Government Expenditure and Economic Growth: A Cross-Country Study

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I. Introduction

This paper examines the relationship between the share of government consumption expenditure in GDP and the rate of growth of real per capita GDP. The work of the U.N. International Comparison Project has recently made available new estimates for over 100 countries of both per capita GDP and the share of government consumption. These new estimates are based on direct price comparisons rather than exchange rate conversions.[1] As a result, the statistics for different countries are more comparable and cross-country studies will be more reliable.

It would be preferable to study the relationship between total government expenditure and the growth rate of per capita output. It would be better still to examine the relationship between total government economic impact—including regulation—and the growth rate. Ideally we would want to study the relationship between total government impact and a comprehensive measure of economic welfare. While per capita real output is probably positively correlated with economic welfare, obviously welfare includes many other dimensions. Unfortunately, the necessary data for these broader studies are not available.[2] Given the importance of government impacts on the economy, even the partial relationship should be of interest.

The rest of the paper divides into three parts: methodology, results, and analysis. There is also a short appendix giving data sources.

II. Methodology

From here on the letter y will be used for per capital real GDP and GS will be used for the share of government consumption expenditure in GDP.

1. The data on GS and y are from Kravis [6]. See Kravis [5] for a fuller presentation of the methodology of the ICP. For a survey and critique of the ICP methodology see Marris [11].

2. Obviously using total government expenditure would be superior to using only consumption expenditure. However, a central point of the ICP is that international comparisons using shares of nominal values in nominal national product are inappropriate. Thus to use total government expenditures would require measuring total

Economic theory does not give a clear prediction about the impact of an increase in GS on the growth of y. From an income accounting perspective, a higher GS could come at the expense of either investment in conventional capital or private consumption. If GS increases at the expense of investment this would tend to diminish the growth rate of y. However, substantial portions of government "consumption expenditure" are in fact investment in the broader sense, especially education and health care. Thus a higher GS doesn't necessarily reduce capital formation even if it is at the expense of conventional investment. The implications are also not clear if GS increases at the expense of private consumption. On the one hand, private consumption may be an incentive to labor supply and savings; furthermore, some private 'consumption'—as counted by the U.N.—is really investment. On the other hand, government investment in basic health and education could be more important than the incentive effects of spending on say luxury goods.

Looking at the question more broadly, there are conflicting points of view. A strong believer in the free market would expect government expenditure to be less efficient than private even if it was in the field of human capital, and thus he would predict the higher GS the lower the growth of y. However, many development economists of what Chenery [2] called the "Structuralist School" would contend that certain government expenditures have been and will be necessary to remove impediments to economic growth. For the structuralists, under certain circumstances, a higher GS would be associated with faster growth.[3]

Clearly, when we examine the empirical relationship between GS and the growth of y we must allow for other factors. Unfortunately, there is not any accepted theory of what determines the growth rate of y and therefore, there is no generally accepted set of variables to include in the study. Rather, various studies and common sense suggest various factors which could have significant impact on the growth rate.

One such factor is simply the level of per capita output—y. We do not have a simple prediction for the effect of an increase in y on its growth rate. Kuznets's [10] studies suggest that among the higher income "developed countries" there is a convergence process with lower y countries in this group having a higher growth rate. However, for lower y "lesser developed countries" the simple correlation between y and its growth rate is negative. Thus y was included as a regressor while tests were made for non-linearity as well.

Another factor which may be quite important is human capital, either the stock per capita or the rate of growth of the stock.[4] In the study, four variables were tried which measure the investment in human capital in the form of education, one for the stock of human capital in the form of education, and two for the health and nutrition aspects of human capital. The investment in education variables tried were the adjusted enrollment ratios in primary and secondary schools, the percentage of the 20-24 year old population enrolled in higher education, and a weighted sum of these three—"total investment in education" TIE.[5] The stock variable for educational human capital was the adult literacy

government expenditures at international prices just as Kravis, Summers and Heston did with government consumption expenditures. Unfortunately, the U.N. and World Bank published national accounts make this a complex research project in itself.

