*-5.127*	*-4.337*	*-4.961*	*-4.335*	
gr(LF)-gr(pop)	0.704	0.12	0.500	0.09	0.604	0.495	0.598	0.468	0.08
	2.976		*2.210*		*2.197*	*1.898*	*2.067*	*1.707*	
External shocks									
terms of trade shock	0.055	0.07	0.053	0.07	0.056	0.046	0.052	0.045	0.06
	1.900		*1.822*		*1.840*	*1.494*	*1.694*	*1.439*	
trading partner growth	0.574	0.22	0.406	0.15	0.591	0.390	0.604	0.390	0.15
	3.187		*2.417*		*2.995*	*2.140*	*3.039*	*2.075*	
Geography									
landlocked	-0.821	-0.10	-0.380	-0.05	-0.636	-0.206	-0.593	-0.209	-0.02
	-2.744		*-1.342*		*-1.673*	*-0.581*	*-1.577*	*-0.588*	
Investment *and aid*									
investment/GDP	--	--	0.157	0.39	--	0.172	--	0.171	0.42
	--		*6.539*		--	*6.411*	--	*6.040*	
aid ex TC grants/GDP	--	--	--	--	--	--	0.046	0.003	0.01
	--	--	--		--	--	*1.881*	*0.126*	
constant	10.453		8.577		8.550	8.731	7.547	9.008	
	4.519		*3.990*		*3.296*	*3.580*	*2.767*	*3.427*	
# of observations	615		592		490	478	468	457	
R^2	0.317		0.423		0.302	0.428	0.293	0.416	
Root MSE	2.488		2.293		2.697	2.452	2.726	2.490	

Notes: All regressions include halfdecade dummy variables. *t*-statistics are in italics. Variables are defined in Appendix Table A1. A decomposition of predicted growth deviations by region, using the regression in column 1, appears in Table 5.1.2.

Table 5.1.2 *Decomposition from the baseline regression, by region.*

Region	Observed growth rate	Deviation from sample mean		Residual	Implied country effect
		Observed	Predicted		
SSA	**0.69**	**-1.23**	**-1.16**	**-0.06**	**-0.06**
LAC	1.39	-0.53	-0.12	-0.41	-0.41
SASI	2.33	0.42	0.43	-0.01	-0.01
EAP	4.49	2.58	1.52	1.06	1.06
MENAT	2.93	1.02	0.35	0.67	0.67
INDU	2.74	0.82	1.06	-0.23	-0.23
All countries	1.91	0	0	0	0
	Implied contributions of:				
	Initial conditions	Demo-graphy	External shocks	Geography	Time effects
SSA	**-0.07**	**-0.85**	**-0.05**	**-0.15**	**-0.04**
LAC	0.18	-0.21	-0.17	0.07	0.03
SASI	0.58	-0.22	0.10	0.04	-0.07
EAP	0.27	0.60	0.56	0.12	-0.04
MENAT	0.15	0.24	-0.09	0.12	-0.07
INDU	-0.42	1.26	0.07	0.03	0.11
All countries	0	0	0	0	0

Source: Calculated from the regression coefficients in column 1 of Table 5.1.1. The decomposition applies to the regression sample only. For a full set of fits, residuals, and implied contributions for the African case study countries, see Ndulu and O'Connell (2000), "Background Information on Economic Growth".

Table 5.1.3 *Baseline pooled regressions, SSA-only sample.*

Dependent variable: growth in real GDP per capita	Sub-Saharan Africa only					
	(1)		(2)	(3)	(4)	
	Coef.	Beta	Coef.	Coef.	Coef.	Beta
Initial conditions						
ln(initial income)	-0.826	-0.140	-1.873	-0.540	-1.959	-0.303
	-1.352		*-2.891*	*-0.823*	*-2.643*	
initial life expectancy	0.064	0.105	0.044	0.102	0.031	0.046
	1.000		*0.699*	*1.428*	*0.414*	
Demographics						
age dependency ratio	-0.044	-0.124	-0.012	-0.041	-0.012	-0.031
	-1.309		*-0.405*	*-1.215*	*-0.382*	
growth in potential	-0.619	-0.069	-0.042	-0.561	-0.047	-0.005
LF participation	*-1.022*		*-0.072*	*-0.896*	*-0.080*	
External shocks						
terms of trade shock	0.069	0.109	0.049	0.059	0.051	0.083
	1.234		*0.917*	*1.006*	*0.909*	
trading partner growth	-0.383	-0.142	-0.228	-0.389	-0.215	-0.078
	-0.837		*-0.545*	*-0.837*	*-0.497*	
proportion of dry years	-2.016	-0.201	-1.684	-2.041	-1.896	-0.184
	-1.953		*-1.764*	*-1.902*	*-1.889*	
Geography						
landlocked	-1.116	-0.164	-0.790	-0.974	-0.835	-0.123
	-2.060		*-1.524*	*-1.769*	*-1.517*	
Investment and aid						
investment/GDP	--	--	0.182	--	0.180	0.480
	--		*4.194*	--	*3.822*	
Aid ex TC grants/GDP	--		--	0.067	-0.002	-0.005
	--		--	*1.781*	*-0.047*	
constant	10.747		11.940	6.863	12.890	
	1.766		*2.071*	*1.099*	*1.905*	
Number of obs	181		172	175	166	
R-squared	0.169		0.335	0.181	0.333	
Root MSE	3.119		2.812	3.140	2.861	

Notes: All regressions include halfdecade dummy variables. *t*-statistics are in italics. Variables are defined in Appendix Table A1.

Appendix Table A5.1.4 *Average proportion of dry years per halfdecade, 1960/64-1990/97.*

Guinea	0.665	Cote d'Ivoire	0.396	Congo, Rep.	0.188
Mali	0.637	Cameroon	0.380	Uganda	0.171
Congo, D. R.	0.629	Ethiopia	0.327	Gabon	0.159
Senegal	0.629	Zambia	0.310	Namibia	0.135
Burkina Faso	0.616	Botswana	0.282	Tanzania	0.106
Sudan	0.608	Ghana	0.282	Kenya	0.086
Sierra Leone	0.588	Benin	0.261	Rwanda	0.086
C.A.R.	0.571	Togo	0.261	Burundi	0.057
Niger	0.531	Zimbabwe	0.212	Madagascar	--
Nigeria	0.453	Malawi	0.204	Mauritius	--
Angola	0.445	Mozambique	0.204		
Chad	0.424	South Africa	0.204		

Source: Authors' calculations using updated version of gridded weather station data presented in Hulme (1992b).

Table 5.2 *Partial correlations of growth with policy, institutions, and political stability.*

