DOES AFRICA GROW DIFFERENTLY?

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Abstract

This paper argues that understanding the mechanisms of growth requires going beyond the reduced form, and demonstrates important differences in the mechanisms of growth in Africa. Certain policy distortions and exogenous factors are more costly to growth in Africa than elsewhere, while the growth benefits of other reforms and exogenous factors are more limited in Africa than elsewhere. These differences are most apparent in equations which separately explain the explanatory variables common in reduced form growth equations. An expanded growth accounting framework shows that many of the differences in Africa's growth mechanisms are also quantitatively significant in explaining Africa's slow growth.

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1. Introduction

Generating sustained growth in Sub-Saharan Africa is often cited as the most pressing challenge in global development; yet, in the voluminous empirical literature on economic growth, Sub-Saharan Africa exists primarily as a dummy variable in a single reduced-form growth regression.[1] This paper seeks to address that problem by examining in greater detail the mechanisms of economic growth, asking in particular whether those mechanisms operate differently in Africa.

Several recent studies have suggested that Africa is not different from other regions with regard to the factors contributing to growth.[2] The present paper argues that such a view can only be sustained (with exceptions) at the level of the Barro-style growth regression, in which one identifies the "direct" (reduced form) determinants of growth. Yet, if one goes beyond the basic reduced-form growth regression to specify the determinants of the explanatory variables commonly found in reduced-form growth regressions, Africa fails to benefit from several important mechanisms which contribute to growth in a broader cross-section of countries. Similarly, the negative indirect growth effects of several variables are magnified in Africa. For instnace, institutional improvement in Africa is less effective than elsewhere in promoting openness, the lack of which is more costly to growth in Africa. At the same time, institutional reform has a greater impact on deficit reduction in Africa; yet, the growth benefits of deficit reduction are smaller in Africa than elsewhere. These differences can have important implications for policies designed to promote economic growth, and may help to explain the mixed results to date from policy reform efforts in Africa.

The discussion is organized as follows. The following section sets the context, providing a brief overview of descriptive statistics comparing African and non-African low- and middle-income countries. Section 3 outlines the theoretical framework guiding the analysis, the two-part goal of which is to identify the channels of influence through which the determinants of growth operate and to determine whether those channels operate similarly in African and non-African countries. Section 4 presents the empirical results of that analysis, while Section 5 presents a growth accounting framework to assess the relative importance of the differences in African growth mechanisms. Section 6 concludes.

2. Data: Africa vs. Other Developing Areas

A simple comparison of the African and non-African data on the variables used in this analysis highlights many of the challenges confronting African governments. Of course, there is substantial variation within Africa on each of these variables. Recognizing that variation, however, one can still distinguish the African experience from that of the rest of the world at a

[1] For the remainder of this paper, the term "Africa" is intended to refer specifically to Sub-Saharan Africa as defined in Appendix B.

[2] Easterly and Levine (1997), Sachs and Warner (1997), and Rodrik (1997), Bloom and Sachs (1998).

certain level of aggregation, which is the level addressed in this paper. The data set itself includes 89 countries (listed in Appendix A) with 1990 real GDP per capita less than $15,000 (in 1985 international prices).[3] Of these 89 countries, 35 are located in Africa. The data set covers the period 1970 - 1995, and is structured as a panel with observations for each country consisting of five-year averages. Each country thus has 5 observations -- the averages for 1970-1974, 1975-1979, 1980-1984, 1985-1989, and 1990-1995. The statistical analysis presented in this paper is estimated using the last four periods only (1975-1995) so that observations from the first period could be reserved for use as instruments. This section provides an overview of descriptive statistics for Africa versus non-Africa during the period 1975-1995.

The most basic (and striking) point is that the average growth in per capita income for Africa over this period was slightly negative (-0.23 percent per year), compared with an average growth rate of 1.6 percent per year in the non-African low- and middle-income countries. Variation in growth rates within Africa was also substantially greater, as measured by the coefficient of variation of 16.8 versus 2.4 for non-Africa. Africa's uniquely disappointing experience over this period has motivated a plethora of studies, the titles of which justifiably use words like "tragedy" and "crisis." Not only did average African incomes grow more slowly than elsewhere, but African countries began in the first period (1970-74) with less than half the initial income per capita of the non-African countries: $926 versus $2184 (in 1985 international prices). While the most recent data indicate more robust growth in average African incomes (5 percent growth in 1996), Rodrik (1997) notes that roughly one-third of African countries today have real per capita incomes lower than they did in the early 1960s.

In many respects the differences are not great; yet, in most of the instances where there are substantial differences in means, the comparison is unfavorable to Africa. Cases in point include such social indicators as life expectancy at birth, the stock of education, and ethnolinguistic fragmentation.[4] There are also large differences between the African and non-African sub-samples in certain policy-related indicators, such as degree of openness to trade, investment price distortions, and inflation.

The broad picture of Africa that emerges in comparison to other low- to middle-income areas is of a poorer set of countries with lower investment, the economies of which slowly shrank while other economies grew. Institutional development tended to be lower, population growth higher, human capital less available, and policy distortions more severe. Exogenous factors added disproportionately to the challenges of African development, as well.

3. Theoretical Framework

[3] Data definitions and sources are presented in Appendix B.

[4] Variable definitions and sources are presented in Appendix B.

The empirical analysis presented in this paper has two goals: 1) to identify the mechanisms through which the ostensibly direct (e.g., reduced form) determinants of growth operate, and 2) to determine whether these mechanisms operate differently in Africa. The theoretical approach to the first goal loosely follows Taylor (1998), which argues that the standard growth regressions alone are incapable of identifying the mechanisms through which reduced form explanatory variables affect growth. To address this problem, Taylor constructs a theoretical framework which relates the growth of output to a system of equations which, in addition to the Barro-style reduced-form regression, includes equations designed to identify the sources of transmission through which the reduced form explanatory variables affect growth. This is accomplished by specifying equations to explain the relevant reduced form regressors.[5]

As Taylor notes, the appeal of a typical reduced form growth equation lies in the absence of endogenous control variables. In practice, however, it is implausible to hold that all potentially relevant environmental variables (fertility is a common example) are exogenous in the long run. Moreover, reduced form equations alone shed no light on the *mechanisms* of growth. For example, openness to trade is often found to contribute to growth in reduced-form regressions. Yet, is this contribution direct, or does openness make its principal contribution to growth through some more specific mechanism, such as through its effect on investment?

Thus, the system of equations to be estimated in the following section begins with a reduced-form regression which includes environmental variables and initial conditions which have become common in the empirical growth literature. I then specify and estimate "explanatory" equations for the relevant control variables. Table 1 summarizes the particular specifications to be estimated in this system of equations.