3. The relationship between GS and the growth of y could be non-linear so GS^2 and GS^3 were also tested.

4. If the growth process is a balanced "accumulation" of physical capital, human capital, technology, etc., then only the increase of human capital per capita ought to influence the growth rate of y. However, if the process is not a balanced "accumulation" than the stock of per capita capital will also be important.

5. The weights were 1 for % adjusted primary school enrollment ratio, 2 for % secondary school, and 3 for % of

rate.[6] For the other dimensions of human capital, life expectancy and food supply were tried.

Studies by Kuznets [7] and others have identified many "structural" characteristics that differentiate the developed from the low income countries. These include the share of the labor force in agriculture, the share of industry in GDP, and the share of primary products in exports. If one has faith in the market, he would expect these characteristics to change of their own accord as part of the unfettered growth and development process. However, the structuralist approach is that government actions to change these characteristics may be necessary to promote or accelerate economic growth. From this perspective, a higher share of the labor force in agriculture is not just a sign that growth has not taken place, it is also a negative influence on the growth rate.

Similarly, primary products exports are believed by some to be a poor basis for economic growth; therefore, the higher their share in exports the lower the growth rate. Energy consumption per capita was used as a proxy for the share of industry in GDP.[7]

Limitations on free trade may create 'economies of size' in the growth process. For a given level of per capita output, a larger nation may be able to attain greater specialization and thus grow faster. The study already includes per capita output-y, size effects were tested for by including population and real GDP equal to population times per capita output.

It has frequently been contended that rapid population increase slows the rate of increase in y. Kuznets [8] tends to reject this conclusion; a recent study by J. Simon has cast further doubt.[8] The rate of population increase was included in the regressions, but we have no firm prediction what the sign of its coefficient should be.

Marxists and some other development economists contend that colonialism or "neo-colonialism" has had serious negative impacts on the growth of the low income countries. Since there are almost no colonies in the sample, it is not possible to test for the effects of colonialism directly. However, many students of development including Kuznets [9] believe that: one, after independence there is a long process of "nation building;" two, until nation building is completed economic growth will be slower. This approach and the neo-colonialism thesis both predict that the growth of y will be inversely related to the length of time that a country has been independent politically. To test this relationship years since independence—*YI*—was used in the regressions. It should be positively related to the growth of y. *YI* squared and cubed were also tried to allow for non-linearity. Clearly *YI* is far from capturing all aspects of either "neo-colonialism" or of nation building; however, the author is not aware of additional suitable variables for which the necessary data are available.

Finally, we must allow for the natural endowments of a country. If a country has less

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20-24 year old population in higher education. Thus, *TIE* runs from a possible 0–600. The weights are arbitrary approximations to the relative values of the 3 types of education. The TIE variable is necessary because of the high multicollinearity between the various enrollment rates. The data on investment in local currency units in education are incomplete and are only nominal values; thus the enrollment rates are probably superior measures of investment in education.

6. Obviously adult literacy is not a complete measure of the stock of human capital per capita. Unfortunately, better measures are not available for the large set of countries studied.

7. The proxy measure of the industrial share in total product seems superior to nominal industrial output in nominal value GDP; see F.N.2 and Kravis [5].

8. That higher rates of population increase ought to slow the growth of per capita output seems to follow simply from the definition. However, rapid growth in *total* real output may, in fact, provide increased incentives to innovations which increase per capita output. For a discussion of the empirical evidence see Simon [12].

agricultural land per capita, the opportunities for increasing agricultural output would be more limited, and this might slow growth. However, Boserup [1] has contended that countries with more limited agricultural possibilities may be forced to make more radical economic and institutional adjustments and thus they ultimately grow faster. A variable measuring agricultural land per capita was tried in the regressions.

