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Economic Growth in Latin America 1/

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Abstract

This paper studies growth determinants in 12 Latin American countries during the period 1950-85. In a simple growth accounting framework, the share of labor in income is found to be lower in the sample group than in developed countries, while factor productivity growth accounts for a larger proportion of growth in the fastest growing countries in the sample. Using panel data, macroeconomic stability is found to play, in addition to investment (physical and human), a crucial role in growth. To a lesser extent, growth is negatively correlated with government consumption and political instability. The terms of trade appear to have no significant effect on growth.

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I. Introduction

In the last few years, the literature on economic growth has been characterized by numerous and interesting new developments, as well as by the rediscovery of old, though somewhat forgotten, insights. In the empirical field, many papers have attempted to test the implications of economic growth theories and to determine the main sources of growth using cross-section data for large samples of countries.

Earlier empirical research on economic growth contained detailed studies of country-specific experience. Putting this material together has allowed a number of inferences to be made about factors affecting economic growth. The advantage of this work is that by looking at case studies it is possible to obtain more specific information than would be revealed by a large cross-country study. The disadvantage is that, because of factors specific to each case and the relatively small sample, general conclusions can not be drawn with confidence.

This study falls somewhere in between the above two approaches. Although the methodology is basically to use cross-country analysis, the focus is on growth in Latin American countries. 1/ Mainly because of data limitations, this paper focuses on 12 selected Latin American countries during the 1950-85 period (see Table 1).

Latin America provides a relatively homogenous sample of countries with enough policy experiments to adequately assess the sources of growth that have been analyzed in larger samples. In studying the growth experience of Latin American countries, several approaches are used. First, some basic characteristics or indicators bearing on growth performance are examined. Next, growth accounting exercises are undertaken, and finally, estimations using panel data are carried out. The main findings, not all of them original, are as follows:

- The rate of income growth in Latin America has been comparatively modest during 1950-85.

- Growth has been higher in countries where the shares of industry and exports have had the largest increase, and where the change in the share of agriculture has been the lowest.

- There is no evidence of (unconditional) convergence of per capita income across Latin American countries.

- Labor's share is about 50 to 55 percent of income, which is substantially lower than in developed countries.

1/ Few studies about sources of growth in Latin America were found in the literature. See Cardoso and Fishlow (1989) and the references therein.

• The proportion of growth explained by factor productivity growth increases with the rate of growth itself. This finding is inconsistent with traditional versions of the neoclassical growth model.

• Investment is one of the main determinants of growth, but its components have a differential impact. Foreign investment appears to be more efficient than domestic investment.

• The terms of trade appear to have no significant effect on growth.

• The level of inflation, as well as its variability, have negative effects on growth, beyond their possible negative effect on the rate of investment. This result is valid in general and not only in countries which have had experience with high rates of inflation.

• Human capital, measured by literacy rates, also has a positive effect on growth. Paradoxically, school enrollment indexes have no positive relationship with growth.

• The degree of openness of the economy and the distribution of income are found not to have significant effects on growth.

• The effect of government consumption on growth is negative. The degree of political stability, measured as an increase in civil and political rights, is positively correlated with growth. These results are, however, less robust than the others reported here.

The rest of this paper is devoted to explaining the above findings and substantiating them empirically. The results are qualified and interpreted in the light of recent developments in the theory of economic growth. The paper is organized in six sections together with a data appendix. Section II presents some basic facts and data about countries in the sample. Section III examines growth accounting in the Solow tradition. Sections IV and V takes a broad look at factors affecting growth using panel data. The role of macroeconomic instability (measured mainly by inflation), government spending, investment, political stability and other factors are considered. Finally, Section VI provides some concluding remarks and suggests areas for further research.

II. A First Look at the Evidence

In this section, some basic data on growth in Latin America are presented. Twelve countries provide too few observations for formal cross-section statistical testing, so this section presents correlations and graphical figures to set out some stylized facts. Basic data are summarized in Tables 1 and 2, while Table 3 shows the cross correlations among the variables.

Table 1. Basic Indicators for Latin America, 1950-85 1/

	GDP	GDP Per Capita	Population	Terms of Trade	Investment (As a percent of GDP)	Inflation (Percent per annum)	GDP Per Capita 1950-52	GDP Per Capita 1960-62	GDP Per Capita 1970-80
	(Growth rates in percent per annum)						(Period averages in 1980 U.S. dollars)		
Argentina	2.4	0.8	1.6	-1.2	25.1	75.3	...	3,069	4,198
Bolivia	2.7	0.2	2.4	2.3	12.9	62.5	1,051	881	1,441
Brazil	7.5	4.7	2.7	-2.3	24.4	55.5	...	1,115	2,598
Chile	2.8	0.9	1.9	-1.4	29.7	53.0	...	2,893	3,648
Colombia	4.9	2.3	2.6	-0.5	18.8	14.8	1,194	1,348	2,138
Costa Rica	5.6	2.4	3.1	-0.5	14.2	9.0	1,208	1,652	2,712
Ecuador	5.7	2.8	2.8	-1.8	24.1	9.2	938	1,125	2,070
Guatemala	4.0	0.9	3.0	-2.7	8.8	4.4	1,154	1,272	1,754
Mexico	5.8	2.5	3.1	0.9	18.8	15.2	1,716	2,137	3,592
Peru	4.0	1.5	2.5	1.3	13.2	25.4	1,296	1,693	2,408
Uruguay	1.5	0.5	0.9	-1.3	12.1	40.4	3,084	3,241	3,729
Venezuela	3.5	-0.2	3.7	3.4	11.7	4.8	4,024	5,374	5,339

Sources: Summers and Heston (1988), ECLAC, and IFS.

1/ All data for GDP and GDP per capita are in real terms (1980=100).

Table 2. Structure of Production and Demand in Latin America, 1965 and 1985

(In percent of GDP)

	Agriculture		Industry		Manufacturing		Services		Exports	
	1965	1985	1965	1985	1965	1985	1965	1985	1965	1985
Argentina	12	11	38	33	29	23	50	56	8	15
Bolivia	19	24	40	29	13	13	41	46	21	18
Brazil	22	12	36	39	28	29	41	49	8	14
Chile	9	8	42	39	25	20	50	53	14	29
Colombia	23	19	32	33	22	22	45	49	11	15
Costa Rica	23	19	21	26	...	...	55	55	23	32
Ecuador	22	12	23	42	12	17	55	46	16	27
Guatemala	28	26	19	20	16	16	53	54	17	19
Mexico	12	8	29	32	20	21	59	60	9	16
Peru	15	12	39	39	21	19	46	49	16	22
Uruguay	13	13	30	27	...	23	57	60	19	25
Venezuela	4	6	60	43	11	19	37	51	31	27

Sources: The data on exports are taken from the "World Development Report 1987," World Bank. Remaining data from the 1987-88 and 1989-90 editions of the World Bank's "World Tables."

Table 3. Cross Correlations Between Key Variables 1/

GDPP 2/	1											
GDP	0.92	1										
Population	0.08	-0.30	1									
Terms of trade	-0.51 (0.70)	-0.57	0.23	1								
Investment ratio	0.79 (0.72)	0.83	-0.19	-0.26	1							
GDPP (1950-52) 2/	-0.25 (1.53)	-0.55	0.86	0.64	-0.31	1						
GDPP (1960-62) 2/	-0.19 (1.73)	-0.49	0.87	0.61	-0.28	1.00	1					
Inflation rate	-0.56 (1.25)	-0.30	-0.65	0.43	-0.13	-0.35	-0.41	1				
Agriculture share	-0.89 (4.39)	-0.89	0.08	0.68	-0.75	0.39	0.31	0.58	1			
Industry share	0.80 (2.33)	0.88	-0.32	-0.77	0.73	-0.65	-0.59	-0.33	-0.94	1		
Manufacturing share	0.08 (1.25)	-0.21	0.77	0.25	0.19	0.72	0.73	-0.43	-0.05	-0.13	1	
Services share	-0.65 (0.75)	-0.78	0.44	0.75	-0.65	0.76	0.72	0.10	0.80	-0.96	0.21	1
Exports share	0.87 (0.60)	0.94	-0.29	-0.61	0.74	-0.55	-0.48	-0.34	-0.94	0.95	-0.19	-0.86	1

Source: Tables 1 and 2.

1/ The numbers in parenthesis are the t statistics (absolute value) for the coefficient on the respective variable in a regression for the rate of growth of per capita GDP on a constant and that variable. Data on sectoral shares are the change in share between 1965 and 1985.

2/ GDPP: GDP per capita.

The 12 countries selected contribute about 95 percent of the GDP of Latin America. Among them, the fastest growing country is Brazil, followed by Mexico, Costa Rica, Colombia and Ecuador. All five countries have experienced rates of growth above 4 percent a year and have had, on average, the highest investment rates in Latin America. Figure 1 plots per capita growth rates against the investment rate where, except for Argentina and Chile, there is a strong positive correlation between investment and per capita income growth.

To compare growth performance of Latin American countries with other regions, Table 4 presents data on performance for selected industrialized and developing countries. Except for Brazil, GDP growth in Latin America has been lower than that of successful Asian countries. On average, it has also been lower than that of the developed countries. Differences are more pronounced in per capita terms. This is consistent with cross-section regressions of per capita growth rates, where the "Latin American dummy" has a significant negative coefficient. 1/

The importance of the terms of trade has always been at the heart of the discussion about development in Latin America. In addition, the idea of a secular deterioration in the terms of trade has served as a basis for the early proposals by the Economic Commission for Latin America and the Caribbean (ECLAC) on development through import substitution. 2/ Figure 2 and Table 3 show that the correlation between the terms of trade and output growth is rather low, and if anything, the relationship appears to be negative. As is discussed later, although the terms of trade may be quite important in short-run fluctuations, they do not appear to be an important factor affecting long-term growth.

Another characteristic of most Latin American countries is macroeconomic instability. Only four countries have had average inflation in single digits, while others have averaged above 50 percent. In the latter group several countries have also had periods triple digit inflation and hyperinflation. For a first look at the effects of inflation on growth, see Figure 3. A low correlation between the level of inflation and the rate of per capita growth is again observed. As is shown later in the paper,

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1/ African countries, especially the Sub-Saharan economies, are excluded from the comparison. If they were included the comparative performance of Latin America would be better. The relative performance of Latin America also improves when the period 1980-85 is excluded from the comparison. In fact, Summers and Heston (1991) show that between 1960 and 1980 Latin America increased its share in world income from 7.9 percent to 11.1 percent. This result is, however, partly explained by the good performance of Brazil and Mexico, which are the largest economies in the region (about 55 percent of regional GDP in 1980).

2/ See, for example, Prebisch (1984) for a historical perspective.