Variable	Estimated coefficient on policy variable				Africa effects in pooled regression			Conditioning on investment in pooled regression		
	Obs	Pooled	WG	Beta coeff from pooled regression	Intercept dummy	Coeff on policy	Africa/ policy interaction	Obs	I excluded	I included
		(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)
Macroeconomic policy										
fiscal deficit after	357	-0.1134	-0.1373	-0.189	-0.1162	-0.1144	0.0054	355	-0.1145	-0.1310
grants/GDP		*-3.54*	*-3.53*		*-0.20*	*-2.98*	*0.08*		*-3.58*	*-4.25*
inflation rate (< 500%)	605	-0.0087	-0.0130	-0.099	-0.3677	-0.0089	-0.0020	582	-0.0089	-0.0049
		-3.49	*-3.32*		*-0.94*	*-3.47*	*-0.20*		*-3.52*	*-1.95*
black market premium	549	-0.0072	-0.0120	-0.143	-0.4191	-0.0076	0.0005	531	-0.0071	-0.0068
(< 500%)		*-3.14*	*-5.10*		*-1.01*	*-2.60*	*0.11*		*-3.06*	*-2.91*
overvaluation index	564	-0.0047	-0.0045	-0.121	-0.5847	-0.0056	0.0032	542	-0.0046	-0.0061
		-4.37	-2.74		*-1.09*	*-7.39*	*1.14*		*-4.13*	*-7.36*
standard deviation of the	601	-0.0051	-0.0036	-0.097	-0.2669	-0.0060	0.0031	578	-0.0051	-0.0042
real exchange rate		-2.04	-1.86		*-0.71*	*-2.88*	*0.52*		*-2.05*	*-1.43*
initial reserves/GDP	569	0.0369	0.0335	0.121	-0.3721	0.0415	-0.0396	548	0.0372	0.0157
		3.48	*1.36*		*-0.84*	*3.74*	*-1.02*		*3.46*	*1.18*
initial external debt/GDP	292	-0.0017	0.0031	-0.042	-0.1177	-0.0023	0.0041	289	-0.0016	-0.0036
		-0.84	*1.07*		*-0.18*	*-0.91*	*0.59*		*-0.79*	*-1.26*
Openness										
Sachs/Warner openness	477	0.5150	--	0.081	-0.4082	0.6268	-4.0008	457	0.5317	0.6917
		1.34	--		*-0.82*	*1.59*	*-1.19*		*1.35*	*1.95*
trade/GDP	615	0.0106	0.0437	0.148	-2.3545	0.0079	0.0291	592	0.0109	0.0020
		3.78	*4.82*		*-2.81*	*3.53*	*2.31*		*3.84*	*0.89*
manufacturing trade/GDP	485	0.0205	0.0495	0.171	-2.2934	0.0192	0.0786	478	0.0201	0.0095
		4.60	*3.46*		*-3.65*	*4.44*	*3.48*		*4.51*	*2.11*
manufacturing	491	0.0420	0.0490	0.177	-0.7621	0.0414	0.0853	484	0.0276	0.0414
exports/GDP		*4.41*	*1.79*		*-1.65*	*4.39*	*2.28*		*2.78*	*4.34*
Share of manufacturing	491	0.0162	-0.0026	0.167	-0.0879	0.0165	-0.0060	484	0.0161	0.0150
in exports		*3.38*	*-0.20*		*-0.17*	*3.38*	*-0.38*		*3.30*	*3.25*

Notes: see continuation of table.

Table 5.2, continued *Partial correlations of growth with institutions, political instability, and policy.*

Variable	Estimated coefficient on policy variable				Africa effects in pooled regression			Conditioning on investment in pooled regression.		
	Obs	Pooled	WG	Beta coeff from pooled regression	Intercept dummy	Coeff on policy	Africa/ policy interaction	Obs	I excluded	I included
		(1)	(2)	(3)	(4)	(5)	(6)		(7)	(8)
Public sector										
gov't nonprod cons/GDP	483	-0.0601	-0.0070	-0.140	0.1889	-0.0543	-0.0161	461	-0.0564	-0.0581
(Barro-Lee)		*-2.38*	*-0.16*		*0.24*	*-2.15*	*-0.30*		*-2.11*	*-2.58*
gov't consumption/GDP	288	-0.0165	-0.0833	-0.066	-0.4963	-0.0146	0.0001	288	-0.0165	-0.0122
		-0.95	*-2.48*		*-0.35*	*-0.79*	*0.00*		*-0.95*	*-0.69*
share of public sector	328	-0.0132	-0.0095	-0.069	0.0016	-0.0123	-0.0019	328	-0.0132	-0.0119
in total investment		*-1.18*	*-0.60*		*0.16*	*-0.70*	*-0.08*		*-1.18*	*-1.05*
gov't corruption index,	505	0.0783	--	0.048	-1.0063	0.1802	-0.0084	489	0.0948	0.1131
early 1980s		*0.80*	--		*-1.48*	*1.49*	*-0.04*		*0.96*	*1.30*
quality of bureaucracy,	505	0.1388	--	0.085	-1.5910	0.2324	0.1782	489	0.1645	0.1754
early 1980s		*1.30*	--		*-2.47*	*1.84*	*0.92*		*1.52*	*1.77*
law and order index,	505	0.1189	--	0.073	-0.5751	0.2216	-0.1738	489	0.1440	0.2250
early 1980s		*1.09*	--		*-0.68*	*1.89*	*-0.52*		*1.28*	*2.22*
composite governance	258	0.1002	0.1671	0.153	-1.6557	0.1790	0.0037	258	0.1002	0.1186
index		*1.72*	*1.22*		*-1.23*	*2.51*	*0.03*		*1.72*	*2.21*
Financial depth										
initial M2/GDP ratio	521	0.0126	0.0028	0.099	-0.6456	0.0120	0.0102	514	0.0012	0.0125
		2.19	*0.20*		*-0.91*	*2.03*	*0.47*		*0.18*	*2.17*
Political stability										
coups	485	-1.6652	-2.2352	-0.054	0.0618	-0.6543	-2.3789	462	-2.3720	-1.4702
		-1.38	*-1.69*		*0.15*	*-0.45*	*-0.96*		*-2.01*	*-1.29*
political instability index	585	-1.1417	-1.2071	-0.146	-0.3113	-1.1179	-2.5953	562	-1.1638	-0.6975
		-5.20	*-3.50*		*-0.78*	*-5.18*	*-2.13*		*-5.23*	*-3.40*
Investment										
investment/GDP	592	0.1572	0.1811	0.389	-0.9439	0.1439	0.0264		--	--
		6.54	*7.90*		*-1.17*	*7.59*	*0.65*		--	--

Source: Variables defined in Appendix Table A1. Variables are added individually to the baseline regression in col 1 Table 5.1.1. Partial correlations are therefore conditional on thebaseline variables, including a set of halfdecade dummy variables. Investment is excluded except in column 8. *t*-statistics are in italics.

Table 5.3.1 *Growth, policy and institutions: pooled sample.*

Dependent variable: growth in real GDP per capita	Specification 1		Specification 2		Specification 3		Specification 4	
		Beta coeff.		Beta coeff.		Beta coeff.		Beta coeff.
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
ln(initial income)	-1.765	-0.631	-1.698	-0.580	-1.833	-0.657	-2.065	-0.772
	-6.104		-4.951		*-5.778*		*-6.087*	
life expectancy	0.089	0.375	0.076	0.300	0.085	0.353	0.079	0.327
	2.872		2.136		*2.424*		*2.613*	
age dependency ratio	-0.052	-0.338	-0.043	-0.269	-0.047	-0.308	-0.051	-0.348
	-4.222		-3.125		*-3.492*		*-2.988*	
growth of potential	0.728	0.126	0.786	0.131	0.661	0.114	0.785	0.138
LF participation	*2.711*		2.622		*2.359*		*2.504*	
terms of trade shock	0.004	0.006	0.016	0.023	0.016	0.023	-0.016	-0.025
	0.146		0.530		*0.546*		*-0.546*	
trading partner growth	0.540	0.231	0.607	0.249	0.516	0.220	0.488	0.191
	2.759		2.962		*2.463*		*1.876*	
landlocked	-0.912	-0.113	-1.185	-0.143	-0.874	-0.106	-0.694	-0.086
	-2.725		-2.949		*-2.246*		*-1.559*	
political instability	-0.975	-0.137	-1.062	-0.154	-0.740	-0.109	-0.780	-0.122
	-4.220		-4.382		*-3.040*		*-2.565*	
financial depth (M2/GDP)	--	--	0.021	0.164	--	--	--	--
	--		2.842		--		--	
inflation	-0.004	-0.051	--	--	-0.003	-0.032	-0.002	-0.030
	-1.830		--		*-1.170*		*-0.766*	
black market premium	-0.007	-0.134	-0.008	-0.153	-0.008	-0.153	-0.009	-0.176
	-2.403		-2.687		*-2.399*		*-2.293*	
gov't nonprod. cons./GDP	-0.113	-0.254	-0.105	-0.225	-0.113	-0.252	-0.100	-0.239
(Barro/Lee)	*-4.555*		-3.931		*-4.210*		*-3.681*	
ratio of manufacturing	--	--	--	--	0.026	0.137	0.029	0.175
trade to GDP	--		--		*2.721*		*3.032*	
fiscal deficit after	--	--	--	--	--	--	-0.103	-0.181
grants/GDP	--		--		--		*-2.928*	
constant	15.347	--	12.782	--	13.934	--	16.883	--
	5.365		4.449		*4.903*		*5.053*	
# of observations	422		364		363		258	
F	15.58		13.58		13.68		12.53	
Prob > F	0		0		0		0	
R-squared	0.407		0.402		0.417		0.467	
Root MSE	2.186		2.278		2.179		2.005	

Notes: All regressions include halfdecade dummy variables. *t*-statistics are in italics. Variables are defined in Appendix Table A1.