Just as important as the quantity of agricultural land is the quality. Some observers believe tropical agriculture simply has less potential than temperate zone agriculture; others would ascribe the differences in achieved results to lack of agricultural research in the tropics. In either case, the agro-climatic nature of a country could significantly influence the possibilities for economic growth. Of course, climate might influence growth in other sectors also. Dummy variables were tried to allow for the basic climate zones.[9]

Mineral resource endowments will influence a country's potential for growth and its actual growth during certain periods. The oil exporting countries are an especially serious problem because of their explosive growth during the period covered by this study—1960–77. Kuznets suggests that they be ignored in discussing growth patterns. The bulk of results reported follow this approach and exclude eight major oil exporters from the raw sample of 104 countries. However, the major oil exporters include Indonesia and Nigeria, thus it seemed advisable to also test the relationship with the oil exporters included and using a dummy variable to allow for their special situation.[10] Other large mineral resources could not be allowed for directly; however, they are partially captured by the variable measuring the share of primary products in exports. If this linkage is important, then the sign of the coefficient for this variable would be positive rather than negative as predicted above.

The data on GS and y are taken from Kravis [6]; most of the other variables come from the World Bank Atlas [19]. The data allow a sample of 104 countries (with a population of one million or more) minus eight major oil exporters or 96 non-communist countries.[11] The important growth rates examined were for the periods 1961–70, 61–72, 61–74, and 61–76; the shorter periods 1961–68 and 1970–76 were also tested. The growth rates were calculated from a three year centered average of the level of y to reduce the effects of special conditions during the beginning or end year of a period.[12]

There is a potential simultaneity problem for the study because various explanatory variables like the share of labor in agriculture, student population ratios, etc. are both influenced by the growth rate and influence the growth rate. The problem was reduced by taking the values for most variables from the start of the period—1960 or 1970. Thus the simultaneity problem only applies to the share of government consumption—which is the arithmetic average of the shares for the period studied—and the growth rate of y. This was dealt with by two-stage least squares.

The long list of potential influences on the growth rate had to be narrowed down. The

9. The zones are: Continental humid cool summer, continental humid warm summer, Mediterrean dry summer, Steppe, Tropical Savanna, Marine West Coast, Humid Sub-Tropical, desert, tropical rain-forest, and irrigated river valley The source is Times Atlas [15, XXIV]. A few countries—like the U.S.—do not fit into one zone, but for most their agricultural land is almost all in one zone.

10. See Kuznets [9]. In fact two dummies had to be used, one for major oil exporters in general and one for the capital surplus countries Libya and Saudi Arabia.

11. Kravis [6] has no data for the Communist countries. See the appendix for a list of the 104 countries.

12. The longer periods studied all start at 1961 because many of the data series used were only available (for the whole set) for 1960 and 1970.

procedure chosen was a stepwise regression. The specification problem was dealt with by running the stepwise regression on a stratified random half of the full set—48 countries—for the period 1961–72. *GS* and *y* were included as explanatory variables and other variables were added until the mean square error of the regression was minimized.[13] The resulting specification was tested on the other half of the 1961–72 sample and then used for all the various time periods and subsets of the 96 countries.[14]

A cross section study of such a wide range of *y*—the U.S. *y* in 1961 was roughly 30 times the lowest *y* country—can be expected to exhibit heteroscedasticity by income. Accordingly, the observations were divided into fourths by *y*, the heteroscedasticity was tested for by Bartlett's Test, and the data were transformed to correct the problem.[15]

III. Results

The variables that emerged from the specification procedure were the share of the government consumption—*GS*, per capital GDP—*y*, total investment in education—*TIE*, two climate zone dummies, Mediterranean and Tropical Rain Forest—*Z13* and *Z19*, plus energy consumption per capita, *EC*. One or more of the last three variables—*Z13*, *Z19* and *EC*—proved quite insignificant in some of the regressions so they were dropped from those regressions.

The regressions results for the full sample are in Table I. From panel A we see the effect of an increase *GS* is to reduce the growth rate of *y* for all four longer periods. The coefficient is significant at the 5% level for 61–70 or 61–72 and at the 1% level for 61–74 and 61–76. An increase in *y* decreases the rate of growth of *y* for all four periods and the coefficient is significant at the 1% level. The growth rate of *y* is positively related to *TIE* and the coefficient is significant at at the 1% level for all periods. The regional dummies were positively related to the growth of *y* but the significance level of the Mediterranean dummy was low. Energy consumption proved quite insignificant for the full set of countries and was dropped.