After estimating this set of relationships as a baseline, the paper then turns to the central question of whether these mechanisms have the same impacts in Africa as elsewhere. For instance, we know that investment contributes to growth. Yet, does investment make the same marginal contribution to growth in Africa as in other low- and middle-income countries? And, do the factors that influence investment ratios operate the same in Africa as elsewhere? The answers to such questions will both illuminate the nature of economic growth in Africa and provide insights for growth-oriented public policies. By limiting the analysis to a reduced-form equation, and by forcing growth rates in Africa and elsewhere to have the same sensitivity to given influences, previous studies have assumed away potentially important differences in the mechanisms of growth in Africa. The results presented below suggest that there are indeed differences in the mechanisms of growth in Africa, most of which are not apparent at the level of the reduced-form growth regression.

To address the question of whether Africa grows differently, each of the equations described in Table 1 is estimated in three forms: "restricted," "partially unrestricted," and "fully unrestricted." In the generic case the fully unrestricted regression takes the form:

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[5] Temple (1998) takes a similar approach in attempting to explain the policy variables that appear in a reduced form growth regression.

$$Y = \beta_0 + \gamma_0 * d + X\beta + (d * X)\gamma + \varepsilon \quad (1)$$

where *d* is a vector of dummy variables equal to 1 for observations from Africa and X is a matrix which, for each regression, includes columns corresponding to the specifications indicated in Table 1. This is equivalent to running a separate regression for Africa, though the single equation facilitates hypothesis testing of the constraints imposed in the partially unrestricted and restricted regressions.[6] The partially unrestricted regression frees only the Africa intercept, imposing the constraint $\gamma = 0$. The restricted regression estimates common coefficients for the entire sample, imposing the constraint $\gamma_0 = \gamma = 0$. Chow tests (presented in Table 8) then determine the extent to which the mechanisms of growth operate differently in Africa, and at what level in the system differences exist.

The likely endogeneity of many of the explanatory variables in this system suggest the need for a structural estimator, such as two-stage least squares (2SLS), as OLS estimates could be inconsistent and biased. Similarly, a full-information estimator, such as three-stage least squares (3SLS), might well be preferred to 2SLS given the present system of equations. The dominance of 2SLS over OLS in such circumstances, however, is asymptotic. As Greene (1990) notes, the small-sample properties of 2SLS are largely unknown, and the variance around its mean of OLS in small samples can be less than that of 2SLS. Greene also notes that 3SLS can propagate any specification error in the model's structure throughout the system, while single-equation methods tend to contain the problem. As a precaution against the dangers inherent in relying exclusively on either OLS or 2SLS in a small sample where endogeneity is likely, I will present results from both OLS and 2SLS estimates of the equations described above.[7] In general, these approaches yield similar results (as did the unreported 3SLS estimation of these equations).

4. Results

The broad picture that emerges from this analysis is that the direct reduced form determinants of growth, with important exceptions, have the same impact in Africa as elsewhere. Yet, there are critical differences in several of the explanatory equations such that Africa fails to benefit from factors which indirectly contribute to growth (as determinants of the direct determinants of growth) and such that Africa pays a heavier penalty than other regions for several factors that indirectly diminish growth.

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[6] The validity of this pooled regression requires that $E[\varepsilon^2 \mid d = 0] = E[\varepsilon^2 \mid d = 1] = \sigma^2$.

[7] Breaking the data into five-year averages to create a panel has a distinct advantage in structural estimation in that it facilitates the choice of instruments. For each equation estimated by two or three stage least squares presented below, this panel structure allows each variable, lagged by one period, to serve as its own instrument. Additional instruments include dummy variables for Africa, Latin America, and Asia. Pritchett's (1998) criticism of short-average panels in growth equations is well-taken, but applies primarily to fixed effects models.

Reduced Form

The reduced form growth equation is estimated as in equation (1), where $GRGDP = f(LGDP(0), LLEB(0), LOCK, INST, GRTOT, OPEN, DEF, GPOP)$.[8] This reduced-form specification is broadly representative of the recent growth literature.

Columns (1) and (2) of Table 2 present the restricted regressions of the reduced form estimated by OLS and 2SLS, respectively. All of the estimated coefficients are of the expected sign, though not all are statistically significant. The choice between OLS and 2SLS is not clear in this case. Initial life expectancy at birth and the terms of trade are clearly exogenous; yet, Hausman tests on the fiscal deficit, institutional quality, and government consumption all indicate possible simultaneity bias. Thus, on balance, 2SLS is preferable for this specification.

The implied rate of conditional convergence (based on 2SLS) is 2.9 percent per year, which, in turn, implies that an "average" developing country in this sample takes just over 24 years to close half the gap between its initial income and its steady-state income.[9] (The OLS estimates imply an even faster rate of conditional convergence of 3.1 percent per year.) Contrary to the findings of Sachs and Warner (1997), a country's status as landlocked does not affect its growth rate.

Primary interest lies in the statistical significance of the constraints imposed in the fully and partially restricted versions of this regression. Table 2, column (3), presents the results of the partially unrestricted estimation of the reduced-form OLS regression. The Africa intercept is highly significant, indicating that the explanatory variables in the restricted model fail to account for Africa's slower growth. The question at hand is whether the determinants of growth identified in the reduced form have the same effects on growth in Africa as elsewhere.

Table 2, column (4), presents the OLS results from estimating the fully unrestricted reduced-form regression. In most respects, growth in Africa operates no differently from growth elsewhere. Yet, there are three critical exceptions: African countries benefit less from starting poor, pay a higher price for being closed, and fail to reap the same benefit from deficit reduction as other low- and middle-income countries in the sample.

The statistically significant (at the 10-percent level) difference in the effect of initial income on subsequent growth in Africa implies a slower rate of conditional convergence for Africa. Specifically, the results in Table 2 (column 4) imply a 2.3 percent per year rate of

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[8] See Appendix B for variable name abbreviations.

[9] Barro and Sala-I-Martin (1995) note that if the length of the observational interval were negligible, then β_{Y_0} would exactly identify the rate of conditional convergence as specified in the neo-classical growth model. However, when data are observed over interval *T*, the continuous rate of convergence is $-(1 - e^{-\beta T})/T$. In that case, the half life of convergence is obtained by solving the term $e^{\beta_{implied} \cdot T} = 0.5$ for *T*.

conditional convergence for Africa --roughly three-fourths the convergence rate for the general sample -- indicating that African countries require nearly 30 years to halve the gap between initial income and the steady state.

With regard to openness, the interpretation is that all countries grow 1.5 percent per year faster if they are completely open, and that open African countries grow faster still by 3.5 percent per year. Thus, complete openness increases growth in Africa by 5.0 percent per year above what it would be if countries were completely closed.

This finding raises the question of *why* openness should have such an extraordinarily stronger effect on African growth. Collier and Gunning (1999) report a similar finding based on the black market premium, which they find (for a given level) to be half again as damaging to growth in Africa than elsewhere. Their explanation for why the effect is more intense in Africa is the combination of more severe trade restrictions and smaller economies. A given level of trade restriction, they argue, should be expected to be more damaging in a smaller economy. Wang and Winters (1998) make a similar claim about Africa.