Figure 1: Investment and Growth

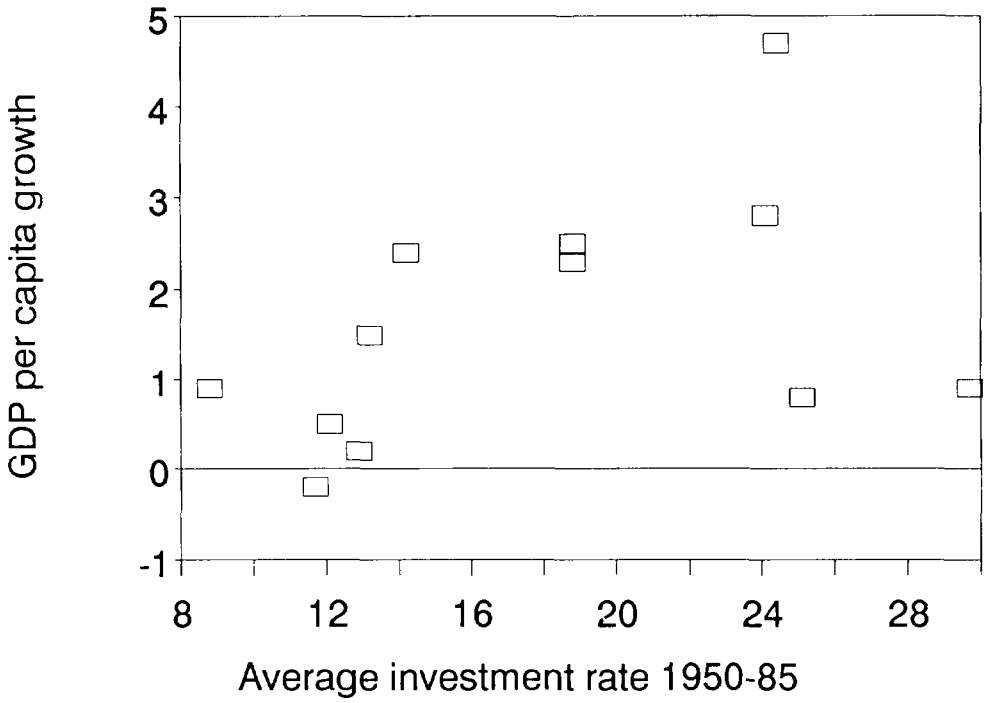

Figure 2: Terms of Trade and Growth

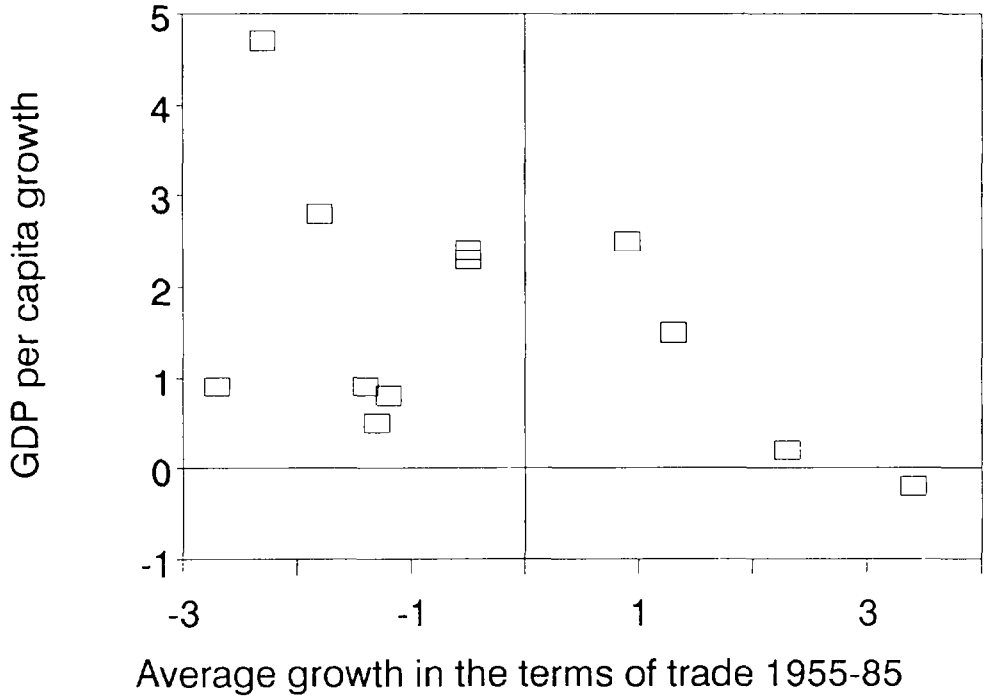

Table 4. Growth Rates in Selected Countries, 1950-85 1/

(In percent per year)

	GDP	Per Capita GDP
Belgium	3.4	3.0
Canada	4.2	2.4
France	4.2	3.4
Germany	4.6	4.0
Greece	5.2	4.4
Hong Kong	9.3	6.8
Japan	7.4	6.3
Korea	7.4	5.1
Singapore	9.6	7.7
Taiwan 2/	9.6	6.6
Turkey	5.9	3.3
United Kingdom	2.6	2.2
United States	3.3	1.9

Source: Summers and Heston (1988).

1/ Data for Hong Kong and Singapore are for 1960-85, while for Korea the period covered is 1953-85.

2/ Taiwan Province of China.

however, inflation and its variability have significant effects on long term growth. 1/

An important prediction of the standard neoclassical model of growth with a constant savings rate is that population growth affects per capita income negatively in steady state. Figure 4 shows average per capita GDP for the 1970s and population growth. The data are consistent, although weakly, with the standard premise that richer countries have a lower rate of population growth.

With the recent questioning of the simple versions of the neoclassical growth model, considerable research has been done to test whether per capita output converges across countries. 2/ A basic prediction of neoclassical growth models states that, given the same technology and preferences, per capita output should converge. A simple implication of this proposition is that poorer countries should grow faster than richer ones. Figures 5 and 6 show rates of per capita growth as a function of the initial level of per capita income, using two alternative dates for that variable. Neither of the figures demonstrate convergence. 3/ Therefore, it can be conjectured that some other factor, which was not considered, could be causing the sustained income differences. In recent literature on endogenous growth, such disparities occur because the marginal product of capital does not fall enough to stop the process of capital accumulation, even though nonreproducible factors are not growing. This feature has been explored for nonconvex technologies in Romer (1986) and Lucas (1988), and, for the convex case, by Rebelo (1991) and Jones and Manuelli (1990). 4/ 5/

The sectoral structure of production and the share of exports in output is shown in Table 2. There is a clear change in composition away from agriculture toward services. Between 1965 and 1985, the share of agriculture decreased in 9 countries, while in 11 countries the share of services increased.

Comparing growth performance and output composition during the period 1965-85, it can be seen that the share of industry increases in all fast-growing countries, while it decreases in those growing more slowly. This relationship does not hold, however, with respect to manufacturing. For

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1/ A negative effect of inflation on growth has also been reported in Kormendi and Meguire (1985), Fischer (1991), and Roubini and Sala-i-Martin (1991), among others.

2/ See for example Abramovitz (1986), Baumol (1986), De Long (1988), Barro and Sala-i-Martin (1990) and Dowrick and Nguyen (1990). A cointegration approach to this question has been presented by Bernard (1990) and Quah (1990).

3/ As discussed later, the cases of Uruguay, and particularly Venezuela, explain the negative correlation shown in Table 2.

4/ Mankiw, Romer and Weil (1990), in a neoclassical model that incorporates human capital, find that, after controlling for technology and tastes, most of the income differences across countries are explained.

5/ For a recent survey, see Sala-i-Martin (1990).

Figure 3: Inflation and Growth

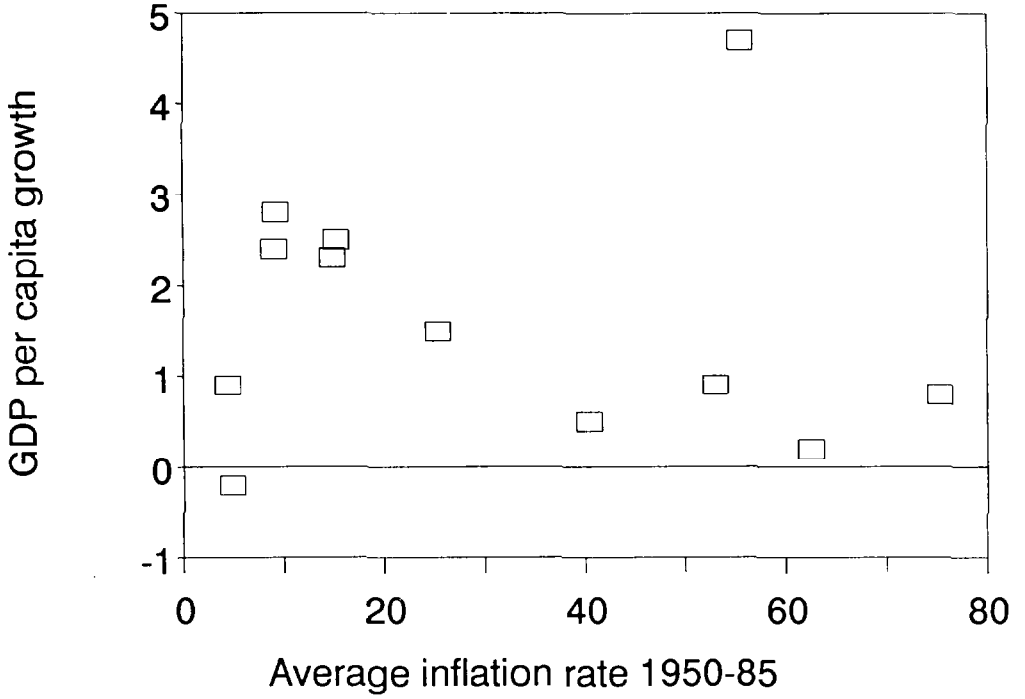


Figure 4: Population Growth and Income

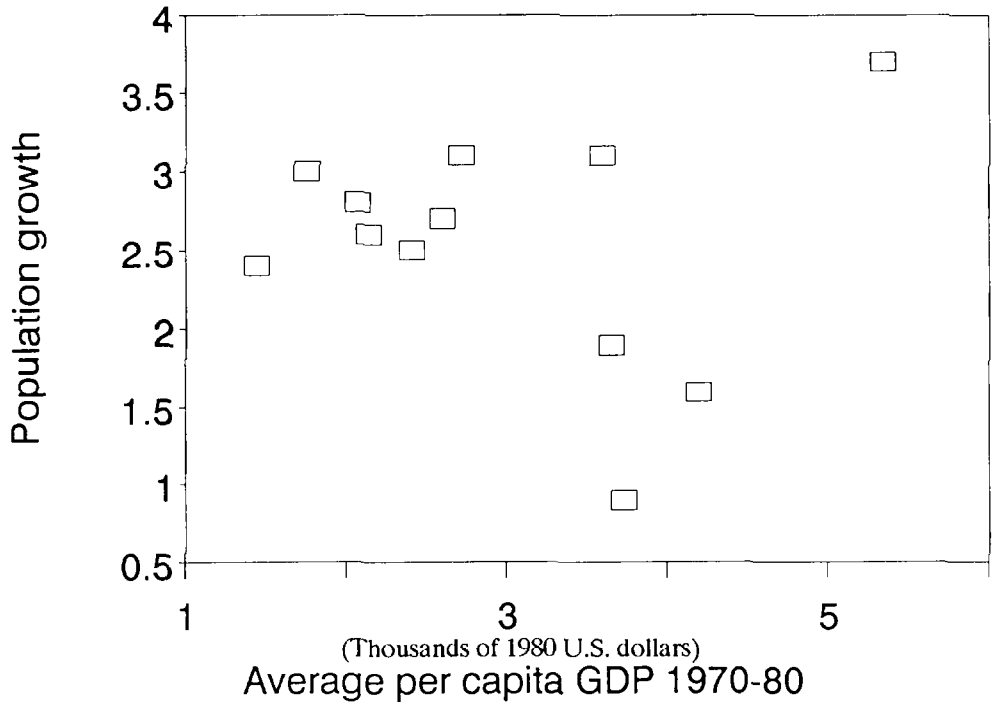


Figure 5: Does per capita GDP converge?
(base 1959-61)

