Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960-1980

Author(s): Daniel Landau

Source: *Economic Development and Cultural Change*, Vol. 35, No. 1 (Oct., 1986), pp. 35-75
Published by: The University of Chicago Press
Stable URL: http://www.jstor.org/stable/1154144
Accessed: 02/10/2013 17:13

Government and Economic Growth in the Less Developed Countries: An Empirical Study for 1960–1980*

Daniel Landau
University of Connecticut at Waterbury and Yale University

I. Introduction

Adam Smith founded modern economics with a powerful argument that free markets are the best route to prosperity and economic growth. His conclusion has been studied and debated by economists ever since, including Nobel Prize winners Friedman, Hayek, Kuznets, Lewis, Myrdal, and Schultz. Whatever economists have concluded, since World War II the majority of the less developed countries seem to have opted for extensive government regulation of the private sector and for a large public sector. Has the large government role slowed or accelerated the growth of LDCs? Obviously, this is an important issue.

This study looks at government expenditure, revenue raising, and regulation. Greater emphasis is put on expenditure because (1) the revenue raised is presumably a function of the level of expenditure, and (2) there are few internationally comparable measures of regulation. There are virtually no empirical studies of the general impact of government on economic growth. An extensive literature search turned up only three papers. Gemmell analyzed the impact of nonmarket sector growth on various measures of macroeconomic performance for 27 LDCs and developed countries for 1960 and 1970. He drew no general conclusions about the relation between the size of the nonmarket sector and economic growth.[1] Marsden found a negative relation between tax/GDP ratios and economic growth for a cross section of 20 LDCs and developed countries for the 1970–79 period.[2] I found a negative relationship between the share of government consumption expenditure in GDP and the growth of per capita GDP for a cross section of 96 LDCs and developed countries over various time periods between 1961 and 1976.[3] This paper extends the approach used in my 1983 article.

0013-0079/87/3501-0003$01.00

The rest of the paper is organized as follows. Section II develops the approach used in the regressions. Section III presents the regression results. The last section is a summary and conclusion. Appendix A describes the data and sources, and Appendix B gives definitions of regressors.

II. Regression Model

There are no generally accepted models of the growth process and therefore no standard analytical frameworks that are appropriate for studies such as this one.[4] The best approach possible is to use a very simple production function framework. The level of real product depends on the stocks of labor, physical capital, and human capital available to the economy and the productivity of their use. Productivity will depend on both technology and the efficiency with which factors of production are used. Per capita product will depend on per capita stocks of human and physical capital, hours of work per capita, and productivity. Increases in per capita product will be a function of the increases in and the level of the four elements that determine per capita product. Further formalization of this framework, although possible, does not seem to be worthwhile.

The explanatory variables used in the regressions are discussed in detail below; of them, five directly relate to human and physical capital. All other variables in the regressions will exert their influences on growth either through productivity or by changing the rate of accumulation of human and physical capital. It is not always possible to say whether a particular category of government spending or any noneconomic regressor is influencing the rate of accumulation or productivity.

Economic growth is measured for purposes of this study by the rate of increase in per capita GDP. The explanatory variables used as regressors are listed in alphabetical order in Appendix B. The regressors divide into 10 categories: measures of government expenditure and revenue raising, regulation and other government impacts, the level of per capita product, international economic conditions, human and physical capital variables, the structure of production, historical-political factors, resources and geo-climatic factors, population, and a time trend. All the regressors listed in Appendix B are plausible influences on the growth rate, and virtually all of them have been suggested as significant by scholars studying economic growth. There were two additional motivations for looking at such a wide range of potential influences on growth: (1) in order to avoid spurious correlations between the key government expenditure variables and economic growth; and (2) because many of them are of interest in themselves (the rate of population growth, changes in the terms of trade, the country having been a colony, etc.). A proper study of the impact of government expenditure required the assembly of a uniquely large data set

that could shed new light on many controversies in the study of economic development. It would not make sense to miss the opportunity.

The government expenditure used in this study is general government expenditure, including both the national government and the state and local governments. It is divided into five types: consumption other than defense or education (OCSA), education (AEDS), defense (ADS), transfers (ATRNS), and capital expenditure (AKES). The revenue sources are current revenue (AREVS), the deficit (BREVS), and a partial measure of foreign aid, official transfers from abroad (AOFTS). To run a pooled cross section, the expenditure figures must be comparable over time and across countries; the most direct way to achieve this is to express them all as shares in GDP. These eight regressors were also made averages of three lagged values to prevent contemporaneous correlation between these regressors and the disturbance.

The variables regarding regulation and other government impacts are the rate of change of the money supply (DMSS), the inflation rate (AINF), an index of the real exchange rate (AEXRR), and the real interest rate (ARIR). The last three regressors are also averages of three lagged values to avoid contemporaneous correlation with the disturbance. The level of per capita product (LRGDP) was included because my cross-section study showed that countries with lower per capita product, ceteris paribus, grow faster—a sort of catch-up effect.[5]

The regressors for international economic conditions are the change in the country's terms of trade (DTRT), the growth rate of world GDP (GDPWGR), and the world inflation rate (PIWGR).

The variables for human and physical capital are private investment as a share of GDP (AIP), a direct measure of current education output (EDO), and life expectancy at birth in 1970 (LE7), along with the government investment in human and physical capital ([AEDS] and [AKES]). All of these are investment measures (except LE7, which is a kind of stock measure). AIP is also the average of three lagged values. The education measure (EDO) is a relative-income-weighted total of enrollment rates at all three levels of education.[6] A direct measure of education output is useful, since government education expenditure may not be a good proxy for the level of investment in this kind of human capital.

The variables for structure of production are the shares of agriculture, manufacturing, and other industry in GDP. They are A, M, and O, respectively, in Appendix B. The structuralist school has held that the structure of the economy in terms of shares of agriculture and industry influences the growth rate independent of the level of per capita income, so deliberately changing the structure could change the growth rate.[7] My previous study found no structural effects, but this study allows for a more rigorous test.

The historical-political factors examined were a dummy variable for the country having been a colony (COL), a dummy for the country having been a democracy since independence or the 1950s (DEMO), the years that the country has been independent (YI), two measures of internal political stability (the political death rate [PDR] and the incidence of coups and attempted coups [COUP]), a dummy for wars with foreign countries (WFS), and the share of the population that is of European extraction (SEUR). The last variable comes from my study of the spread of modern economic growth and higher per capita incomes from Western Europe to other parts of the world.[8] This study showed a high correlation between the European share and the *level* of per capita income attained. The explanation given was that Europeans brought with them the market-style property rights and the public goods that together helped European economic growth. Here, SEUR is testing whether these effects still influence current growth.

The resources and geo-climatic factors are agricultural land per capita (AGLPC), the distance to the nearest seaport for landlocked countries (DLP), a dummy for major oil producers (OIL) (the other industry share in GDP [O] also picks up general effects of having mineral deposits), rainfall (RAIN), and temperatures (not in Appendix B, since it was insignificant).

The two population regressors are the population in millions (LPOP), and the growth rate of population (PGR). The latter variable should test for neo-Malthusian and related concerns, while the total population—since per capita income is a regressor—is a measure of the scale of the economy. There is also a linear time trend (T).

If we had a well-established theory of economic growth, it would allow us to start with a much more limited set of potential explanatory variables. Unfortunately, no such theory exists. The variables tested here are all a priori plausible influences on economic growth; furthermore, almost all of them have been suggested to be important by one or more students of economic growth. Details about the data and data sources are in Appendix A.

III. Regressions Results

General Remarks

The regressions are all ordinary least squares (OLS). Most of the regressors are lagged values, which avoids problems of contemporaneous correlation between regressors and the disturbance. As explanatory variables, all the regressions include private investment, the level of per capita product, government expenditure shares in GDP, a human capital measure, population, the population growth rate, and a time trend. Other regressors are included in the reported regressions if they are significant or of special interest. All the regressions had heteroscedasticity, which was tested for by Bartlett's test and corrected.

Most of the regression tables have four regressions, one for each of four subsamples of the data. Two of these subsamples are for annual observations of the growth rate, one is for 4-year periods, and one for 7-year periods.[9] The first regression in each table is usually what is called the small annual subsample. It has 489 usable observations. Although the whole data set consists of 1,190 observations, many of them lack data on foreign aid or the discount rate. The small annual subsample is limited to the higher quality data that include both of these variables. The large annual subsample includes observations that have data on foreign aid—825 usable observations. The large annual subsample contains poorer-quality data, and this probably explains why the R^2 only reaches .472, whereas it reaches .629 for the small annual subsample. For the 4-year regressions the dependent variable is the compound annual growth rate over 4-year periods. The explanatory variables are mostly averages over 3 years, ending with the first year of the growth period. As a result, there are only 151 usable 4-year observations. The 7-year regressions use the compound annual growth rate over 7-year periods, and there are 98 usable 7-year observations.

For the longer periods the R^2 is .71. There are two obvious explanations for the higher R^2: (1) the growth process is more regular and thus more easily explained for the longer periods; and (2) the random error in the source data washes out over the longer periods. It is difficult to choose between the various subsamples for reliability. The annual subsamples have more degrees of freedom, but the multiyear subsamples look at longer periods.

The basic regressions are in table 1. Table 2 brings together the major results for government expenditure regressors and foreign aid. Table 3 summarizes results for other variables of special interest. Tables 1 and 4–7 contain the actual regressions behind the key table, table 2. (Many of the coefficients in table 3 are insignificant, so the actual regressions are not included in the paper.) The regressions were also tried with income interaction terms—the regressor times per capita real GDP (LRGDP). The interaction terms were only statistically significant for the annual subsamples. The coefficients in table 2 are compared with the results with interaction regressors in table 8. Tables 9 and 10 have the most important regressions, including interaction terms.