Table 5.3.2 *Decompositions based on full pooled regression.*

Region	Deviation of actual growth from sample mean	Contribution of:			
		Baseline variables	Political instability	Policy	Residual
	(1)	(2)	(3)	(4)	(5)
Column 1 of Table 5.3.1:					
SSA	**-1.24**	**-0.53**	**0.12**	**-0.73**	**-0.12**
LAC	-0.61	-0.31	-0.14	0.00	-0.19
SASI	0.12	1.06	-0.22	-0.76	0.06
EAP	2.13	1.38	0.08	0.33	0.38
MENAT	1.00	0.21	-0.01	0.19	0.69
INDU	0.57	0.06	0.05	0.61	-0.16
Column 2 of Table 5.3.1:					
SSA	**-1.4**	**-0.42**	**0.15**	**-1.01**	**-0.17**
LAC	-0.62	-0.14	-0.17	-0.24	-0.09
SASI	0.53	1.26	-0.27	-0.76	0.34
EAP	2.42	1.53	0.11	0.25	0.56
MENAT	1.02	0.13	0	0.49	0.45
INDU	0.57	-0.31	0.07	1.1	-0.27
Column 3 of Table 5.3.1:					
SSA	**-1.26**	**-0.32**	**0.10**	**-0.89**	**-0.19**
LAC	-0.61	-0.25	-0.10	-0.14	-0.15
SASI	0.42	1.31	-0.20	-0.91	0.28
EAP	2.32	1.41	0.07	0.50	0.37
MENAT	0.91	0.14	-0.01	0.28	0.56
INDU	0.38	-0.26	0.03	0.78	-0.16
Column 4 of Table 5.3.1:					
SSA	**-1.14**	**-0.12**	**0.11**	**-1.05**	**-0.15**
LAC	-0.93	-0.2	-0.1	-0.18	-0.46
SASI	0.68	1.59	-0.21	-1.17	0.57
EAP	2.35	1.48	0.07	0.65	0.14
MENAT	0.71	0.18	-0.03	0.04	0.56
INDU	0.18	-0.65	0.04	0.8	0.01

Source: Calculated using regression coefficients from Table 5.3.1. The decomposition applies to the regression samples only.

Appendix 1
Definitions of variables

Table 2.1.1 (Chenery-Syrquin-style regressions)

shares of agriculture, industry, services etc in GDP are from WDI99, in constant 1995 dollars. These three sum up to 1. The share of manufacturing in GDP is a subset of industry and from the same source.

labor force share of agriculture is from WDI99.

ratio of APL in agri to APL in non-agri is constructed from real sectoral GDPs and sectoral labor forces for agri and non-agri, all from WDI99.

initial income is the value of real GDP per capita in chained 1985 international prices, for the first year of the halfdecade (PWT 5.6, extended in GDN dataset).

population is population in thousands (GDN dataset).

Table 4.1 (Hoeffler 1999, augmented Solow model)

growth in real GDP per capita is the difference between the log of initial income (as defined below) in the next halfdecade and the log of initial income in the current halfdecade.

initial income is the same variable as in Table 2.1.1.

investment rate is the ratio of investment to GDP, both in constant 1985 international dollars (PWT5.6), averaged over 1960-65, 1965-70, etc (note overlap).

$g + \delta + n$ is 0.05 plus the average population growth rate over the halfdecade (following Mankiw, Romer and Weil (1992), $g + \delta$ is taken to be 0.5). Population data from World Bank.

schooling is average years of total schooling for the population aged 15 and over, from Barro and Lee 1993 as updated by Barro and Lee.

Table 5.1.1 – 5.1.3 (Baseline pooled regression)

growth in real GDP per capita is the average growth rate of real GDP in constant local currency for the halfdecade (GDN dataset).

initial income is the same variable as in Table 2.1.1.

life expectancy is years of life expectancy at birth, for the initial year of the halfdecade (GDN dataset, values linearly interpolated to initial year where necessary).

age dependency is the ratio of population aged below 15 or above 65 to population between 15 and 65 (WDI99).

growth in the potential labor force is the difference between the average growth rate of the population of labor force age (15 – 65) (WDI99) and the average growth rate of the total population (GDN dataset) over the halfdecade.

terms of trade shock is the average annual cumulative income effect of changes in the terms of trade over the halfdecade, as defined in equation (6) in the text. The share of exports in GDP is from WDI99 and pertains to the initial year of the halfdecade. Terms of trade data are from the GDN dataset, as supplemented by data made available by Susan Collins.

trading partner growth is the halfdecade average weighted growth rate of real GDP per capita (as defined above) for the country's trading partners, with weights defined as the partner's share in total imports plus exports (GDN dataset).

proportion of dry years is the proportion of years in the halfdecade in which total precipitation was more than 1 standard deviation below the mean annual precipitation for 1940-1969. Details available from the authors.

landlocked is a dummy variable taking the value 1 for landlocked countries (GDN dataset).

investment/GDP is the halfdecade average ratio of gross domestic investment to GDP, both in current local currency (WDI99).

Table 5.2 (Partial correlations)

fiscal deficit after grants/GDP is the halfdecade average of the percentage ratio of the government budget deficit including grants to GDP, both in current local currency (GDN dataset).

inflation rate (< 500) is the halfdecade average percentage increase in the consumer price index from the previous year (GDN dataset). We extended the coverage of this series using GDP deflator data from the IMF's IFS. This variable is replaced with missing if its value exceeds 500%.

black market premium (<500) is the percentage excess of the black market exchange rate over the official exchange rate (GDN dataset). This variable is replaced with missing if its value exceeds 500%.

overvaluation index is from the GDN dataset; it is the real exchange rate against the US dollar, multiplied by a country-specific constant so as to convert the average for 1976 to be equal to the average degree of overvaluation 1976-85 estimated by Dollar (1993). We extended the coverage of this series by creating an extended real exchange rate variable. This was done by splicing GDP deflators to the CPI series where possible.

standard deviation of the real exchange rate is the halfdecade standard deviation of the extended real exchange rate against the US dollar.

initial reserves/GDP is the ratio of total reserves minus gold (IMF, IFS) to GDP in current dollars (WDI99). in the initial year of the halfdecade.

initial external debt/GDP is the ratio of external debt to GDP in the initial year of the halfdecade (GDN dataset).

Sachs/Warner openness is the proportion of years 1965-90 that a country is deemed 'open' by the criteria of Sachs and Warner (1997). This includes low average tariffs, low black market premium, absence of government monopoly of exports, and non-socialist government.

trade/GDP is the average percentage ratio of imports plus exports (in current dollars) to GDP in current dollars (WDI99).

manufacturing trade/GDP is the average percentage ratio of manufacturing imports plus manufacturing exports (in current dollars) to GDP in current dollars (WDI99).

manufacturing exports/GDP is the average percentage ratio of manufacturing exports (in current dollars) to GDP in current dollars (WDI99).

share of manufacturing in exports is the average ratio of manufacturing exports to total exports, both in current dollars (WDI99).

government nonproductive consumption/GDP (Barro-Lee) is the ratio of real government consumption to GDP, both at 1985 international prices, minus the ratios of nominal government spending on education and defense to nominal GDP. Where the resulting series is negative, Barro and Lee replace it with .01. We extended this variable using local currency data on government spending and GDP from the GDN dataset (ultimately from IMF, Government Finance Statistics). This required 'splicing' the two series, since the sources are not identical. We spliced by setting average values equal for the 1980-84 period.