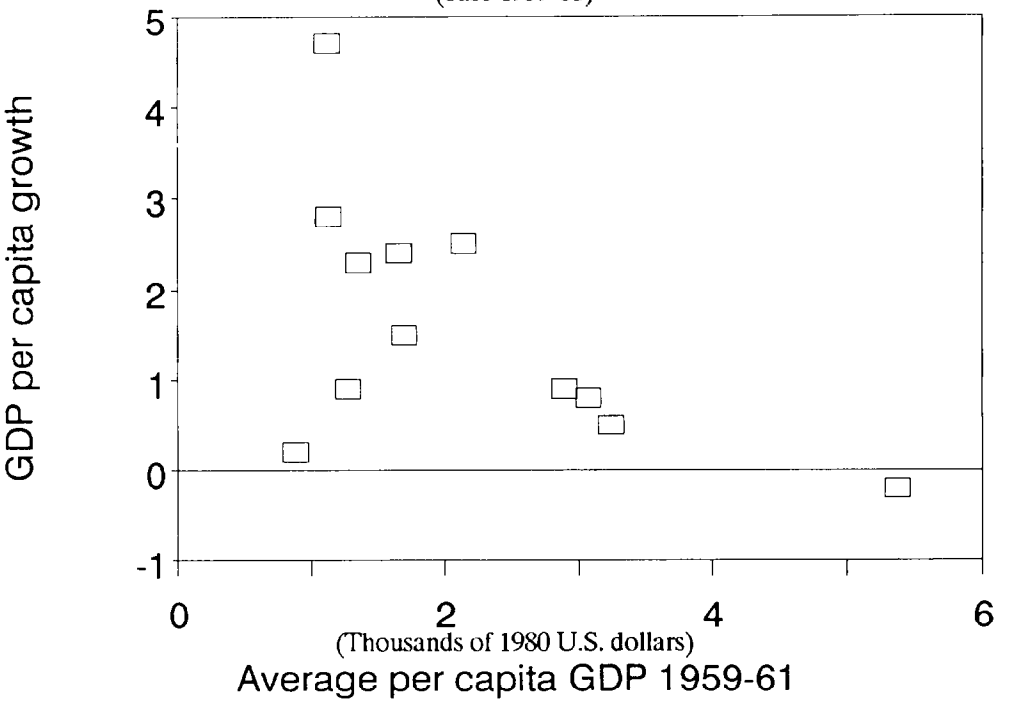
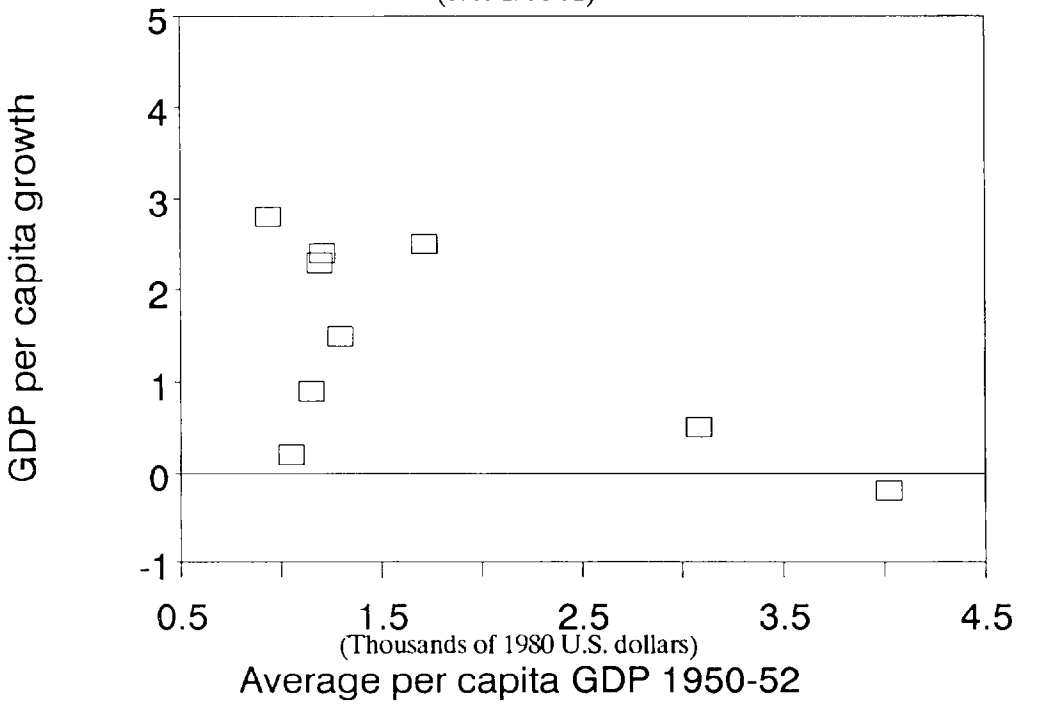


Figure 6: Does per capita GDP converge?
(base 1950-52)



agriculture, the correlation between the change of share and growth is negative. Table 3 also shows a positive correlation between the change in export share and per capita growth. 1/ Thus, growth is correlated with industrialization, an increase in the share of exports and a diminishing role for agriculture, no matter what the initial structure of production was. Note, however, that there is no causal relationship in this empirical regularity. In fact, the evidence to be presented later does not support a link from the structure of production to growth; this finding suggests that the relationship may be from growth to sectoral composition.

III. Neoclassical Growth Accounting

A logical starting point for investigating the basic facts on growth is an examination of the sources of growth. Although there is renewed interest in explaining growth across countries, there are no recent growth accounting studies for Latin America. A traditional Solow decomposition (Solow, 1957) is the starting point for evaluating the relative contribution to the rate of GDP growth of factor input growth and total factor productivity growth.

Consider the following production function:

$$Y = e^{\theta t} F(K,L), \tag{1}$$

where K is capital, L is labor input and θ is a constant rate of productivity growth. Assume the technology is constant returns to scale and there is marginal cost pricing, then the rate of output growth can be written (using small letters to denote rates of growth) as: 2/

$$y = \alpha l + (1-\alpha)k + \theta, \tag{2}$$

where α represents the share of labor and, because of constant returns to scale, $1-\alpha$ corresponds to the share of capital. The first two terms of equation (2) represent the contribution of capital and labor to growth. The last term represents the contribution of technical progress.

1/ All of these results have been confirmed with regressions of per capita GDP growth against a constant and each of the variables. The t-statistics of these regression are reported in parentheses under the first column of Table 3.

2/ Bruno and Sachs (1985) show that the effects on real income of a change in the terms of trade (the relative price of inputs in their case) is equivalent to technical progress. This equivalence does not hold for GDP, since it is measured at constant terms of trade. However, there is still a bias when measuring productivity growth if there is no control for terms of trade effects, but it is not systematic as in the case of income. In fact, in a previous version of this paper, the growth accounting exercises were performed including the terms of trade, but the results showed that the bias is rather small and is not systematic, so in this version the results exclude the terms of trade.

The standard approach to growth accounting is to obtain input shares directly from the data. Then, by applying historical growth rates of capital, labor and other inputs, total factor productivity growth is obtained as a residual. This approach has two main problems for Latin American countries. First, there are no reliable data on factor shares, at least not in a systematic cross-country sample. The second problem, is that there are no consistent and reliable data on the stock of capital. Accordingly, the investment rate (i) is used. The series are short enough to obtain a measure of the capital-output ratio (by adding investment rates) independent of the assumption about the starting capital output-ratio. For this reason k is replaced by iY/K and the equation becomes:

$$y_t = \theta + \beta_1 l_t + \beta_2 i_t + u_t, \qquad (3)$$

where β_1 is equal to α and β_2 is equal to $(1-\alpha)Y/K$. Note that a constant capital-output ratio is implicitly assumed. This equation allows us to recover factor shares and the capital-output ratio, which then are used to perform growth accounting.

The primary data source is Summers and Heston (1988), where yearly data, covering the period 1950-85 for most of the countries, are provided. With approximately 30 yearly observations per country, it is difficult to obtain reliable estimates of long-term growth parameters without the results being contaminated by short-run fluctuations. For this reason the data have been pooled, assuming that the underlying technology is the same across countries, except for the constant. The results are presented in Table 5.

The first three regressions report the results of using the seemingly unrelated regression technique (SUR), taking into account that technical progress, in spite of being different across countries, is correlated. Regression 1 considers that the only technological difference across countries is in total factor productivity growth. The share of labor appears to be 0.5. Regression 4 is similar in the sense that it pools the data and adds a dummy per country. As a result, it does not take into account correlation of the residuals for each period, but assumes that factor productivity growth is the only difference in the production function across countries. In this regression, the labor share is 0.58. Regression 2 assumes that in addition to productivity growth, the capital-output ratio differs across countries, and an even lower labor share is obtained. Regressions 3 and 5 assume that all the coefficients, including technical progress, are the same, but with a different covariance structure for the residuals. Regression 3 controls for the correlation of the residuals at each period of time across countries, and regression 5 controls for the correlation of residuals per country across time. 1/ Results are similar and unappealing since the labor ratio rises to 1. The general fit is poor, which is not surprising using annual data, since many sources of short-run output variability are excluded. In the least squares regressions 4 and 5, the R^2 are 0.18 and 0.08, respectively.

1/ Similar results are obtained when the data are pooled and OLS is used for the estimation.

Table 5. Regression Results 1/

Regression	Method 2/	β_1	β_2	K/Y 3/	Number of observations
1	SUR	0.490 (2.981)	0.403 (8.403)	1.27	312
2	SUR	0.387 (2.283)	0.454* (--)	1.35	312
3	SUR	0.958 (6.372)	0.198 (9.095)	0.21	312
4	LSDV	0.575 (1.403)	0.379 (5.204)	1.12	354
5	GLS	1.042 (3.145)	0.226 (4.759)	--	354

1/ t-statistics in parentheses.
2/ SUR: seemingly unrelated regressions; LSDV: least squares dummy variables, includes one dummy per country; GLS: generalized least squares (panel data with random effects).
3/ K/Y: capital-output ratio.

Notes on the regressions

1. Equal coefficients, except constant.
2. Different coefficients, except β_1. * represents the simple average (across countries) of the estimates of the coefficient β_2.
3. Equal coefficients.

Although the estimated labor share is sensitive to the estimation procedure, regressions 1, 2 and 4 indicate that it is between 0.39 and 0.58. These values contrast strongly with evidence of a 70 percent labor share for developed countries. Evidence for Japan, the U.K., and the United States show labor shares in the 70 or 75 percent range. 1/ The results reported here confirm evidence from input-output matrices for developing countries, where the labor share appears to be around 50 percent to 60 percent at most. This low labor share is interpreted here as being explained by the existence of a larger degree of imperfect competition and increasing returns to scale in developing countries compared to industrialized economies. In other words, growth would be accompanied by an increase in the degree of competition and a larger exploitation of scale economies. Hall (1988) has stressed the importance of the assumption of perfect competition and constant returns to scale in growth accounting and the difference that arises when using cost shares as opposed to revenue shares. To show how this effect may be important and provide some rough measurement, consider income to be composed of labor income (wL), capital income (rK) and pure profits (π). Note that the last of these is caused by the wedge between marginal cost and prices and the existence of scale economies,

$$Y = rK + wL + \pi, \tag{4}$$

The common accounting practice is to first measure labor costs and then assign the residual to the contribution of capital. In this case, the following shares in income would be obtained (α_r and $1-\alpha_r$ to distinguish from cost shares, which are α and $1-\alpha$):

$$\alpha_r = wL \;/\; (wL+rK+\pi)$$

$$1-\alpha_r = (rK+\pi) \;/\; (wL+rK+\pi), \tag{5}$$

while,

$$\alpha = wL \;/\; (wL+rK)$$

$$1-\alpha = rK \;/\; (wL+rK), \tag{6}$$

Thus, a higher proportion of profits in revenue will reduce the observed labor share. Since the dependent variable is income instead of costs, the estimates are recovering income shares. A simple calculation can illustrate the magnitude of the degree of competition and the increasing returns to scale effect. Assume that labor share in costs is, as in developed countries, between 0.65 and 0.70. As a benchmark case, developed countries are also assumed to be competitive and face constant returns to scale. Then, a labor share in income between 0.45 and 0.55 would imply that noncompetitive profits and increasing returns to scale account for between 15 percent (0.65 vs. 0.55) and 35 percent (0.70 vs. 0.45) of total income. Another possible source of growth, not accounted for in the results, could

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1/ See Maddison (1987) and Romer (1989). The latter also reports evidence that Japan, the U.K., and the United States had a labor share about 60 percent one hundred years ago.

be the gain in competitiveness and fuller exploitation of scale economies as output grows.