The 96 countries in the sample range from giants like India down to little ones like Singapore and Panama (countries under 1 million population were excluded). Giving all countries equal weight *could be* misleading. Therefore, the longer period regressions were also run with the observations weighted by population of the country in 1960. The results are in Panel B of Table I. They are similar to the unweighted regressions except that the significance of the coefficient of *GS* is higher.

The negative relationship between *GS* and the growth of *y* could be expected to be weaker for shorter time periods. The regression in Panel C of Table I test this for 1961–68

13. See Wonnacott [16,186].

14. The 48 countries used for the stepwise regression were a random sub-set of 24 of the countries in the bottom half of the *y* distribution in 1961 and 24 from the top half. Since high income DC's are considered to be a different statistical universe than low income LDC's, the stratification seemed in order. The division of the set for specification purposes into two halves is a compromise between the limited size of the sample and Theil's suggestion [14, 603] to divide the sample into three parts. The period 1961-72 were choosen for specification purposes because it is the longest period ending before the oil price shock. Tests—some of which are reported below—were run to see if excluded variables might be significant in regressions for the whole set and subsets.

15. See Intriligator [4,157,168]. The residual variances used to transform the data—were calculated for fourth's of the sample ordered by *y*.

Table I. Regressions of the Growth Rate of Per Capita GDP for the Full Set of 96 Countries

Time Period	Constant	*GS*	*Y*	*TIE*	*Z13*	*Z19*	*EC*	*DF*	$\bar{R}^2$
Panel A: Longer Periods									
1961-70	3.97^{b}	$-.179^{b}$	$-.0019^{c}$	$.026^{c}$	1.04^{a}	1.91^{c}	—	90	.793
	(1.69)	(0.87)	(.0004)	(.004)	(.55)	(.56)			
61-72	3.77^{c}	$-.178^{b}$	$-.0021^{c}$	$.028^{c}$	1.08^{b}	1.67^{c}	—	90	.841
	(1.44)	(.074)	(.00037)	(.0036)	(.47)	(.48)			
61-74	4.14^{c}	$-.188^{c}$	$-.0020^{c}$	$.027^{c}$	$.751^{a}$	1.23^{c}	—	90	.851
	(1.31)	(.067)	(.00033)	(.0033)	(.43)	(.44)			
61-76	4.25^{c}	$-.188^{c}$	$-.0021^{c}$	$.026^{c}$	.432	.604	—	90	.820
	(1.33)	(.067)	(.00034)	(.0034)	(.45)	(.46)			
Panel B: Regressions Weighted by Population									
1961-70	6.42^{c}	$-.381^{c}$	$-.0018^{c}$	$.027^{c}$	1.01^{b}	2.76^{b}	—	90	.859
	(1.22)	(.067)	(.00033)	(.004)	(.51)	(1.07)			
61-72	6.33^{c}	$-.371^{c}$	$-.0016^{c}$	$.025^{c}$	$.984^{a}$	3.02^{c}	—	90	.856
	(1.20)	(.065)	(.00033)	(.004)	(.51)	(1.06)			
61-74	6.36^{c}	$-.345^{c}$	$-.0013^{c}$	$.020^{c}$	.769	2.39^{b}	—	90	.858
	(1.13)	(.062)	(.00031)	(.0038)	(.48)	(1.00)			
61-76	6.38^{c}	$-.328^{c}$	$-.0011^{c}$	$.016^{c}$	.53	1.38		90	.839
	(1.14)	(.052)	(.00031)	(.0038)	(.48)	(1.00)			
Panel C: Shorter Periods									
1961-68	2.69^{b}	$-.101$	$-.0017^{c}$	$.024^{c}$	1.05	1.58^{b}	—	90	.708
	(1.29)	(.108)	(.00053)	(.005)	(.67)	(.68)			
1970-76	4.34^{a}	$-.21^{b}$	$-.0023^{c}$	$.022^{c}$	—	—	.00039	91	.595
	(2.28)	(.107)	(.008)	(.0047)			(.00033)		

