Foreign Aid and Population Growth: Evidence from Africa

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African Development and Poverty Reduction: The Macro-Micro Linkage

Forum Paper 2004

13 - 15 October 2004
Lord Charles Hotel, Somerset West, South Africa

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Abstract

This paper investigates the relationship between foreign aid and population growth in Sub-Saharan Africa. Using a panel of African countries over the last four decades, it demonstrates the positive effect of foreign aid on fertility and population growth in this region.

JEL classification: F35, J11, O11.
Keywords: Foreign aid, Fertility, Population growth

I would like to express my thanks to Daniel Tsiddon for guidance and help. I also thank Zvi Hercowitz and Yona Rubinstein for valuable suggestions. Comments of seminar participants at the Hebrew University of Jerusalem, Tel-Aviv University and the University of Haifa are gratefully acknowledged.

1. Introduction

Sub-Saharan Africa has long been the most aided region of the developing world.[1] At the same time, the Sub-Saharan African population has been growing faster than that of any other major world region.[2] Although an enormous literature has been devoted to different aspects of foreign aid,[3] existing works do not consider a possible connection between the two aforementioned facts. This paper attempts to fill the existing gap by investigating the effect of foreign aid on population growth.

The benefits of foreign aid have been recently under severe scrutiny. Several observers argue that a large portion of aid is wasted and only increases unproductive consumption.[4] It is argued that, where economic and political environment is poor, foreign assistance has no positive impact on the recipient's macroeconomic policies and growth,[5] and can generate more development problems than it solves.[6]

The present study expands the previous literature by examining the empirical relationship between foreign aid and population growth. It provides evidence of the positive and significant effect of aid on population growth rates using a panel of main 43 Sub-Saharan African countries over the last four decades of the 20th century. The paper also directly addresses the positive association between aid and fertility.

The work is motivated by the belief that the true appreciation of the demographic effect of foreign aid can have important implications for policies designed to promote economic growth,[7] and may also help to explain the results of development efforts in Africa to date.[8]

[1] Since independence, foreign aid as a proportion of the recipients' gross national income has averaged over 10% in more than one-third of African countries. For most countries, aid increased over decades. In the 1990s, foreign assistance averaged over 10% in nearly two-thirds of the countries. (Here and further on the data are from World Bank (2001).)

[2] In the mid-1990s, African population was growing by about 2.7% per year. Moreover, in more than a half of the countries population growth rate increased from the 1960s to the 1990s. As a result, over past four decades, the region's total population increased almost three-fold – from 229 million people in 1961 to 659 million in 2000. For detailed descriptions of the long-term trends in African population growth, see, for instance, Caldwell and Caldwell (1987), Caldwell et al. (1992), Foote et al. (1993), Goliber (1997), Tarver (1997); cf. also World Bank (1986), United Nations (2000).

[3] Jepma (1997) presents a broad survey of the literature from the seventies onward. Drazen (2000) provides a survey of the political economy literature on foreign aid.

[4] On this point, see, e.g., the classical study by Boone (1994, 1996).

[5] Poor institutional development, inefficiencies and bureaucratic failures are often cited as reasons for this result. For an extensive discussion of these issues, see World Bank (1998); cf. also Burnside and Dollar (2000).

[6] This point of view can be traced back to Milton Friedman (1958) and Bauer (1972) who argued that foreign aid detracts from development. In a particular case of Africa, it has been postulated that the region has been overaided and that a substantial decrease in aid might prove to be a benefit rather than a cost for many countries (e.g., Lancaster, 1999).

[7] In an interesting theoretical study, Blackorby et al. (1999) postulate that foreign assistance can be given in a form of population-control aid.

[8] Negative consequences of high population growth for economic performance have long been recognized in both, demography (e.g., Goliber (1997)) and development economics (e.g., Lancaster, 1999; Block, 2001). For a voluminous literature that points to a diverse set of potential causes of Sub-Saharan African ills, see, e.g., Easterly and Levine (1997).

The rest of the paper is organized as follows. Section 2 presents the central variables in the analysis. Section 3 demonstrates the potential of the hypothesis postulated in the paper. Section 4 shows the positive effect of aid on population growth and fertility in Africa in a panel regression framework. Section 5 concludes.

2. Data: Central Variables in the Analysis

The data used in this paper are from the World Bank's *World Development Indicators*, *2001*. The data set includes main 43 Sub-Saharan African countries over the period 1961 – 2000 (see Appendix A). Table (1) provides an overview of descriptive statistics for the central variables in the analysis.

Table 1: **Summary Statistics for the Central Variables in the Analysis**

Variable	AID [a]	PGR [a]	AID [b]	PGR [b]	TFR [b]	CBR [b]
Mean	11.15	2.66	8.63	2.60	6.17	44.00
St. Dev.	11.21	0.85	7.37	0.68	1.14	7.05
Observations	1402	1402	920	920	368	368
			Variables in their first differences			
Mean	0.17	-7.45E-04	0.13	-1.05E-03	-0.10	-0.66
St. Dev.	5.25	0.41	4.12	0.21	0.19	1.02
Observations	1357	1357	897	897	345	345

Notes: (*a*) All 43 African countries. (*b*) Balanced sample of 23 countries, for which the data are available throughout all of the period. AID is foreign aid as percent of the recipient's GNI, PGR is population growth rate, TFR is total fertility rate, and CBR is crude birth rate. [9]

As can be seen, aid flows have been very high relative to the size of African economies. Moreover, the average first difference of foreign aid as percent of the recipient's GNI over the last four decades of the 20th century is positive.[10] The difference between the two samples with respect to the two major variables in the analysis – PGR and AID – is relatively minor.

[9] Total fertility rate represents the number of children that would be born to a woman if she were to live to the end of her childbearing years and bear children in accordance with prevailing age-specific fertility rates. Crude birth rate indicates the number of live births occurring during the year, per 1000 population estimated at midyear.