There are also other factors whose contribution is not measured. Among them, the most important is human capital. In contrast to the pure profits case, however, there is no reason to believe that exclusion of human capital generates a bias toward increasing the share of capital.

Protectionist policies in less developed countries may help to explain why the degree of competition increases along with the degree of development. The increasing market size may also explain why monopoly power and the extent of scale economies may fall with growth.

There is an alternative explanation for the low labor share observed in developing economies. The explanation is based on the existence of independent workers, whose income would be imputed to capital rather than labor. Consequently, the labor share would be underestimated. Harberger and Weiscarver (1977) found that in Uruguay during 1967-71 the return to capital would have been overestimated by 23 percent on account of independent workers. Therefore, if the true share would have been 30 to 35 percent, the observed return would have been 37 to 43 percent. Consequently the labor share would be around 0.57 and 0.63. Even under the extreme assumption that all independent worker income is correctly included as labor income in developed countries (i.e., the factor shares are correctly computed), the discrepancy between developed and developing countries can not be fully accounted for. Cross-country evidence on how this accounting distortion may be related to the level of income is not available. But, the above discussion suggests that the independent-worker effect is not enough to explain the differences in labor shares across countries at different stages of development. Nevertheless, the existence of this effect will reduce the above estimates of the share of rents from scale economies and noncompetitive profits.

Finally, the capital output ratio is computed as $(1-\beta_1)/\beta_2$ and is presented in the fourth column of Table 5. Regression 2 presents the largest value for this ratio equal to 1.35, which is still low by international standards. Estimates of this ratio usually fall between 2.5 and 4. 1/

1/ An economy in steady state growing at a rate of y, investing in net terms i-δ (i is gross investment and δ the depreciation rate) would have a capital-output ratio equal to (i-δ)/y. Low values of net investment, say 5 percent, and low growth of 2 percent would produce a capital-output ratio equal to 2.5. At the other extreme, an economy investing 20 percent net and growing at 5 percent would have a capital-output ratio as high as 4. Note that this computation assumes constant returns to scale.

The reason for a low capital-output ratio is because the parameter β_2 may be biased upward. In general, this bias would be obtained whenever there is an omitted variable positively correlated with investment. This is the case, for example, with endogenous growth models where investment and productivity are positively correlated. High rates of investment will produce high rates of technical progress and this correlation will bias upward the estimate of β_2. Note that if we were using employment and possibly the labor force, instead of population, a positive bias in β_1 could be obtained. The fact that population is barely affected by low frequency fluctuations makes it more reliable for estimation of long-run production functions.

Table 6 reports the results of growth accounting using the parameter estimates from regression 1. During the period 1950-85, Latin America grew by an average (simple) rate of 4.2 percent, of which 51 percent is explained by investment, 30 percent by population growth, and the remaining 19 percent by productivity growth. The results are somewhat different than those of Chenery, Robinson and Syrquin (1986) for a sample of 20 developing countries with an average growth rate of 6.3 percent, where 40 percent of growth is explained by capital accumulation, 28 percent by population growth and the remaining 32 percent by productivity growth. In terms of relative factor contribution to growth, the results in Table 6 are similar to those obtained by Chenery and associates, although it appears that in Latin America the role of productivity growth has been lower. This result has to be qualified, since the role of productivity growth is larger when the period 1950-70 is considered, and, as is well known, the late 1970s and the 1980s are periods of productivity slowdown.

The evidence for developed countries is different; the main difference being the relative contribution of factor growth. For the United States, Denison (1985) reports that capital contributed only 20 percent, labor 46 percent and productivity growth 35 percent to overall growth. In Korea, labor is also a more important source of growth than capital over the period 1963-82 (Dornbusch and Park, 1987). The differences between these figures and those obtained for Latin American countries are not surprising since they are consistent with the assumption made here with regard to technology. When capital is scarce, its marginal productivity is considerable. Therefore, for similar investment rates, the contribution of capital deepening should be larger in economies with less capital.

There are differences across the Latin American countries of the sample. The most important regularity is shown in Figures 7 and 8. In Figure 7, the vertical axis represents average growth while in Figure 8 it represents per capita growth; the horizontal axis shows the relative contribution of productivity growth to total growth (col. 5, Table 6). A strong positive relationship is shown. The five fast growing economies (above 4.9 percent), all have a contribution above 20 percent. In the remaining seven slow growing economies (below 4 percent), productivity growth has a contribution of under 20 percent. This relationship is in contradiction with the simplest neoclassical growth model, according to which no correlation should be expected. Figures 7 and 8 indicate that some

Figure 7: Relative Importance of Productivity Growth

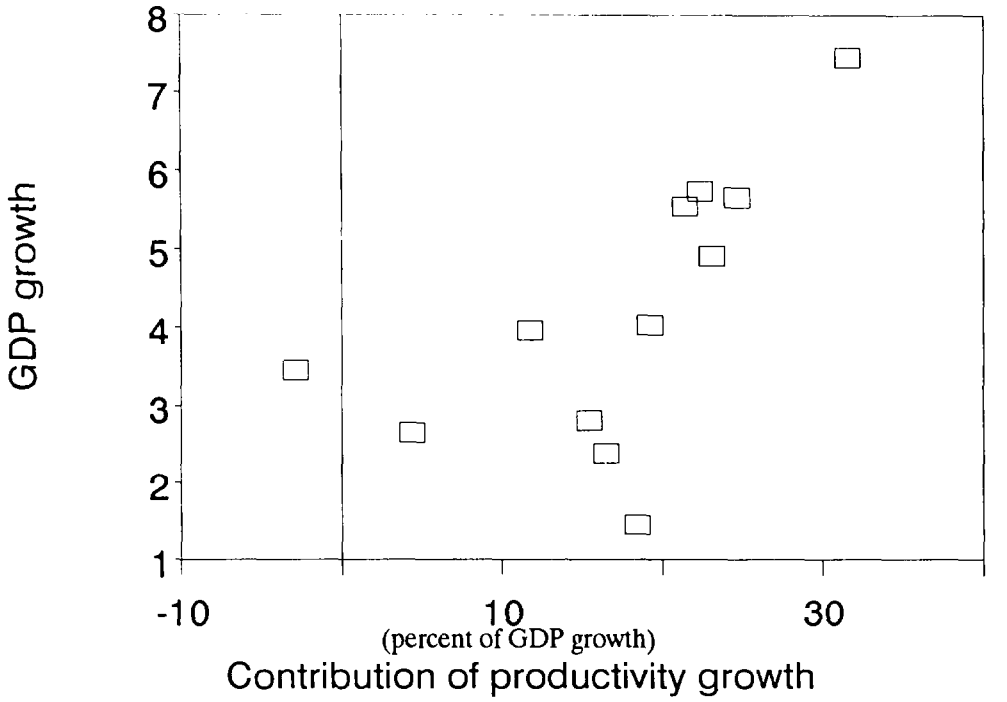

Figure 8: Relative Importance of Productivity Growth

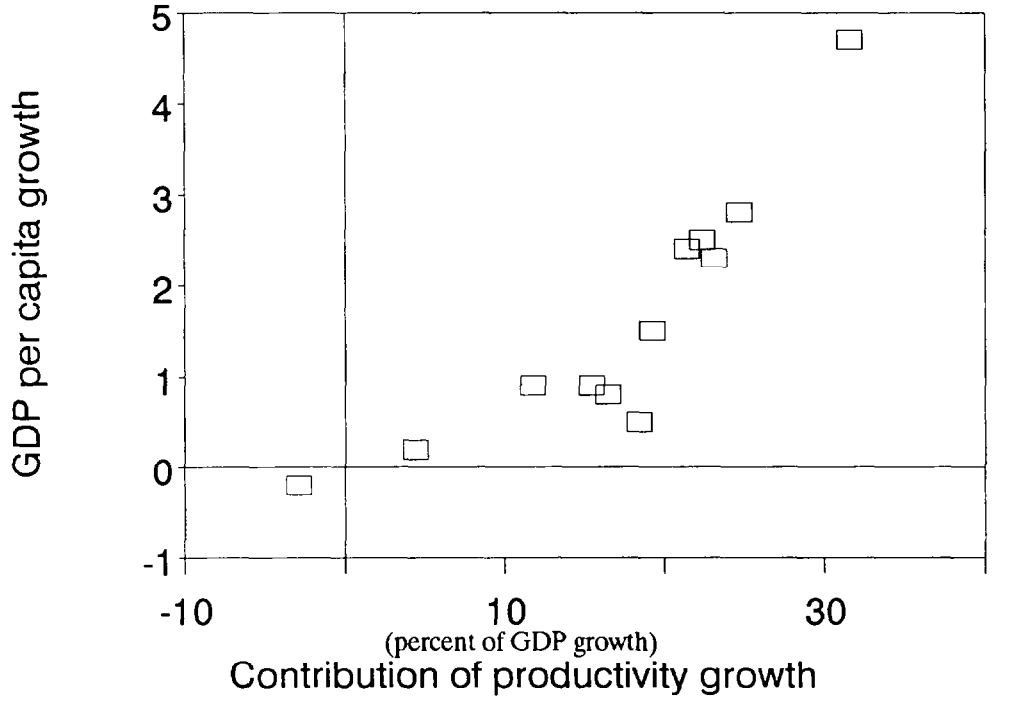

Table 6. Growth Decomposition, 1950-1985

(In percent)

	GDP Growth (1)	Population (2)	Investment (3)	Productivity (4)	(4)/(1) (×100) (5)
Argentina	2.4	0.8	1.2	0.4	16
Bolivia	2.7	1.2	1.4	0.1	4
Brazil	7.5	1.3	3.8	2.4	32
Chile	2.8	0.9	1.4	0.4	15
Colombia	4.9	1.3	2.5	1.1	23
Costa Rica	5.6	1.5	2.8	1.2	21
Ecuador	5.7	1.4	2.9	1.4	25
Guatemala	4.0	1.5	2.0	0.5	12
Mexico	5.8	1.5	2.9	1.3	22
Peru	4.0	1.2	2.1	0.8	19
Uruguay	1.5	0.4	0.7	0.3	18
Venezuela	3.5	1.8	1.8	-0.1	-3
Average 1/	4.2	1.2	2.1	0.8	19
Avg. 50-70 1/	5.3	1.3	2.7	1.3	24
Avg. 70-85 1/	2.9	1.1	1.5	0.3	10

1/ Simple average.

Discrepancies in the sums are due to rounding.

form of endogenous growth exists: productivity growth is proportionally more important, the higher is the growth rate. Since growth increases with investment, the relationships observed in the two figures can again be explained by the omission of a variable positively correlated with investment.