Government Expenditure

The most important results are summarized in table 2. Panel A brings together the coefficients for OCSA. The third line in Panel A allows for the effects of this type of expenditure on taxes, deficits, and private investment. The coefficients are all negative and highly significant; this result suggests that this type of expenditure has a marked negative impact on economic growth. The growth rates and the shares in GDP

TABLE 1

BASIC REGRESSIONS

	Regression 1—Small Annual Subsample			Regression 2—Large Annual Subsample			Regression 3—4-Year Period Subsample			Regression 4—7-Year Period Subsample		
I.V.	*b*	*t*	P.V.	*b*	*t*	P.V.	*b*	*t*	P.V.	*b*	*t*	P.V.
AIP	.153	3.08	.002	.059	1.51	.13	.059	1.37	.17	.082	1.73	.088
LRGDP	−.305	5.14	.0001	−.310	6.13	.0001	−.311	4.80	.0001	−.288	3.94	.0002
GDPWGR	.302	2.88	.004	.238	2.77	.006	...	...	...	...	...	...
OCSA	−.241	3.07	.002	−.125	2.93	.004	−.183	2.70	.008	−.243	3.03	.003
AEDS	.169	1.52	.129	.083	.83	.40	−.067	.46	.64	−.022	.14	.89
ADS	.056	.607	.54	−.008	.14	.88	−.030	.34	.73	−.236	2.51	.014
ATRNS	.104	2.63	.009	−.011	.32	.75	.083	1.14	.25	.082	1.83	.071
AKES	.011	.27	.79	.005	.14	.88	.004	.08	.94	.016	.33	.74
DMSS	−.017	1.12	.26	−.016	1.52	.13	...	...	...	...	...	...
LPOP	.0013	.61	.54	.0003	.17	.86	−.008	3.34	.001	−.0068	2.64	.010
PGR	−.398	2.55	.01	−.18	1.50	.13	−.262	1.35	.18	−.199	.93	.36
LE7	.150	3.39	.0008	.143	4.83	.001	...	...	...	...	...	...
T	.000	.000	.99	.019	.60	.55	.029	.76	.45	.021	.46	.65
AOFTS	.077	1.09	.28	.133	2.13	.033	−.021	.29	.77	.169	2.39	.019

DEMO	−2.41	3.94	.0001	−.178	3.65	.0003	...	...	...	...	...	...
AEXRR	.0073	1.40	.161	.0089	2.10	.036	...	...	...	...	...	...
COUP	−.405	2.79	.005	−.261	2.24	.025	...	...	...	...	...	...
OIL	2.06	3.03	.003	1.10	1.77	.077	1.61	1.88	.06	...	...	...
APUTS	.090	4.04	.0001	.039	2.86	.004	.030	1.43	.15	...	...	...
WFS	−.708	1.93	.054	...	...	...	...	...	...	...	...	...
ARIR	.056	3.70	.0002	...	...	...	...	...	...	...	...	...
A	...	...	...	.020	.92	.36	...	...	...	...	...	...
M	...	...	...	.105	2.81	.005	...	...	...	...	...	...
O	...	...	...	.082	2.85	.005	...	...	...	...	...	...
AINF	...	...	...	−.007	2.70	.007	...	...	...	...	...	...
SEUR	...	...	...	.019	2.79	.005	...	...	...	...	...	...
INF	...	...	...	...	...	...	−.0069	1.80	.07	...	...	...
EDO	...	...	...	...	...	...	.032	4.87	.0001	.022	2.56	.012
DLP	...	...	...	...	...	...	−.004	2.74	.007	−.005	2.57	.01
RAIN	...	...	...	...	...	...	−.011	1.58	.12	...	...	...
INT	−4.11	1.58	.12	−7.51	3.12	.002	3.46	2.92	.004	3.44	2.52	.014
R^2		.629			.472			.714			.717	
df		467			800			133			84	
D-W		1.86			1.77			2.12			1.92	
B.T.*		.21			.66			.50			.40	

* Bartlett's Test with 4 *df*.

TABLE 2

MAJOR RESULTS SUMMARIZED

		Subsample							
		Small Annual		Large Annual		4-Year Periods		7-Year Periods	
INCLUDED IN REGRESSION	I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
Panel A—current consumption expenditure other than education or military as a share in GDP:									
Table 4—AIP, AREVS, BREVS	OCSA	−.196	1.86	−.076	1.18	−.114	1.47	−.300	3.10
Table 1—AIP, no AREVS, BREVS		−.241	3.07	−.125	2.93	−.183	2.70	−.243	3.03
Table 5—no AIP, AREVS, BREVS		−.234	2.96	−.126	2.96	−.172	2.54	−.230	2.85
Panel B—government educational expenditure as a share in GDP:									
Table 4—LE7, AREVS, BREVS	AEDS	.173	1.24	.147	1.26	.0001	.0009*	−.065	.38*
Table 1—LE7, no AREVS, BREVS		.169	1.52	.083	.83	−.067	.46*	.022	.14*
Table 6—AEDS only		.131	1.18	.073	.72	.036	.23	.147	.93
Table 6—EDO only	EDO	.018	2.39	.025	4.64	.032	4.87	.022	2.75
Panel C—military expenditure as a share in GDP:									

Table 4—AIP, AREVS, BREVS	ADS	.074	.73	.059	.88	.087	.84	−.270	2.75
Table 1—AIP, no AREVS, BREVS		.056	.67	−.008	.14	−.030	.34	−.236	2.51
Table 5—no AIP, AREVS, BREVS		.048	.51	.003	.06	−.037	.43	−.227	2.39
Panel D—Transfers and other current nonconsumption expenditure as a share in GDP:									
Table 4—AIP, AREVS, BREVS	ATRNS	.081	1.80	−.018	.48	.166	1.74	.052	1.02
Table 1—AIP, no AREVS, BREVS		.104	2.63	−.011	.32	.083	1.14	.082	1.83
Table 5—no AIP, AREVS, BREVS		.085	2.17	−.022	.68	.064	.89	.058	1.33
Panel E—government capital expenditure as a share in GDP:									
Table 4—AIP, AREVS, BREVS	AKES	.146	1.16	.173	1.56	.098	1.24	−.027	.33
Table 1—AIP, no AREVS, BREVS		.011	.27	.005	.14	.004	.08	.016	.33
Table 5—no AIP, AREVS, BREVS		−.069	1.91	−.024	.78	−.021	.47	−.011	.25
Panel F—official transfers received as a share in GDP:									
Table 4—AIP, AREVS, BREVS	AOFTS	.136	1.76	.146	2.31	−.052	.74	.216	2.88
Table 1—AIP, no AREVS, BREVS		.077	1.09	.133	2.13	−.021	.29	.169	2.39
Table 7—no government expenditure, AIP		.026	.51	.101	1.92	−.089	1.61	−.008	.15
Panel G—private transfers received as a share in GDP:									
Table 4—AIP, AREVS, BREVS	APUTS	.097	4.29	.040	2.92	.030	1.48	...	...
Table 1—AIP, no AREVS, BREVS		.090	4.04	.039	2.86	.030	1.43	.005	.25†
Table 7—no government expenditure, AIP		.093	4.11	.039	2.84	.027	1.30	...	...

* EDO, not LE7.

† APUTS was not statistically significant for 7-year periods. It was dropped from the basic regression in table 1 and not tested further.

TABLE 3

SUMMARY OF RESULTS FOR OTHER VARIABLES OF INTEREST

SUBSAMPLE	I.V.	b	t	I.V.	b	t	I.V.	b	t	R^2	df
Panel A—structure of the economy:											
Small annual	A	.019	.56	M	−.021	.35	O	.018	.34	.628	426
Large annual		.020	.92		.105	2.81		.082	2.85	.472	800
4-year periods		.028	.81		.008	.12		.061	1.33	.724	118
7-year periods		.003	.08		−.004	.06		.051	1.07	.730	77
Panel B—major oil producer:											
Small annual	OIL	2.06	3.03		...	...		...	...	.629	467
Large annual		1.10	1.77		...	...		...	...	.472	800
4-year periods		1.61	1.88		...	...		...	...	.714	133
7-year periods		.111	.14		...	...		...	...	.717	83
Panel C—agricultural land per capita:											
Small annual	AGLPC	.913	1.14		...	...		...	...	.628	428
Large annual		.421	.89		...	...		...	...	.473	786
4-year periods		−.770	1.14		...	...		...	...	.715	127
7-year periods		−.249	.31		...	...		...	...	.715	80
Panel D—population growth rate:											
Small annual	PGR	−.398	2.55		...	...		...	...	.629	467
Large annual		−.18	1.50		...	...		...	...	.472	800
4-year periods		−.262	1.35		...	...		...	...	.714	133
7-year periods		−.199	.93		...	...		...	...	.717	84
Panel E—economies of scale:											
Small annual	LPOP	.0013	.61		...	...		...	...	.629	467
Large annual		.0003	.17		...	...		...	...	.472	800
4-year periods		−.008	3.34		...	...		...	...	.714	133
7-year periods		−.007	2.64		...	...		...	...	.717	84