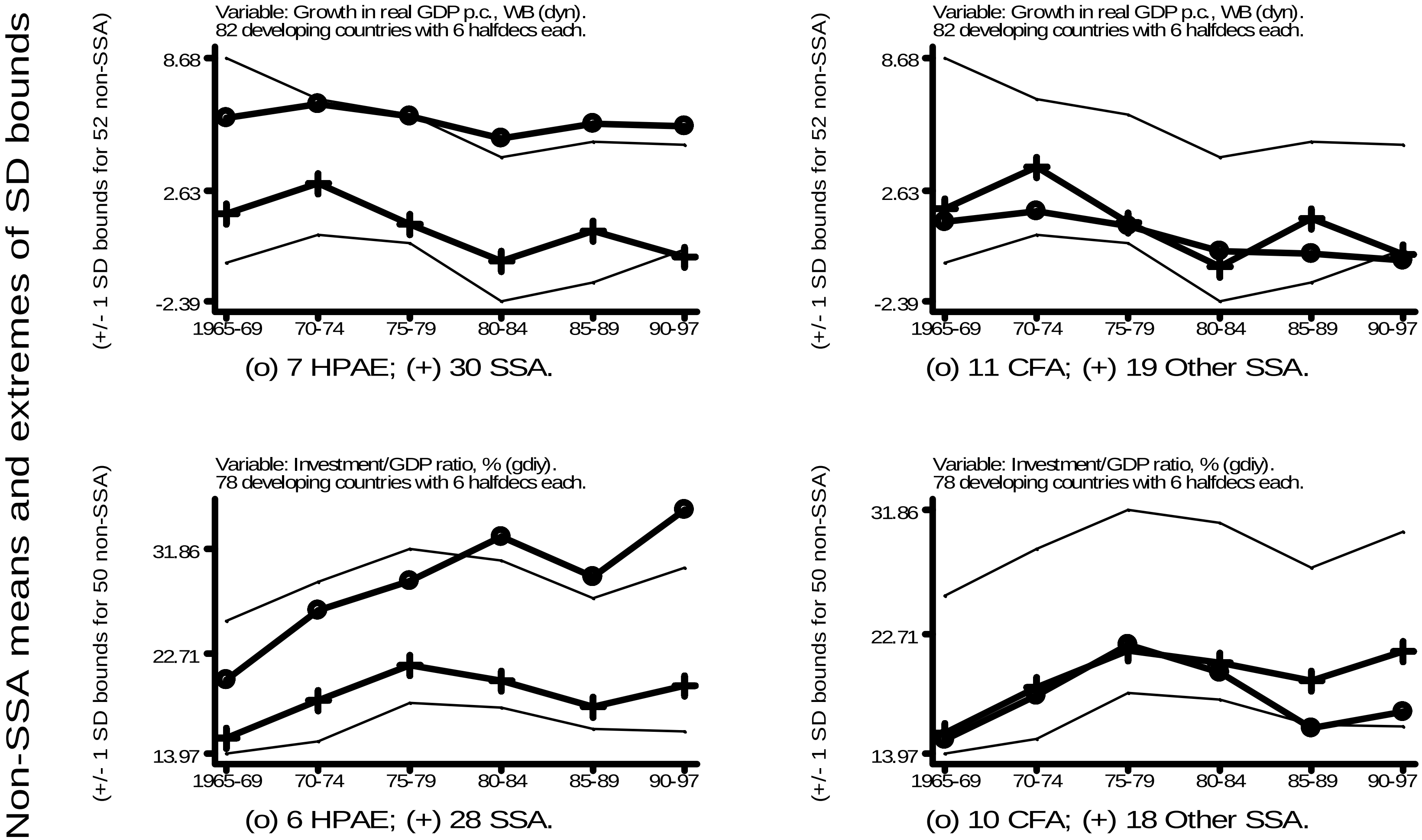
share of public sector in total investment is the percentage ratio of public investment as a share of GDP (GDN dataset) to total investment/GDP (from WDI99, as described above). For 5 observations where this variable exceeded 100, we set the value equal to missing.

government corruption index, early 1980s is an index from 1 to 6, with an increase denoting less corruption, from the ICRG dataset. We use the average of values for the 1980-84 halfdecade

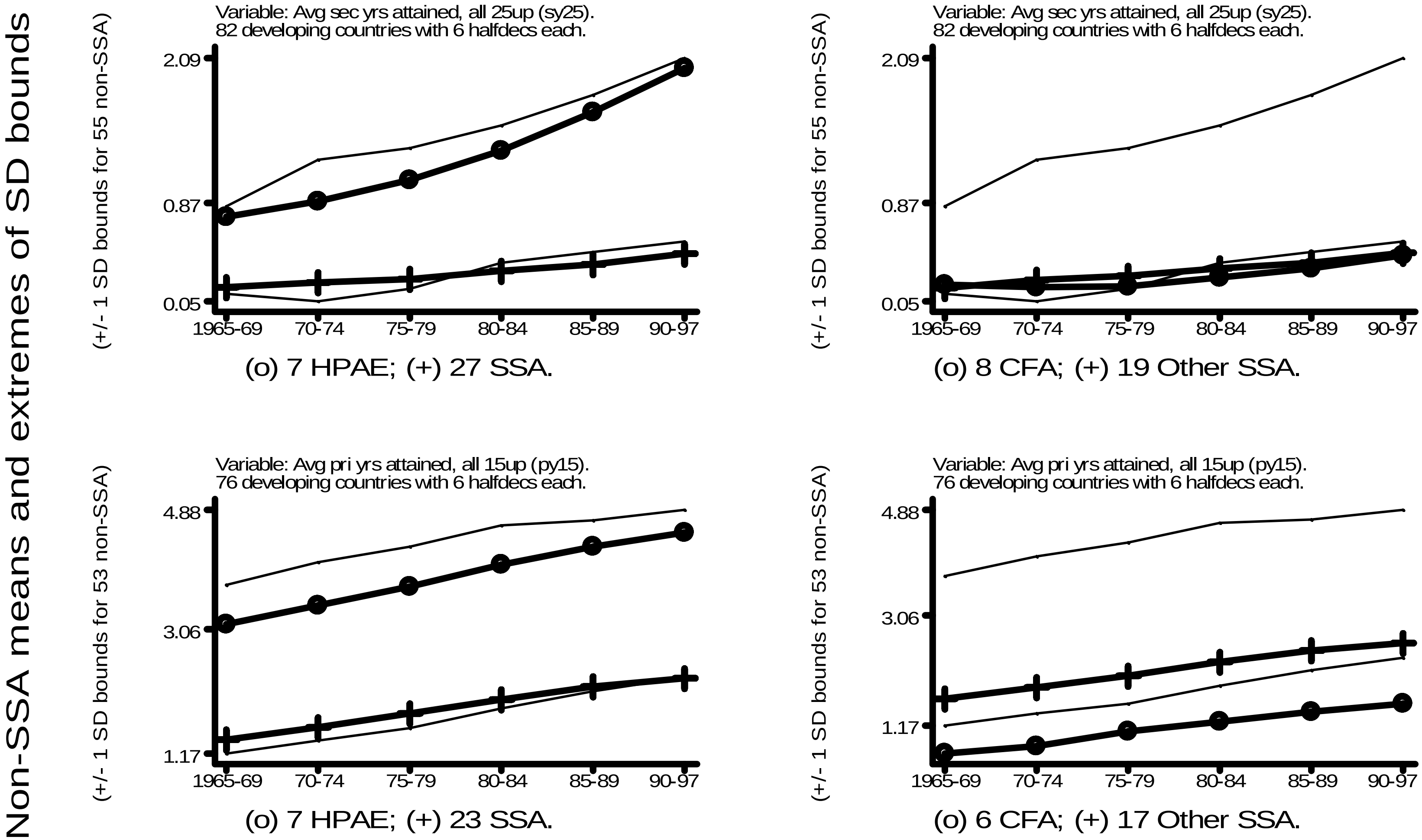
quality of bureaucracy, early 1980s is an index from 1 to 6, with an increase denoting higher quality, from the ICRG dataset. We use the average of values for the 1980-84 halfdecade.

law and order index, early 1980s is an index from 1 to 6, with an increase denoting improved law and order, from the ICRG dataset. We use the average of values for the 1980-84 halfdecade.