Table 6 also shows growth decompositions for the sample of Latin American countries during the periods 1955-70 and 1970-85. The first period is one of faster growth, which is mostly accounted for by higher rates of investment and productivity growth. As expected, the role of population growth is more stable. It should be noted, however, that growth decompositions do not change significantly when other sets of parameters are used. 1/ It appears particularly remarkable that the role of productivity growth decreases substantially during the period 1970-85. This reinforces the results shown in Figures 7 and 8 using time series data: periods of low growth are characterized by a low relative contribution of productivity growth. Thus, changes in the path of growth are due to a large extent to changes in total factor productivity growth. Therefore, further examination of the factors affecting growth is warranted.

IV. Growth Determinants: Preliminary Considerations

The empirical question posed by the new literature on endogenous growth is whether productivity growth is in fact exogenous or whether its economic determinants can be identified. The systematic relationship between the share of productivity growth and income growth is an indication that productivity growth is not driven by an exogenous process.

One approach to analyzing the determinants of productivity growth would be to take the country-specific residuals obtained in the previous section and undertake cross-country regressions. The problem with this approach is that if productivity growth is endogenous, the estimates obtained in the previous section will be biased.

The standard approach, which is followed here, is to study the determinants of growth by regressing per capita growth on a set of relevant variables. Although this approach is silent with respect to the underlying model, it is very helpful in highlighting the main factors affecting growth. There are, however, problems. The estimation of semi-reduced forms, in general, presents problems of endogeneity that are difficult to overcome. Also, adding variables may be capturing spurious correlations rather than economic relationships. For these reasons, auxiliary evidence is required.

Growth equations are estimated using panel data. As may be seen from the results of the previous section, the frequency attributes of the data are important. This is particularly relevant when using variables that may affect output by different channels in the long and the short run. By using

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1/ Since a constant capital-output ratio is assumed, changing the value of β_2 has no effect on the decomposition.

six-year periods, it is implicitly assumed that short-run effects of the determinants of growth average out within this period.

The list of variables included in growth equations has to be as exhaustive as possible to avoid omitted variable bias that can lead to incorrect conclusions. As will be made clear in the Section V, whether a variable is included or not may have dramatic effects on the statistical significance of other variables. 1/ Of course, availability and quality of data dictate the range of choice. The strategy followed in the analysis to follow is to have at least one proxy for each of the main determinants of growth. Variables linked to capital accumulation (human and physical), the macroeconomic environment, government spending, degree of openness, terms of trade, income distribution and political stability are all explored. 2/ The remainder of this section presents the econometric technique and the data sources, while Section V presents the results.

1. Econometric implementation

For variables like GDP and the terms of trade, computing the average rate of change within a period by comparing the starting and final level of the variable may be very misleading if one of these data points is "abnormal". The distortion may be quite important when data covering relatively short periods are employed. Instead, from a regression of the log of the variable on a constant and a time trend, the estimated coefficient on the time trend is used. This procedure gives some weight to all the yearly observations, not just to the extremes. The rest of the data were constructed using simple averages for the available yearly observations.

To briefly discuss the econometric technique, the equation to be estimated can be written as follows:

$$y_{it} = \alpha_i + \beta\, x_{it} + u_{it}, \qquad (7)$$

where i denotes a country and t a time period (six-year average). α_i is a country-specific parameter. y represents the rate of growth of per capita GDP while x is a matrix of the explanatory variables. A key issue in the use of panel data is how the country-specific effect is treated and consequently how the parameters should be estimated. 3/

When α_i is considered a time-invariant parameter, OLS provides consistent estimates of α_i and β. The OLS estimation consists of regressing y_{it} on x_{it} and country dummies and is called least square dummy variables

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1/ Levine and Renelt (1990) perform a detailed exploration of the sensitivity of cross-country regressions of growth and conclude that most of the results from recent studies are not robust.

2/ These are variables for which results are reported. Variables for output composition and demographics were also explored, but with inconclusive results.

3/ See, for example, Hausman and Taylor (1981), Hsiao (1986) and Greene (1990).

(LSDV). This procedure is equivalent to computing, for each variable, the deviations of each observation from the per-country mean and to using OLS on the transformed data. This approach is known as "fixed effects" or the "within-groups" estimator.

The fixed effects approach has three main problems. First, it does not consider variations across countries in the sample, so there is a loss of efficiency. Second, there is a large loss in degrees of freedom. Third, and more important, it is not possible to include variables that are time-invariant for each country, since they are perfectly collinear with the dummies.

The other main approach to estimating panel data, which circumvents the problems of fixed effects, is known as "random effects". This approach considers each α_i as a random variable, which can be written as $\alpha+v_i$, where v_i is white noise. Then, the error term in equation (7) will be $u_{it}+v_i$. Since v_i is common for all of the time series of a given country, the covariance matrix of the residuals is no longer diagonal. Hence, the equation should be estimated by using Generalized Least Squares (GLS). Random effects allow the inclusion of variables that are time-invariant, such as initial per capita income, or variables that are available only at a very low frequency, such as income distribution, for example. The main disadvantage of this approach is that the unobserved effect, v_i's, may be correlated with the regressors, and hence the estimates of the β's would be inconsistent and biased. Since we are interested in estimating the effect of variables that are time-invariant, random effects are used extensively in the analysis to be presented. To check that the residuals are in fact uncorrelated with the regressors, Hausman specification tests are performed.

There is also a third approach, which consists of estimating the regression by OLS using the pooled data without considering country-specific effects. This method is also known as "between estimators" and has the same problems as GLS. That is, if unobserved variables are correlated with the regressors, then the parameter estimates will be biased and inconsistent. Moreover, when the error term and the regressors are orthogonal, this method is less efficient in estimating the β's than GLS, and it also provides inconsistent estimates of the variance-covariance matrix. GLS (random effects) can be shown to be an optimal weighted average of the "between" and "within" estimators.

2. Data sources

A description of the data is given in the Appendix and a printout is shown in Table A.1. An important fact to bear in mind, is that some variables are time-invariant (e.g., initial GDP per capita), or there may be only one observation for the entire sample period (e.g., income distribution), while other variables are available as regular time series.

The sample period considered is from 1950 to 1985. This period was subdivided into five six-year periods (1951-56, 1957-62, 1963-68, 1969-74,

1975-80) and one five-year period, 1981-85. Several sources were used in the construction of the data:

Summers and Heston (1988) provide yearly data since 1955 on GDP, population, investment and government consumption.

World Tables 1987-88 and World Tables 1989-90 from the World Bank were used for yearly data since 1960 on output composition, and for primary and secondary school enrollment ratios.

The Social Indicators of Development 1989, also from the World Bank, contains data on demographic variables, agricultural land, literacy rates, college enrollment in science and engineering, and income distribution for the period 1967-85. The data used on income distribution are the share of private income received by the highest 20 percent of households, the lowest 20 percent, and the lowest 40 percent of households. These three variables, however, are available for a few years only, and do not necessarily coincide for all the countries in the sample. These variables generally have very low variability across time. For this reason all the variables obtained from the Social Indicators were considered time-invariant.

Yearly data since 1950 on inflation, foreign investment, nominal value of exports, imports and GDP were obtained from International Financial Statistics from the IMF.

The data for the terms of trade (price of exports over price of imports) were taken from recent yearbooks of the Economic Commission for Latin America and the Caribbean (ECLAC) that span the years 1955 to 1988 for most of the countries. Data on political instability were taken from Barro and Wolf (1989). These data provide yearly statistics on the number of assassinations per million population, number of coups d'etat, number of riots, an index of civil liberties and an index of political rights, among many others. The last two indexes are constructed in such a way that an increase reflects a decrease in civil liberties or political rights. They may take a value between one for the highest and seven for the lowest level. Also used were data on government consumption (excluding defense and education spending) from Barro and Wolf (1989) as an alternative to government consumption overall. All of these variables are time-invariant, and most of them are averages for 1960-85 period.

Finally, the index of outward orientation was taken from the World Bank publication World Development Report 1987. Countries are classified in four qualitative categories: strongly outward-oriented, moderately outward-oriented, moderately inward-oriented, and strongly inward-oriented. Values of 4, 3, 2 and 1 are assigned to each one of the above categories, respectively. Only nine countries in the sample are included in this classification and none of them is classified in the strongly outward-oriented category. The data are reported for two periods: 1963-73 and 1973-85. The value for 1963-73 was used for the first four subperiods in the panel, and the value for 1973-85 was employed for the remaining two subperiods.

V. Growth Determinants: Results

The results are presented in Tables 7 to 10. The two estimation procedures are LSDV (least square dummy variables) for fixed effects and GLS for random effects. The estimates using OLS and pooled data, but without country-specific dummies, are not reported, since they do not change the main conclusions. All the standard errors were computed using White's (1980) heteroskedasticity-robust procedure.

The first five regressions of Table 7 show the set of the "most robust" determinants of growth. Private investment, foreign investment and the variance or the average rate of inflation appear to be the most important determinants of growth. The coefficients appear to be statistically significant with all estimation procedures, independently of whether or not other variables were included. Another variable that appears to be significant in many specifications is the literacy rate, which is used as a proxy for human capital. The overall fit of the regressions is quite good, and the regressions explain up to 60 percent of the variability of the six-year average rates of growth. The last line of Table 7 shows the χ^2 statistics for the specification tests, which cannot reject the hypothesis of no specification error at standard significance values. 1/ Therefore, GLS would provide consistent estimates, and we can proceed using the random effects approach.

1. Convergence

Regressions 3 and 5 in Table 7 show that after controlling for inflation (average or standard deviation) and investment, convergence is achieved; that is initial GDP has a negative coefficient. However, to address the question of convergence properly one should first establish non-convergence when growth is regressed on initial per capita GDP, and then look at which variables produce convergence.

As can be seen in Figures 5 and 6, apart from two outliers (Uruguay and Venezuela), convergence should not be obtained. Regressing growth rates on initial GDP per capita shows a significant negative coefficient for the full sample, but not when Venezuela is excluded from the sample. Therefore, the rest of the discussion on convergence excludes Venezuela.

The next question to be addressed is which variables are sufficient to produce convergence. Barro and Sala-i-Martin (1990) found that, after controlling for human capital, government spending and other additional variables, there is evidence of convergence. They argue that these variables control for the cross-country differences in the steady state level of per capita income and in the rate of technology growth.

1/ The specification test compares the relevant LSDV estimation with the GLS estimation, and the degrees of freedom are equal to the number of parameters estimated excluding the constant.

Table 7. Growth Determinants

	Regressions						
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Constant		-0.011	0.011	-0.011	0.010	-0.228	-0.001
		(-1.34)	(2.08)	(-1.28)	(1.86)	(-0.25)	(-0.16)
Investment	0.321	0.130	0.097	0.134	0.105	0.086	0.078
	(2.35)	(-1.34)	(3.97)	(3.24)	(4.07)	(3.01)	(2.93)
Terms of trade (10^{-2})							
Variance of inflation (10^{-2})	-0.176	-0.181	-0.224				-0.221
	(-4.84)	(-10.70)	(-12.03)				(-12.36)
Average inflation (10^{-2})				-0.382	-0.418	-0.414	
				(-6.01)	(-11.88)	(-12.30)	
Foreign investment	0.616	0.552	0.555	0.537	0.521	0.559	0.600
	(3.88)	(3.26)	(4.34)	(3.27)	(4.04)	(4.28)	(4.67)
Literacy (10^{-2})						0.022	0.021
						(1.57)	(1.65)
Initial GDP (10^{-5})			-0.726		-0.708	-0.807	-0.823
			(-6.81)		(-6.11)	(-7.03)	(-7.81)
Method	LSDV	GLS	GLS	GLS	GLS	GLS	GLS
Number of observations	65	65	65	65	65	65	65
R^2	0.30	0.26	0.57	0.29	0.54	0.58	0.61
χ^2		2.83	4.68	3.81	1.47	3.82	3.69

t-statistics in parentheses.