Panel F—growth rate of world GDP:									
Small annual	GDPWGR	.302	2.88	...	...	...	...	.629	467
Large annual		.238	2.77	...	...	...	...	.472	800
4-year periods		.146	.80	...	...	...	...	.713	127
7-year periods		−.468	1.56	...	...	...	...	.725	83
Panel G—change in terms of trade:									
Small annual	DTRT	−.026	1.94	...	...	...	...	.631	428
Large annual		−.006	.44	...	...	...	...	.473	786
4-year periods		−.006	.46	...	...	...	...	.713	127
7-year periods		.003	.13	...	...	...	...	.730	81
Panel H—world inflation rate:									
Small annual	PIWGR	−.027	.031	...	...	...	...	.627	428
Large annual		−.040	.60	...	...	...	...	.473	786
4-year periods		.096	.68	...	...	...	...	.713	127
7-year periods		−.238	1.00	...	...	...	...	.718	80
Panel I—country was a colony:									
Small annual	COL	−.290	.51	...	...	...	...	.630	466
Large annual		−.312	.72	...	...	...	...	.473	799
4-year periods		−.529	.77	...	...	...	...	.720	120
7-year periods		−.249	.31	...	...	...	...	.715	80
Panel J—years the country has been independent:									
Small annual	YI	.0006	.19	...	...	...	...	.629	466
Large annual		.0005	.19	...	...	...	...	.473	786
4-year periods		−.0006	.17	...	...	...	...	.714	132
7-year periods		.0003	.08	...	...	...	...	.717	83
Panel K—Democracy:									
Small annual	DEMO	−2.41	3.94	...	...	...	...	.629	467
Large annual		−1.78	3.65	...	...	...	...	.472	800
4-year periods		−.286	.43	...	...	...	...	.714	132
7-year periods		.74	1.02	...	...	...	...	.720	82
Panel L—incidence of coups:									
Small annual	COUP	−.405	2.79	...	...	...	...	.629	467
Large annual		−.261	2.24	...	...	...	...	.472	800
4-year periods		−.211	1.06	...	...	...	...	.716	132
7-year periods		.119	.73	...	...	...	...	.719	83

TABLE 4

CURRENT REVENUE AND DEFICITS

	REGRESSION 1—SMALL ANNUAL SUBSAMPLE		REGRESSION 2—LARGE ANNUAL SUBSAMPLE		REGRESSION 3—4-YEAR PERIOD SUBSAMPLE		REGRESSION 4—7-YEAR PERIOD SUBSAMPLE	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
AIP	.143	2.85	.054	1.38	.080	1.90	.086	1.74
LRGDP	−.358	5.49	−.361	6.47	−.307	4.96	−.334	4.31
GDPWGR	.299	2.85	.232	2.70	...	...	...	...
OCSA	−.196	1.86	.076	1.18	−.114	1.47	−.300	3.10
AEDS	.173	1.24	.147	1.26	.0001	.0009	−.064	.38
ADS	.074	.73	.059	.88	.087	.83	−.270	2.75
ATRNS	.081	1.80	−.018	.48	.167	1.74	.052	1.02
AKES	.146	1.16	.172	1.55	.098	1.24	−.028	.33
DMSS	−.016	1.10	−.016	1.51	...	...	...	...
LPOP	.0007	.33	.00003	.01	−.008	3.43	−.007	2.72
PGR	−.42	2.69	−.181	1.53	−.225	1.20	−.181	.85
LE7	.146	3.32	.134	4.45	...	...	...	...
T	.020	.43	.031	.96	.020	.54	.028	.59
AOFTS	.136	1.76	.146	2.31	−.052	.74	.216	2.88

DEMO	−2.23	3.52	−1.66	3.38	...	...	...	...
AEXRR	.006	1.06	.008	1.96	...	...	...	...
COUP	−.330	2.19	−.242	2.07	...	...	...	...
OIL	1.62	2.26	.79	1.23	1.61	1.97	...	...
APUTS	.097	4.29	.040	2.92	.030	1.48	...	...
WFS	−.66	1.78	...	...	...	...	...	...
ARIR	.059	3.88	...	...	...	...	...	...
A	...	...	.008	.38	...	...	...	...
M	...	...	.083	2.18	...	...	...	...
O	...	...	.068	2.28	...	...	...	...
AINF	...	...	−.007	2.57	−.007	1.89	...	...
SEUR	...	...	.020	2.97	...	...	...	...
EDO	...	...	...	...	.031	4.80	.021	2.44
DLP	...	...	...	...	−.003	2.03	−.005	2.64
RAIN	...	...	...	...	−.010	1.49	...	...
AREVS	−.115	.92	−.151	1.39	−.079	1.12	.087	1.40
BREVS	−.174	1.46	−.190	1.85	−.066	1.48	−.019	.41
INT	−1.64	.55	−3.82	1.23	3.19	2.74	3.41	2.44
R^2	.632		.478		.741		.728	
df	465		798		129		82	
D-W	1.87		1.78		2.01		1.95	

TABLE 5

NET EFFECTS OF GOVERNMENT CAPITAL EXPENDITURE

	REGRESSION 1—SMALL ANNUAL SUBSAMPLE		REGRESSION 2—LARGE ANNUAL SUBSAMPLE		REGRESSION 3—4-YEAR PERIOD SUBSAMPLE		REGRESSION 4—7-YEAR PERIOD SUBSAMPLE	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
LRGDP	−.264	4.51	−.285	5.97	−.281	4.59	−.251	3.55
GDPWGR	.302	2.86	.239	2.79	...	...	...	...
OCSA	−.234	2.96	−.127	3.96	−.173	2.55	−.230	2.85
AEDS	.139	1.25	.084	.85	−.047	.32	.033	.21
ADS	.048	.51	−.003	.07	−.037	.43	−.226	2.39
ATRNS	.086	2.17	−.023	.68	.064	.89	.057	1.33
AKES	−.069	1.91	−.024	.79	−.021	.47	−.011	.25
DMSS	−.019	1.30	−.017	1.61	...	...	...	...
LPOP	.002	1.01	.0004	.22	−.008	3.19	−.006	2.49
PGR	−.331	2.13	−.148	1.26	−.247	1.27	−.180	.83
LE7	.193	4.60	.148	4.98	...	...	...	...
T	.053	1.25	.027	.90	.044	1.16	.036	.79

AOFTS	.068	.94	.141	2.25	−.025	.34	.151	2.13
DEMO	−2.69	4.41	−1.74	3.57	...	...	...	...
AEXRR	.005	.90	.009	2.07	...	...	...	...
COUP	−.461	3.17	−.297	2.62	...	...	...	...
OIL	2.36	3.48	1.08	1.73	1.51	1.77	...	...
APUTS	.097	4.33	.039	2.83	.028	1.34	...	...
WFS	−.65	1.74	...	...	...	...	...	...
ARIR	.065	4.36	...	...	...	...	...	...
A	...	...	.019	.90	...	...	...	...
M	...	...	.110	2.96	...	...	...	...
O	...	...	.086	2.99	...	...	...	...
AINF	...	...	−.008	3.15	...	...	...	...
SEUR	...	...	.019	2.86	...	...	...	...
EDO	...	...	...	...	.034	5.03	.023	2.78
DLP	...	...	...	...	−.0036	2.62	−.0046	2.39
RAIN	...	...	...	...	−.012	1.58	...	...
INT	−.488	1.86	−7.30	3.04	3.75	3.21	3.79	2.77
R^2	.622		.471		.710		.707	
df	468		801		134		85	
D-W	1.83		1.77		2.15		1.87	

TABLE 6

EDUCATION

	Regression 1—Small Annual Subsample		Regression 2—Small Annual Subsample		Regression 3—Large Annual Subsample		Regression 4—Large Annual Subsample		Regression 5—4-Year Period Subsample		Regression 6—4-Year Period Subsample		Regression 7—7-Year Period Subsample		Regression 8—7-Year Period Subsample	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
AIP	.208	4.37	.159	3.18	.076	1.93	.065	1.66	.081	1.75	.056	1.32	.099	2.02	.083	1.74
LRGDP	−.180	3.83	−.260	4.71	−.237	4.85	−.283	5.73	−.126	2.21	−.307	4.78	−.167	2.90	−.290	4.16
GDPWGR	.298	2.81	.290	2.75	.243	2.79	.231	2.68	...	...	...	...	...	...	...	...
OCSA	−.298	3.84	−.249	3.13	−.145	3.38	−.116	2.70	−.236	3.25	−.182	2.68	−.254	3.08	−.244	3.07
AEDS	.131	1.18	...	...	.072	.72	...	...	.036	.23	...	...	.147	.93	...	...
ADS	.054	.59	.047	.51	−.049	.95	−.039	.78	.028	.31	−.032	.38	.176	1.87	−.238	2.62
ATRNS	.131	3.35	.103	2.53	−.008	.24	−.007	.20	.100	1.28	.078	1.10	.102	2.21	.083	1.84
AKES	.040	.90	.022	.49	.011	.31	.005	.14	.007	.14	−.003	.06	.007	.13	.018	.41
DMSS	−.013	.89	−.016	1.10	−.014	1.37	−.016	1.53	...	...	...	...	...	...	...	...
LPOP	−.0022	1.19	−.002	1.32	−.0019	1.07	−.002	1.22	−.0069	2.65	−.0078	3.32	−.0058	2.22	−.0068	2.76
PGR	−.54	3.63	−.457	2.92	−.250	2.09	−.156	1.30	−.385	1.84	−.269	1.39	−.357	1.68	−.195	.92
EDO	...	...	.017	2.38	...	...	.025	4.64	...	...	.032	4.87	...	...	.022	2.75

