

**HOW TO MAKE A TRAGEDY:
ON THE ALLEGED EFFECT OF ETHNICITY ON GROWTH**

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There is no doubt that African growth has been slow relative to the rest of the world, and in a recent paper, Easterly and Levine (1997) provide a provocative explanation based on the deleterious impact of ethnic fragmentation. In Easterly and Levine's explanation, economic policies are important determinants of growth performance, be it in Africa or in the rest of the world. In turn, the greater the degree of ethnic fragmentation, the poorer the policies. Since ethnic fragmentation is (according to their measure) greater in Africa, a significant portion (one third) of the difference between the average rate of growth in sub-Saharan Africa, relative to East Asia, is readily accounted for.

This explanation is generally in accordance with one's *a priori* views on the bitter inheritance stemming from the carve-up of the continent by the colonial powers during the mid- to late-nineteenth century. It also squares with the view that policies matter for growth, and that policies have tended to be extremely poor in Africa. It is also, however, an explanation that leaves little scope for improvement, in that it is hard to see how a practical solution to ethnic fragmentation can be found. In other words, if ethnic fragmentation lies at the heart of Africa's growth tragedy, there is very little, if anything, that can be done about it. The tragedy is no longer merely a tragedy, it is the fate of Africa.

This paper questions both the robustness of Easterly and Levine empirical results as well as whether anything can be said regarding the impact of ethnicity on African countries based on their data set and model. It also offers some comments on other related econometric papers devoted to the same topic.

First, we consider the empirical relevance of their explanation, which runs from ethnic fragmentation, through poor policies, to low rates of growth. Second, we consider whether Easterly and Levine's results, which are based on a sample in which African countries play an extremely limited role, constitute a solid basis on which to construct an explanation for the poor growth performance of African countries.

1. Ethnic fragmentation and economic policies: a debatable assumption

In this part we raise three points which render Easterly and Levine's main assumption regarding the link between ethnic diversity and policies debatable.

An ambiguous indicator of ethnicity

Since Mauro (1993) first used it in a cross-sectional growth regression, the ethno-linguistic fragmentation index (ELF) constructed by Taylor and Hudson (1972) from a Soviet Atlas (Atlas Narodov Mira, 1964) has been frequently used in other regressions and taken as a good synthetic indicator of ethnic diversity. The ELF index is defined as the probability that two randomly selected persons of a given country will not belong to the same ethno-linguistic group. It varies from 0, when there is only one ethnic group, to one when the number of groups tends to infinity. When there are two groups of the same size the index equals 0.5. This last case corresponds to polarization, which is thus quite distinct from fragmentation, although Easterly and Levine use the terms indifferently. Moreover, polarization, rather than a high level of fragmentation, may be a source of conflict, that is detrimental to growth.

Other authors have tried to tackle this problem by introducing ethnic fragmentation as well as ethnic fragmentation squared, expecting a U-shaped relationship (Temple 1998, on the determinants of growth; Collier and Hoeffler 1998 on the causes of civil war; Arcand, Guillaumont, Guillaumont Jeanneney 1998 on the relation between fragmentation and polarization): if growth is a decreasing function of ELF until some level and an increasing function thereafter, it may reflect the negative influence of polarization which would be the strongest at the turning point. Temple (1998) insists on this assumption and obtains significant results when testing it.

Coefficients associated with macro policy variables not reduced when ethnic variables are included

The crux of Easterly and Levine's argument is that ethnic fragmentation is an empirically important determinant of economic policies and that poor economic policies, caused by a high degree of ethnic fragmentation in Africa, are the root cause of Africa's poor growth performance. If this argument is correct, then one would expect, when economic policy variables (fiscal surplus, black market premium, financial depth, number of telephones per capita) are included, that the effect of ethnic fragmentation on the growth rate of per capita GDP would disappear, or at least be *significantly* reduced. In Easterly and Levine's results, moving from their regression in which the policy variables are excluded to that in which they are included, there is almost no change in the point estimate of the coefficient on ethnic fragmentation (the coefficient is equal to -0.017 in the first case, while it is -0.016 in the second), and the difference is not statistically significant. This comparison is not altogether fair in that the number of observations (country-decades) included in the first regression is significantly greater than in the second one, owing to missing variables for the indicators of economic policy.