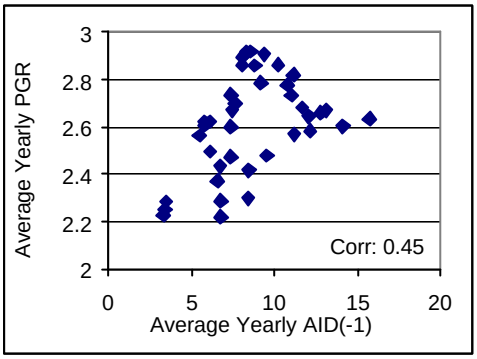
[10] The positive average first difference reflects the fact that foreign aid as percent of the recipient's GNI in Africa has extended over decades.

3. Evidence: A First Look

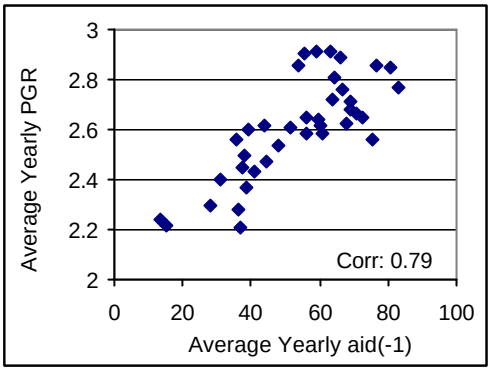
This section demonstrates the potential of the hypothesis postulated in the paper. A formal examination follows in Section 4.

The graphs present in this section refer to the balanced sample of 23 African countries, for which the data are available throughout all of the period (see Appendix A). Graphs (1) and (2) present yearly averages over the whole sample, whereas Graphs (3) to (6) deal with separate countries.

Graph 1: **PGR vs. AID(-1)**



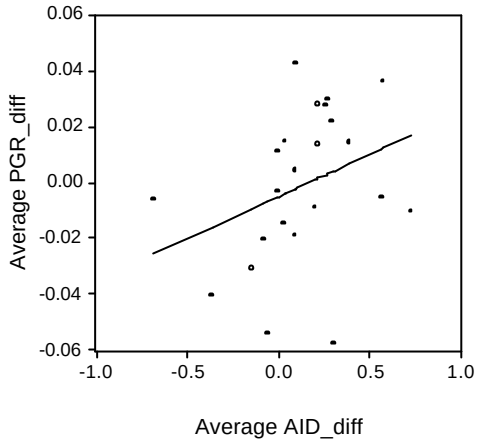
Graph 2: **PGR vs. aid(-1)**



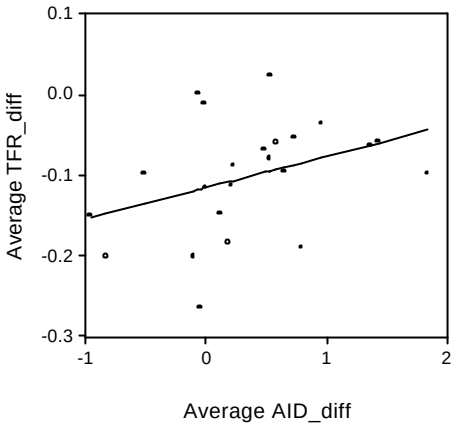
Notes: On Graph (1) AID refers to foreign aid as percent of the recipient's GNI. On Graph (2) aid refers to foreign aid refers to foreign aid in constant 1995 US$.

Graphs (1) and (2) show that the years with higher population growth rare are associated with relatively generous aid accepted in the previous year. Graph (1) demonstrates a strong positive association between the average yearly rate of population growth and the average yearly foreign aid as percent of the recipient's GNI lagged one year. Graph (2) shows that the relationship between the average yearly PGR and foreign aid in constant 1995 US$ is even stronger.

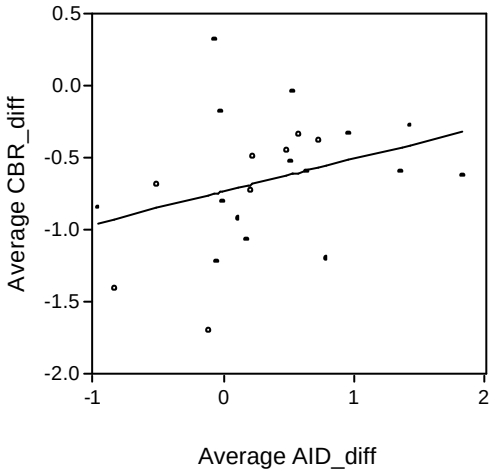
Graph 3: **Population Growth Rate (PGR)**



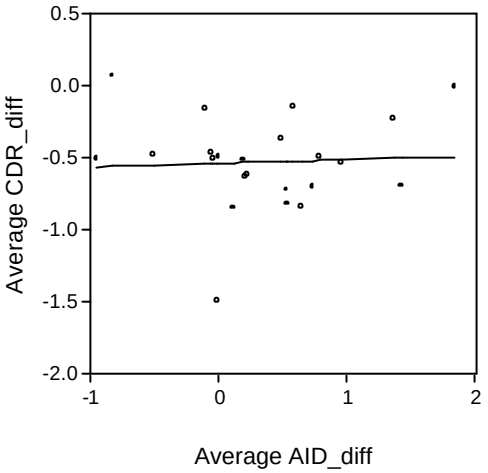
Graph 4: **Total Fertility Rate (TFR)**



Graph 5: **Crude Birth Rate (CBR)**



Graph 6: **Crude Death Rate (CDR)**



Notes: Average PGR_diff, TFR_diff, CBR_diff, CDR_diff, and AID_diff are defined as the averages of the first differences of the corresponding variables for each of the countries over the period.[11]

[11] For Graph (3), the average first differences for each of the countries are calculated from the yearly data over the entire period. For Graphs (3) to (6), the average first differences (including the average AID_diff) are calculated from 16 years within the period, for which the data on TFR, CBR, and CDR are available (see Appendix A).