T	−.065	1.56	−.005	.12	−.005	.17	.022	.71	−.034	.86	.027	.71	−.021	.48	.023	.55
AOFTS	.085	1.18	.051	.72	.093	1.49	.117	1.92	−.036	.46	−.024	.33	.164	2.25	.170	2.44
DEMO	−1.05	2.25	−1.55	2.97	−.669	1.53	−1.32	2.99	...	...	...	...	...	...	...	...
AEXRR	.010	2.06	.009	1.89	.011	2.59	.010	2.40	...	...	...	...	...	...	...	...
COUP	−.44	3.00	−.550	3.76	−.327	2.80	−.366	3.20	...	...	...	...	...	...	...	...
OIL	1.02	1.67	1.56	2.37	.907	1.44	.89	1.46	1.18	1.29	1.65	1.95	...	...	...	...
APUTS	.089	3.96	.092	4.11	.036	2.62	.036	2.63	.029	1.29	.028	1.37	...	...	...	...
WFS	−.533	1.45	−.530	1.45	...	...	...	...	...	...	...	...	...	...	...	...
ARIR	.053	3.48	.056	3.69	...	...	...	...	...	...	...	...	...	...	...	...
A	...	...	...	...	−.011	.56	.018	.88	...	...	...	...	...	...	...	...
M	...	...	...	...	.121	3.22	.087	2.33	...	...	...	...	...	...	...	...
O	...	...	...	...	.042	1.50	.072	2.54	...	...	...	...	...	...	...	...
AINF	...	...	...	...	−.007	2.67	−.007	2.80	−.0068	1.63	−.0069	1.80	...	...	...	...
SEUR	...	...	...	...	.023	3.54	.015	2.36	...	...	...	...	...	...	...	...
DLP	...	...	...	...	...	...	...	...	−.004	2.71	−.003	2.71	−.004	2.20	...	...
RAIN	...	...	...	...	...	...	...	...	−.0006	.82	−.011	1.65	...	...	...	...
INT	3.46	2.54	2.36	1.63	1.01	.61	−2.11	1.21	6.11	5.37	3.42	2.90	5.30	4.43	3.44	2.53
R^2	.620		.623		.457		.470		.662		.713		.694		.716	
df	468		468		801		801		134		134		85		85	
D-W	1.84		1.86		1.71		1.76		2.19		2.11		1.96		1.91	

TABLE 7

NET EFFECT OF FOREIGN OFFICIAL AID

	Regression 1—Small Annual Subsample		Regression 2—Large Annual Subsample		Regression 3—4-Year Period Subsample		Regression 4—7-Year Period Subsample	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
LRGDP	−.286	4.92	−.273	6.30	−.267	4.65	−.212	3.04
GDPWGR	.298	2.78	.231	2.67	...	...	...	...
DMSS	−.015	1.04	−.014	1.38	...	...	...	...
LPOP	.004	2.23	.0014	.78	−.0062	2.67	−.005	1.96
PGR	−.314	2.03	−.145	1.24	−.262	1.41	−.197	.87
LE7	.299	5.57	.155	5.34	...	...	...	...
T	.060	1.42	.019	.64	.038	1.04	.0055	.12
AOFTS	.025	.51	.101	1.91	−.089	1.60	−.008	.14
DEMO	−3.44	6.24	−1.88	4.06	...	...	...	...
AEXRR	.0085	1.67	.010	2.48	...	...	...	...

COUP	−.401	2.92	−.267	2.39	...	...	...	...
OIL	2.34	3.55	1.13	1.84	1.59	1.89	...	...
APUTS	.092	4.10	.039	2.84	.027	1.30	...	...
WFS	−.267	.77	...	...	...	...	...	...
ARIR	.063	4.25	...	...	...	...	...	...
A	...	...	.016	.79	...	...	...	...
M	...	...	.104	2.87	...	...	...	...
O	...	...	.078	2.76	...	...	...	...
AINF	...	...	−.0078	3.09	...	...	...	...
SEUR	...	...	.015	2.43	...	...	...	...
EDO	...	...	...	...	.035	5.62	.022	2.78
DLP	...	...	...	...	−.0028	2.09	−.0036	1.82
RAIN	...	...	...	...	−.010	1.47		
INT	−8.38	3.65	−8.44	3.65	2.13	2.18	2.33	1.80
R^2	.604		.462		.694		.659	
df	473		806		139		90	
DW	1.74		1.72		2.03		1.83	

TABLE 8

COMPARISON OF COEFFICIENTS WITHOUT AND WITH INCOME INTERACTION TERMS IN THE REGRESSION

		Subsample									
		Small Annual					Large Annual				
		Without		With		Combined at Mean	Without		With		Combined at Mean
Included in the Regressions	I.V.	*b*	*t*	*b*	*t*	*b*	*b*	*t*	*b*	*t*	*b*
Panel A—government consumption expenditure other than education or military as a share in GDP:											
No AIP, AIPX	OCSA	−.234	2.96	−3.70	2.51	...	−.126	2.96	−.148	2.25	...
Panel B—education:											
AEDS, AEDSX only	AEDS	.131	1.18	.278	1.15	.217	.073	.72	.088	.89	...
	AEDSX	...	...	−.018	.34	...	...	...	...	...	...
EDO EDOX only	EDO	.018	2.39	.010	1.01	.023	.025	4.64	.014	2.03	.025
	EDOX	...	...	.0037	1.93	...	...	...	.0034	2.16	...
Panel C—mililtary expenditure as a share in GDP:											
No AIP, AIPX	ADS	.048	.51	.097	1.06	...	−.003	.06	.189	2.90	...

Panel D—transfers and other current nonconsumption government expenditure as a share in GDP:											
No AIP, AIPX	ATRNS	.085	2.17	.057	1.37	...	−.022	.68	−.004	.12	...
Panel E—government capital expenditure as a share in GDP:											
No AIP, AIPX	AKES	−.069	1.91	.142	1.81	.002	−.024	.78	.036	.69	−.033
	AKESX	...	...	−.039	2.20	...	...	...	−.021	1.69	...
Panel F—official transfers received as a share in GDP:											
No government expenditure, AIP	AOFTS	.026	.51	.017	.35	...	.101	1.92	.150	2.17	.104
	AOFTSX	...	...	...	...	...	...	...	−.014	.94	...
Panel G—private transfers received as a share in GDP:											
No government expenditure, AIP	APUTS	.093	4.11	.104	4.68	...	.039	2.84	.048	3.37	...

TABLE 9

SMALL ANNUAL SUBSAMPLE REGRESSIONS WITH INCOME INTERACTION TERMS

	Regression 1		Regression 2		Regression 3		Regression 4	
	Basic		Dropping AIP, AIPX		Dropping LE7, LE7X		EDO, EDOX	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
AIP	.311	3.59	...	...	.187	2.8	.239	2.79
AIPX	−.058	2.91	...	...	−.012	.94	−.044	2.30
LRGDP	−.713	7.74	−.712	7.72	−.557	6.57	−.687	7.56
GDPWGR	.266	2.65	.267	2.63	.267	2.61	.249	2.47
OCSA	−.419	2.85	−.370	2.51	−.621	4.37	−.516	3.98
OCSAX	.085	2.14	.072	1.82	.138	3.59	.133	3.94
AEDS	.418	1.72	.360	1.49	.278	1.15	...	...
AEDSX	−.059	1.03	−.035	.64	−.018	.34	...	...
ADS	.110	1.21	.097	1.06	.080	.88	.100	1.10
ATRNS	.057	1.37	.027	.67	.085	2.05	.042	.99
AKES	.142	1.81	−.027	.43	.055	.76	.080	1.03
AKESX	−.039	2.20	−.0063	.44	−.012	.78	−.024	1.42
DMSS	−.048	1.75	−.063	2.32	−.064	2.32	−.055	2.04
DMSSX	.010	1.40	.015	2.22	.017	2.45	.013	1.87
LPOP	−.010	2.74	−.008	2.25	−.013	4.01	−.016	4.84

LPOPX	.0074	3.94	.0065	3.68	.0077	4.14	.0094	4.91
PGR	−.331	2.12	−.280	1.79	−.529	3.54	−.391	2.55
LE7	.031	.59	.132	2.95	...	...	...	...
LE7X	.023	3.24	.007	1.52	...	...	...	...
EDO	...	...	...	...	...	...	.010	1.01
EDOX	...	...	...	...	...	...	.0037	1.93
T	−.0006	.01	.037	.89	−.052	1.26	.022	.51
AOFTS	.076	1.04	.030	.42	.089	1.21	.047	.64
DEMO	−1.57	2.45	−2.09	3.31	−.82	1.72	−1.21	2.30
AEXRR	.009	1.78	.0067	1.29	.0085	1.66	.008	1.59
COUP	−.340	2.42	−.375	2.65	−.378	2.65	−.512	3.65
OD	2.21	3.32	2.40	3.61	1.37	2.27	1.89	2.91
APUTS	.074	3.15	.098	4.34	.084	3.57	.079	3.33
WFS	−1.88	2.84	−1.53	2.34	−1.45	2.19	−1.44	2.22
WFSX	.458	2.88	.327	2.25	.400	2.51	.412	2.68
ARIR	.041	2.75	.045	3.04	.038	2.53	.046	3.11
INT	.011	.004	−1.02	.39	5.89	4.23	4.29	2.94
R^2	.674		.664		.660		.668	
df	459		461		461		461	
D-W	1.95		1.89		1.89		1.92	
B.T.*	2.19		...		...		...	

* Bartlett's Test with 4 *df*.