Standard Errors in parenthesis. For data sources see appendix. Dependent variable for all regressions is the average annual percentage growth rate of per capita GDP. Variable definitions: *GS* = share of government consumption expenditure in GDP, *y* = per capita GDP, *TIE* = Total Investment in Education, *Z*13 = dummy for Mediterrean Climate Zone, *Z*19 = Dummy for Tropical Rain Forest Climate Zone, *EC* = Energy Consumption per capita.
a. Significant at .10 level.
b. Significant at .05 level.
c. Significant by .01 level.

and 1970–76. The coefficients and significance levels are similar to the longer period regressions for *y* and *TIE*, but as expected for GS the significance level is lower. *GS* is not signifiant at even the 10% level for the earlier period. In addition, the $\bar{R}^2$ are lower for the shorter periods and EC is not totally insignificant for the 70–76 period.

Table II reports the results of regressions for the time periods 1961–72 and 1961–76 for the top, middle and bottom 48 countries by *y*. The Table also has the results (for 1961–72 only) for the "Third World" and the full set of 104 countries including the major oil exporters.[16] The top 48 starts at 13.5% of U.S. *y* in 1961. For this sub-set the *GS*, *y* and *TIE* coefficients are all of the same sign as the full set regressions. Not surprisingly, the size

16. The "Third World" is all countries in the sample except for Europe, U.S., Canada, S. Africa, Israel, Japan, Australia, and New Zealand.

Table II. Regressions of the Growth Rate of Per Capita GDP for the Subsets of Countries and Including Major Oil Exporters

Subset	Period	Constant	*GS*	*Y*	*TIE*	*Z13*	*Z19*	*EC*	*DF*	$\bar{R}^2$
High Income 1/2	61-72	6.49[b]	−.320[a]	−.0032[c]	.032[c]	.88	—	.00033	42	.373
		(3.04)	(.171)	(.0008)	(.0055)	(.55)		(.00031)		
	61-76	8.85[c]	−.392[b]	−.0031[c]	.022[c]	.47	—	.00053[a]	42	.310
		(3.05)	(.172)	(.00076)	(.0055)	(.55)		(.00031)		
Middle Income 1/2	61-72	5.65[a]	−.258[b]	−.0018	.023[c]	1.41[b]	1.78[c]	—	42	.852
		(2.53)	(.108)	(.0014)	(.0054)	(.67)	(.66)			
	61-76	8.22[c]	−.360[c]	−.0026[a]	.021[c]	1.31[a]	.93	—	42	.808
		(2.64)	(.110)	(.0016)	(.0062)	(.77)	.73			
Bottom Income 1/2	61-72	3.80	.059	−.0039[a]	.024[c]	2.48[a]	2.10[c]	—	42	.685
		(3.23)	(.091)	(.0021)	(.0057)	(1.37)	(.58)			
	61-76	4.45	.032	−.0043[b]	.031[c]	3.31[b]	1.22[b]	—	42	.580
		(3.42)	(.447)	(.0021)	(.005)	(1.31)	(.49)			
Third World	61-72	4.84[c]	−.220[b]	−.0027[c]	.027[c]	—	1.94[c]		67	.741
		(1.91)	(.094)	(.00077)	(.0049)		(.529)			
						OD		*Z18*		
Including Oil Producers	61-72	6.23[c]	−.312[c]	−.0024[c]	.030[c]	2.71[c]	1.40[b]	3.01[b]	97	.799
		(1.75)	(.091)	(.00044)	(.0043)	(.71)	(.57)	(1.31)		

Standard errors in parenthesis. For data sources see appendix. For variable definitions see notes to Table I except *OD* = dummy for 8 major oil exporters, *Z18* = dummy for desert countries.
Subset definitions: Top 1/2 is the 48 countries with the highest per capita GDP in 1961. Middle 1/2 is from 25 by *y* in 1961 to 72 by *y*. Bottom 1/2 is from 49 by *y*. Third world is defined in fn. 16.
a. Significant at .10 level.
b. Significant at .05 level.
c. Significant at .01 level.

of the coefficients is different and the significance levels lower—especially for *GS* which is only sigificant at the 10% level for 61–72. For this sub-set, the variables explain much less of the variation in the growth of *y* than for the whole set.