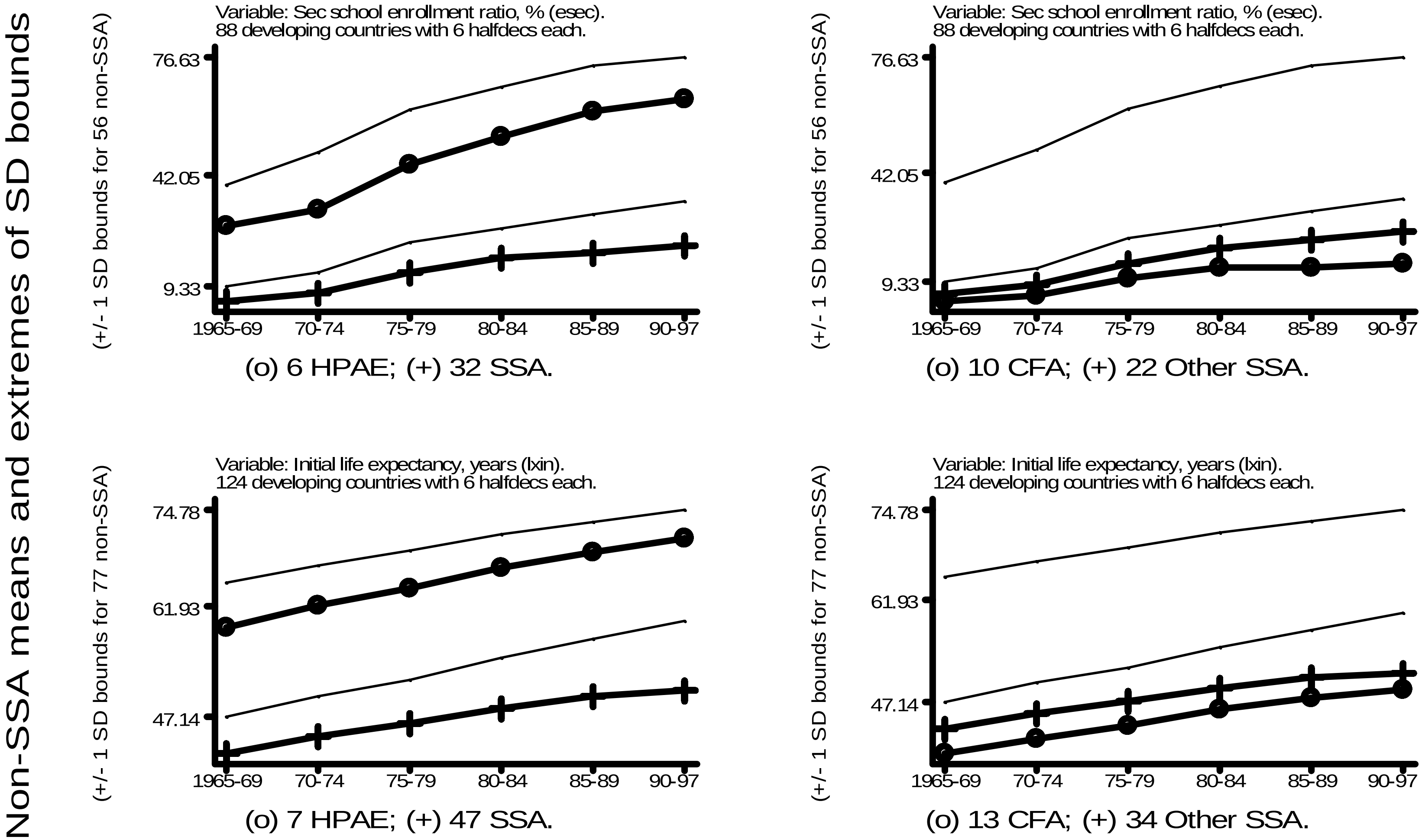
composite governance index is the sum of the government corruption index, the quality of bureaucracy index, and the law and order index, from ICRG.
investment/GDP is as defined above for Table 5.1.1.



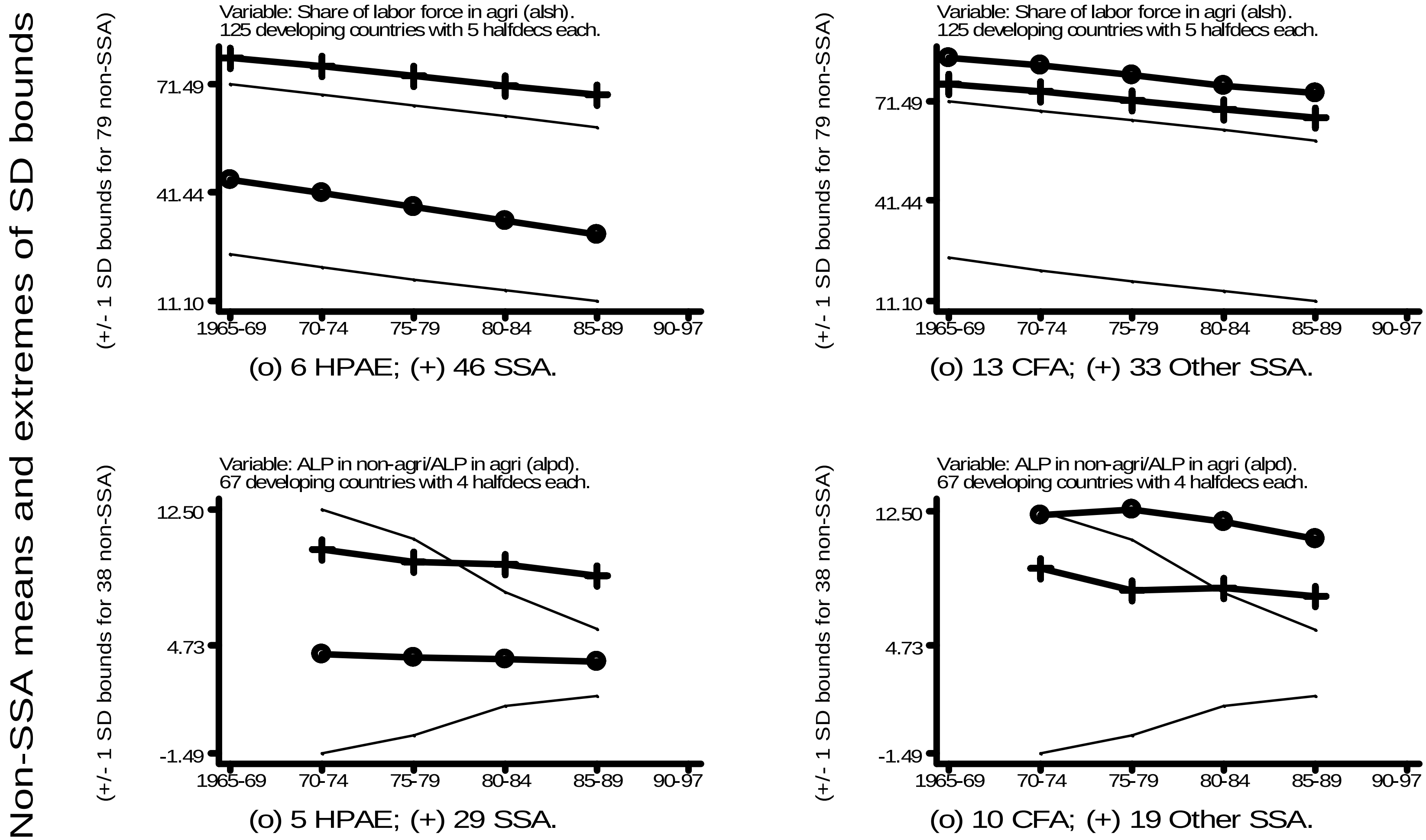
Figures 1a and 1b: dyn and gdiy.