Reestimation with an homogeneous sample

We therefore re-estimated the regressions corresponding to these two equations using the more limited sample of the second one. Our Table A provides the results of these estimations, as well as the two baseline cases in which economic policy variables are excluded. Note that, when the policy variables are added in column (3), the coefficient on ethnic fragmentation, which was equal to -0.019, is now equal to -0.017, a difference in magnitude which is in no way statistically significant. It is only when the logarithm of the number of telephones per worker, which can hardly be construed as a "policy variable", is introduced into the specification that the coefficient on ethnic fragmentation falls somewhat, but still not significantly, to -0.012. Thus, whether one considers the broadest sample that data availability allows or whether one focuses on the most restrictive sample to permit meaningful comparisons, the decrease in the coefficient on ethnic fragmentation that one would expect were Easterly and Levine's line of reasoning correct does not obtain.

Moreover, it is worth noting that Easterly and Levine test the assumption of a direct effect of ethnic fragmentation on economic policies by examining the simple correlation between ethnicity and the various indicators of economic policy. This seems tenuous, at best. It is one thing for a public policy indicator to be correlated with ethnic fragmentation. It is another for this correlation to hold up once one has controlled for other, more traditional explanations for the indicator in question¹.

Other tests hardly more conclusive

Temple's regressions may seem favorable to the assumption that ethnic fragmentation is detrimental to good economic policies. In his growth regressions where the ethnic fragmentation index enters simultaneously in linear and quadratic form, the coefficients, which were jointly significant (at the 10 per cent level of confidence) in the regression without the policy variables, become insignificant when the policy variables are included. However, the size of the sample is considerably reduced in the latter case. It should be noted that the link between ethnicity and "policy variables" has also been directly explored by Temple (1998) in a model including both ELF and ELF squared as well as other control variables: he finds that the coefficients associated with the ethnic diversity variables are jointly significant, but that the average level of ethnic diversity of African countries is well beyond the level (implied by a U-shaped relationship) at which the deleterious impact of ethnic fragmentation on policy choices is maximized.

Recently, La Porta, Lopez-de-Silva, Shleifer and Vishny (1998) have extensively explored the link between several indicators of the quality of government (grouped under five headings: interference with the private sector, efficiency, output of public goods, size of the public sector and public freedom) and several indicators of social structure, including the ethno-linguistic fragmentation index. It appears that for most of the indicators of government quality, the ethnicity variable is indeed significant when GNP per capita is not included among the control variables², but is usually insignificant when GNP per capita is included. Despite these results, the authors maintain the hypothesis that ethnic

¹ Besides, and we do not wish to belabor this point : if ethnic diversity determines the policy variables, then one should be using instrumental variable techniques in which ethnic diversity would be one of several instruments used to identify the effects of the policy variables on economic growth.

² There are only two exceptions (among 17 dependent variables taken as "indicators of government performance") the log of infant mortality and the illiteracy rate. But these exceptions may be due to the functional form of the relation of these variables –possibly non linear- with the log of GNP per capita.

fragmentation leads to a lower quality of government, assuming that the level of income per capita is also adversely affected by ethnicity. They do not, however, present any empirical support for this hypothesis and moreover ethnic fragmentation is far from being the sole determinant of income per capita. Thus the results obtained by La Porta, Lopez-de-Silva, Shleifer and Vishny (1998) cannot be considered as a convincing test of the assumption that ethnicity significantly influences policy...

2. Relevance to Africa

We now raise several points about the relevance to Africa of Easterly and Levine's study of the impact of ethnicity on growth

A dummy variable insensitive to ethnicity

First, there is the question of the sub-Saharan Africa dummy variable. If ethnic diversity is a significant determinant of growth, and if this variable is significantly larger for sub-Saharan Africa than for the rest of the sample, then one would expect that its inclusion in the regression would eliminate, or at least significantly reduce, the magnitude of the Africa dummy. As can be seen from Easterly and Levine's results (comparing their regressions where ethnic diversity is excluded, with the same regressions but in which ethnic diversity is included), there is no significant change in the magnitude of the coefficient on the Africa dummy variable (for example it goes from being equal to -0.014 ($t = -3.24$) to being equal to -0.013 ($t = -2.82$). The expected reduction in the magnitude of the coefficient on the Africa dummy does therefore not obtain. The same holds for the in other results.³

The African subsample: nine out of forty

It is essential to note that the focal point of Easterly and Levine's argument regarding Africa is based on regression results carried out on a sample of 172 observations corresponding to three decades. It is equally important to bear in mind that this is the most restrictive sample that is dealt with by Easterly and Levine: it includes the greatest number of explanatory variables, thus maximizing the probability of there being missing variables

³ We also note that an Africa dummy appears to be significant in Temple's results along with the ethnic variables in most of his specifications.

which lead one to drop a given observation. Upon inspection of the Easterly and Levine dataset, it turns out that 27 observations correspond to sub-Saharan Africa, on average 9 for each decade. There are, to be precise, 13 observations for the 1970s, 13 observations for the 1980s and a single observation for the 1960s which may be termed African⁴, whereas more than forty countries are generally classified as sub-saharan African countries.