Graph (3) demonstrates a positive association between the average first difference of population growth rate and the average first difference of foreign aid as percent of the recipient's GNI for 23 African countries in the balanced sample. Correlation between these two variables is 0.33. In the OLS estimation of average PGR_diff on average AID_diff and a constant term, the coefficient on AID_diff is positive and significant at a 10% level.

Table 2: **Correlation Matrix**

	Aver TFR_diff	Aver CBR_diff	Aver CDR_diff	Aver AID_diff
Aver PGR_diff	0.694977	0.752133	-0.449743	0.332375
Aver TFR_diff		0.929400	-0.375178	0.358093
Aver CBR_diff			-0.404888	0.334105
Aver CDR_diff				0.050336

Notes: For definitions, see notes to Graphs (3) to (6).

Graphs (2) to (4) attempts to distinguish between two components of population growth rate – fertility and mortality. As can be seen, there exists a positive association between the average first difference of foreign aid and the average first differences of two directly fertility-related variables – total fertility rate and crude birth rate.[12] In the case of crude death rate, on the contrary, no significant statistical association is found.[13]

Table 3: **OLS Estimation**

Dep. Variable	Aver PGR_diff	Aver TFR_diff	Aver CBR_diff	Aver CDR_diff
Aver AID_diff	3.02E-02	3.91E-02	0.227	2.44E-02
	(1.75) [0.09]	(2.44) [0.02]	(1.99) [0.06]	(0.20) [0.84]

Notes: White heteroscedasticity-consistent standard errors in parentheses, *p*-values in brackets. Constants are not reported.

Next section analyzes the effect of foreign aid on population growth rate and fertility in Africa in a formal panel regression framework.

[12] The relationship with the average first difference of foreign aid calculated over the whole period is slightly stronger: correlations are 0.41 and 0.36; in OLS estimation, *p*-values are 0.01 and 0.04, for average first differences of TFR and CBR, respectively. In the case of CDR, on the contrary, correlation shrinks to 0.02 and *p*-value becomes 0.94.

[13] If we exclude an outlier, Zambia, the coefficient of correlation becomes negative (-0.14). The level of significance in OLS estimation is still extremely low ($p = 0.53$). For average first difference of PGR, TFR, and CBR without Zambia, correlation rises to 0.42, 0.41, and 0.37, and *p*-values improve to 0.03, 0.007, and 0.03, respectively.

4. Panel Regression Framework

Theoretical growth models with endogenous fertility have long postulated that income transfers to the poor increase population growth because the income effect entices the poor to increase their family size (e.g., Morand, 1999; Azarnert, 2005).[14] Accordingly, the theory predicts that aid flows from advanced economies to developing countries should have a similar effect. This section analyzes the effect of foreign aid on fertility and population growth in Africa in a panel regression framework.[15] In every specification, the estimation coefficient on foreign aid is shown to be positive and statistically significant.

4.1. Foreign Aid and Population Growth

This section shows the effect of foreign aid on population growth rate – the only demographic indicator, for which systematic yearly data are available. The analysis is performed separately in a balanced sample that includes 23 countries, for which the data are available throughout all of the period, and in an unbalanced panel that includes all 43 African countries (see Appendix A). The method of estimation throughout is GLS with cross section weights and county specific fixed effects. To capture the idea that foreign aid affects population growth primarily via its effect on fertility, all aid regressors are lagged one year.

To begin discussion, consider first the relatively persistent population growth rate. Table (4) in Appendix presents the main results of estimation in both, the balanced sample and the unbalanced panel of all of the countries. Along with foreign aid, the set of explanatory variables include the percent of urban population and the percent of female in total population in previous year, the time trend, and two lags of the dependent variable.[16]

The table shows three different approaches to the regression model. Columns (1) and (4) report the result of estimation of population growth rate on foreign aid as percent of the recipient's GNI per capita in the balanced sample and in the unbalanced panel, respectively. In the other four columns, foreign aid and the recipient's national income per capita are introduced separately: in Columns (2) and (5), aid and the recipient's GNI are in constant 1995 US$, whereas in Columns (3) and (6), they are in current US$.[17] As can be seen, in every specification the estimated effect of aid on population growth rate is positive and statistically significant. Interestingly, when aid and the recipient's national income are introduced separately, the estimated effect of aid is

[14] The direct income effect may also be accompanied by the influence on the quantity-quality tradeoff of endogenous fertility models to induce a reallocation of parental resources away from quality of children toward quantity.
[15] The estimation is done using Eviews software.
[16] A re-estimation of the regression model without lags of the dependent variable also yields the positive and significant effect of aid that is quite similar to that observed in the basic specification.
[17] The reason for dealing with current US$ is that the US CPI that deflates the constant US$ may not properly reflect changes in the purchasing power of the US$ in Africa. Unfortunately, data on GNI (or GDP) in PPP are available starting from the year 1975 only.

stronger and more significant that that of the recipient's GNI.[18] As to the effect of the other control variables, as one could expect, the percent of female in population affects population growth positively, whereas the percent of urban population affects it negatively.