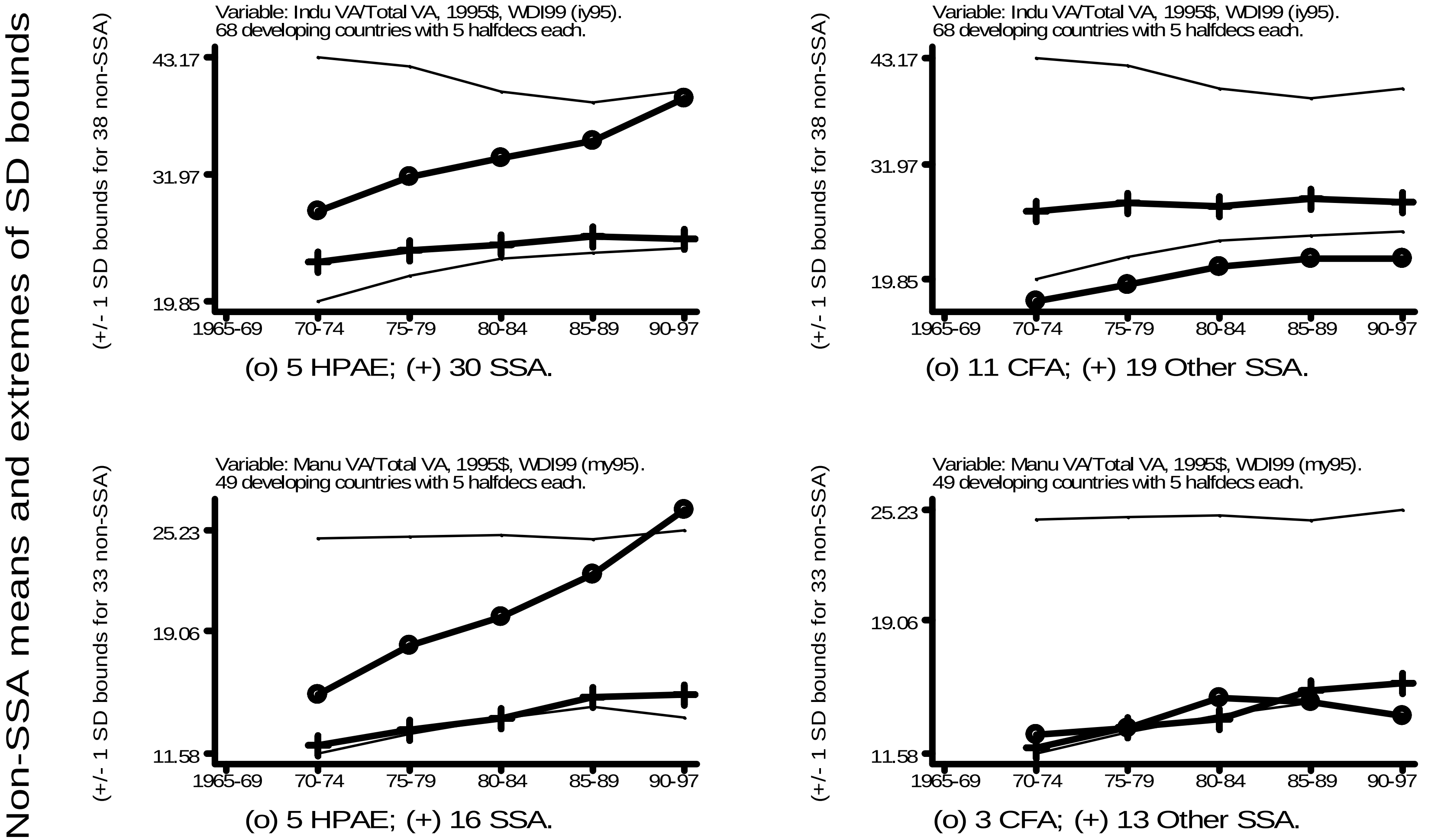
Figures 2a and 2b: sy25 and py15.



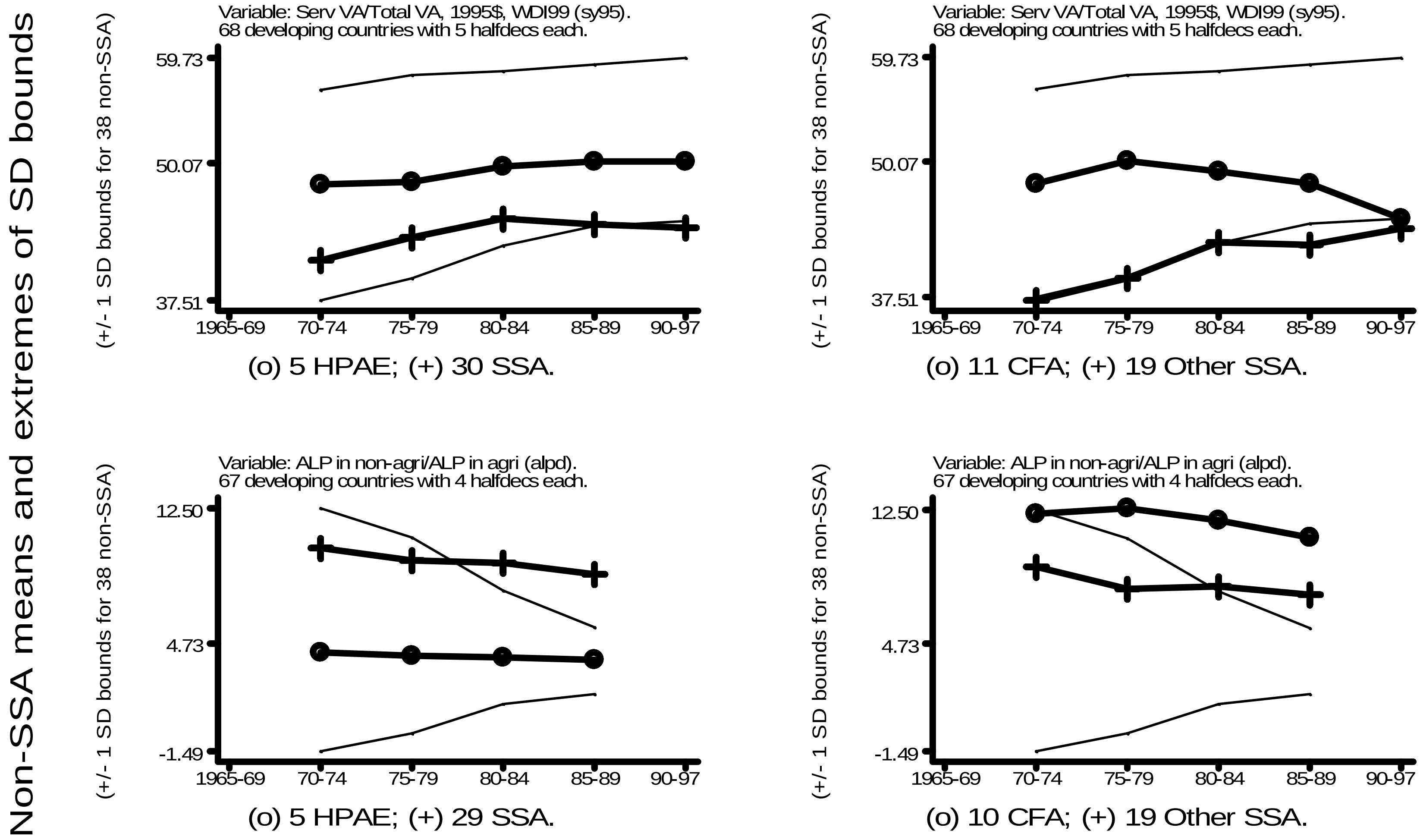
Figures 3a and 3b: esec and lxin.