While the limited sample size is conditioned by data availability, particularly with respect to the economic policy variables, it does suggest that caution should be exercised in interpreting the results. In particular, generalizing the results to the whole of Africa south of the Sahara may be stretching the limits of statistical inference too far.

Is Africa specific? An unstable relationship

It may be the case that the African subsample, in and of itself, constitutes a special case. This issue lies at the heart of a long-standing debate as to whether one can explain differences in growth performance on the basis of (i) a general, worldwide model of growth in which different groups of countries differ in terms of the level of their variables, but in which the regression coefficients linking the variables in question to the growth rate are constant, or (ii) a specific model in which the coefficients and structure of the model linking the explanatory variables to the growth rate are specific to a given region (Guillaumont, Guillaumont- Jeanneney and Brun 1997). In econometric terms, the issue boils down to the stability of the regression coefficients over different subsamples of countries. Obviously, the criteria by which one assigns a particular country to a given subsample are not restricted solely to geographical considerations.

While Easterly and Levine do note that their results remain approximately the same when they focus on the "out of Africa" subsample, they do not present, or mention, results corresponding to their limited African subsample. Moreover, they do not perform the usual Chow tests in order to verify that their estimated coefficients remain stable across African and non-African subsamples.

⁴ The country-decades are as follows: Botswana (70, 80), Ghana (60, 70, 80), Kenya (70, 80), Liberia (70), Mauritius (70, 80), Malawi (70, 80), Senegal (70, 80), Sierra Leone (70, 80), Sudan (70), Tanzania (70, 80), Togo (80), Uganda (70, 80), Zaire (70, 80), Zambia (70, 80), Zimbabwe (80).

A series of Chow tests on the stability of the regression coefficients between the African and out of Africa subsamples, presented in the last line of Table A, reject the null hypothesis that the coefficients are equal across subsamples. The p-values of these Chow tests are all extremely small⁵.

Results from the limited African sub-sample

Given the instability of the regression coefficients, we now turn to regression results based on the African subsample itself.

In Table B, our purpose is to re-estimate the Easterly and Levine regressions with the largest African subsample possible (the regressors are the same as Easterly and Levine). This implies, as we add explanatory variables, that sample size (for the three decades) decreases rapidly, going from 68 observations when only the basic determinants of per capita GDP growth are included, to only 27 when economic policy variables and ethnic fragmentation are present. Note that we estimated by pooling data over the three decades, since the limited sample size when policy variables are included rendered a system of seemingly unrelated decade-specific equations with cross-equation restrictions on the coefficients infeasible. Standard errors were computed using White's heteroskedasticity-consistent method.

Four results in Table B are worth highlighting. First, the point estimate of the coefficient on the ethnic fragmentation variable is much larger (between 3 and 19 times bigger, depending upon the regression and the sample) in the results based on the (limited) African subsample than in the full sample. This suggests that the importance of ethnic diversity in the African context may be underestimated by the Easterly and Levine results, or perhaps that its impact is overestimated or misspecified in some manner in the out of Africa subsample. Second, the log of initial income and the log of initial income, squared, as well as the log of schooling, are much less important determinants of growth performance in the African subsample than in the full sample. Third, the economic policy variables have much less explanatory power than in the full sample: the fiscal surplus to GDP ratio and the black market premium, which were highly significant in all equations in

⁵ Curiously, Temple (1998) who scrutinized the robustness of Easterly and Levine's results, concluding favourably, did not raise this point.

which they appeared in the full sample are now significant only when the log of telephones per worker is *excluded*. Financial depth, which was statistically significant in all equations in which it was included in the Easterly and Levine full sample, is now only significant in the equation presented in column (7).

We also examined whether Easterly and Levine's argument, according to which ethnic fragmentation causes poor economic policies (which in turn cause poor growth performance) was verified for the African subsample. As in the previous argument based on the full sample, we therefore re-estimated all of our equations on the basis of an African subsample that will remain unchanged across regressions. This "unchanging" subsample corresponds to those observations for which data are available both on economic policy variables and ethnic fragmentation. This allows one to ascertain whether, for the same group of observations, inclusion of the policy variables leads to a reduction in the magnitude of the coefficient on ethnic fragmentation, as Easterly and Levine's argument would have it. These results are presented in Table C. As with (i) the full sample, (ii) the full sample restricted to the set of observations for which the policy variables and ethnic fragmentation are available, and (iii) the African subsample that maximizes sample size, the *fall* in the coefficient associated with the ethnic fragmentation variable when the policy variables are introduced is statistically indistinguishable from zero.