African countries also fail to reap the same benefit from reducing fiscal deficits. A 1 percentage point reduction in deficits, which increases economic growth by 0.24 percentage points outside Africa, increases growth in Africa by only 0.1 percentage points.[10]

A Chow test of the joint restriction that $\gamma_0 = \gamma = 0$ is strongly rejected ($F(9, 166) = 2.91$, upper tail area = 0.003).[11] Yet, when one raises the bar for rejection of the null hypothesis by excluding the African intercept dummy from the restrictions, imposing only $\gamma = 0$, a Chow test fails to reject ($F(8, 166) = 1.09$, upper tail area = 0.37). Thus, if the analysis stopped at this point (as most have), one might feel comfortable in concluding that the reduced form more or less explains African growth, despite the individual significance of three of the African slope interaction terms. Indeed, a fuller depiction of how African growth differs, as demonstrated below, requires analysis not just of the reduced form but of a set of explanatory equations, as well.

Explanatory Equations

The explanatory equations (summarized in Table 1) seek to explain the direct determinants of growth identified in the previous regressions. The goal is to go beyond the reduced form and

[10] Further research is required to explain why this effect is different in Africa. One possibility may lie in a smaller effect on private consumption (and hence on savings) resulting from deficit reduction when most of the deficit is financed by foreign rather than domestic debt (as may be differentially the case in Africa).

[11] Easterly and Levine (1997) specifically report that a similar Chow test on their reduced-form regression indicates no difference in the African coefficients, though it is not clear whether their restricted regression included an intercept dummy.

growth accounting specifications to identify the channels of influence through which the direct determinants operate. How do the state and other exogenous variables influence the control variables which have been shown above to determine economic growth? This section will specify models to explain five key variables in the system, asking in each case whether the determinants of these key variables have the same effects in Africa as elsewhere, in effect asking whether Africa grows differently.

Investment

Given the primacy of investment in the neo-classical growth model it says little to include investment in a reduced-form explanation of growth. Yet, that primacy also makes it critical to understand whether the determinants of investment operate in Africa as they do elsewhere. The estimating equation for investment is in the form of equation (1), where INV = *f* (LLEB(0), OPEN, CPI, LPIPY, INST, LBMP).

Table 3, columns (1) and (2), present the OLS and 2SLS estimates of the restricted regression for investment. Results of the OLS and 2SLS estimates are generally similar, though the effects of inflation and openness are greater in 2SLS. In neither case was initial life expectancy at birth or the log of the black market premium on local currency significant. Hausman tests indicate likely simultaneity in the OLS estimates for both openness and inflation. Both investment and inflation, for instance, may be jointly determined by a third variable, such as interest rates. The 2SLS estimates may thus be preferable for this specification. Openness has a substantial impact on investment -- a finding of direct relevance to the issue of channels of influence on growth. The result in column (2) demonstrates that a completely open country invests 4.8 percentage points more of GDP than a completely closed country. This finding suggests that openness exerts its influence on economic growth at least partially through its favorable impact on investment.

The effect of investment price distortions on investment is also substantial, suggesting that the underlying investment demand curve is significantly downward-sloping. As expected, both OLS and 2SLS indicate a significant positive contribution of institutional quality to investment.

As in the previous cases, the significant Africa intercept dummy in the partially unrestricted estimation (column (3)) indicates that the partially unrestricted model does not fully account for the difference between African and non-African investment ratios, where *ceteris paribus* investment shares of GDP are 3.4 percentage points lower. Yet, eliminating the constraint that $\gamma = 0$, the African intercept term loses its explanatory power in the fully unrestricted model (column (4)). In its place, three of the African slope interaction terms are individually significant: the relative price of capital, institutional quality, and the black market premium.

Interventions which raise the relative price of investment were found to have a strong

negative impact on investment ratios. In Africa, this effect, though still problematic, is less severe for a given degree of distortion. The marginal reduction in investment in Africa that results from a given increase in the relative price of capital is only 75 percent of the marginal reduction outside Africa. Effectively, this finding indicates that (controlling for other influences) investment demand in Africa is less price elastic than elsewhere. This is logically consistent with African countries' typically high dependence on imported capital goods and relative lack of domestic substitutes. The indirect growth implication is that African countries may have less to gain from reductions in investment price distortions (though the gains are still positive).

Similarly, investment ratios in Africa are positively related to improvements in institutional quality, yet a given improvement in institutional quality yields only 38% of the increase in investment ratios as occurs outside Africa. The fully unrestricted regression suggests that while a one-level improvement in institutional quality increases the investment ratio outside of Africa by 3.1 percentage points, a similar improvement in Africa increases the investment ratio by only 1.2 percentage points. The emerging pattern is that the benefits to Africa from improvements in factors positively associated with growth are smaller than elsewhere.

Table 3, column (4), also demonstrates that distortions in exchange rates, as proxied by the log of the black market premium, have a significant negative effect on African investment ratios with no significant effect outside Africa.

Fiscal Deficit

The fiscal deficit is also estimated in the form of equation (1), where DEF = *f* (LGDP(0), WORKER, INST, GRTOT, OPEN). The rationale for including the labor force share in the population as a regressor, based on the political economy literature cited above, is that an economy with a lower dependency ratio (i.e., a higher labor force share) might also have lower demand for transfer payments, as well as a higher tax base per capita. Thus, one expects the labor force share in the population to contribute indirectly to growth by mitigating the fiscal deficit. It is also reasonable to expect that improved institutions would mitigate fiscal deficits by reducing opportunities for rent seeking.

Two trade-related variables are also included in the deficit equation. Growth in the external terms of trade is included to capture the effects of terms of trade shocks on government revenue and expenditure. Gersovitz and Paxson (1996) show that the heavy reliance of African countries on primary commodity exports, as well as the central role played by many governments in those markets, exposes government revenue (and hence fiscal deficits) to export price shocks. The inclusion of openness in this equation extends the argument to include trade policy. Being closed, typically associated with a strategy of import substitution, may be expected to increase deficits by depriving governments of export revenue and creating conditions conducive to subsidization of protected sectors.

The results presented in Table 4, columns (1) and (2), agree in supporting the hypothesis

regarding labor force participation and in rejecting the hypotheses regarding the effects of institutional quality and the external terms of trade. Openness, as expected, contributes to deficit reduction, though that finding is supported only in the OLS estimation.[12]

In this case, the Africa intercept in the partially unrestricted regression (Table 4, column (3)) is not significant, indicating that the specified model does account for African as well as non-African fiscal deficits. Yet, this does not preclude more specific identification of African differences in the fully unrestricted specification. Indeed, column (4) shows that there are two important results in the fully unrestricted regression. As in the restricted regressions, institutional quality has no detectable impact on fiscal deficits in the non-African countries, yet has quite a substantial impact within Africa (albeit with P = .09). A one-level improvement in institutional quality reduces deficits by 1.4 percentage points of GDP in Africa. *This points clearly to poor institutions as a cause of fiscal deficits in Africa, and suggests a particular focus on institutional reform as an approach to deficit reduction in Africa.*

Such a finding, of course, only raises the question: *why* does institutional quality matter more to fiscal deficits in Africa than in other regions? The political economy literature provides a reasonable explanation, if the components of the institutional quality index are interpreted as reflecting deeper characteristics of Africa's political economy. A central characteristic is often described as a lack of state autonomy from particular, urban-based, well-organized interest groups who are able to extract targeted policy and program advantages in exchange for political support (Bates, 1981).