Table 7 (Concluded). Growth Determinants

	Regressions						
	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Constant	-0.14	-0.013	0.001	-0.003		-0.005	0.011
	(-1.49)	(-1.43)	(0.05)	(-0.27)		(-0.63)	(1.65)
Investment	0.139	0.142	0.091	0.090	0.516	0.094	0.100
	(3.11)	(3.25)	(2.91)	(2.78)	(3.72)	(2.44)	(3.61)
Terms of trade (10^{-2})			0.045		0.995	-0.603	0.013
			(0.57)		(4.98)	(-4.71)	(0.18)
Variance of inflation (10^{-2})	-0.174		-0.218		-0.136	-0.185	-0.221
	(-8.98)		(-10.31)		(-4.03)	(-11.37)	(-9.80)
Average inflation (10^{-2})		-0.371		-0.406			
		(-5.57)		(-11.18)			
Foreign investment	0.712	0.677	0.504	0.644	0.527	0.789	0.485
	(2.01)	(1.93)	(1.79)	(2.32)	(2.06)	(3.00)	(2.21)
Literacy (10^{-2})			0.020	0.031			
			(1.12)	(1.25)			
Initial GDP (10^{-5})			-0.976	-0.815			-0.764
			(-3.44)	(-5.82)			(-3.11)
Method	GLS-IV	GLS-IV	GLS-IV	GLS-IV	LSDV	GLS	GLS
Number of observations	65	65	65	65	58	58	58
R^2	0.24	0.26	0.55	0.50	0.39	0.37	0.56
χ^2						71.88	44.72

t-statistics in parentheses.

A more general question then would be which of the relevant variables are sufficient to produce convergence? This question is explored by regressing growth rates on initial GDP per capita with each additional explanatory variable added one by one. Convergence is obtained with investment, the variance of inflation, and literacy rates (with the right sign for each parameter), but not for foreign investment and government spending. Although the extreme convergence hypothesis can be rejected, the results cannot disentangle which variables are sufficient statistics for steady state growth. 1/

A traditional problem with using these kind of regressions to check convergence is that when the initial level of GDP is transitorily measured with error, there will be a bias toward convergence. For example, when the initial GDP is underestimated, the country appears poorer initially and will give the impression that it grew faster than was actually the case (Romer, 1989). The advantage of panel data is that transitory measurement errors are less important since initial GDP is only used to compute the average growth rate in the initial subperiod.

2. Foreign investment

Since part of investment is foreign investment, the results show that foreign investment is three to six times more efficient than investment on average. 2/ This result should not be too surprising since total investment data includes many kinds of investment, but it is useful to remark that there are large differentials in the quality of investment. Therefore, reallocation of investment may have substantial effects on growth. 3/

One possible problem with the result for foreign investment is that of endogeneity; that is, high growth may reflect a "good investment climate" and therefore attract foreign investment. To control for possible endogeneity, the growth regression is estimated by using total foreign investment in Latin America (in 1980 U.S. dollars) as an instrument. Total foreign investment could be expected to be correlated with foreign investment by country but uncorrelated with country-specific shocks to growth. In Table 7, regressions 8 to 11 confirm that foreign investment is an important determinant of growth.

1/ The Barro and Sala-i-Martin (1990) procedure is more general since it compares the implied convergence parameter with what is implied from U.S. data.

2/ Data on total investment used in the regressions include foreign investment, therefore average investment corresponds to the average between domestic (public and private) and foreign investment. In this data, the average of total investment is 17 percent of GDP, while the average of foreign investment is 1 percent; hence results for average investment are very close to those for domestic investment.

3/ An analogous result is obtained by De Long and Summers (1991) for investment in equipment.

There may still be other arguments to explain the wide gap between domestic and foreign investment beyond productivity differentials. For most of the 1950-85 period, Latin American countries lacked full access to international capital markets to finance investment. The extent of these borrowing constraints is likely to be correlated with foreign investment. Therefore, the high coefficient on foreign investment may also be capturing the effect of the availability of capital inflows in addition to the higher marginal productivity of capital. Therefore, the results not only reflect that productivity of foreign investment is higher than that of domestic investment, but may also show the positive effect of capital inflows on growth.

3. Inflation

The anti-growth effects of inflation and the variance of inflation appear to be very important in all specifications. It is necessary, however, to check whether the results are dependent on the sample, and in particular whether they are driven by the inclusion of countries experiencing high inflation.

To check the robustness of this result, the sample was varied according to two criteria. The first is to eliminate countries that experienced high inflation. Regressions similar to 1 to 6 were run sequentially, first excluding Brazil, then Argentina, then Bolivia and, finally, Chile. In most of the regressions, in particular those that use random effects, the impact of inflation and the variance of inflation are both negative and significant. The second procedure was to eliminate all observations with inflation rates higher than a specified cutoff point. As cutoff points, inflation rates of 50, 40, 30, 20 and 10 percent per year were used. Again the results are robust.

Although average inflation and variance of inflation have a negative effect on growth, providing an estimate of the quantitative effect is difficult because the value of the parameter is highly dependent on the sample. For the whole sample 0.004 is a good estimate of the negative impact of inflation. But, when the Bolivian hyperinflation is eliminated this value doubles to 0.008. Then, when all inflation rates above 50 percent are excluded, this coefficient rises to 0.067. This result suggests a nonlinear relationship between inflation and growth. Given the nonlinearity of the relationship between inflation and growth, a regression such as number 5 is run by replacing the level of inflation by its logarithm. The coefficient has the form of semi-elasticity and is robust to changes in the sample. This value is around 0.008, 1/ which implies that decreasing the average rate of inflation (excluding Bolivian hyperinflation)

1/ See regression 27 in Table 9, which includes also government spending as explanatory variable.

from 34 percent to 17 percent would increase per capita growth by 0.4 percent per annum. 1/

Inflation can also affect growth by reducing the rate of investment, hence the total effect of inflation on growth should include the impact of inflation on investment. A simple way to estimate this effect, without estimating investment equations, is to exclude all forms of investment from the growth equations. This procedure provides a crude estimate since the equation omits particular variables. The semi-elasticity of growth with respect to inflation rises to 0.01. Therefore, a reduction of inflation of 17 percentage points is required for 0.5 percentage points increase in growth. 2/

The channels by which inflation affects growth are diverse. Traditionally emphasized in the literature is the premise that inflation affects investment negatively (e.g., Fischer, 1991). But, after controlling for investment--both foreign and domestic--inflation and its variability still have a negative effect on growth. This result indicates that inflation affects not only the rate of capital accumulation, but also its productivity. Since inflation is an important source of fiscal revenue, this additional effect is viewed as proxying for inefficiencies in the tax system and consequent resource misallocations.

In De Gregorio (1991) an endogenous growth model to illustrate the channel from taxation to inflation and growth is presented. In the model, the government finances its budget with both inflation and income taxes. Income tax is subject to inefficiencies, i.e. collection costs or evasion. Inflation, on the other hand, affects profitability of investment by inducing firms to hold low real balances for the purchase of new capital. An increase in the inefficiency of the tax system is shown to lead to an increase in the rate of inflation and a consequent reduction in the growth rate.

The role of money in the economy, and consequently the effect of inflation on growth, can be interpreted in a broader context than simply as money helping to purchase new capital. Money plays an important role in the operation of firms. High inflation may lead to efforts to avoid the costs of inflation and thus to excessive resources being devoted to cash and portfolio management which otherwise could be used to promote endogenous growth through such activities as R&D.

Finally, note that the above result contradicts the traditional Phillips-curve relationship. Nevertheless, the two are not necessarily inconsistent. The reason is the frequency of the time series used. It is

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1/ This result is similar to the one found by Cardoso and Fishlow (1989), although their result holds only for high inflation experiences. The difference is that their regression is per capita growth against inflation, without including other determinants of growth.

2/ For further evidence and discussion of the effects of inflation on growth see De Gregorio (1991).

possible that at a quarterly frequency inflation and output growth may display a positive correlation, which at lower frequencies (six-year observations) may average out and only a negative effect may remain.

4. Terms of trade

In Table 7, regressions 12, 13 and 14 introduce the terms of trade as an additional explanatory variable. The results vary and depend critically on the estimation procedure used. In general, however, the terms of trade appear to have no significant effects on growth.

The above are the only regressions where a specification test comparing fixed versus random effects rejects the null hypothesis of no specification error. Therefore, if there are omitted variables, this result would suggest they are correlated with the terms of trade; thus, strong conclusions can not be obtained, other than to omit the terms of trade when random effects are used. The conclusion would be that secular changes in the terms of trade have no effect on growth. 1/

The terms of trade could affect growth indirectly by affecting the rate of investment. Excluding investment, however, does not alter the result obtained. 2/

Latin American economies are highly vulnerable to the external environment. It is not surprising that at high frequencies the terms of trade are highly correlated with output fluctuations. What the results of this paper show is that, in the long run, this correlation disappears and it cannot be argued that improving terms of trade will induce faster growth, although income will certainly grow. A possible reason for this is that many Latin American economies depend quite heavily on the export of primary commodities. An improvement in the terms of trade may be an incentive to investment and growth in the commodities sector, but at the expense of other, probably more dynamic, sectors. This could be characterized as a sort of "long-run dutch disease" phenomenon. Further research is required to provide more support for this hypothesis.

5. Economic openness and measures of investment in human capital

Although is not a general proposition, it is expected that openness positively affects growth. 3/ Regressions 15, 16 and 17 in Table 8 show representative regressions for three alternative measures of openness. The first two regressions use the share of total trade (exports plus imports)

1/ The terms of trade were included in many specifications. The most common finding was a coefficient insignificantly different from zero. Regressions 12 and 13 are among the few cases where the coefficient is statistically different from zero, although the sign of it is not robust.

2/ Cardoso (1991), when estimating investment equations, has found that investment is affected negatively by the terms of trade.

3/ For further discussion see, for example, Edwards (1991) and Roubini and Sala-i-Martin (1991).

Table 8. Openness and Measures of Human Capital

	Regressions						
	(15)	(16)	(17)	(18)	(19)	(20)	(21)
Constant		-0.018	-0.014	0.02		0.016	-0.002
		(2.13)	(-1.08)	(1.92)		(2.77)	(-0.19)
Investment	0.342	0.108	0.108	0.143	0.337	0.138	
	(2.68)	(2.34)	(2.34)	(3.68)	(2.30)	(4.43)	
Variance of inflation (10^{-2})	-0.178	-0.206	-0.175	-0.161	-0.171	-0.228	-0.230
	(-5.32)	(-9.69)	(-9.10)	(-8.51)	(-4.43)	(-11.56)	(-15.05)
Foreign investment (10^{-2})	0.738	0.696	0.471	0.363	0.632	0.558	0.617
	(4.42)	(4.57)	(1.01)	(1.58)	(1.86)	(4.31)	(4.21)
Initial GDP (10^{-5})		-1.549		-0.229		-0.659	-0.954
		(-5.57)		(-1.07)		(-6.03)	(-6.42)
Openness	-0.115	-0.038	0.005				
	(-1.90)	(-1.25)	(1.09)				
Variable:	*Trade share*	*Export share*	*World Bank index*				
Human capital (10^{-2})				-0.085	-0.001	-0.066	0.043
				(-3.68)	(-0.51)	(-1.76)	(2.56)
Variable:				*School Second.*	*School Primary*	*Engin. Enroll.*	*Literacy*
Method	LSDV	GLS	GLS	GLS	LSDV	GLS	GLS
Number of observations	65	65	53	58	58	65	65
R^2	0.34	0.54	0.28	0.52	0.28	0.60	0.42

t-statistics in parentheses.

and the share of exports in GDP, respectively. They show a marginally significant coefficient, but negative in sign.