There is thus no reasonable sample of observations for which the introduction of the policy variables leads to the reduction in the magnitude of the coefficient on the ethnic fragmentation variable which one would expect in light of Easterly and Levine's argument. Moreover, of the six possible coefficients associated with the three policy variables in the two regressions in which they are included, only one (financial depth when the log of telephones per worker is excluded) is statistically significant. This is in sharp contrast with the results in the full sample presented by Easterly and Levine, and highlights that the link between policy and the growth rate of per capita GDP does not obtain in the African subsample.

Thus, while ethnic diversity may affect economic growth in sub-Saharan Africa, Easterly and Levine's econometric results refute their very own hypothesis regarding the transmission mechanism.

Concluding remarks

Ethnicity is indeed an important matter, but it is a complex one. We believe that many of the results presented by the major paper on this topic -Easterly and Levine, 1997- are both debatable and weak from an econometric point of view. Its points seem well taken, but its conclusions –that ethnic fragmentation (high in Africa) makes for poor policies, which lower growth- are extremely fragile and implicitly too pessimistic.

It is not surprising that other studies do not find similar significant results for the ethnic fragmentation index when it is introduced in cross sectional growth regressions with appropriate control variables (Sachs and Warner 1997, Rodrik 1998, Guillaumont, Guillaumont-Jeanneney and Brun 1998).

This does not mean that ethnicity has no effect on growth. More scrutiny needs to be paid to the channels through which it may affect growth and on the conditions making its effect more or less strong (a similar opinion is expressed by Temple, 1998). This is the topic of another paper (Arcand, Guillaumont, Guillaumont-Jeanneney 1998).

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TABLE A

FULL SAMPLE RESTRICTED TO THOSE OBSERVATIONS FOR WHICH THE ETHNIC
FRAGMENTATION AND ECONOMIC POLICY VARIABLES ARE AVAILABLE
DEPENDENT VARIABLE: GROWTH RATE OF REAL GDP PER CAPITA

	(1)	(2)	(3)	(4)
Constant	-0.397 (-3.58)	-0.414 (-3.66)	-0.338 (-3.00)	-0.328 (-3.14)
Dummy for Africa	-0.012 (-1.68)	-0.013 (-1.78)	-0.009 (-1.42)	-0.012 (-1.92)
Dummy for Latin America	-0.013 (-7.76)	-0.012 (-7.30)	-0.010 (-6.09)	-0.010 (-6.12)
Dummy for the 60s	0.017 (4.76)	0.016 (4.54)	0.008 (2.14)	0.007 (2.02)
Dummy for the 70s	0.019 (4.89)	0.019 (4.97)	0.015 (4.77)	0.015 (4.68)
Log of initial income	0.112 (3.91)	0.116 (3.99)	0.104 (3.67)	0.105 (4.00)
Log initial income. squared	-0.008 (-4.11)	-0.008 (-4.18)	-0.007 (-4.11)	-0.008 (-4.70)
Log of schooling	0.014 (2.87)	0.014 (2.77)	0.014 (3.08)	0.010 (2.12)
Assassinations		-17.656 (-1.85)	-17.655 (-2.23)	-18.539 (-2.32)
Financial depth			0.015 (2.27)	0.012 (1.88)
Black market premium			-0.019 (-2.77)	-0.019 (-2.73)
Fiscal surplus / GDP			0.184 (4.28)	0.195 (4.41)
Log of telephones per worker				0.005 (2.00)
Ethnic fragmentation	-0.020 (-3.07)	-0.019 (-2.90)	-0.017 (-2.81)	-0.012 (-1.86)
R-squared	0.44	0.45	0.60	0.61
No. of observations	172	172	172	172
Chow test of parameter stability based on African / non African split (p-value)	$\mathbf{c}^2(6) = 23.2$ (0.0007)	$\mathbf{c}^2(7) = 27.5$ (0.0002)	$\mathbf{c}^2(10) = 24.1$ (0.007)	$\mathbf{c}^2(11) = 32.4$ (0.0006)

Note: White heteroskedasticity-consistent t-ratios in parentheses.
Datasource : same as Easterly and Levine.