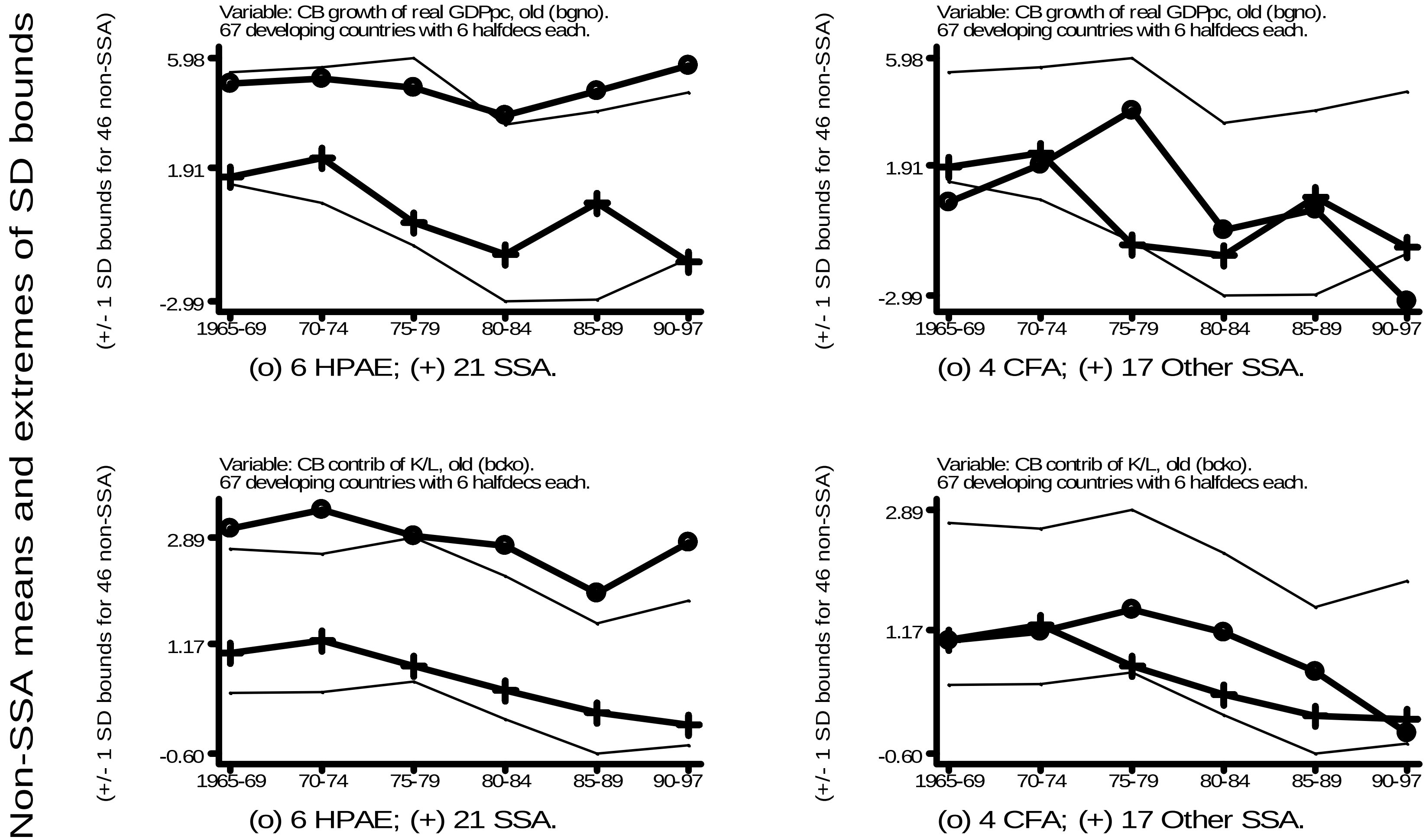
Figures 4a and 4b: alsh and alpd.



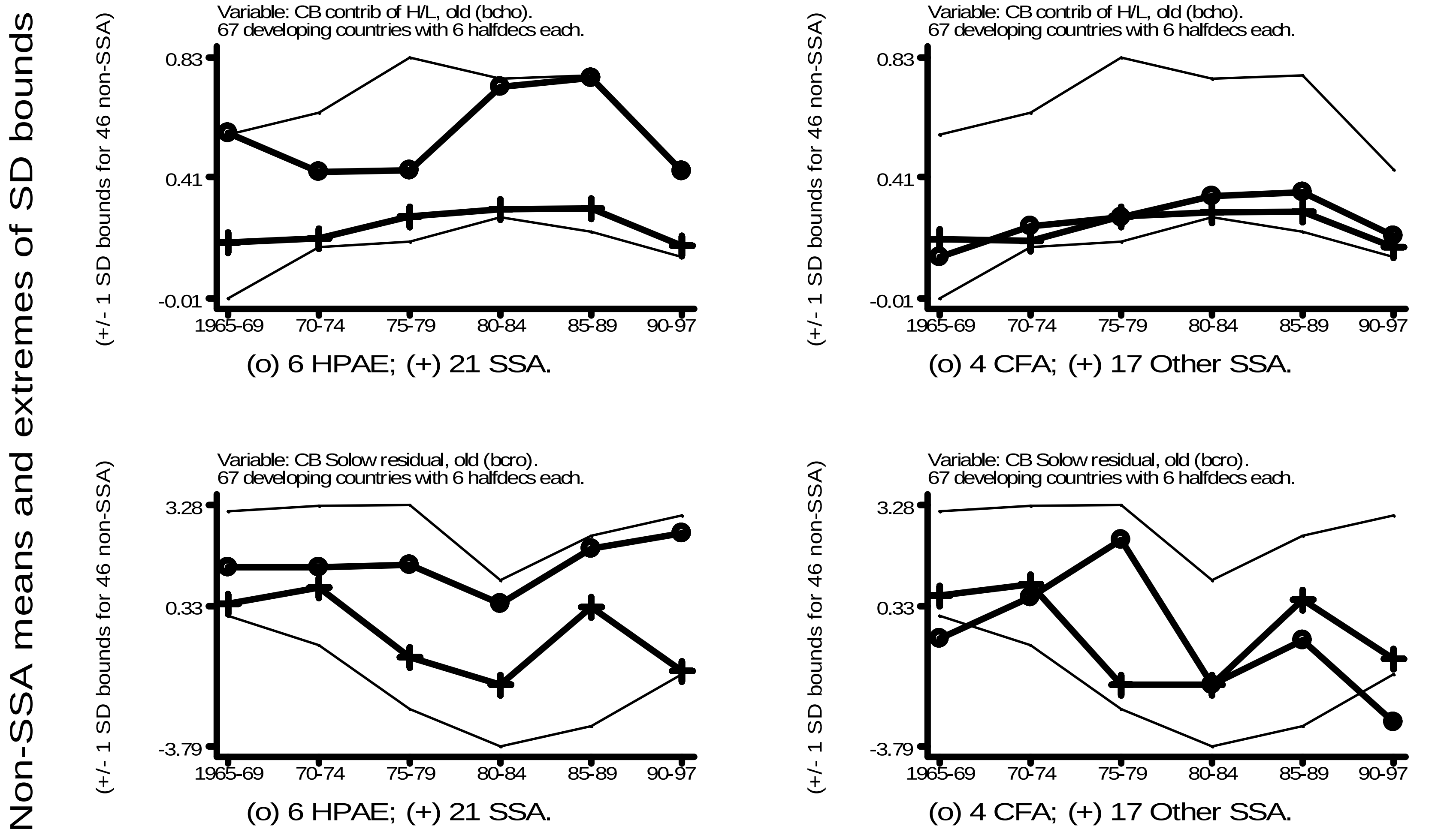
Figures 5a and 5b: iy95 and my95.