Till now the paper focused on the effect of foreign aid lagged one year following the idea that aid affects population growth primarily via its effect on fertility. To test the robustness of this assumption, the regression model is re-estimated with foreign aid in current period along with its first and second lags. As shown in Table (5) in Appendix, in all these regressions the estimated coefficient on once-lagged aid is positive and significant (at least at 0.1% level), whereas the coefficients on current and twice-lagged foreign aid are generally statistically insignificant and sometimes are of opposite sign.[19]

Another more rigorous way to examine the hypothesis postulated in the paper is to estimate the effect of aid using the less persistent first differenced data. The results of estimation of the first differences are reported in Table (6) in Appendix. In this table, Columns (1) and (4) show foreign aid as percent of the recipient's GNI, whereas in the other four columns foreign aid and the recipient's national income are introduced separately. As can be seen, all the regressions demonstrate the positive and statistically significant effect of the first difference of foreign aid on the first difference of population growth rate.[20] As in the level estimation, the effect of the first difference of aid is also stronger and more statistically significant than that of the first difference of the recipient's GNI. It seems to be also worthy of mention that in this specification the other explanatory variables mostly change their sign relative to that observed in the level estimation.[21]

The regression model can be also re-estimated with both, linear and quadratic, functional forms of foreign aid. As shown in Tables (7) and (8) in Appendix, in such specification the positive linear effect of aid is much stronger than the negative effect of aid in square thus testifying the positive overall effect that is characterized by the diminishing returns to scale.[22]

It should be also noted that this positive effect of aid on population growth rate does not contradict to the view that foreign aid may also respond to faster population growth. In fact, as shown in Table (9) in Appendix, if we re-estimate the regression model with foreign aid as a dependent variable, the estimated coefficients on once-lagged population growth rate are also statistically significant. More importantly, however, when the data are first-differenced, the coefficients on once-lagged first difference of

[18] For the relationship between fertility and per capita output in a broad sample of developing countries, see, e.g., Barro and Sala-i-Martin (1995).

[19] Adding further lags of aid, such as the third and the fourth, does not alter this result.

[20] If the regression model is estimated without time trend, it does not alter the results concerning the effect of foreign aid.

[21] The estimated coefficient on the first difference of the percent of female is positive and significant, whereas that the percent of urban population is negative and mostly insignificant.

[22] For example, in the case of foreign aid as percent of the recipient's GNI, given the coefficients estimated in the balanced sample, the overtaking point is about 53 in the level estimation, and is about 16 in the first difference of aid. In reality, for the countries in the balanced sample, the average yearly aid as percent of the recipient's GNI was nearly 9%, and the average first difference of aid was only 0.13.

population growth rate are either positive or negative and insignificant (see Table 10 in Appendix). This result probably suggests that the major effect is rather from aid to PGR. In any case, both lines of causality are consistent with the view that foreign aid substantially facilitates population growth.

4.2. Foreign Aid and Fertility

This section demonstrates the effect of foreign aid on fertility in Africa using three different estimation methods. It considers both demographic directly fertility-related indicators – total fertility rate (TFR) and crude birth rate (CBR).

Table (11) in Appendix presents the results of estimation in the balanced panel of 23 African countries.[23] Columns (1) to (3) report the results of estimation of total fertility rate. Crude birth rate is present in Columns (4) to (6). Both these variables are assumed to depend on foreign aid as percent of the recipient's GNI, mortality – infant mortality rate in the case of TFR and crude death rate in the case of CBR, – life expectancy, and the percent of urban population.[24] Given that total fertility rate is calculated per woman, the percent of female in population is included in the CBR regressions only. The set of explanatory variables also includes the time trend.[25] All the regressors are lagged one period.[26]

Columns (1) and (4) show the results of a GLS estimation with cross section weights and country specific fixed effects. To check the robustness of the results of the basic specification, the regression model is estimated using two other methods: (1) pooled LS with fixed effects and no weights, and (2) GLS with random effects. The results for TFR are reported in Columns (2) and (5). The results for CBR are in Columns (3) and (6), respectively. As can be seen, the effect of aid on both – total fertility rate and crude birth rate – is shown to be positive and significant regardless of the method of estimation.[27] All three methods also yield relatively similar coefficients on aid.

4.2. Foreign Aid and Life Expectancy

This section considers another component of population growth – life expectancy. The results of estimation in the balanced panel of 23 African economies are reported in Table (13) in Appendix. In the estimation, life expectancy is assumed to depend on foreign aid as percent of the recipient's GNI, fertility – TFR in Columns (1) to (3) and CBR in Columns (4) to (6), – mortality – infant mortality rate in Columns (1) to (3) and crude death rate in Columns (4) to (6), – the percent of urban population, and the percent of female in population. The time trend is included too.

[23] The regressions are run over 16 years within the period, for which the data on TFR and CBR are available (see Appendix A).
[24] Systematic data on schooling (particularly, that of female) and contraceptive prevalence that are generally used in the literature to estimate fertility decisions (e.g., Schultz, 1997) are not available for the early part of the period.
[25] Adding once-lagged PGR does not affect the results concerning the effect of aid. The estimated coefficients on once-lagged PGR are positive and significant.
[26] Introducing aid in the previous year does not alter the results concerning aid's effect on fertility.
[27] If the model is re-estimated with both, linear and quadratic, functional forms, the positive and statistically significant linear effect of aid is much stronger than the negative effect of the quadratic form (see Table (12) in Appendix).

As in the previous section, the regression model is estimated using three different methods: (1) GLS with cross section weights and country specific fixed effects, (2) pooled LS with fixed effects and no weights, and (3) GLS with random effects. As can be seen, all six regressions yield statistically insignificant (even at 15% level) coefficients on aid.[28]

5. Conclusion

This work investigates the effect of foreign aid on fertility and population growth. It uses a panel of main 43 Sub-Saharan African countries over the last four decades of the 20th century. In the analysis of population growth rate, two different specifications of the regression model are applied. The first specification is to regress population growth rate. The second specification is to estimate the first difference of population growth rate on the first differences of the explanatory variables. Both the approaches demonstrate a positive and statistically significant effect of foreign aid on population growth. In the analysis of fertility, three different estimation methods are applied. The effect of aid on both – total fertility rate and crude birth rate – is shown to be positive and significant regardless of the method of estimation. These findings suggest that the true appreciation of the demographic effect of foreign aid can have important implications for policies designed to promote economic growth.