The middle 48 countries run from 7% to 26% of U.S. y in 1961. The results are similar to the full set except that the significance levels for the *y* coefficient are much lower inside this group.

The bottom 48 countries ran from 3–13% of U.S. *y* in 1961. For this group the coefficients for *y* and *TIE* are similar to the full set and significant at the 10% level or better. However, the negative relationship between *GS* and the growth of *y* does not hold inside this group.

For the "Third World" the regression is similar to the full set except that the dummy for Mediterranean climate was totally insignificant and was dropped from the regression.

The last regression in Table II includes the 8 major oil exporters excluded from the other regressions. Inclusion of these countries required respecification of the model with a stepwise regression. The set that emerged included *GS*, *y*, *TIE*, and the tropical rain forest dummy (like the other regressions) plus a dummy for the oil exporting countries—*OD*, and a dummy for desert countries—*Z18* (which is picking up the explosive growth of Libya and Saudi Arabia). The coefficients for *GS*, *y* and *TIE* are of the same sign as the 96 country regression, but the significance level of the *GS* coefficient is higher.

IV. Analysis

Due to the limitations of the theory behind the variables chosen for this study, and further due to weaknesses in the data available, all conclusions drawn from the results of this study must be quite tentative. Furthermore, the relations found apply to the growth of per capita output, but not necessarily to increases in economic welfare.

The results of this study suggest a negative relationship exists between the share of government consumption expenditure in GDP and the rate of growth of per capital GDP. The negative relationship was found for the full sample of countries, unweighted or weighted by population, for all six time periods examined, and excluding or including the major oil exporters. It was also found for the top and middle halves of the set (sorted by per capita income) and for the third world. The negative relationship did not hold inside the bottom half (by income). The negative regression coefficients were significant at the 5% level or better except for the shorter period 1961–68 and for one of the two regressions for the top half. The positive coefficients for the bottom half were not statistically significant at the 20% level.

These results are consistent with a pro-free market view that—within the market economies—a growth of government hurts economic growth. However, they are not a solid foundation for strong conclusions because: one, the government share variable is only government consumption expenditure, not either total government expenditure or total government economic impact; two, government expenditure might help increase economic welfare even if it decreases the growth of per capital GDP.[17]

The second influence on economic growth examined was the level of per capita GDP in the initial year of the period. The prior expectation about this relationship was that it should be negative—convergence—for the higher income countries and positive—the widening gap—for the lower income countries. Since the majority of countries are low income—relative to the U.S. or Western Europe—the relationship for the whole sample should have been positive or statistically insignificant. However, for all regressions on the whole set of countries the relationship was negative and significant at the 1% level or better. For the subsets of countries, the relationship was also negative. It was significant at the 1% level for the top half and the Third World, at the 5% or 10% level for the bottom half, and less for the middle half.

Low per capita income countries have in fact grown slower than the middle or high income countries. Since the coefficient for per capita income in the regressions is negative, we can conclude that other variables included in the regressions provide the "proximate explanations" or "transmission channels" for the slow growth of lower income countries. The two variables that are serving as "proximate explanations" are the share of government expenditure in GDP and investment in education. Lower income countries invest less in education and government consumption expenditure is a higher share of their GDP. Thus the regression results suggest three possibilities: one, higher government