TABLE B

AFRICAN SUBSAMPLE THAT MAXIMIZES SAMPLE SIZE
DEPENDENT VARIABLE: GROWTH RATE OF REAL GDP PER CAPITA

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Constant	0.023 (0.09)	-0.003 (-0.01)	-0.051 (-0.12)	-0.100 (-0.29)	0.486 (2.01)	0.457 (1.75)	0.399 (1.36)	0.722 (2.75)
Dummy for the 60s	0.029 (4.16)	0.029 (4.15)	0.014 (1.55)	0.020 (1.25)	0.025 (4.07)	0.025 (3.91)	0.004 (0.39)	0.000 (0.02)
Dummy for the 70s	0.018 (2.24)	0.018 (2.24)	0.018 (1.62)	0.019 (1.49)	0.019 (2.48)	0.019 (2.53)	0.012 (1.57)	0.009 (0.92)
Log of initial income	-0.014 (-0.18)	-0.005 (-0.06)	0.020 (0.16)	0.038 (0.36)	-0.135 (-1.97)	-0.126 (-1.71)	-0.070 (-0.79)	-0.135 (-2.20)
Log initial income. squared	0.001 (0.21)	0.001 (0.09)	-0.002 (-0.20)	-0.004 (-0.46)	0.010 (1.98)	0.009 (1.73)	0.004 (0.66)	0.008 (1.72)
Log of schooling	0.012 (1.29)	0.014 (1.29)	0.007 (0.40)	0.003 (0.11)	0.002 (0.28)	0.004 (0.43)	-0.013 (-1.32)	-0.048 (-1.53)
Assassinations		-156.540 (-1.16)	-127.125 (-0.52)	-107.401 (-0.63)		-165.216 (-1.42)	-304.276 (-2.44)	-536.191 (-2.12)
Financial depth			0.087 (1.60)	0.014 (0.16)			0.078 (2.18)	0.077 (1.70)
Black market premium			-0.028 (-2.31)	-0.033 (-1.71)			-0.017 (-2.63)	-0.017 (-1.71)
Fiscal surplus / GDP			0.257 (2.01)	0.202 (1.16)			0.165 (2.28)	0.052 (0.45)
Log of telephones per worker				0.017 (1.14)				0.019 (1.90)
Ethnic fragmentation					-0.061 (-2.78)	-0.064 (-2.79)	-0.152 (-2.49)	-0.206 (-2.94)
R-squared	0.19	0.21	0.45	0.50	0.32	0.34	0.72	0.81
No. of observations	68	67	34	29	64	63	32	27

Note: White heteroskedasticity-consistent t-ratios in parentheses.
Datasource : same as Easterly and Levine.

TABLE C

AFRICAN SUBSAMPLE RESTRICTED TO THOSE OBSERVATIONS FOR WHICH
THE ETHNIC FRAGMENTATION AND ECONOMIC POLICY VARIABLES ARE
AVAILABLE
DEPENDENT VARIABLE: GROWTH RATE OF REAL GDP PER CAPITA

	(1)	(2)	(3)	(4)
Constant	0.609 (2.14)	0.693 (2.58)	0.594 (1.90)	0.722 (2.75)
Dummy for the 60s	-0.004 (-0.45)	0.002 (0.23)	0.000 (-0.01)	0.000 (0.02)
Dummy for the 70s	0.017 (1.79)	0.015 (1.59)	0.013 (1.37)	0.009 (0.92)
Log of initial income	-0.134 (-1.58)	-0.148 (-1.84)	-0.109 (-1.37)	-0.135 (-2.20)
Log initial income. Squared	0.010 (1.47)	0.010 (1.67)	0.007 (1.15)	0.008 (1.72)
Log of schooling	-0.003 (-0.23)	-0.008 (-0.71)	-0.023 (-1.04)	-0.048 (-1.53)
Assassinations		-383.017 (-2.36)	-375.394 (-1.98)	-536.191 (-2.12)
Financial depth			0.103 (2.28)	0.077 (1.70)
Black market premium			-0.013 (-1.39)	-0.017 (-1.71)
Fiscal surplus / GDP			0.119 (1.08)	0.052 (0.45)
Log of telephones per worker				0.019 (1.90)
Ethnic fragmentation	-0.194 (-2.62)	-0.216 (-3.10)	-0.203 (-2.31)	-0.206 (-2.94)
R-squared	0.58	0.65	0.74	0.81
No. of observations	27	27	27	27

Note: White heteroskedasticity-consistent t-ratios in parentheses.
Datasource : same as Easterly and Levine.