[28] Introducing aid in current year does not alter the results concerning the effect of aid on life expectancy significantly.

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Appendix A: **List of main Sub-Saharan African countries and data availability (the period 1961 – 2000)** [a]

Country	AID [b]	Aid and GNI separately [c]
Angola	1985 – 2000	1987 – 2000
Benin*	1961 – 2000	1962 – 2000
Botswana*	1961 – 2000	1962 – 2000
Burkina Faso*	1961 – 2000	1962 – 2000
Burundi*	1961 – 2000	1962 – 2000
Cameroon*	1961 – 2000	1962 – 2000
Capo Verde	1986 – 2000	1988 – 2000
Central African Rep.*	1961 – 2000	1962 – 2000
Chad*	1961 – 2000	1962 – 2000
Congo, Dem. Rep.	1961 – 1998	1962 – 1969; 1973 –1998
Congo, Rep.*	1961 – 2000	1962 – 2000
Cote d'Ivoire*	1961 – 2000	1962 – 2000
Equatorial Guinea	1985 – 2000	1987 – 2000
Eritrea	1993 – 2000	1994 – 2000
Ethiopia	1981 – 2000	1983 – 2000
Gabon*	1961 – 2000	1962 – 2000
Gambia	1966 – 2000	1968 – 2000
Ghana*	1961 – 2000	1962 – 2000
Guinea	1986 – 2000	1988 – 2000
Guinea-Bissau	1974 – 2000	1975 – 2000
Kenya*	1961 – 2000	1962 – 2000
Lesotho*	1961 – 2000	1962 – 2000
Liberia	1961 – 1987	1962 – 1987
Madagascar*	1961 – 2000	1962 – 2000
Malawi*	1961 – 2000	1962 – 2000
Mali	1967 – 2000	1969 – 2000
Mauritania*	1961 – 2000	1962 – 2000
Mauritius*	1961 – 2000	1962 – 2000
Mozambique	1980 – 2000	1982 – 2000
Namibia [1]	1990 – 2000	1990 – 2000
Niger*	1961 – 2000	1962 – 2000
Nigeria*	1961 – 2000	1962 – 2000
Rwanda [2]	1961 – 2000	1962 – 2000
Senegal	1968 – 2000	1970 – 2000
Sierra Leone	1964 – 2000	1966 – 2000
Somalia	1961 – 1990	1962 – 1990
Sudan*	1961 – 2000	1962 – 2000
Swaziland* [3]	1961 – 2000	1972 – 2000
Tanzania	1988 – 2000	1990 – 2000
Togo*	1961 – 2000	1962 – 2000
Uganda	1961 – 1968; 1980 – 2000	1984 – 2000
Zambia*	1961 – 2000	1962 – 2000
Zimbabwe [1]	1980 – 2000	1980 –2000

Notes to Appendix A: Countries with asterisk are in the balanced sample.

(*a*) The year 1960 saw granting independence to 16 Sub-Saharan African countries. From the year 1960 to the next, for 11 countries, for which the data are available, foreign aid as percent of the recipient's GNI increased more than 10-fold. For 4 of the countries, it increased more than 100-fold. For this reason, the year 1960 is excluded.

South Africa that did not receive aid, but suffered from international sanctions throughout almost all of the period is excluded.

(*b*) Foreign aid as percent of the recipient's GNI.

(c) Foreign aid and the recipient's GNI per capita in constant 1995 US$ (deflated by the US CPI) and in current US$, separately.

Yearly data on population growth rate (PGR), the percent of female in total population (FEM), and urban population as percent of total population (URBAN) are available throughout all of the period. Data on total fertility rate (TFR), crude birth rate (CBR), crude death rate (CDR), and infant mortality rate (MORT), over the period 1961 – 2000 are available for the following years: 1962, 1965, 1967, 1970, 1972, 1975, 1977, 1980, 1982, 1985, 1987, 1990, 1992, 1995, 1997, 2000.

(1) For Namibia and Zimbabwe, data refer to the years of independence only.

(2) For Rwanda, the 1994 – 1997 period that saw substantial movements of Rwandans across the county's boundaries as a consequence of the civil war is excluded.

(3) Whenever aid and GNI are introduced separately, Swaziland is not included in the balanced sample.

Table 4: **Level Estimation of PGR on AID(-1)**

Dependent Variable	PGR	PGR	PGR	PGR	PGR	PGR
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	836	836	1312	1279	1279
AID(-1)	4.89E-04	8.76E-05	1.45E-04	7.48E-04	1.82E-04	2.79E-04
	(3.19)	(3.06)	(4.30)	(5.13)	(7.71)	(7.71)
GNI(-1)		1.26E-05	1.50E-05		1.63E-05	1.34E-05
		(2.49)	(1.89)		(5.11)	(2.77)
TIME	2.09E-04	6.70E-04	5.36E-04	-1.60E-04	3.70E-04	7.81E-05
	(1.01)	(3.36)	(2.68)	(-0.91)	(2.33)	(0.49)
PGR(-1)	1.551	1.528	1.536	1.441	1.452	1.453
	(28.06)	(27.35)	(27.58)	(23.26)	(24.36)	(24.26)
PGR(-2)	-0.582	-0.570	-0.574	-0.501	-0.519	-0.518
	(-10.51)	(-10.41)	(-10.43)	(-8.26)	(-8.97)	(-8.86)
URBAN(-1)	-1.44E-03	-1.49E-03	-1.95E-03	-7.11E-04	-1.08E-03	-1.52E-03
	(-5.27)	(-5.26)	(-8.26)	(-3.46)	(-5.78)	(-8.06)
FEM(-1)	7.73E-03	2.38E-02	2.34E-02	1.04E-02	1.60E-02	1.61E-02
	(1.19)	(3.75)	(3.68)	(2.07)	(3.59)	(3.55)
Adj. R^2	0.999	0.999	0.999	0.997	0.997	0.997