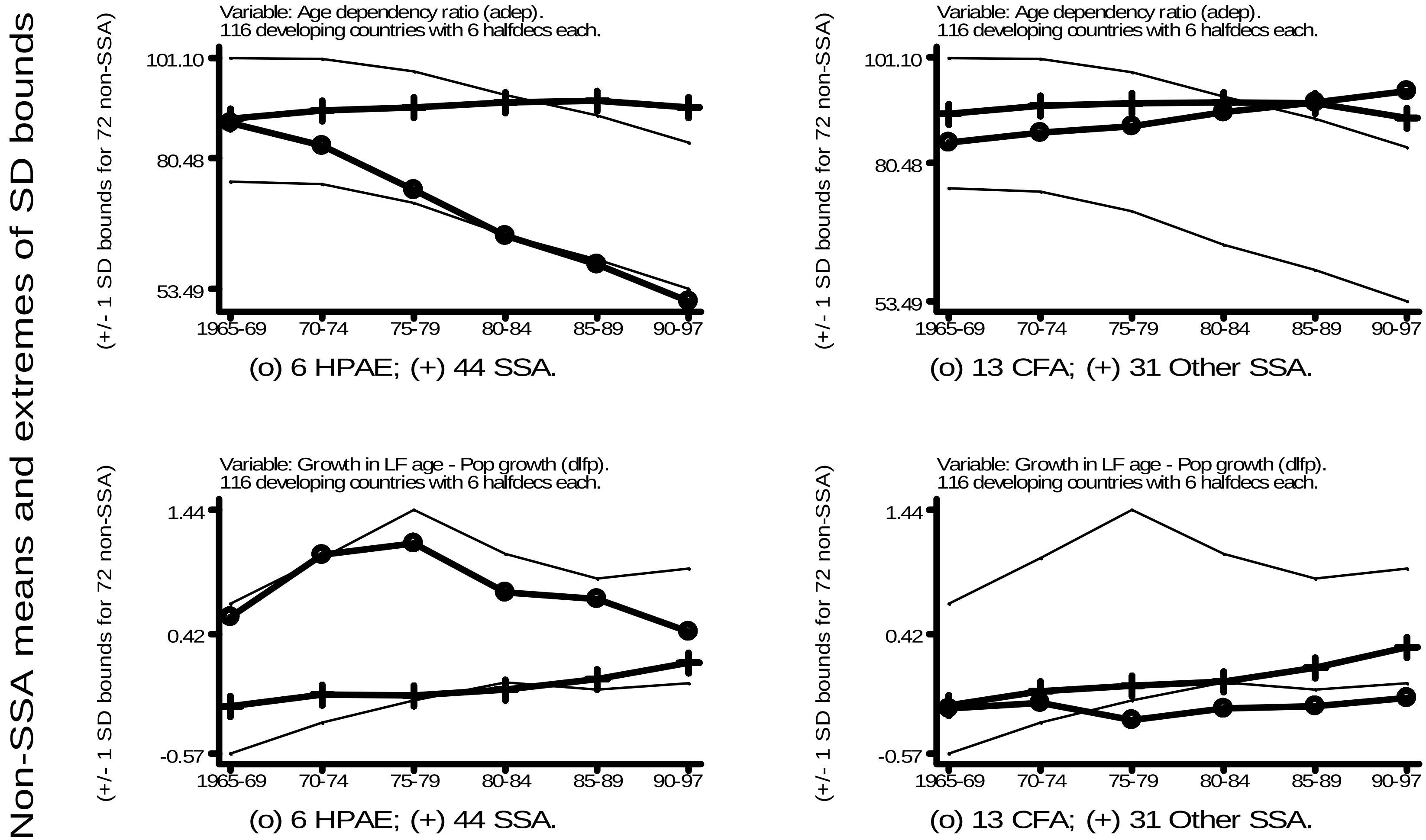
Figures 6a and 6b: sy95 and alpd.



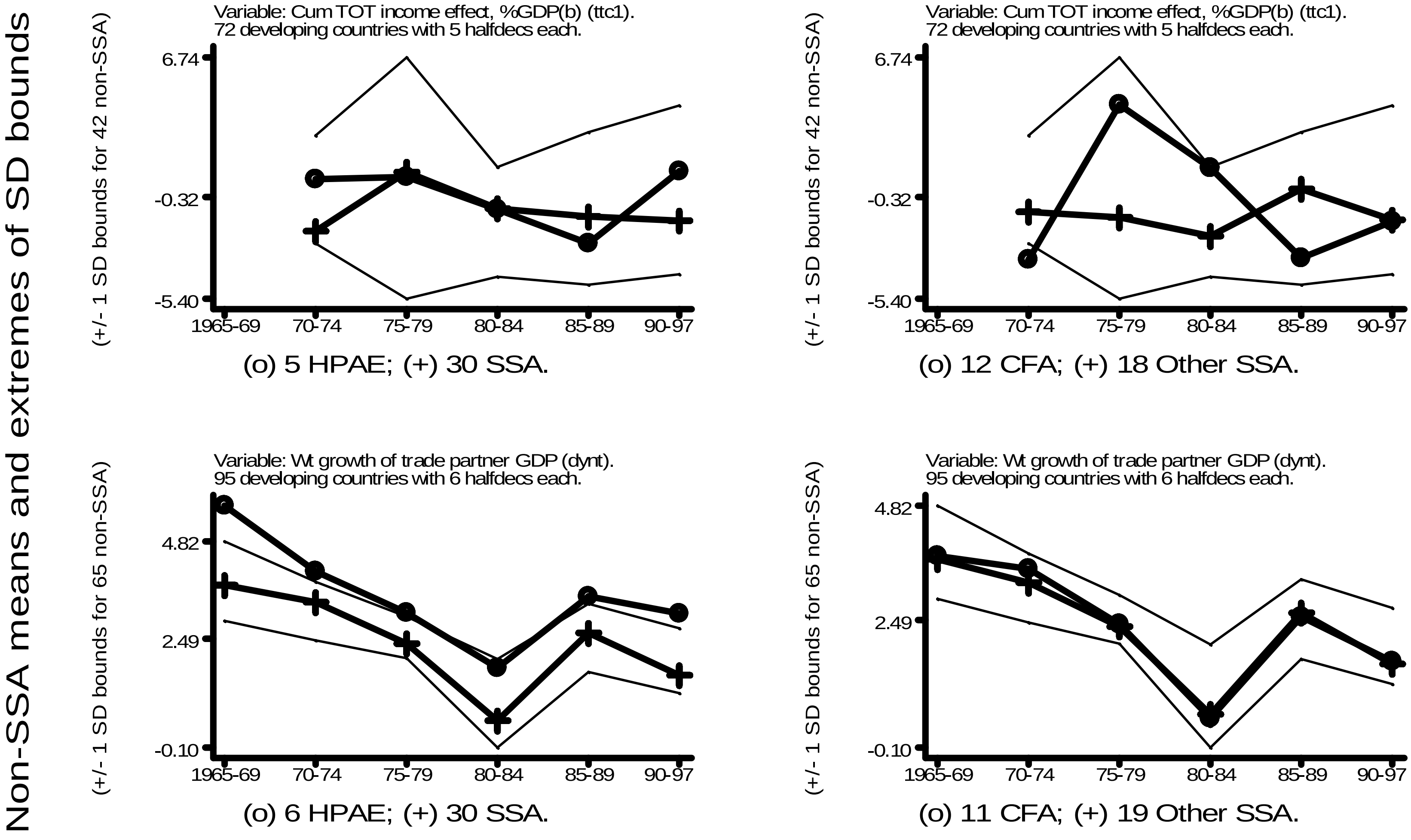
Figures 7a and 7b: bgno and bcko.



Figures 8a and 8b: bcho and bcro.



Figures 9a and 9b: adep and dlfp.



Figures 10a and 10b: ttc1 and dynt.