Regression 17 is the only one that shows a coefficient of the expected sign although it is statistically insignificant. This regression uses the index based on the classification made by the World Bank in the World Development Report 1987.

Two plausible explanations can account for this contradictory result. The first is that most of the growth in the sample of Latin American countries has been characterized by policies oriented toward sustaining growth through import substitution. Therefore, the more successful the anti-export bias was, the larger the growth rates were in the early stages of import substitution. Since there also was a lack of variability in trade policies across countries, the implication is that the sample is inadequate to address the question of openness and growth. In addition, the effect of outward orientation takes some time to yield benefits; in Latin America significant efforts toward openness began only in the 1970s. The second problem may be that an inappropriate measure of openness is being used. For example, the use of Leamer's (1988) outward orientation index could produce different results (Edwards, 1991). This index, however, has been computed for only half of the sample, which impedes its use. Moreover, it is not clear that the index is in fact the appropriate measure of openness. 1/

Table 8 also presents regressions for alternative measurements of investment in human capital. Regressions 18 and 19 use school enrollment indexes, primary and secondary, respectively. Barro (1991) finds a positive sign for the coefficient of school enrollment in a cross section of 98 countries, while Romer (1990) finds no significant effect. The problem with human capital proxies is that the theoretical presumption is that they are correlated with other forms of investment, so there is a problem of multicollinearity. Surprisingly, however, the school enrollment indexes show a negative, and in many specifications statistically significant, coefficient. In the sample, primary school enrollment is positively correlated with physical investment; therefore, the collinearity problem may be serious. Nevertheless, secondary school enrollment, which always has a significant negative effect, is uncorrelated with investment. A similar result is obtained when college enrollment in engineering and sciences is used as a proxy for human capital investment (regression 20). These results are puzzling. A conclusion may be that these variables may not adequately reflect human capital accumulation. Some correction for quality of education and structure of population may be required to improve the results.

1/ Quah and Rauch (1990) develop an explicit model of growth and openness where the relevant variable is the share of trade to GDP. They found only weak support for the effects of openness on growth.

As pointed out previously, only the literacy rate has the expected sign and is significant in some specifications. 1/ The failure of the literacy rate to show a significant coefficient in other cases may be the result of collinearity with physical investment. The correlation coefficient between physical investment and literacy is 0.37. This is confirmed in regression 21, which excludes physical investment. Compared with regression 7, most of the coefficients are the same, except that on the literacy rate, which increases and becomes statistically significant.

6. Government consumption

Recent literature on growth has focused on the role of government spending on growth (Barro, 1990; King and Rebelo, 1990). It is necessary to distinguish between productive—for example, education—and not directly productive spending, i.e., "government consumption." The basic argument is that increasing government consumption will increase the amount of distortionary taxation, and hence will reduce growth. An additional reason why government consumption affects growth negatively is that it leads to crowding out of the private sector, however, government spending can also be complementary to private sector investment. These hypotheses are investigated by adding government consumption in the growth regressions. The results are reported in Table 9.

Regression 22 in Table 9 uses the fixed effects technique and is one of the regressions where government consumption has a significant negative impact on growth. Regression 23 is the same regression estimated by GLS, which results in government consumption becoming insignificant. A specification, test cannot reject the hypothesis that there is no specification error in the GLS estimation. 2/ Therefore, one cannot reject the hypothesis that in a specification such as in regressions 22 and 23, government spending has no effect on growth.

To see whether the low significance of government consumption is due to a crowding out of private investment, regressions 24 and 25 exclude investment as a growth determinant. The results suggest that there is no significant crowding out effect. Additional support for this finding is the fact that the correlation coefficient between investment and government consumption is positive and equal to 0.20.

Regressions 25 and 27 include the logarithm of the average rate of inflation instead of the variance, as in the previous regressions. The coefficient on inflation is more stable with respect to sample changes when this variable is included in a logarithmic form. The overall fit is, however, worse than in regressions that include the inflation measures in linear form. 3/

1/ In particular it is not significant when the initial level of per capita GDP is not included.

2/ The value of the $\chi^2(4)$ test is 6.62 and its significance level is 15.8 percent.

3/ Compare, for example, the R^2's of regressions 27 an 28.

Table 9. Government Spending and Growth

	Regressions						
	(22)	(23)	(24)	(25)	(26)	(27)	(28)
Constant		-0.006	0.031	-0.044	0.013	-0.047	-0.003
		(-0.61)	(3.20)	(-1.91)	(1.61)	(-2.40)	(-0.31)
Investment	0.417	0.140			0.104	0.145	0.065
	(3.10)	(3.20)			(3.61)	(3.29)	(2.25)
Variance of inflation (10^{-2})	-0.109	-0.171	-0.234		-0.208		-0.198
	(-1.96)	(-6.77)	(-14.21)		(-10.16)		(-7.37)
Average inflation (log, 10^{-2})				-0.687		-0.801	
				(-3.03)		(-4.10)	
Foreign investment	0.440	0.538	0.555	0.369	0.575	0.328	0.637
	(2.64)	(3.08)	(4.05)	(2.17)	(4.60)	(2.38)	(4.87)
Literacy (10^{-2})				0.107		0.027	0.033
				(3.74)		(2.35)	(2.01)
Initial GDP (10^{-5})			-0.794	-1.218	-0.744	-0.963	-0.896
			(-4.26)	(-6.39)	(-5.45)	(-4.89)	(-7.36)
Government spending	-0.440	-0.048	-0.165	-0.139	-0.027	-0.107	-0.052
	(-2.51)	(-0.71)	(-0.28)	(-2.18)	(-0.65)	(-1.89)	(-1.22)
Method	LSDV	GLS	GLS	GLS	GLS	GLS	GLS
Number of observations	65	65	65	64	65	64	65
R^2	0.38	0.28	0.33	0.36	0.49	0.46	0.62

t-statistics in parentheses.

It is interesting to note in Table 9 that when the literacy rate is included in the regressions, the significance level of government consumption increases. Finally, regression 28 uses the Barro (1991) measure of nonproductive government spending, which subtracts defense and education spending from government consumption. The result is similar to the regressions that use total government consumption data taken from Summers and Heston (1988).

7. Income distribution and political instability

The final set of regressions appear in Table 10, where the roles of income distribution and political instability on growth are explored. The expected sign for income distribution is uncertain. The traditional hypothesis, due to Kuznets (1955), is that there is an inverted-U relationship between the level of income inequality and the level of per capita income. The link to growth is, however, unclear.

The coefficient of the income distribution variable in the growth equation, although most of the time negative, is not significantly different from zero. The most precise estimate, but still insignificant, is in regression 29, where the income-distribution variable is the share of income of the poorest 20 percent of households. It can be concluded that there is no direct link between income distribution and growth in the sample beyond the effect that income distribution may have on the other determinants of growth.

Regressions 30 to 35 include political instability variables. Consistent with other studies, a higher level of civil liberties or political rights, and a lower index of assassinations were found to have a positive influence on growth. Note again, that these results control for investment. Thus, the role of political instability channel is not confined to the possible negative effect on the rate of physical investment.

A traditional explanation given to this correlation is that civil liberties have a positive influence on property rights, hence on growth. The argument is that undefined property rights—for example, threat of expropriations—reduce the incentive to invest and to innovate, since the appropriability of the returns is not guaranteed. 1/ Although the hypothesis is appealing it seems an unlikely explanation for the results for Latin America. A look at the political evolution of Latin America, at least measured with the variables used in Table 10, shows that the cross-country relationship between the political stability and the protection of property rights is at most weak. It is common to find absence of political rights in the presence of strong protection of property rights, and vice versa.

A more attractive explanation for the negative effect that political instability has on growth, although without clear empirical support, is that the political environment has an influence on the choice of public policy, which in turns affect growth. Different political environments may set

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1/ See, for example, Özler and Rodrik (1991).

Table 10. Income Distribution and Political Instability

	Regressions						
	(29)	(30)	(31)	(32)	(33)	(34)	(35)
Constant	0.018	0.014	0.025	0.021	0.017	0.008	0.021
	(2.50)	(2.81)	(4.02)	(4.09)	(0.89)	(0.56)	(1.41)
Investment	0.090	0.090	0.105	0.117	0.099	0.103	0.100
	(3.90)	(4.00)	(5.45)	(6.04)	(3.08)	(3.06)	(3.71)
Variance of inflation (10^{-2})	-0.220	-0.236	-0.224	-0.205			-0.222
	(-12.28)	(-12.31)	(-12.28)	(-10.92)			(-12.28)
Average inflation (10^{-2})					-0.356	-0.350	
					(-7.55)	(-7.41)	
Foreign investment	0.481	0.531	0.183	0.193	0.356	0.413	0.233
	(3.65)	(4.20)	(1.01)	(1.16)	(2.13)	(2.73)	(1.07)
Literacy (10^{-2})					0.026	0.028	0.005
					(1.33)	(1.36)	(0.34)
Government spending					-0.079	-0.053	
					(-1.88)	(-1.61)	
Income distribution	-0.163				-0.048		
	(-1.33)				(-0.32)		
	bot. 20%				*bot. 20%*		
Political instability (10^{-2})		-0.242	-0.386	-0.303	-0.287	-0.193	-0.350
		(-1.81)	(-3.14)	(-3.31)	(-1.44)	(-1.35)	(-2.05)
		assass.	*civil lib.*	*polit. rights*	*civil lib.*	*polit. rights*	*civil lib.*
Initial GDP (10^{-5})	-0.677	-0.739	-0.719	-0.734	-0.866	-0.887	-0.744
	(-6.85)	(-7.68)	(-7.93)	(-8.11)	(-6.06)	(-6.32)	(-7.37)
Method	GLS	GLS	GLS	GLS	GLS	GLS	GLS
Number of observations	65	65	65	65	65	65	65
R^2	0.60	0.62	0.66	0.67	0.58	0.57	0.66

t-statistics in parentheses.

different constraints on public policy. For example, the quantity and quality of public investment, the role of the government in production, the extent of regulation, and many other factors, may be determined to a large extent by the characteristics of the political system.

Another interesting finding is that not all of the political variables chosen were significant. Only the three reported in Table 10 are statistically significant. In particular, the number of strikes and the number of government crises do not have a significant coefficient in regressions. To a lesser extent the same happens to a variable corresponding to the number of constitutional changes occurring. These results raise the question of which variables are good proxies for political instability, at least the ones that are relevant for growth. High frequency of elections may be a indication of political stability rather than the opposite. Finally, variables like the number of coups, revolutions and riots, although with point estimates of negative sign, were in general not significantly different from zero.

The political instability variables are, however, not significant when the measures of inflation are introduced in logarithmic form rather than in linear form. For example, in regression 27 of Table 9, the coefficient on any of the political variables is not significantly different from zero.

The findings that political instability reduces growth may be the result of reverse causality. That is, political stability may be caused by growth, rather than the other way around. But, the positive relationship may come from the *level*, rather than the growth rate, of per capita income. Further empirical evidence is required to answer this question.

8. An assessment of growth determinants

Most of the previous discussion was based on whether the coefficients are found to be statistically significant and of the expected sign, and on the robustness of the findings. This section closes by presenting a decomposition of the deviation of each country's per capita growth with respect to the regional mean, thus providing a means of establishing the quantitative importance of each variable in explaining actual growth performance.