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 5: **Level Estimation of PGR on AID, AID(-1), and AID(-2)**

Dependent Variable	PGR	PGR	PGR	PGR	PGR	PGR
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	814	814	1312	1236	1236
AID	-2.17E-04	-2.23E-05	-2.83E-05	7.59E-06	3.55E-05	1.06E-04
	(-1.35)	(-0.78)	(-0.79)	(0.39)	(1.34)	(2.73)
AID(-1)	7.45E-04	1.30E-04	1.93E-04	9.35E-04	1.77E-04	2.65E-04
	(4.23)	(3.95)	(5.43)	(5.91)	(7.20)	(8.28)
AID(-2)	-1.94E-04	-4.96E-05	-6.92E-05	-2.52E-04	-1.19E-05	-5.47E-05
	(-1.20)	(-1.67)	(-2.22)	(-1.58)	(-0.59)	(-1.83)
GNI(-1)		1.07E-05	1.25E-05		1.44E-05	1.02E-05
		(1.91)	(1.40)		(4.37)	(1.99)
TIME	2.78E-04	7.01E-04	5.94E-04	-1.80E-04	3.46E-04	2.82E-05
	(1.28)	(3.11)	(2.64)	(-0.97)	(2.03)	(0.16)
PGR(-1)	1.550	1.503	1.514	1.439	1.434	1.433
	(27.72)	(24.05)	(24.40)	(23.08)	(23.09)	(22.93)
PGR(-2)	-0.581	-0.544	-0.552	-0.501	-0.501	-0.499
	(-10.38)	(-8.75)	(-8.88)	(-8.21)	(-8.22)	(-8.12)
URBAN(-1)	-1.51E-03	-1.82E-03	-2.08E-03	-7.23E-04	-1.33E-03	-1.73E-03
	(-5.41)	(-5.51)	(-7.77)	(-3.49)	(-6.55)	(-8.55)
FEM(-1)	8.16E-03	2.17E-02	2.28E-02	9.08E-03	1.43E-02	1.42E-02
	(1.22)	(3.06)	(3.25)	(1.81)	(3.00)	(2.94)
Adj. R^2	0.999	0.998	0.999	0.997	0.997	0.997

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 6: **First Difference Estimation of PGR_diff on AID_diff(-1)**

Dependent Variable	PGR_diff	PGR_diff	PGR_diff	PGR_diff	PGR_diff	PGR_diff
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	814	814	1312	1237	1237
AID_diff(-1)	4.18E-04	8.40E-05	9.45E-05	4.12E-04	7.77E-05	7.82E-05
	(5.28)	(6.72)	(5.88)	(5.56)	(11.16)	(7.35)
GNI_diff(-1)		5.17E-06	1.81E-05		7.86E-06	2.42E-05
		(1.09)	(2.42)		(2.59)	(4.91)
TIME	-1.06E-03	-1.13E-03	-1.12E-03	-1.21E-03	-1.21E-03	-1.21E-03
	(-8.60)	(-7.76)	(-7.70)	(-10.05)	(-9.62)	(-9.57)
PGR_diff(-1)	0.579	0.548	0.549	0.496	0.497	0.494
	(12.22)	(10.43)	(10.38)	(10.17)	(10.30)	(10.14)
URB_diff(-1)	2.28E-03	2.70E-03	2.10E-03	6.11E-03	2.68E-03	2.27E-03
	(1.30)	(1.37)	(1.04)	(3.31)	(1.98)	(1.48)
FEM_diff(-1)	-0.133	-0.111	-0.110	-0.167	-0.156	-0.156
	(-10.41)	(-8.85)	(-8.66)	(-15.53)	(-14.95)	(-14.74)
Adj. R^2	0.526	0.499	0.498	0.408	0.465	0.460

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 7: **Level Estimation with AID in Square**

Dependent Variable	PGR	PGR	PGR	PGR	PGR	PGR
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	836	836	1312	1279	1279
AID(-1)	1.99E-03	2.60E-04	4.30E-04	1.81E-03	6.12E-04	8.49-04
	(5.20)	(3.93)	(2.79)	(4.44)	(9.88)	(8.19)
$AID(-1)^2$	-3.77E-05	-6.36E-07	-1.73E-06	-2.32E-05	-1.62E-06	-3.75E-06
	(-4.86)	(-3.63)	(-2.09)	(-1.97)	(-9.29)	(-6.64)
GNI(-1)		1.18E-05	1.18E-05		1.44E-05	8.26E-06
		(2.20)	(1.29)		(4.37)	(1.63)
TIME	-5.25E-05	6.01E-04	2.98E-04	-3.32E-04	8.27E-05	-3.36E-04
	(-0.25)	(2.94)	(1.46)	(-1.91)	(0.52)	(-2.04)
PGR(-1)	1.547	1.528	1.534	1.443	1.452	1.453
	(28.12)	(27.42)	(27.71)	(23.71)	(24.63)	(24.39)
PGR(-2)	-0.580	-0.571	-0.574	-0.505	-0.522	-0.519
	(-10.56)	(-10.50)	(-10.52)	(-8.47)	(-9.16)	(-8.96)
URBAN(-1)	-1.30E-03	-1.54E-03	-1.83E-03	-5.95E-04	-9.53E-04	-1.35E-03
	(-4.69)	(-5.41)	(-7.67)	(-3.07)	(-5.16)	(-7.43)
FEM(-1)	2.74E-03	2.18E-02	2.23E-02	5.43E-03	1.32E-02	1.45E-02
	(0.43)	(3.47)	(3.53)	(1.18)	(3.12)	(3.30)
Adj. R^2	0.999	0.998	0.999	0.997	0.997	0.997