Bates (1994) provides a simple model which links micro-level distortions to fiscal imbalances. In this model, opportunistic public officials generate economic distortions aimed at lowering key prices below equilibrium levels (to favor consumers of those commodities, such as the price of inputs consumed by industry), thus inducing excess demand. Fiscal deficits are exacerbated because such policies can only be sustained by public subsidies to compensate suppliers in the distorted markets. Bates goes on to argue that Africa is distinct in the severity of such patterns and their economic consequences. Thus, poor "institutional quality" is symptomatic of deeper political economy issues. The specific result is a more pronounced impact of institutional quality on fiscal deficits in Africa.

The fully unrestricted specification in Table 4 also reveals that openness has a substantially greater impact on deficit reduction in Africa than elsewhere. Stated alternatively, the fiscal cost of being closed is substantially greater in Africa.[13] A reasonable explanation may lie in Africa's strong historical tendency to adopt import substitution. The associated problems of reduced

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[12] If openness does contribute to reduced deficits, this provides yet another channel through which openness contributes indirectly to growth in the reduced form equation.

[13] The mean openness score for Africa in this regression is .08, compared with .37 for the non-African countries.

export earnings and increased state involvement in the economy may be more severe in Africa, where domestic markets are smaller and where external financing of fiscal deficits is more difficult to obtain.

Openness

Openness, broadly defined in policy terms, has a substantial and robust impact on growth. Results presented above suggest that this impact is in large measure via the impact of openness on investment in particular. Openness is estimated as in equation (1), where OPEN = *f* (LGDP(0), INST, POP, POPDN).

To the extent that improved institutional quality increases transparency, it may determine openness. Total population is included to test the theory that larger countries, with larger domestic markets, tend to be less open to trade. Similarly, Sachs and Warner (1995) propose a political economy-style argument regarding the effect of factor endowments on openness: land-scarce, labor-abundant societies (e.g., those with high population densities) should be more open because governments are likely to favor labor over land-owning interests.

The evidence presented in Table 5, columns (1) and (2), supports each of these hypotheses. Initial income is not related to openness in this specification. Confirmation that institutional quality is strongly associated with openness leads to a more subtle interpretation of the growth-accounting and augmented structural equations presented above. In addition to its remaining direct contribution to growth and its effect on deficits, institutional quality also enhances openness, which in turn has a strong effect on growth.

As in the previous cases, the restricted model fails to account for Africa's difference. The significant African intercept in the partially unrestricted regression (column (3)) loses significance when all African slope terms are freed (column (4)). Two African slope interaction terms are significant in the fully unrestricted regression: initial income and institutional quality. In the full sample, lower initial income, *ceteris paribus*, is associated with a higher degree of openness. The logic is that poorer economies have greater potential gains from trade. Yet, here, too, Africa fails to benefit from what should be an advantageous initial condition.

Similarly, freeing the Africa slope term for institutional quality reveals it to be only one-fifth of the effect in non-African countries. Effectively, as with fiscal deficits, openness in Africa does not benefit from improvements in institutional quality. The explanation for Africa's failure to become more open in response to lower initial income and improved institutional quality remains an open question, though it highlights the historical embeddedness import substitution in Africa.

Institutional Quality

Results presented thus far indicate that institutional quality is important to growth both directly and indirectly through its effects on openness and deficits. Institutional quality is estimated as in equation (1), where INST = *f* (ELF, TYR, RAW).

Ethnolinguistic fragmentation is an indicator of a country's social cohesion. Several recent political economy models argue that an inability of social groups to resolve conflict or to agree on the allocation of costs and resources can undermine economic performance. This is likely to be particularly important in Africa, where civil wars have been endemic. To a large extent, these failures can be seen as institutional failures. Thus, if a high degree of ethnolinguistic fragmentation reduces social cohesion, it follows that the quality of institutions required to resolve conflicts and to promote development will also suffer. Conversely, one expects that a more educated society -- one with a greater stock of human capital -- will be better equipped to evolve a strong set of social institutions. The inclusion of raw materials as a regressor for institutional quality draws on the potential existence of rent-seeking behavior, such as suggested by Lane and Tornell (1995). The opportunity and possibly greater ease of capturing the rents from raw materials exports may be conducive to corruption, and should thus enter negatively in this equation.

Each of these hypotheses is sustained in the restricted OLS and 2SLS estimates reported in Table 6. This is the only specification among the explanatory equations in which the African intercept term is insignificant in the partially unrestricted regression, and in which the African slope interaction terms are both individually and jointly insignificant. Thus, in the case of institutional quality, the determinants operate identically inside and outside of Africa.[14]

Population Growth Rate

Population growth is also characterized as an endogenous control variable in the growth-accounting equation, and thus requires further explanation. The estimating equation for population growth is of the form of equation (1), where GPOP = *f* (LLEB(0), TYR, WORKER).

A large theoretical and empirical literature specifically addresses fertility decisions and the endogeneity of population growth. The proposed specification draws broadly on this literature without claiming to capture its depth and detail. The evidence presented in Table 7, columns (1) and (2) strongly supports the proposed specification.

Table 7, columns (3) and (4), present the partially and fully unrestricted regressions for the

[14] A conceptual distinction is worth noting here: while ethnolinguistic fragmentation does not differentially affect institutional quality in Africa due to any greater sensitivity of its impact, the existence of much greater ethnolinguistic fragmentation in Africa does contribute to poorer institutional quality. The average degree of ethnolinguistic fragmentation in Africa is .62 as compared with an average of .33 outside Africa. This channel may help to explain Easterly and Levine's (1997) finding that ELF is negative and statistically significant in growth regressions.

determinants of population growth. As in previous specifications, eliminating the constraint that $\gamma_0 = 0$ reveals that the restricted model fails to account for Africa's differences in population growth rates. *Ceteris paribus*, Africa's population grows faster by 0.45 percentage points per year. In this case, relaxing the further constraint that $\gamma = 0$ reveals that two specific determinants operate differently in Africa than elsewhere (though even the fully unrestricted model fails to account fully for Africa's differences). Among the African slope interaction terms both initial life expectancy at birth and the labor force share of the population are statistically significant at the 10 percent level. These results are consistent with recent theoretical contributions by Galor and Weil (1998), which demonstrate that at low levels of income, the income effect dominates substitution of quality for quantity in the demand for children. In both cases, Africa fails to benefit from factors that reduce population growth elsewhere. This is particularly problematic, given the exaggerated negative effect of population growth on African output growth established above.