TABLE 10

LARGE ANNUAL SUBSAMPLE REGRESSIONS WITH INCOME INTERACTION TERMS

	Regression 1		Regression 2		Regression 3		Regression 4	
	Basic		Dropping AIP, AIPX		Dropping LE7, LE7X		EDO, EDOX	
I.V.	*b*	*t*	*b*	*t*	*b*	*t*	*b*	*t*
AIP	.175	2.56	...	...	.114	1.90	.168	2.45
AIPX	−.025	2.07	...	...	−.005	.53	−.023	1.88
LRGDP	−.708	8.49	−.672	8.21	−.564	7.15	−.644	7.91
GDPWGR	.210	2.53	.218	2.63	.214	2.54	.202	2.43
OCSA	−.141	2.15	−.148	2.25	−.244	3.90	−.184	2.90
AEDS	.091	.94	.108	1.11	.088	.89	...	...
ADS	.204	3.12	.189	2.90	.176	2.65	.169	2.60
ATRNS	.020	.56	−.004	.12	.027	.75	.012	.35
AKES	.115	1.89	.036	.69	.028	.52	.070	1.17
AKESX	−.032	2.32	−.021	1.69	−.009	.73	−.019	1.39
DMSS	−.035	2.10	−.036	2.17	−.036	2.12	−.035	2.08
DMSSX	.0067	1.68	.0072	1.81	.0077	1.92	.0069	1.73
LPOP	−.0067	2.05	−.0061	1.90	−.0079	2.40	−.012	3.67
LPOPX	.004	2.21	.0037	2.11	.0033	1.82	.0065	3.31
PGR	−.473	2.37	−.454	2.27	−.474	2.37	−.394	1.98
PGRX	.089	1.93	.089	1.94	.065	1.43	.071	1.57
A	.003	.14	.002	.09	−.030	1.38	−.004	.17
M	.028	.67	.051	1.24	.021	.51	.006	.15

O	.082	2.76	.088	2.97	.038	1.36	.071	2.41
AINF	−.007	2.80	−.008	3.10	−.008	3.26	−.008	3.10
SEUR	.011	1.60	.012	1.79	.020	2.93	.007	.91
LE7	.087	2.37	.119	3.44	...	...	...	...
LE7X	.015	2.79	.0085	2.05	...	...	...	...
EDO	...	...	...	...	...	...	.014	2.03
EDOX	...	...	...	...	...	...	.0034	2.16
T	−.059	1.23	−.018	.40	−.106	2.23	−.066	1.37
TX	.016	1.69	.011	1.16	.023	2.40	.018	1.86
AOFTS	.228	3.05	.243	3.26	.263	3.49	.207	2.74
AOFTSX	−.065	2.75	−.068	2.85	−.067	2.81	−.054	2.25
DEMO	−1.30	2.53	−1.39	2.73	−.467	1.05	−.815	1.78
AEXRR	.0096	2.31	.0084	2.02	.010	2.50	.010	2.49
COUP	−.445	2.17	−.581	2.93	−.54	2.66	−.542	2.67
COUPX	.065	1.23	.090	1.70	.072	1.33	.068	1.27
OD	.30	.47	.275	.43	.007	.01	−.051	.08
APUTS	.040	2.79	.042	2.98	.045	3.12	.036	2.50
AGLPC	−1.14	1.62	−.85	1.23	−2.44	3.74	−1.34	1.93
AGLPCX	.23	1.36	.179	1.04	.45	2.61	.227	1.28
INT	−2.76	.98	−2.91	1.03	5.92	3.26	2.23	1.09
R^2	.537		.534		.523		.533	
df	788		790		790		789	
D-W	1.84		1.83		1.78		1.82	
B.T.*	.18							

* Bartlett's Test with 4 *df*.

are both in percentages, so taken literally the coefficient of −.234 for the small annual subsample says that an increase by 1% of GDP in this category of government expenditure would slow the growth rate of per capita product by .23%. For this subsample the growth rate of per capita GDP averages 2.95%, and OCSA has a mean of 6.6% of GDP. The impact of this kind of spending on growth could be important.

Some readers may be bothered by the inference of causality from a regression coefficient. Such caution is usually in order. However, it is argued at the end of this section that, for the results in this paper, we can safely infer that causality runs from government spending to changes in the growth rate.

The other lines in Panel A, table 2, show us how the coefficient of OCSA changes when, first, the private investment share (AIP) is held constant in line 2 and, second, private investment, the share of taxes in GDP-AREVS, and the share of deficits in GDP-BREVS are all held constant in line 1. When we go from line 3 to line 2, the coefficients of OCSA change very little, indicating that this kind of spending does not crowd out private investment directly. Then when we go from line 2 to line 1, the coefficients from three of the four subsamples decrease in absolute value. Since the coefficients for AREVS and BREVS are negative for these subsamples (see table 4), we can infer that part—but not all—of the negative impact of OCSA is due to the need to raise revenue to finance this type of spending.

Panel B, table 2, compares the impact of government educational expenditure as a share in GDP-AEDS with a direct measure of education output by weighted enrollment rates (EDO). The results in the third line of Panel B are from regressions including AEDS but not EDO or other human capital regressors (see table 6 for the whole regression). Thus the coefficients for AEDS are not reduced by positive correlation with EDO. The coefficients are all positive, but far from statistically significant. The coefficients from regressions including EDO but not AEDS are in line 4; they are all positive and highly significant. Most education in these countries is government funded, so efficient government spending on education ought to be correlated with the quantity of education enrollment rates and the quality. Thus the level of government spending on education ought to have a significant positive coefficient. Since it does not, this implies that LDC government spending is inefficient; there is a weak correlation between spending levels and the actual education produced.[10]

Panel C, table 2, presents the same comparisons as Panel A for the share of military expenditure in GDP-ADS. The third line again indicates the net impact, allowing for the influence of this kind of spending on private investment, taxes, and deficits. The impact is roughly zero except for the 7-year subsample, in which it is significantly negative. Assuming that the first three samples are the accurate picture, the

impact of ADS is markedly different from the strong and significant negative impact of OCSA.

Panel D, table 2, provides the same analysis as Panels A and C for current nonconsumption expenditure (ATRNS). The net impact in line 3 ranges from positive and significant—the small annual subsample—to negative and insignificant—the large annual subsample.[11] The mean value for ATRNS for this subsample is 4.6% of GDP, so the implied impact of this type of expenditure is limited.

Perhaps the most important regression results are in line 3 of Panel E, table 2, which gives the net impact of AKES—the government capital expenditure share in GDP. The coefficients in line 3 are all negative, but only the coefficient for the small annual subsample is statistically significant. Thus, on net, government capital expenditure is at best no help to growth, and perhaps it is slightly harmful. This probably surprising result is explained by comparing lines 1, 2, and 3. In line 1, holding constant both private investment and revenue raising, the coefficient of AKES is positive in three of the four cases, though the statistical significance is only in the 10%–25% range. When we allow for the revenue raised to finance government capital expenditure—line 2—the coefficients fall to virtually zero, and when we allow for crowding out of private investment—line 3—the three coefficients that were positive become negative. In sum, there is some return to government investment, but the return does not cover the opportunity cost in terms of higher taxes, larger deficits, and the crowding out of private investment. For the small annual subsample the mean value of AKES is 7.1% of GDP, so a sizable fraction of the LDCs' GDP is going for government investment with no return in faster growth.

One possible explanation for the failure of government investment expenditure to show net positive coefficients is that it is mainly infrastructure, and infrastructure may take more than 7 years to impact on economic growth. The data do not allow either a separation of infrastructure from other government capital expenditure or tests for lags longer than 7 years. This possibility thus cannot be empirically rejected.

In contrast to government investment, private investment (AIP) does increase the growth rate. AIP is the first regressor in table 1; the coefficients are all positive, and the significance levels run from better than 1% to 17%. Although the payoff to private investment is much better than to public investment, it is not what one would hope for. The last section of the paper gives some possible reasons for this result.

Foreign Aid

Panels F and G in table 2 summarize the regression results for official unrequited transfers (AOFTS)—our proxy for foreign aid—and private unrequited transfers (APUTS). The net impact—allowing for effects on government expenditure and private investment—is, as usual, in

line 3. For official transfer only one coefficient is positive and statistically significant, whereas one is negative and significant at the 10% level, and two are insignificant. For private transfers, two of the coefficients are positive and highly significant, one is positive and significant at the 20% level, and one is insignificant. In short, private transfers help, but official transfers may be doing nothing to further economic growth.

This result will be surprising to many people, but it is easily explained by comparing lines 1, 2, and 3 of Panel F, table 2. In line 1, the regressions include taxes, deficits, government spending, and private investment. Holding all these constant, official transfers have a positive and statistically significant impact in three of the four subsamples. In line 2, the regressions do not include taxes and deficits; the coefficients for AOFTS are reduced in size and significance indicating a positive association between government revenue raising and foreign aid. In line 3, taxes, deficits, government expenditure, and private investment are all dropped from the regressions. This again reduces the coefficients for AOFTS. Thus the problem with official foreign transfers is that they reduce private investment, increase government expenditure, and even increase taxes and deficits. That is, such aid causes government expenditure to increase by more than the external financing that it provides. AOFTS does not include all foreign aid, and it is possible that broader—but unavailable—measures of official aid would show different results. However, there is no reason to believe that AOFTS is a bad proxy.