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 8: **First Difference Estimation with AID_diff in Square**

Dependent Variable	PGR_diff	PGR_diff	PGR_diff	PGR_diff	PGR_diff	PGR_diff
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	814	814	1312	1237	1237
AID_diff(-1)	5.61E-04	1.21E-04	1.26E-04	4.95E-04	9.98E-05	1.03E-04
	(6.10)	(9.26)	(8.10)	(6.77)	(13.01)	(9.77)
AID_diff(-1) ^{2}	-3.51E-05	-1.28E-06	-2.28E-06	-1.83E-05	-9.05E-07	-2.05E-06
	(-5.94)	(-6.69)	(-9.42)	(-4.43)	(9.92)	(-14.26)
GNI_diff(-1)		4.74E-06	1.13E-05		7.25E-06	1.97E-05
		(1.11)	(1.52)		(2.49)	(3.93)
TIME	-9.89E-04	-1.09E-03	-1.02E-03	-1.19E-03	-1.19E-03	-1.14E-03
	(-8.23)	(-7.47)	(-7.06)	(-9.95)	(-9.48)	(-9.20)
PGR_diff(-1)	0.576	0.544	0.546	0.496	0.495	0.492
	(12.16)	(10.36)	(10.33)	(10.18)	(10.25)	(10.07)
URB_diff(-1)	1.35E-03	2.89E-03	1.84E-03	5.38E-03	2.81E-03	2.13E-03
	(0.78)	(1.49)	(0.91)	(3.00)	(2.10)	(1.38)
FEM_diff(-1)	-0.138	-0.115	-0.118	-0.169	-0.157	-0.161
	(-10.56)	(-9.09)	(-9.05)	(-15.61)	(-15.07)	(-14.93)
Adj. R ^{2}	0.528	0.499	0.499	0.409	0.464	0.457

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 9: **Level Estimation of AID on PGR(-1)**

Dependent Variable	AID					
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	814	814	1312	1236	1236
PGR(-1)	0.126	2.424	2.728	0.175	0.786	0.935
	(1.92)	(5.37)	(7.80)	(2.06)	(3.04)	(4.00)
TIME	4.13E-02	-1.56E-02	4.64E-02	5.51E-02	-7.40E-03	6.40E-02
	(5.31)	(-1.11)	(2.33)	(8.27)	(-0.66)	(3.72)
AID(-1)	0.637	0.662	0.704	0.632	0.683	0.732
	(12.08)	(12.45)	(10.53)	(18.24)	(16.39)	(15.13)
AID(-2)	0.146	0.117	0.174	0.133	0.101	0.137
	(2.89)	(2.17)	(2.70)	(4.00)	(2.20)	(2.97)
GNI(-1)		-1.52E-03	1.13E-04		-8.70E-04	1.17E-03
		(-5.24)	(0.12)		(-4.08)	(1.45)
URBAN(-1)	-4.43E-02	-0.196	-4.62E-02	-5.27E-02	-0.210	-5.74E-02
	(-6.79)	(-3.09)	(-0.92)	(-9.41)	(-4.19)	(-1.53)
FEM(-1)	0.769	2.005	1.450	0.900	1.586	1.690
	(3.19)	(4.96)	(2.64)	(5.22)	(4.94)	(3.52)
Adj. R^2	0.759	0.709	0.853	0.771	0.737	0.846

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 10: **First Differences Estimation of AID_diff on PGR_diff(-1)**

Dependent Variable	AID_diff	Gaid95_diff	Gaid_diff	AID_diff	Gaid95_diff	Gaid_diff
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	874	814	814	1312	1238	1238
PGR_diff(-1)	-0.195	1.15E-02	0.236	-0.225	-0.130	-0.270
	(-1.23)	(0.01)	(0.34)	(-1.21)	(-1.05)	(-1.89)
TIME	-1.08E-02	-0.168 (-7.39)	-8.04E-02	-1.19E-02	-0.170 (-10.60)	-9.40E-02
	(-4.67)		(-6.15)	(-5.95)		(-9.16)
AID_diff(-1)	-0.245	-0.228	-0.223	-0.242	-0.210	-0.203
	(-4.19)	(-3.76)	(-3.15)	(-6.18)	(-4.22)	(-4.01)
GNI_diff(-1)		1.73E-03	4.98E-03		2.42E-03	4.22E-03
		(0.23)	(0.96)		(0.46)	(1.01)
URB_diff(-1)	-0.351	-2.925	-1.487	-0.358	-3.591	-1.490
	(-3.01)	(-1.51)	(-1.26)	(-4.25)	(-2.75)	(-1.90)
FEM_diff(-1)	1.010	8.468	3.786	1.096	7.629	2.756
	(3.44)	(3.39)	(2.53)	(4.04)	(3.58)	(1.82)
Adj. R^2	0.042	0.045	0.035	0.041	0.043	0.029

Notes: Columns (1) to (3): Balanced Sample, Columns (4) to (6): Unbalanced Panel.
In Columns (1) and (4), AID is foreign aid as percent of the recipient's GNI. In Columns (2) and (5), AID and GNI are in constant 1995 US$. In Columns (3) and (6), AID and GNI are in current US$.
Method of estimation: GLS with cross section weights and country specific fixed effects. White heteroskedasticity-consistent *t*-values in parentheses.