5. How Important Are the Differences?

The results presented in the previous section indicate that the mechanisms of growth in Africa differ in several critical respects, particularly when one explores beyond a reduced form growth regression. Yet, statistically significant African differences in particular point estimates (or even sets of points estimates) do not necessarily play a quantitatively large role in explaining Africa's slower growth relative to other low- and middle-income areas. This section measures the importance of Africa's differences by reporting the results of a growth accounting framework that is augmented to accommodate the fully unrestricted specifications estimated above.

Traditional growth accounting assumes that the restricted model is true, and accounts for the differences in outcomes as the weighted sum of the differences in the means of the explanatory variables (where the weights are the estimated regression coefficients for each variable). Allowing all the parameter estimates for Africa to vary from the non-African estimates requires an enhanced growth accounting framework. The intuition for the expanded growth accounting framework, and the contrast with traditional growth accounting, is illustrated in Figure 1, which depicts the generic restricted and fully unrestricted regressions defined in equation (1).

Suppose the observed growth rates for Africa and the rest of the world (RoW), evaluated at their respective means on the x-axis, are points *d* and *a*. The traditional growth accounting, based on a model that constrains the intercepts and all slope terms to be identical for Africa and the RoW, calculates the share of the vertical distance between *d* and *a* explained by the vertical distance between *e* and *f* along the restricted regression line. Note that the restricted regression line must pass through the full sample means for X and Y ($\bar{X}_{All}$ and $\bar{Y}_{All}$ in Figure 1).

Now, suppose that the fully unrestricted model is true, and that the slope and intercept terms differ between Africa and the RoW. In that case, the fully unrestricted regression would be equivalent to estimating separate regressions for Africa and the RoW, both of which would pass through their respective means for X and Y. The resulting regression lines are labeled SSA and

RoW in Figure 1. While the restricted growth accounting asks simply how much of the observed difference in outcomes is explained by the weighted difference in the means between the two sub-samples, the expanded framework permits a more subtle question: if the RoW parameters pertained to both Africa and the RoW (as has generally been asserted), what share of the observed difference in outcomes (*d* - *a*) would be explained by the difference in means along the RoW regression line {(d-b)/(d-a)} versus the residual share explained by differences in the parameters themselves {(b-a)/(d-a)}?[15] If the mechanisms of growth operate no differently in Africa than elsewhere, then the differences in outcomes between Africa and the RoW would be explained primarily by the difference in the means of the explanatory variables. The validity of the unrestricted regression rests on the Chow tests (Table 8), which for each equation estimated in the previous section (with the exception of institutional quality) reject the null hypothesis that the intercept and all slope terms for Africa are jointly equal to the non-African parameters.

Table 9 summarizes the results of this decomposition, generalized to *k* parameters, for each of the equations estimated in the previous section. In most instances, freeing the African parameters undermines the assertion that the difference in the means along the RoW regression line sufficiently explains the differences in outcomes. In the reduced form equation, the difference in means predicts a difference in growth rates of the wrong sign (nearly 24 percent in the wrong direction), leaving differences in the parameters to explain more than the total observed difference in growth outcomes between SSA and RoW.

In contrast, this decomposition applied to the investment equation demonstrates that the difference in means accounts for just over half of the observed difference in investment ratios. Thus, institutional quality, and distortions in both exchange rates and the relative price of capital differ in the strength of their effects in Africa, and those differences account for 46% of the differences in investment ratios between African and non-African countries.

These examples illustrate that statistically significant differences in the African slope parameters might or might not play a large role in explaining the differences in outcomes between African and non-African countries. If one adopts the arbitrary standard that differences in the African parameters are important only if the difference in means explains less than 50 percent of the difference in outcomes, then the equations in which statistically significant African differences are quantitatively important are: fiscal deficits, openness, and population growth, in addition to the reduced form, structural, and augmented structural equations. In contrast, differences in the African parameters are relatively unimportant in explaining different outcomes in institutional quality and investment.

[15] This framework permits an alternative decomposition based on the assumption that the African parameters pertained to both Africa and the RoW, though that hypothesis is clearly less relevant.

6. Summary and Policy Implications for African Development

The common assertion of recent literature has been that the mechanisms of growth operate just the same in Africa as elsewhere. On the surface, this appears more or less true: most of the determinants of growth identified in a reduced-form regression affect growth similarly in sub-samples of African and non-African countries. Most of the differences in Africa's growth mechanics arise not in the functioning of the direct (reduced form) determinants of growth, but rather in the underlying mechanisms through which those determinants operate. Indeed, most of the indirect growth channels do not differ in Africa. Yet, there are important ways in which Africa does grow differently, failing to reap the indirect growth benefits of several positive influences and paying a harsher penalty for several negative influences on growth.

Even at the surface, there is evidence that several growth mechanisms operate differently in Africa. In the reduced-form regression, being closed to trade is more costly in terms of growth forgone in Africa than in other low- and middle-income areas. This is true both directly (as in the reduced form equation) and indirectly through the magnified effect of being closed on fiscal deficits in Africa. In addition, reducing fiscal deficits does not bring the same growth benefit in Africa as elsewhere, and Africa exhibits a slower rate of conditional convergence than the broader sample.

One implication of these findings is that trade reform is particularly crucial for Africa. Yet, other evidence presented above indicates that needed trade reforms may be more difficult to achieve in Africa: improvements in the quality of institutions have much less (though still a positive) impact on trade reform than they have outside Africa.

The inconsistent impacts of institutional reform highlight the paradox of Africa's growth mechanisms. Institutional improvement in Africa is less effective than elsewhere in promoting openness, the lack of which is more costly to growth in Africa. At the same time, institutional reform has a greater impact on deficit reduction in Africa; yet, the growth benefits of deficit reduction are smaller in Africa than elsewhere. In short, Africa's advantage counts for less and its disadvantage counts for more.

Africa also appears to face greater challenges to capital accumulation than other regions. Part of the explanation may lie in the different sensitivity of investment in Africa to particular policy distortions. For instance, real exchange rate distortions hurt investment in Africa more than elsewhere. In addition, investment appears to be less price sensitive in Africa than elsewhere, suggesting that the benefits from reductions in investment price distortions may be smaller.

Higher population growth reduces economic growth in the broad sample. While this effect is not differentially severe in Africa, average population growth in Africa was 38 percent faster in Africa than elsewhere, making it a serious concern. Yet, once again, the explanation for population growth differentially magnifies the challenge of successful development in Africa:

additional schooling helps to reduce population growth in Africa as elsewhere, but African population growth appears *not* to benefit from gains in initial life expectancy at birth or increases in the labor force share of the population (though these factors reduce population growth elsewhere).