17. As was pointed out in fn. 2, it is inappropriate to compare between countries the ratio of nominal valued total government expenditure to nominal valued national income. If we ignore this caution and calculate the correlation between GS—from Kravis—and the nominal total government expenditure share, we would find for a sample of 64 countries for the years 1970-72, the correlation coefficient is 0.308—significant at the 2% level. For the 20 of these countries in the top half group by y, the correlation coefficient was only 0.171—not significant at the 25% level. For the 44 in the bottom half, the correlation coefficient was 0.685—significant at the 1% level.

expenditure and low investment in education explain slow growth of low income countries; two, other factors, which are *better correlated* with government expenditure and investment in education than with low income itself, explain the slow growth; three, reality is a mixture of one and two. For instance, perhaps low investment in education, high government expenditure, and extensive government regulation are the explanation. This would raise very interesting questions; after all, these are to some extent policy variables. Of course, the true explanatory factors could be quite different.

The relationship found between total investment in education and the growth rate is also interesting. The coefficient is positive and highly significant in the regressions for all time periods for both the full set and all subsets of countries. This result requires testing; however, it seems to provide strong support for the human capital school lead by T. W. Schultz.

Finally it is worth commenting on some of the variables that dropped out in the specifications process. There do not appear to be economies of scale in the growth process for the period studied. When population and GDP were added to the set of regressors for both the full 96 and the bottom 48 countries, the coefficient for population was negative and not significant at the 25% level while GDP was totally insignificant. When agricultural land per capita was added to the regressions its coefficient had the expected positive sign, but it was insignificant. The rate of increase in population—when added on—had a positive sign, but it was insignificant. The years since independence (neo-colonialism and nation building variable) when added on—has the wrong sign—negative, and was insignificant for the full sample and the Third World. Of course this one variable far from adequately tests these theories. If the share of primary products in exports was added on the sign of the coefficient was positive, but it was insignificant.

Appendix

Data Source and Country List

The sources of the variables used in this study are as follows. GS, y and population are from Kravis [6, Basic Data Table]. Primary school and secondary school enrollments come from World Tables [19] 'Social Indicators,' Table 4. Higher education data come from the World Development Report 1980, Table 23. Years since independence was based on dates of independence recorded in Taylor [13, Table 2.1]. The agricultural land per capita was calculated as "arable and permanent crop land"—FAO, [3, Table 1]—divided by the population in 1960. The share of labor in agriculture, and energy consumption per capita (in kilos coal equivalents) come from World Tables, [18, Table 5]. The food supply is "calorie supply per capita (percentage of requirements)" from Social Indicators Table 3. The adult literacy rate is from Table 4 of Social Indicators. The share of primary products in exports is the sum of the percentages of "food and beverages," "non-food agriculture," and "fuels, minerals & metals" from World Tables, "Comparative Economic Data," Table 5. The rate of increase in population is the log change in population over the ten years terminating at the starting date of the period studied.

The countries in the 104 country sample are: Algeria, Angola, Benin, Burundi, Cameroon, Central African Rep., Chad, Congo, Egypt, Ethiopia, Ghana, Guinea, Ivory Coast, Kenya, Lesotho, Liberia, Libya, Madagascar, Malawi, Mali, Mauritania, Morocco, Mozambique, Niger, Nigeria, Rhodesia, Rwanda, Senegal, Sierre Leone, Somalia, S. Africa, Sudan, Tanzania, Togo, Tunisia, Uganda, Upper Volt, Zaire, Zambia, Afghanistan, Bangladesh, Burma, Hong Kong, India, Iran, Iraq, Israel, Japan, Jordon, S. Korea, Lebanon, Malaysia, Nepal, Pakistan, Philippines, Saudi Arabia, Singapore, Sri Lanka, Syria, Thailand, Austria, Belgium, Denmark, Finland, France, W. Germany, Greece, Ireland, Italy, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom, Canada, Costa Rica, Dominican Rep., El Salvador, Guatemala, Haiti, Honduras, Jamaica, Mexico, Nicaragua, Panama, Trinidad, United States, Argentina, Bolivia, Brazil, Chile, Columbia, Ecuador, Paraguay, Peru, Uruguay, Venezuela, Australia, Indonesian, New Zealand, and Papua.

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