Level of Per Capita GDP and the Structure of Production

In Table 1, the second regressor in each of the four regressions is LRGDP, the lagged level of per capita income. The coefficient is always negative and highly significant. Thus the catch-up effect that is so visible for the developed countries seems to exist for the LDCs also. However, it is not possible to rule out some type of nonlinear relationship.[12]

Panel A of table 3 summarizes the coefficients for A, M, and O—the shares of agriculture, manufacturing, and other industry in GDP. For three of the four subsamples they were not statistically significant and therefore not included in the basic regressions in table 1. The exception is the large annual subsample. The other industry share (O) includes minerals, and it was close to significant for two more of the subsamples. The dummy for a major oil producer (OIL) had a positive and statistically significant coefficient in three of the four cases (see Panel B). These results suggest that minerals are an aid to growth; the results for M cast doubt on the structuralist notion that changing the structure of the economy will promote faster growth. Are the benefits

of industry perhaps a result of healthy growth rather than a cause? In other words, the industry share increases naturally with per capita GDP—included in the regressions—but promoting it to artificial levels does not accelerate growth in most cases.

Population

Panel C, table 3, contains the coefficients for agricultural land per capita (AGLPC). The coefficients are both positive and negative, with none statistically significant. Thus there is no evidence that a shortage of agricultural land was hurting growth over the 1960–80 period.

Panel D of table 3 brings together the coefficients for the rate of increase of population (PGR). The signs are negative, with one coefficient statistically significant, two close to significant, and one not significant. The coefficients range from $-.18$ to $-.398$. Taking the middle of this range, a coefficient of $-.3$ would imply a 1% decrease in the population growth rate, which would increase economic growth by .3%. There is room for various interpretations of the PGR results. The author's interpretation is that a slower population increase would help economic growth, but not by much.

Panel E, table 3, has the coefficients for population (LPOP). Since the regressions contain a variable for per capita income, LPOP tests for possible advantages of large (or small) size for economic growth. (Population is measured in millions.) The coefficients for the multiyear periods are negative and statistically significant, suggesting that larger countries are at a disadvantage. The coefficients for the annual regressions are all insignificant.[13]

World Economic Conditions

Panels F, G, and H of table 3 look at the impact of world economic conditions on LDC growth. Panel F looks at the impact of world growth rates (GDPWGR); they seem to be quite important in the annual regressions with positive, highly significant, and numerically large coefficients. For the longer periods, GDPWGR is either insignificant or has the wrong sign. The impact of changes in the country's terms of trade is examined in Panel G. In three of the four cases, DTRT is not statistically significant, and in one it has the wrong sign.[14] Thus there is no evidence that the terms of trade influence growth in the long run. Panel H looks at the impact of world inflation rates (PIWGR); the coefficients are not statistically significant. To sum up these three sets of results, world economic conditions can have a significant impact on LDC growth in the short run, but over longer periods there is no evidence of impact of world prosperity, LDC terms of trade, or world inflation.

Colonialism

In Panel I, table 3, we have the results from adding COL—a dummy variable for the country having been a colony—to the basic regressions in table 1. The coefficients are all negative, but none is even close to statistically significant. Thus, by this test, colonialism is not slowing the growth of the former colonies now. It is difficult to objectively establish lingering effects of colonialism on the growth of LDCs. Of course, the use of dummy variables may not be the right test, but I know of no better one. The effects of colonialism on the *level* of per capita income in former colonies is not relevant for this study; it is a remnant of historical interest. However, in another study with a different body of data, I found no negative relation between having been a colony and the level of per capita income.[15]

Panel J, table 3, looks at the coefficients if YI—years the country was independent—is included in the regressions. Many students of development from various disciplines have suggested that the recently independent ex-colonies are undergoing a process of nation building, which, until it is completed, can harm economic growth. YI is measured in years, so the coefficients in Panel J are both statistically insignificant and numerically very small. If YI is an adequate measure, then nation building is not an important problem for economic growth.[16]

Internal Political Factors

Panels K and L in table 3 look at certain internal political factors. Panel K gathers together the coefficients for the dummy variable (DEMO). Three of the coefficients are negative; two of the three are also statistically significant and large in absolute value. The fourth coefficient is positive but statistically insignificant. These results support a painful idea that has circulated in development circles for many years: democracy is an expensive luxury for poor countries. Panel L includes the coefficients for COUP—total successful and attempted coups divided by the years since the coup to the current year. This variable is one of two tried as measures of internal political instability. Three of the four coefficients are negative; for the annual subsamples the coefficients are also statistically significant. Clearly, political stability aids growth.

Regulation

The set of variables classified as "regulation and other government impacts" is, of course, incomplete, since most government regulatory activities have not been investigated to the point where we have internationally comparable quantitative measures.[17] The variables that we do have showed some importance, especially in the two annual subsamples. The change in the money supply was close to significant and had a negative coefficient. The lagged average inflation rate was statis-

tically significant, with a negative coefficient for the large annual and the 4-year period subsamples.

AEXRR is a 3-year lagged average of an index of the real exchange rate—base 1960 = 100; it had positive coefficients for the annual subsamples. The coefficients were significant at the 16% and 4% levels in the small and large annual subsamples, respectively. Obviously, AEXRR is an imperfect measure of exchange rate distortions, so perhaps it is not surprising that it was not significant for the other subsamples.[18] The final variable in this set is the real interest rate (ARIR).

Only the 489 observations in the small annual subsample contain data on the interest rate, so this regressor could not be tested for the other subsamples. In the small annual subsample regressions, ARIR has a positive and highly significant coefficient. This result implies that efforts to hold down interest rates in spite of inflation have hurt economic growth.

Income Interactions

The regressions were also run with income interaction terms of the regressor times per capita income. The main interaction results are in tables 9 and 10. The interaction regressors are indicated by the basic regressor symbol with an X added at the end. The interaction terms were statistically significant only for the annual subsamples, and there, of course, for only some of the regressors. The major results for these subsamples from table 2 are compared with the interaction results in table 8. The impact of a unit change in a regressor where there is also an interaction regressor will be the coefficient of the basic regressor plus the income level of the country times the interaction regressor's coefficient. In table 8, when the regressors being compared had interaction terms, the comparison was made at the subsample mean per capita income. When the interaction regressor was of very low statistical significance or when the inclusion of the interaction regressor reduced the original regressor to very low significance, the interaction term was not used. Accordingly, some of the regressors compared in table 8 do not have interaction terms. In general, the inclusion of interaction terms made some difference in the results, but it did not change any of the basic implications.

Methodological Issues

The regressions and their interpretation raise two important methodological issues. One is the use of international cross-section regressions. The other is the inference of causality from regression coefficients.

Some economists have doubts about the validity of cross-section regression studies of the LDCs. One criticism of studies such as this one is that the countries are too different in history, size, structure, and

so forth to be comparable. Thus the claim is that South Korea and Somalia or India and Paraguay are just too different to be included in the same regression. This view, although intuitively plausible, on closer examination appears to be unfounded and perhaps even unscientific. For one thing, factors like size, per capita income level, and even many historical influences can be allowed for by including them in the regressions, as is done here. Some critics of the approach taken here have suggested that the set of 65 countries ought to be subdivided by geography, size, or income level into more homogenous groups and the regressions run inside these groups. However, this approach will create samples too small to test for all the possible influences on growth, and it will tend to produce samples too homogenous in key variables to allow tests of their impact. In addition, such an approach implicitly raises doubts about the point of economic studies of the LDCs. If they are too different to put in the same regression, how much of what we know about one group is relevant to another? If conclusions are not relevant across groups of countries, of what scientific value are they? Furthermore, if generalization is not possible across countries, who is to say it is possible across time? Why should we believe that the 1960s experience of India is relevant to 1980s issues even in India? Perhaps the strongest answer to criticism of international regressions is that the regressions implicitly test if the countries are comparable. If the impact of government consumption expenditure or any other factor is very different in the various types of countries in the sample, the standard error of the estimated regression coefficient will be high and the coefficient will be statistically insignificant. Thus, if many of the coefficients are statistically *significant,* as this study found, then evidently the countries are sufficiently comparable to include in the same regression. Finally, rejection of cross-section statistical studies can make us prisoners of conventional wisdom for long periods. If cross-section studies were not used, we would need decades of experience to rigorously test accepted theories.

Causality is a perennial problem for empirical studies in economics. Ultimately, problems of causality can only be solved by sophisticated theoretical frameworks that do not yet exist in the study of economic growth and development. Without such a framework it usually behooves the researcher to be cautious about suggesting causality. If the regression of Y on X produces a negative coefficient, how do we know (1) that the correlation is not spurious and Z, a more fundamental influence, is causing the changes in both X and Y or (2) that the increases in X cause the decreases in Y and not the reverse?

Although these problems *could* exist for the coefficients of regressing per capita income growth on the various government expenditure shares, they most likely do not. First, let us look at the issue of third factors and spurious correlations. There seem to be two answers to

that problem. First, the factors allowed for in these regressions cover most of the range of plausible influences on economic growth. Second, it is at least highly plausible that increased government expenditure would have an impact on economic growth.

However, one important category of influences on economic growth is not adequately covered by the regressors used here—regulation. How do we know that the coefficients found here do not merely reflect bias from missing government regulation regressors? One can never be certain; however, this situation is unlikely because of the large differences in the coefficients for the various types of government expenditure. Government regulation has in general grown along with all types of government expenditure, so if the coefficients for expenditure were mere proxys for the missing regulation regressors, the large difference between the coefficients for OCSA and ATRNS ought not to exist. Furthermore, the notion that the expenditure coefficients are proxys for missing regulation data does not square with the changes in coefficients when taxes and deficits or private investment are added to (or dropped from) the regressions. Obviously, there is some correlation between expenditure and regulation, so the coefficients would change if we had the missing regulation regressors, but there is no reason to believe that the results here are spurious because the set of regulation variables is incomplete.