The expanded growth accounting framework further demonstrates that most of the statistically significant differences in Africa's growth mechanisms are also quantitatively significant in explaining Africa's slow growth. The recognition that there are important differences in the mechanisms of economic growth in Africa raises more questions than it answers. Other differences undoubtedly exist as well. Making use of this information, however, first requires an understanding of *why* certain channels of influence on growth operate differently in Africa. This study has contributed to identifying African differences, but only begins to explain them. This opens up a potentially important avenue of research on growth. Such explanations will be essential if future efforts to promote economic growth in Africa are to be more successful than past efforts.

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Appendix A
List of Countries

BOTSWANA
BURKINA FASO
BURUNDI
CAMEROON
CAPE VERDE IS.
CHAD
EGYPT
ETHIOPIA
GABON
GAMBIA
GHANA
GUINEA-BISSAU
IVORY COAST
KENYA
LESOTHO
LIBERIA
MADAGASCAR
MALAWI
MAURITANIA
MAURITIUS
MOROCCO
MOZAMBIQUE
NAMIBIA
NIGER
NIGERIA
RWANDA
SENEGAL
SIERRA LEONE
SOUTH Africa
SUDAN
SWAZILAND
TANZANIA
TOGO
TUNISIA
UGANDA
ZAIRE
ZAMBIA
ZIMBABWE
BARBADOS
COSTA RICA
DOMINICAN REP.
EL SALVADOR
GUATEMALA
HAITI
HONDURAS
JAMAICA
MEXICO
NICARAGUA
PANAMA
PUERTO RICO
TRINIDAD&TOBAGO
ARGENTINA
BOLIVIA
BRAZIL
CHILE
COLOMBIA
ECUADOR
GUYANA
PARAGUAY
PERU
SURINAME
URUGUAY
VENEZUELA
BAHRAIN
BANGLADESH
CHINA
HONG KONG
INDIA
INDONESIA
IRAN
JORDAN
KOREA, REP.
MALAYSIA
MYANMAR
NEPAL
OMAN
PAKISTAN
PHILIPPINES
SINGAPORE
SRI LANKA
SYRIA
THAILAND
YEMEN
GREECE
HUNGARY
PORTUGAL
ROMANIA
TURKEY
PAPUA N. GUINEA

Appendix B

Data Definitions and Sources

Code	Description	Source
GRGDP	Annual percentage growth rate of GDP at market prices based on constant 1987 local currency. Aggregates are based on constant 1987 U.S. dollars.	WB(1997)
LGDP(0)	Log of real per capita GDP measured at the start of each five-year period.	Penn World Tables, 5.6
INV	Real Investment as a share of GDP (1985 international prices)	PWT, 5.6
FDI	Foreign direct investment is net inflows of investment to acquire a lasting management interest (10 percent or more of voting stock) in an enterprise operating in an economy other than that of the investor. It is the sum of equity capital, reinvestment of earnings, other long-term capital, and short-term capital as shown in the balance of payments.	WB(1997)
LLEB(0)	Log of life expectancy at birth measured in the initial year of each five-year period. Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life.	WB(1997)
POP	Total population.	PWT, 5.6
GPOP	Growth rate of POP.	PWT, 5.6
GPOPDF	Difference between GPOP and growth rate of economically active population, defined as population between ages 15-64 who could potentially be economically active, excluding children	WB(1997)
POPDN	Rural population density is the rural population divided by the arable land area. Arable land refers to land under temporary crops, temporary meadows for mowing or pasture, and land under market and kitchen gardens.	WB(1997)
TYR	Average schooling years in the total population over age 25, measured at the start of each five-year period.	BL(1993)
ELF	Index of ethnolinguistic fractionalization, 1960. Measures probability that two randomly selected people from a given country will not belong to the same ethnolinguistic group.	Easterly and Levine (1997)
INST	Computed from International Country Risk Guide Data (1982-95). Unweighted average of subjective indices of: government repudiation of contracts, risk of expropriation, corruption, rule of law, and bureaucratic quality. Re-scaled to [0,1], averaged over entire period.	Political Risk Services

CPI	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a fixed basket of goods and services. In general, a Laspeyres index formula is used.	WB(1997)
DEF	Overall budget deficit, including grants (% of GDP). Overall budget deficit is current and capital revenue and official grants received, less total expenditure and lending minus repayments.	WB(1997)
GOV	General government consumption (% of GDP). General government consumption includes all current expenditures for purchases of goods and services by all levels of government, excluding most government enterprises. It also includes capital expenditure on national defense and security.	WB(1997)
LPIPY	Log of ratio of price level of investment to price level of GDP.	PWT, 5.6
GRTOT	Growth rate of net barter terms of trade (1987 = 100). Net barter terms of trade are the ratio of the 1987 (base year) export price index to the corresponding import price index.	WB(1997)
LBMP	Log of ratio of black market rate to official exchange rate.	BL(1994)
TTX	Trade taxes as a share of total trade.	WB(1997)
OPEN	Portion of years in each five-year period that is country is "open" as defined by Sachs and Warner (1995).	Sachs and Warner (1995)
WORKER	Ratio of total labor force to total population. Total labor force comprises people who meet the ILO definition of the economically active population: all people who supply labor for the production of goods and services during a specified period. It includes both the employed and unemployed. While national practices vary in the treatment of such groups as the armed forces and seasonal or part-time workers, in general the labor force includes the other unpaid caregivers and workers in the information sector.	WB(1997)
SOC	Classified as a socialist government by J. Kornai.	Sachs and Warner (1995).
LAAM	Dummy variable for Latin America, includes: Barbados, Costa Rica, Dominican Republic, El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Puerto Rico, Trinidad & Tobago, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Guyana, Paraguay, Peru, Suriname, Uruguay, Venezuela.	BL
ASIAE	Dummy variable for Asia, includes: Bahrain, Bangladesh, China, Hong Kong, India, Indonesia, Iran, Jordan, Korea, Malaysia, Myanmar, Nepal, Oman, Pakistan, Philippines, Singapore, Sri Lanka, Syria, Thailand, Yemen.	BL

Africa	Dummy variable for Africa, includes: Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Chad, Ethiopia, Gabon, Gambia, Ghana, Guinea-Bissau, Ivory Coast, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mauritania, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Sudan, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia, Zimbabwe.	BL

Table 1. System of Equations

Reduced Form

GRGDP = *f* (LGDP(0), LLEB(0), LOCK, INST, GRTOT, OPEN, DEF, GPOPDF)

Explanatory Equations

a. INV = *f* (LLEB(0), OPEN, CPI, LPIPY, INST, LBMP)

b. DEF = *f* (LGDP(0), WORKER, INST, GRTOT, OPEN)

c. OPEN = *f* (LGDP(0), INST, POP, POPDN)

d. INST = *f* (ELF, TYR, RAW)

e. GPOP = *f* (LLEB(0), TYR, WORKER)