Table 11: **Directly Fertility-Related Demographic Indicators (TFR and CBR)**

Dependent Variable	TFR			CBR		
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	345	345	345	345	345	345
AID(-1)	1.52E-02	1.81E-02	1.71E-02	6.28E-02	7.91E-02	7.57E-02
	(4.92)	(3.98)	(3.53)	(3.70)	(2.88)	(2.66)
TIME	-0.192	-0.211	-0.168	-0.701	-0.808	-0.647
	(-15.62)	(-12.49)	(-9.92)	(-9.42)	(-7.73)	(-6.39)
LIFE(-1)	5.68E-02	4.71E-02	2.66E-02	0.523	0.460	0.380
	(6.00)	(3.64)	(1.95)	(8.33)	(4.35)	(3.51)
IMR(-1)	-9.24E-03	-1.22E-02	-7.38E-03			
	(-4.76)	(-4.27)	(-2.47)			
CDR(-1)				0.367	0.371	0.494
				(3.42)	(2.37)	(3.09)
URBAN(-1)	5.92E-03	6.83E-03	4.22E-03	-1.32E-03	4.58E-02	2.50E-02
	(1.45)	(1.22)	(0.77)	(-0.05)	(1.35)	(0.77)
FEM(-1)				1.290	0.773	0.680
				(3.18)	(1.31)	(1.23)
Adj. R^2	0.989	0.860	0.834	0.996	0.870	0.856

Notes: AID is foreign aid as percent of the recipient's GNI, LIFE is Life Expectancy, IMR is Infant Mortality Rate, CDR is Crude Death Rate, and FEM is the percent of female in total population.

Methods of Estimation: Columns (1) and (4) – GLS with Fixed Effects (Cross Section Weights), Columns (2) and (5) – Pooled LS with Fixed Effects (No Weights), Columns (3) and (6) – GLS with Random Effects (Variance Components). White heteroskedasticity-consistent *t*-values in parentheses.

Table 12: **Directly Fertility-Related Demographic Indicators (TFR and CBR) with AID in Square**

Dependent Variable	TFR			CBR		
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	345	345	345	345	345	345
AID(-1)	3.16E-02	2.68E-02	3.33E-02	0.153	0.145	0.176
	(5.21)	(2.80)	(3.33)	(4.71)	(2.49)	(2.96)
$AID(-1)^2$	-3.91E-04	-2.17E-04	-4.08E-04	-2.22E-03	-1.61E-03	-2.48E-03
	(-2.96)	(-1.04)	(-1.84)	(-3.22)	(-1.28)	(-1.91)
TIME	-0.193	-0.212	-0.173	-0.741	-0.826	-0.683
	(-16.16)	(-12.54)	(-10.23)	(-10.16)	(-7.83)	(-6.70)
LIFE(-1)	4.88E-02	4.35E-02	2.16E-02	0.461	0.438	0.354
	(4.97)	(3.26)	(1.56)	(6.83)	(4.10)	(3.26)
IMR(-1)	-9.41E-03	-1.23E-02	-7.87E-03			
	(-5.02)	(-4.29)	(-2.65)			
CDR(-1)				0.291	0.373	0.484
				(2.66)	(2.38)	(3.05)
URBAN(-1)	7.74E-03	8.16E-03	6.41E-03	1.15E-02	5.46E-02	3.74E-02
	(1.94)	(1.43)	(1.15)	(0.44)	(1.58)	(1.14)
FEM(-1)				1.237	0.638	0.475
				(3.00)	(1.06)	(0.85)
Adj. R^2	0.991	0.860	0.837	0.996	0.870	0.858

Notes: AID is foreign aid as percent of the recipient's GNI, LIFE is Life Expectancy, IMR is Infant Mortality Rate, CDR is Crude Death Rate, and FEM is the percent of female in total population.

Methods of Estimation: Columns (1) and (4) – GLS with Fixed Effects (Cross Section Weights), Columns (2) and (5) – Pooled LS with Fixed Effects (No Weights), Columns (3) and (6) – GLS with Random Effects (Variance Components). White heteroskedasticity-consistent *t*-values in parentheses.

Table 13: **Life Expectancy**

Dependent Variable	Life Expectancy					
	(1)	(2)	(3)	(4)	(5)	(6)
Observations	345	345	345	345	345	345
AID(-1)	-1.68E-02	-1.66E-02	1.25E-02	5.33E-03	1.86E-02	2.94E-02
	(-1.21)	(-0.67)	(0.49)	(0.61)	(0.86)	(1.38)
TIME	0.417	0.255	-0.109	-0.176	-0.100	-0.281
	(7.59)	(2.40)	(-1.29)	(-4.56)	(-1.15)	(-4.06)
TFR(-1)	1.682	1.543	0.607			
	(8.41)	(5.27)	(2.42)			
IMR(-1)	-9.45E-02	-0.116	-0.156			
	(-10.83)	(-8.24)	(-13.92)			
CBR(-1)				0.239	0.229	0.140
				(10.09)	(5.50)	(3.84)
CDR(-1)				-1.308	-1.219	-1.333
				(-33.48)	(-15.77)	(-20.80)
URBAN(-1)	-7.86E-02	-5.28E-02	-4.99E-02	1.88E-02	1.59E-02	2.00E-02
	(-5.68)	(-1.79)	(-2.03)	(1.84)	(0.61)	(0.97)
FEM(-1)	2.386	2.553	1.027	0.648	1.618	0.656
	(4.69)	(4.96)	(2.46)	(2.17)	(3.58)	(1.89)
Adj. R^2	0.997	0.865	0.846	0.999	0.897	0.889

Notes: AID is foreign aid as percent of the recipient's GNI, LIFE is Life Expectancy, IMR is Infant Mortality Rate, CDR is Crude Death Rate, and FEM is the percent of female in total population.

Methods of Estimation: Columns (1) and (4) – GLS with Fixed Effects (Cross Section Weights), Columns (2) and (5) – Pooled LS with Fixed Effects (No Weights), Columns (3) and (6) – GLS with Random Effects (Variance Components). White heteroskedasticity-consistent *t*-values in parentheses.