The other causality problem is reverse causality. How can we be fairly certain that government expenditure is influencing economic growth and not vice versa? The answer to this has several parts. First, simple reverse causality has been eliminated because the government expenditure shares are lagged, so they take place before the growth rates regressed on them. Thus the only way that changes in the growth rate could be causing the changes in government shares would be if there were long runs of high or low growth rates. That is, if growth were already slow in 1960 and it induced larger government spending in 1961 and 1962 while the slow growth continued from there on, we would get the negative coefficient when we regressed growth rates from 1963 to 1980 on lagged government-spending shares. However, the growth rates are not highly correlated over time. They frequently change from high to low and back again. For many of the countries there is even more than one switch from positive to negative growth rates and back again. Thus the long runs necessary to produce reverse causality with lagged regressors do not exist.

From a substantive point of view the results also do not square with a reverse causality. Slower growth could cause higher government-spending shares in GDP in one of two ways: (1) the growth of actual government spending could be independent of the growth of national product, so that when the growth of national product slowed, the steady growth of government spending would increase its share in

GDP; and (2) slow growth of GDP could induce the government to intentionally spend more either to reduce suffering or to induce faster growth. Neither of these possible reverse causality scenarios fit the pattern of coefficients for the various government shares. The first hypothesis of exogenous growth in government spending would imply that the coefficients for all government-spending shares ought to be similar and negative. In fact, the coefficients for the various types of government spending are quite different, with some—AEDS, ATRNS—mainly positive. The second possible route for reverse causality, deliberate increases in government spending when growth slows, would imply that the maximum increases in government spending ought to come in transfers—ATRNS—or capital spending—AKES. In fact, the strongest negative coefficients are for OCSA. Finally, no scenario for reverse causality can explain the changes in the expenditure coefficients when taxes, deficits, and private investment are added or removed from the regressions. In sum, in spite of the usual dangers of inferring causality from regression coefficients, the richness of the empirical results for this study allows that luxury with relative safety.

IV. Conclusion

The most important empirical results are the estimated impacts of the five types of government expenditure on economic growth (the increase in per capita domestic product). Strictly speaking, all regression results are nothing more than partial correlations. However, in the previous section it is argued that our empirical results here are sufficiently rich to allow causal inferences.

Government consumption expenditure excluding military and educational expenditure (OCSA) appears to have noticeably reduced economic growth. Military and transfer expenditures do not appear to have had much impact on economic growth. Government educational expenditures seem to be inefficient at generating actual education; that is, actual education (measured by enrollment ratios) is strongly correlated with growth rates, but levels of government educational expenditure are not. Government capital development expenditure appears to do nothing to accelerate economic growth. In itself, government investment has a weak positive impact on growth, but, when we allow for the taxation and borrowing needed to finance such investment plus the crowding out of private investment, the net impact is zero. This result is very important, since LDC government capital expenditure is large—averaging 7% of GDP, is supposed to be a major force for development and growth, and has an opportunity cost in lower consumption.

All the regressions showed a strong negative relation between the level of per capita product and the growth rate—a catch-up effect. The implication is that the poorer LDCs ought to be growing faster than the middle-income LDCs; the actual situation is the opposite.[19]

Private investment has a noticeable positive impact on economic growth, especially when compared with public investment; however, the statistical significance and numerical size of the coefficients are not high in some of the subsamples. This may be due to measurement problems. Many countries classify autonomous public enterprises as private when they actually run along the lines of the U.S. Post Office. An additional factor is LDC government influence on the direction of truly private investment, either preventing it in highly productive activities—for example, oil—or encouraging it in activities that do not contribute to economic growth—for example, over-protected industry.

Foreign official (government) aid shows no net positive impact on growth. Foreign official transfers result in increased government expenditure and reduced private investment, which evidently negates the positive impact of foreign funding. In contrast, private foreign transfers generally have a positive impact on economic growth.[20]

Only a limited number of government regulatory activities could be studied, since there are no internationally comparable measures of most regulatory activity. The regulatory activities that could be tested showed some impact on economic growth, especially for 1-year growth rates. Faster money supply growth and higher inflation rates show some negative association with growth. There is also evidence that preventing currencies from depreciating along with inflation and government efforts to hold down real interest rates are damaging to economic growth.

Government policies are not the only causes of differences in growth rates; the regressions included as many of these other factors as possible. Some of the results for these other variables are very interesting. The share of manufacturing in GDP does not seem to influence growth rates.[21] This result casts doubt on the structuralist view that promoting the faster growth of manufacturing is necessary for satisfactory economic growth in the LDCs. It lends support to the free market approach that the growth of manufacturing is a natural part of the process of economic growth and there is no need or benefit to artificially expanding manufacturing output. If this result holds up in further testing, it has far-reaching implications; a wide range of LDC government expenditures and regulation is aimed at promoting manufacturing in the name of accelerating economic growth.

The study looked at several elements of natural conditions that could influence economic growth: minerals, especially oil; agricultural land per capita; temperature; rainfall; and the state of being landlocked. Only oil, and to a lesser extent minerals in general, and being or not being landlocked had impact on LDC economic growth. These results may seem surprising, but there is a fairly obvious explanation. Most natural conditions have already had their impact on the level of per capita product and the density of population; they no longer influence growth significantly. I had already found that in 1950 and 1970

geo-climatic conditions like temperature explained much of the differences between countries in *levels* of per capita product.[22]

There seems to be a negative relation between the rate of increase in population and the rate of economic growth. However, the estimated coefficients imply that even a very rapid population increase slows economic growth only moderately. Thus it is possible to exaggerate the importance of this problem.

The study looked at three aspects of world economic conditions that could influence LDC growth rates: the growth rate of world GDP, the change in LDC terms of trade, and world inflation rates. There is evidence that world economic conditions, especially the growth rate of world GDP, influence LDC growth in the short run, but there is no evidence of longer-run impact.

Several variables were used to test for political influences on economic growth. Those that showed some significant influence were the following: the country being a democracy, the incidence of coups, and a war having been fought on the country's soil. All three were negatively correlated with the growth rate. In contrast, both of the variables that test for lingering effects of colonialism were statistically insignificant. Thus there is no evidence that former colonial rule is still effecting LDC economic growth.

How do the results of this study compare with other empirical studies of economic growth? The only empirical study of the effects of government expenditure is my cross-sectional study referred to in the introduction. There is a fairly extensive empirical literature looking at cross-sectional relations with growth rates, including regression studies by Feder, Hagen and Hawrylyshyn, and Robinson. Adelman and Morris did a cross-country factor analysis.[23]

The three regression studies cover—in various samples—31–42 LDCs for time periods from 1955–60 to 1964–73. The regressions were all OLS with explanatory variables contemporaneous with the dependent variable—the growth rate of GDP. Given the limited number of observations, they could only use a limited number of explanatory variables. They used the investment share in GDP, the population growth rate, and a few others that differed between the three studies. They found larger coefficients for the investment share, and their population coefficients imply a more negative impact on growth of per capita GDP. As those studies differ from this one in the independent variable, sample, specification, and so on, it is hard to pin down the cause of the different results. The most obvious candidate is the many explanatory variables included here but not in those studies. Hagen and Hawrylyshyn and Robinson tested the impact of resource movement out of agriculture—a similar issue to the structural variables A, M, and O here—and reached contradictory conclusions. The Hagen and Hawrylyshyn results are closer to this study. Only the Hagen and

Hawrylyshyn study looked at the impact of education, which was found to be positive with a very long lag. However, their measure of investment in education is probably inappropriate.[24]

The Adelman and Morris study is a factor analysis covering 74 LDCs. The study's measure of growth is the growth rate of per capita GNP over the 1950/51–1963/64 period. The other variables are 35 political, social, and economic measures mostly contemporaneous with the growth period. The majority of the variables are sociopolitical ordinal measures based on combinations of statistics and expert judgment. Adelman and Morris divide their sample into three development levels and perform the analysis separately for each level. The Adelman and Morris study differs from this one in the method of analysis, specification, dependent variable, and sample. Even where the variables are nominally the same, they are measured differently. As a result, only three comparisons are possible. They find a positive impact for education, but not necessarily as important as found here. For two of the three development levels, their results agree with this study that democracy and political instability are negatively associated with LDC economic growth.

It is clear that the findings of this study need further testing. It would be especially valuable to test for price distortions and other government regulatory effects. Unfortunately, not much can be done along these lines until substantial resources are devoted to developing internationally comparable data on regulation and price distortions.

Appendix A
Data and Sources

The data set includes 65 countries and covers the years 1960–80. The sample was limited to countries with populations of one million or more, since for smaller countries special circumstances can too easily dominate all general patterns. Missing data reduced the countries included to 65 and restricted the period covered to 1960–80.

The countries in the data set are Cameroon, Chad, Egypt, Ethiopia, Ghana, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Morocco, Nigeria, Rhodesia, Rwanda, Senegal, Sierra Leone, Somalia, South Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Upper Volta, Zaire, Zambia, Bangladesh, Burma, India, Iran, Israel, Jordan, South Korea, Malaysia, Pakistan, Singapore, Sri Lanka, Syria, Thailand, Greece, Portugal, Spain, Turkey, Costa Rica, Dominican Republic, El Salvador, Guatemala, Honduras, Jamaica, Mexico, Nicaragua, Panama, Trinidad, Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Indonesia, and Papua.