Table 2. Reduced Form Results. Dependent Variable: GRGDP

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	-0.022 (0.076)	0.104 (.096)	0.181** (0.087)	0.066 (0.144)
LGDP(0)	-0.025* (0.005)	-0.023* (0.006)	-0.028* (0.005)	-0.038* (0.007)
LLEB(0)	0.045* (0.023)	0.010 (0.028)	-0.00 2 (0.024)	0.044 (0.042)
LOCK	-0.0002 (0.0076)	0.008 (0.009)	0.005 (0.007)	-0.006 (0.014)
INST	0.094* (0.022)	0.101* (0.024)	0.127* (0.022)	0.129* (0.026)
GRTOT	2.43* (0.80)	5.53* (1.60)	1.29 (0.812)	1.44 (0.933)
OPEN	0.0212* (0.0063)	0.021* (0.009)	0.020* (0.006)	0.015* (0.007)
DEF	0.002* (0.0005)	0.001 (0.0008)	0.002 * (0.0005)	0.002* (0.0006)
GRPOP	-0.665** (0.339)	-0.978* (0.498)	-0.382 (0.377)	-0.268 (0.401)
SSA			-0.034* (0.008)	0.017 (0.185)
LGDP(0)*SSA				0.018** (0.011)
LLEB(0)*SSA				-0.044 (0.053)
LOCK*SSA				0.014 (0.017)
INST*SSA				-0.013 (0.052)
GRTOT*SSA				-1.47 (2.03)
OPEN*SSA				0.035** (0.0185)
DEF*SSA				-0.0018** (0.001)
GRPOP *SSA				-0.469 (0.830)
R^2	0.39	0.34	0.45	0.48
n	184	184	184	184

Standard errors in parentheses *=.05-level of significance
**=.10-level of significance
Coefficients are estimated for the period 1975/79 - 1990/95.

Table 3. Determinants of Investment

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	15.3 (9.45)	19.33** (10.58)	46.09* (12.89)	50.71* (16.95)
LLEB(0)	-0.742 (2.35)	-1.65 (2.60)	-8.55* (3.23)	-9.73* (4.27)
OPEN	2.59* (0.79)	4.81* (1.06)	2.34* (0.77)	2.51* (0.89)
CPI	-0.002* (0.0009)	-0.045* (0.002)	-0.002 * (0.0009)	-0.003 * (0.0009)
LPIPY	-10.21* (0.78)	-10.22* (0.92)	-10.15* (0.763)	-11.98* (1.14)
INST	13.78* (2.66)	11.50* (3.12)	17.56* (2.82)	18.87* (3.41)
LBMP	-0.53 (0.82)	0.23 (1.70)	-0.30 (0.81)	0.87 (0.99)
SSA			-3.42* (0.99)	-10.0 (24.88)
LLEB(0)*SSA				2.97 (6.38)
OPEN*SSA				-1.82 (1.93)
CPI*SSA				0.02 (0.03)
LPIPY*SSA				2.96* (1.53)
INST*SSA				-11.65** (6.54)
LBMP*SSA				-4.79* (1.95)
R^2	0.66	0.64	0.68	0.70
n	231	231	231	231

standard errors in parentheses *=.05-level of significance
**=.10-level of significance
Coefficients are estimated for the period 1975/79 - 1990/95.

Table 4. Determinants of Fiscal Deficit

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	-17.10* (5.85)	-18.78* (6.40)	-15.85* (6.19)	-18.50* (7.77)
LGDP(0)	1.13** (0.68)	0.96 (0.74)	0.92 (0.76)	1.31 (0.96)
WORKER	11.28** (6.46)	16.93* (7.42)	12.07** (6.59)	17.45* (7.94)
INST	-1.89 (3.80)	-0.51 (4.03)	-1.19 (3.96)	-6.16 (4.84)
GRTOT	-123.4 (124.9)	243.6 (227.7)	-155.5 (135.1)	-26.74 (152.5)
OPEN	2.47* (0.93)	0.63 (1.32)	2.33* (0.96)	1.70** (1.03)
SSA			-0.72 (1.13)	-2.92 (12.68)
LGDP(0)*SSA				-0.51 (1.55)
WORKER*SSA				-4.93 (14.58)
INST*SSA				14.48** (8.53)
GRTOT*SSA				-441.7 (317.6
OPEN*SSA				5.51* (2.76)
R^2	0.07	0.03	0.07	0.13
n	219	219	219	219

standard errors in parentheses *=.05-level of significance
**=.10-level of significance

Coefficients are estimated for the period 1975/79 - 1990/95.

Table 5. Determinants of Openness

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	-0.537* (0.237)	-0.382 (0.245)	0.55* (0.313)	0.794* (0.394)
LGDP(0)	0.025 (0.037)	-0.002 (0.038)	-0.136* (0.047)	-0.201* (0.060)
INST	1.11* (0.237)	1.21* (0.240)	1.59* (0.244)	2.13* (0.293)
POP	-0.0000003** (0.00000017)	-0.0000003** (0.00000017)	-.0000006* (0.0000002)	.0000007* (.0000002)
POPDN	0.0000032* (0.0000015)	0.0000032* (0.0000016)	.0000025** (0.0000015)	0.0000014 (.0000015)
SSA			-0.335* (0.067)	-.781 (0.608)
LGDP(0)*SSA				0.183** (0.098)
INST*SSA				-1.71* (0.526)
POP*SSA				-.000001 (.000002)
POPDN*SSA				.000003 (0.0002)
R^2	0.24	0.24	0.33	0.36
n	204	204	204	204

standard errors in parentheses *=.05-level of significance
**=.10-level of significance
Coefficients are estimated for the period 1975/79 - 1990/95.

Table 6. Determinants of Institutional Quality

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	0.502* (0.024)	0.505* (0.025)	0.490* (0.026)	0.50* (0.03)
ELF	-0.085* (0.03)	-0.077* (0.030)	-0.111* (0.035)	-0.122* (0.039)
TYR	0.019* (0.0043)	0.020* (0.0043)	0.023* (0.005)	0.020* (0.005)
RAW	-0.0004 (0.0003)	-0.0007* (0.0003)	-0.00037* (0.0003)	-0.00027 (0.00038)
SSA			0.035 (0.026)	-0.0014 (0.065)
ELF*SSA				0.025 (0.090)
TYR*SSA				0.017 (0.014)
RAW*SSA				-0.0002 (0.0006)
R^2	0.19	0.19	0.20	0.21
n	226	226	226	226

standard errors in parentheses *=.05-level of significance
**=.10-level of significance
Coeffcients are estimated for the period 1975/79 - 1990/95.