The basic data sources were the International Monetary Fund publications, *International Financial Statistics,* and *The Government Finance Yearbook*. Data not available from these sources were taken primarily from the World Bank *World Tables* and a variety of U.N. publications, especially the *Yearbook of National Account Statistics*. Because the coverage of *Govern-*

ment Finance Statistics starts at the earliest in 1970, the non-IMF sources were used for government expenditure and revenue from 1960 until the GFSY data started. In order to make a more consistent series and because the IMF data are generally of higher quality, whenever IMF data existed, the data from other sources were treated as a measure of the change in the IMF figure.

The following data were taken from the *International Financial Statistics,* with occasional use of the *World Tables:* the exchange rate, the money supply, the discount rate, official and private unrequited transfers, government consumption expenditure, gross fixed capital formation, increase in stocks, GDP, the GDP deflator, and population. These data were annual for each country. The same sources also provided the world GDP measure and the world inflation measure.

The following were data taken from the *Government Finance Statistics Yearbook,* 1983 edition: total revenue (central government and other levels of government), total expenditure plus lending minus repayment (all levels of government), current expenditure (all levels), capital expenditure (all levels), defense expenditure (central government), educational expenditure (all levels). Government expenditure data not available from this source came from the *World Tables* and a variety of U.N. publications. Missing defense expenditure data were filled in from the *SIPRI Yearbook.*

A major decision had to be made for countries that only reported central government expenditure on a systematic basis. If all these were excluded, the sample would have been only about 40 countries. Such a step would not have really been justified, since for many of them the central government spends 90% and more of all government expenditure. For countries where the central government spends over 90% of total government expenditure, estimating *general* government expenditure shares in GDP from *central* government shares will be accurate enough except for educational expenditure. Education expenditure data for these countries were taken from the *UNESCO Yearbook.* Countries in which the central government does not spend 90% of general government expenditure and that did not report expenditure of other levels of government were excluded from the sample.

The other variables came from a variety of sources. Data on wars came from the *Political Handbook of the World.* The European share in the population and rainfall data came from the *World Factbook.* Agricultural land data are from the *FAO Production Yearbook.* Life expectancy, enrollments, and the shares of agriculture, manufacturing, and other industry in GDP came from the *World Tables* and the *World Development Report.* The data on coups and political deaths came from the *World Handbook of Political and Social Indicators.*

The full details of all data sources and manipulations will be available from the author.

Appendix B
Definitions of Regressors

A: The share of agriculture production in GDP, lagged average.
ADS: Military expenditure as a share in GDP, lagged 3-year average.
AEDS: General government educational expenditure as a share in GDP, lagged 3-year average.

AEXRR: Index of the real exchange rate—1960 = 100, lagged 3-year average.
AGLPC: Agricultural land per capita.
AINF: The inflation rate, lagged 3-year average.
AIP: Private investment as a share in GDP, lagged 3-year average.
AKES: General government capital expenditure as a share in GDP, lagged 3-year average.
AOFTS: Official transfers from abroad as a share in GDP, lagged 3-year average, the proxy for foreign aid.
APUTS: Private transfers from abroad as a share in GDP, lagged 3-year average.
AREVS: Current revenue as a share in GDP, lagged 3-year average.
ARIR: Real interest rate, lagged 3-year average.
ATRNS: General government current nonconsumption expenditure as a share in GDP, lagged 3-year average.
BREVS: General government budget deficit—total expenditure minus current revenue—as a share in GDP, lagged 3-year average.
COL: Dummy variable with a value of 1 if the country was a colony and O otherwise.
COUP: Total of coups and attempted coups from 1948 to current year divided by the number of years since the coup or attempt.
DEMO: Dummy variable with a value of 1 if the country has been a democracy and 0 otherwise.
DLP: Distance from the capital to the nearest seaport for landlocked countries only.
DMSS: Percentage change in the money supply over the current period.
DTRT: Change in the country's terms of trade.
EDO: Weighted total of enrollment in primary, secondary, and higher education as a percentage of relevant age group, average for years 1965 and 1975.
GDPWGR: Growth rate of world GDP average over the current period.
LE7: Life expectancy at birth in 1970.
LPOP: Population in millions, lagged.
LRGDP: Real gross domestic product per capita. It is lagged 1 year in the annual regressions and an average of 3 years ending in the first year of 4- and 7-year period regressions.
M: The share of manufacturing output in GDP, lagged average.
O: Other industry share in GDP, lagged average.
OCSA: General government consumption expenditure other than defense and education, lagged 3-year average.
OIL: Dummy variable with a value of 1 if the country is a major oil producer and 0 otherwise.
PDR: Political deaths—from internal situations—since 1948 per million of the population divided by the years since the deaths took place.
PGR: Growth rate of the population in percent, average over the period studied.
PIWGR: World inflation rate.
RAIN: Average annual rainfall in inches.

SEUR: Share of the population of European extraction.
T: Time trend.
WFS: A dummy variable with a value of 1 if a war with a foreign country was fought on country's soil since 1940.
YI: Years that the country has been independent.
—X: The regressor times LRGDP.

Notes

*The research for this paper was funded by the Agency for International Development. The author has benefited from comments by Michael Bordo, David Denoon, Norman Hicks, Keith Marsden, Gustav Ranis, Paul Craig Roberts, Jennifer Roback, and two anonymous referees. None of them bears any responsibility for the final product.

1. Norman Gemmell, "International Comparison of the Effects of Non-Market Sector Growth," *Journal of Comparative Economics* 7 (1983): 368–81.

2. Keith Marsden, "Links between Taxes and Economic Growth," Staff Working Paper no. 605 (Washington, D.C.: World Bank, 1983).

3. Daniel Landau, "Government Expenditure and Economic Growth: A Cross-Country Study," *Southern Economic Journal* 49 (January 1983): 783–92.

4. Moses Abramovitz, "Review of *Towards an Explanation of Economic Growth,*" *Journal of Economic Literature* 21 (January 1983): 783–92.

5. Landau.

6. Ibid., app.

7. Hollis Chenery, "The Structural Approach to Development Policy," *American Economic Review* 65 (May 1985): 310–15.

8. Daniel Landau, "Explaining Differences in Per Capita Income between Countries: A Hypothesis and Test for 1950 and 1970," *Explorations in Economic History* 22 (1985): 296–315.

9. For longer periods there were too few observations to test the hypothesis properly.

10. In the basic regressions for the annual subsamples the human capital regressor was LE7—life expectancy. When included with AEDS in these basic regressions, EDO was also significant, but not as significant as LE7. For the longer periods the relation was reversed, with EDO slightly more significant.

11. Between lines 2 and 3, the coefficients all decrease in algebraic value, which indicates some crowding out of private investment. The comparison of lines 1 and 2 gives no consistent picture. The coefficient for ATRNS is statistically significant for the small annual subsample and has a value of .085 in line 3.

12. The simple correlation between per capita product and growth rates is positive. For example, the World Bank's low-income economies (excluding China and India) grew at 0.8 per annum, and upper-middle-income economies grew at 4.2% per annum. Evidently the simple correlation is misleading.

13. In tables 9 and 10—regressions with income interaction terms—the coefficients for LPOP are negative, but the interaction terms are positive. This would imply that smaller countries have advantages, but only at low-income levels. This result is consistent with the hypothesis in Landau, "Explaining Differences in Per Capita Income between Countries," that the growth experience of the countries outside Western Europe is significantly influenced by the ease or difficulty with which the modern market economy spread to each one.

14. When DTRT and DTRX—the change in terms of trade times the level of per capita income—are added to the small annual subsample interactions regressions in table 9, the coefficient of DTRT was .037, with a *t*-value of 1.46,

and the coefficient of DTRTX was −.018, with a *t*-value of 3.00. This indicates some impact of change in the terms of trade at very low income levels. DTRT and DTRTX were statistically insignificant in the interactions regressions for the large annual subsample.

15. Daniel Landau, "Explaining Differences in Per Capita Income between Countries." When the former colonies were divided up into four classes—former U.S. and Japanese colonies, former British colonies, former French colonies, and former colonies of other countries—the coefficients were generally positive, but statistically insignificant. (These regressions are not included in the article.)

16. When YI and YIX are included in the annual subsample interactions regressions, the significance levels are better than in table 3. However, the coefficients at the subsamples' means—see the discussion of table 8—are still a miniscule .001 and −.001.

17. The World Bank has done some work on price distortions, but the published results are not usable in a study such as this one.

18. An alternative to AEXRR based on black-market exchange rates was for some unknown reason insignificant in all regressions.

19. One possible explanation for the reversal is government policies; the problem is definitely not public investment in human or physical capital.

20. The measure of foreign official aid used in the regressions does not cover all such aid, and it is possible that broader—unavailable—measures of official aid would show different results; however, there is no reason to believe official transfers are a bad proxy for all foreign official aid.

21. This was the result for three of the four subsamples studied, and even for the one exception, when income interaction terms were added, the manufacturing share ceased to be statistically significant.

22. Landau, "Explaining Differences in Per Capita Income between Countries" (n. 8 above).

23. Geshon Feder, "On Exports and Economic Growth," *Journal of Development Studies* 12 (1982): 59–73; E. Everett Hagen and Oli Hawrylyshyn, "Analysis of World Income and Growth, 1955–65," *Economic Development and Cultural Change* 18 (October 1969): 1–96; Sherman Robinson, "Sources of Growth in Less Developed Countries," *Quarterly Journal of Economics* 85 (August 1971): 391–408; Irma Adelman and Cynthia Taft Morris, *Society, Politics, and Economic Development: A Quantitative Approach* (Baltimore: Johns Hopkins University Press, 1967).

24. They use the growth of enrollments over the same period as the dependent variable. This would appear to be the appropriate measure of investment in education only if we assume that the enrollment rates at the beginning of the period had existed for a long time.