Table 7. Determinants of Population Growth

	(1)	(2)	(3)	(4)
	OLS	2SLS	OLS	OLS
constant	0.094* (0.0158)	.093* (0.017)	0.066* (0.017)	0.10* (0.024)
LLEB(0)	-0.0127* (0.0039)	-0.0127* (0.0042)	-0.005 (0.0042)	-0.012* (0.006)
WORKER	-0.033* (0.0059)	-0.029* (0.006)	-0.04* (0.006)	-0.053* (0.007)
TYR	-0.0017* (0.0004)	-0.0017* (0.0004)	-0.0017* (0.0003)	-0.001* (0.0004)
SSA			0.005* (0.001)	-0.081* (0.033)
LLEB(0)*SSA				0.015** (0.008)
WORKER*SSA				0.054** (0.014)
TYR*SSA				0.0005 (0.0007)
R^2	0.39	0.39	0.42	0.46
n	282	282	282	282

standard errors in parentheses *=.05-level of significance
**=.10-level of significance
Coefficients are estimated for the period 1975/79 - 1990/95.

Table 8. Chow Test Results for OLS Equations

Constraint:	All SSA Slope Terms and Intercept Jointly = 0 $\gamma_0 = \gamma = 0$			All SSA Slope Terms Jointly = 0 $\gamma = 0$			Only Individually Insignificant SSA Slope Terms Jointly = 0		
Equation	D. F.	Test Statistic	Upper Tail Area	D. F.	Test Statistic	Upper Tail Area	D. F.	Test Statistic	Upper Tail Area
Red. Frm. (3′)	F(9,166)	2.91	0.003	F(8,166)	1.09	0.37	F(5,166)	0.43	0.83
INV (2′a)	F(7,217)	3.90	0.001	F(6,217)	2.50	0.02	F(3,217)	0.47	0.70
DEF (2′b)	F(6,207)	2.18	0.047	F(5,207)	2.53	0.03	F(3,207)	0.71	0.55
OPEN (2′c)	F(5,194)	7.30	0.000	F(4,194)	2.69	0.032	F(2,194)	0.09	0.91
INST (2′d)	F(4,218)	0.94	0.44	F(3,218)	0.65	0.59			
GPOP (2'e)	F(4,274)	9.02	0.000	F(3,274)	6.41	0.000	F(1,274)	0.48	0.49

* = includes FDI in specification

Table 9. Expanded Growth Accounting

Equation	Actual difference in outcomes (RoW-SSA)	Assuming RoW Parameters: Predicted by difference in means	Assuming RoW Parameters: Residual	Assuming SSA Parameters: Predicted by difference in means	Assuming SSA Parameters: Residual
Reduced form (dep.var.=GRGDP)	0.0235	-0.0056 (-23.9%)	0.0291 (123.9%)	0.0035 (15.1%)	0.020 (84.9%)
Investment	6.40	3.44 (53.8%)	2.96 (46.2%)	3.89 (60.8%)	2.5 (39.2%)
Deficit	0.85	0.26 (31.0%)	0.59 (69.0%)	0.56 (66.0%)	0.29 (34.0%)
Openness	0.23	-0.16 (-70.4%)	0.39 (170.4%)	-0.07 (-31.7%)	0.305 (131.7%)
Institutional Quality	0.075	0.106 (142%)	-0.031 (-42%)	0.14 (189.3%)	-0.067 (-89.3%)
Population growth	-0.007	-0.003 (39.8%)	-0.004 (60.2%)	-0.0015 (20.1%)	-0.006 (79.9%)

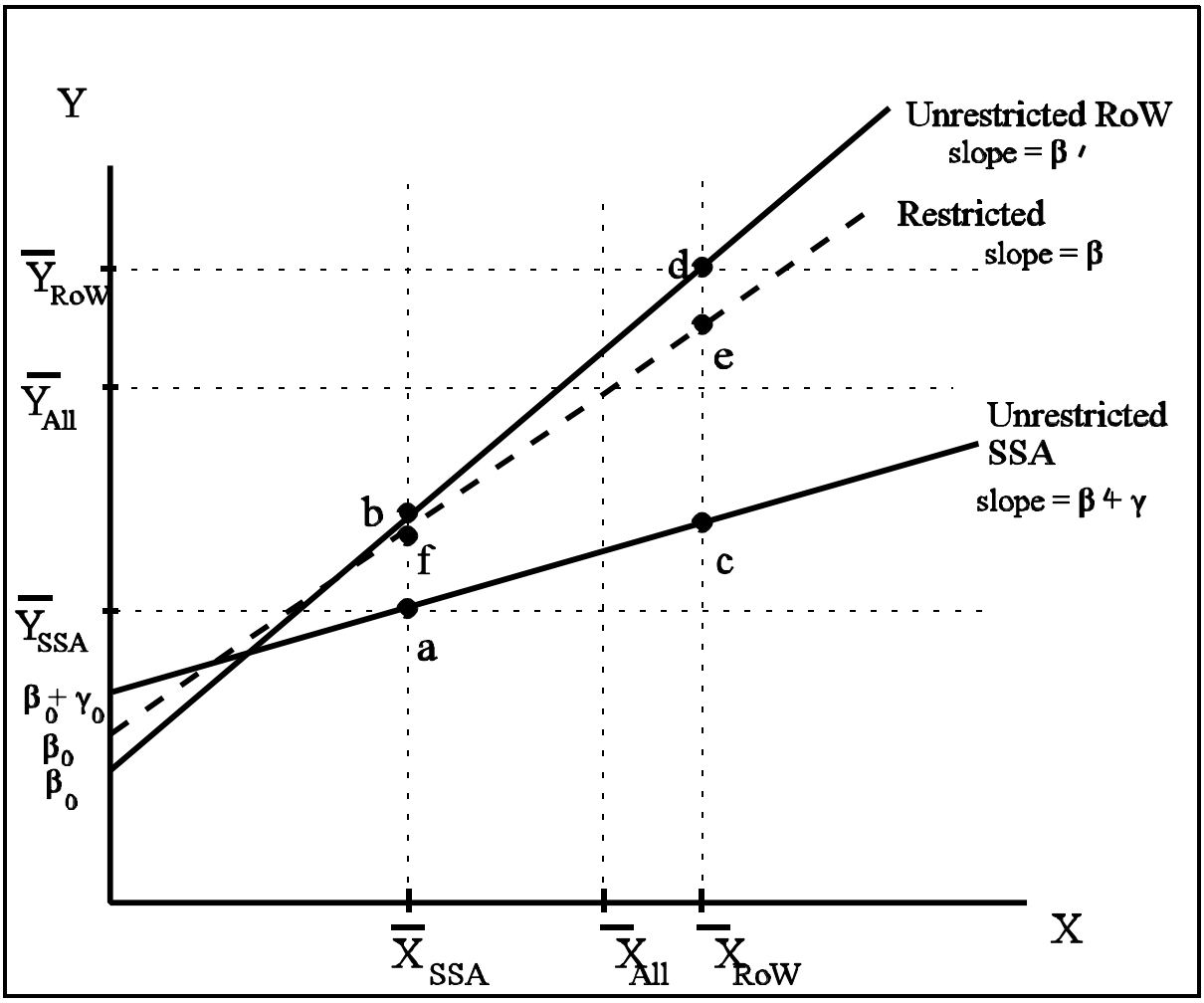

Figure 1 Growth Accounting Decomposition of Restricted and Unrestricted Regressions