Table 11 reports the decomposition using the coefficients from regression 27. This regression, although not having the best fit, produces stable parameters when the sample changes. This is particularly important in the case of inflation, where the estimates of the linear specifications are sensitive to inclusion of countries with high inflation experience. With a log specification for inflation, however, political instability variables loose their statistical significance. The reason for this is that the log of inflation is highly correlated with measures of political instability. Therefore, the figures for inflation shown in Table 11 are likely to be capturing part of the effects of political instability.

Table 11. Determinants of Growth Performance in Latin America

(Average percent per year)

	Investment (1)	Foreign Investment (2)	Literacy (3)	Government Consumption (4)	Inflation (5)	Initial GDP (6)	Residual (7)	Growth GDP per Capita (8)	Deviation from Mean (9)
Argentina	0.8	-0.0	0.7	0.4	-1.4	-1.3	0.1	0.8	-0.8
Bolivia	-0.6	-0.1	-0.6	-0.2	-0.6	0.8	-0.1	0.2	-1.4
Brazil	0.9	-0.1	-0.5	-0.1	-0.9	0.9	2.9	4.7	3.1
Chile	1.7	-0.2	0.7	-0.6	-0.9	-0.9	-0.5	0.9	-0.7
Colombia	0.1	-0.0	0.2	0.2	0.2	0.5	-0.5	2.3	0.7
Costa Rica	-0.5	0.3	0.6	-0.6	0.8	0.3	0.0	2.4	0.8
Ecuador	0.9	0.2	-0.2	-0.2	1.1	0.9	-1.6	2.8	1.2
Guatemala	-1.1	0.1	-1.6	0.5	1.1	0.5	-0.2	0.9	-0.7
Mexico	0.2	0.1	0.1	1.1	0.7	-0.3	-1.1	2.5	0.9
Peru	-0.2	-0.1	0.0	-0.0	-0.0	0.1	0.2	1.5	-0.1
Uruguay	-0.6	-0.2	0.6	-0.1	-0.4	-0.9	0.5	0.5	-1.1
Venezuela	-0.8	0.3	0.1	0.3	1.1	-2.8	-0.1	-0.2	-1.8

Using coefficients from regression 27. Column (7) = (9) - sum of (1) to (7).

The average per capita growth in the sample is 1.6 percent. 1/ Each of the first six columns reports, in percentage points, the amount of the difference between country's growth and Latin America's growth which is attributed to the deviation of each variable with respect to the regional mean. In most cases, investment, literacy, inflation and initial GDP are the most important explanations of growth. Government consumption and foreign investment play a less important role. The case of foreign investment is interesting, since it has a large coefficient; but it is not too important in explaining actual growth performance, because the level of foreign investment has been modest. The fact that the coefficient is large (for example, relative to the coefficient of total investment) reflects, however, that its marginal contribution is high.

Literacy rates have had an important positive contribution in the southern cone countries, while the presence of a low literacy rate has played a significant negative role in Bolivia, Brazil and Guatemala. The effect of initial GDP is large in most countries. In some cases, however, this measure may be distorted by changes in the terms of trade. The case of Venezuela is the most notable. Since GDP data are based on 1980 prices, the initial GDP at 1950s prices is certainly lower than GDP at 1980s prices. Using 1950s prices could give a better approximation for the initial marginal product of capital and the subsequent catch-up effect.

VI. Concluding Remarks

The facts documented in this paper for a sample of Latin American countries confirm some results of previous studies on the determinants of growth. They include the role of productivity growth vis-à-vis growth of factor inputs, the positive effect of investment in physical and human capital, the initial level of per capita income, government consumption and political variables, among others. However, the findings also question other views, such as the effects of terms of trade on growth.

The evidence presented above also points to new directions for empirical research. The role of the macroeconomic environment, measured by inflation, is very important, at least in light of Latin American experience. The links between inflationary performance and the efficiency of the tax system may be an important channel through which macroeconomic conditions affect growth. The macroeconomic environment affects long term-growth through various other mechanisms as well. As recently suggested by Baumol (1990) and Murphy, Shleifer and Vishny (1991), the allocation of abilities across activities having different productivity is an important

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1/ The average growth computed for the entire period does not coincide with the per-country average in the panel data. The discrepancies were assigned proportionally to each determinant of growth. Only in the case of Argentina, is the deviation from the regional mean of different sign depending on which of the two average measures is used. In that case the difference was distributed after separating negative and positive contributions to per capita growth.

explanation of variations in growth performance. Thus, the macroeconomic environment can be an important determinant of the structure of incentives that determines the allocation of talent.

It may also be useful to explore the role of other macroeconomic variables to identify channels through which macroeconomic policy can foster growth (i.e., the role of the real exchange rate or the real interest rate). 1/ But macroeconomic stability is not sufficient for growth. For example, the debt crisis, reinforced by macroeconomic mismanagement and the subsequent stabilization attempts, shows that restoring growth goes beyond success in stabilization. 2/

Perhaps the least explored area of research is the interaction between the economy and the political system. In particular, the subject of how political institutions can affect growth performance requires further research. Especially important is the potential influence that the political system exerts on economic policy-making. 3/ The results confirm recent evidence supporting the hypothesis that the political environment is correlated with economic variables.

1/ Endogeneity problems become more serious with relative prices as explanatory variables for growth.

2/ See Corden (1991) and Dornbusch (1991).

3/ Alesina and Rodrik (1991), Perotti (1990) and Persson and Tabellini (1991), study the role of income distribution on growth in a political economy model.

Data Definitions and Sources
(See also Section IV)

Time-varying data (six-year-averages or sub-samples):

Y: GDP per capita average growth, Summers and Heston (1988), (SH)
TT: Terms of trade average growth, ECLAC
INV: Investment rate, SH
G: Government consumption share on GDP, SH
X: Exports share on GDP (nominal), IFS
XM: Exports plus imports share on GDP (nominal), IFS
P: Average CPI inflation rate, IFS
VP: Standard deviation of P
OO: Outward orientation index, construction based on World Development Report 1987, The World Bank
PSC: Primary school enrollment ratio (gross enrollment of all ages as a percentage of children in the country's primary school age), %, World Tables, The World Bank (WT)
SSC: Secondary school enrollment ratio (WT)
FI: Foreign investment over GDP (nominal), IFS

Time-invariant data:

YO: Average real GDP 1959-61, millions of 1980 US$, (SH)
ASSASS: Number of assassinations per million population per year, 1960-85 or sub-sample, Barro and Wolf (1989), (BW)
CIVLIB: Index of civil liberties (1=highest, 7=lowest), 1965-80, BW
CONSTCH: Number of constitutional changes, 1965-80, BW
COUP: Number of coups per year, 1960-85, BW
CRISES: Number of government crises per year, 1960-85, BW.
POLRIG: Index of political rights (1=highest, 7=lowest), 1960-85, BW
REVCOUP: Number of revolutions and coups per year, 1960-85, BW
REVOL: Number of revolutions per year, 1960-85, BW
RIOT: Number of riots per year, 1960-85, BW
STRIKE: Number of strikes per year, 1960-85, BW
HGSVX: Ratio of net real government consumption net of spending on education and defense, 1970-85, BW
TOP20: Percentage of private income received by the highest 20% of households, average 1967-85 or sub-sample, Social Indicators, The World Bank, (SI)
BOT20: Percentage of private income received by the lowest 20% of households, average 1967-85 or sub-sample, SI
BOT40: Percentage of private income received by the lowest 40% of households, average 1967-85 or sub-sample, SI
ENGI: Tertiary enrollment, science and engineering, students enrolled in science and engineering fields as a percentage of all students enrolled at third level, average 1967-85 or sub-sample, SI
LITER: 100 minus illiteracy rate (%), where the illiteracy rate is the percentage of population 15 years of age or older who cannot, with misunderstanding, read and write, average 1967-85 or sub-sample, SI

Appendix Table: Basic Data

	OBSE	Y	TT	INV	G	X	XM
Argentina	1.1	NA	NA	NA	NA	0.081	0.171
	1.2	0.065	0.014	0.250	0.104	0.098	0.208
	1.3	0.028	0.001	0.237	0.087	0.089	0.161
	1.4	0.026	0.049	0.277	0.076	0.090	0.173
	1.5	0.002	-0.052	0.288	0.087	0.102	0.188
	1.6	-0.037	-0.034	0.195	0.112	0.111	0.209
Bolivia	2.1	-0.030	NA	0.116	0.057	NA	NA
	2.2	0.008	0.018	0.116	0.126	NA	NA
	2.3	0.038	-0.001	0.146	0.154	0.211	0.464
	2.4	0.033	0.045	0.157	0.178	0.210	0.426
	2.5	0.012	0.011	0.159	0.206	0.230	0.481
	2.6	-0.071	0.009	0.069	0.209	0.251	0.437
Brazil	3.1	NA	NA	NA	NA	NA	NA
	3.2	0.092	-0.047	0.288	0.211	NA	NA
	3.3	0.014	-0.007	0.221	0.166	0.062	0.119
	3.4	0.079	-0.148	0.259	0.148	0.072	0.163
	3.5	0.049	-0.039	0.256	0.116	0.073	0.166
	3.6	-0.008	-0.028	0.173	0.096	0.103	0.189
Chile	4.1	NA	NA	NA	NA	NA	NA
	4.2	0.031	-0.004	0.319	0.177	0.127	0.267
	4.3	0.021	0.072	0.339	0.168	0.138	0.277
	4.4	0.008	-0.020	0.309	0.193	0.131	0.283
	4.5	0.037	-0.068	0.266	0.214	0.230	0.476
	4.6	-0.051	-0.021	0.242	0.188	0.227	0.473
Colombia	5.1	0.030	NA	0.220	0.122	0.138	0.273
	5.2	0.008	-0.056	0.198	0.108	0.153	0.298
	5.3	0.018	-0.006	0.182	0.111	0.120	0.250
	5.4	0.052	0.038	0.184	0.116	0.135	0.279
	5.5	0.036	0.065	0.167	0.103	0.163	0.303
	5.6	0.003	-0.019	0.177	0.109	0.125	0.266
Costa Rica	6.1	0.047	NA	0.128	0.176	0.248	0.511
	6.2	0.027	-0.073	0.129	0.198	0.224	0.485
	6.3	0.036	-0.011	0.138	0.204	0.247	0.554
	6.4	0.037	-0.031	0.154	0.206	0.296	0.675
	6.5	0.030	0.049	0.183	0.222	0.288	0.656
	6.6	-0.024	-0.020	0.119	0.227	0.360	0.745
Ecuador	7.1	0.031	NA	0.226	0.147	0.186	0.357
	7.2	0.012	-0.037	0.238	0.143	0.185	0.359
	7.3	0.045	-0.008	0.215	0.156	0.161	0.347
	7.4	0.057	0.070	0.254	0.131	0.203	0.431
	7.5	0.041	-0.096	0.282	0.168	0.249	0.524
	7.6	-0.024	-0.077	0.225	0.169	0.241	0.456
Guatemala	8.1	-0.000	NA	0.079	0.078	0.140	0.275
	8.2	0.016	-0.069	0.086	0.079	0.124	0.274
	8.3	0.018	-0.020	0.090	0.069	0.163	0.348
	8.4	0.028	-0.065	0.089	0.071	0.193	0.390
	8.5	0.024	0.065	0.107	0.075	0.221	0.480

	8.6	−0.041	−0.036	0.075	0.085	0.164	0.359
Mexico	9.1	0.026	NA	0.160	0.053	0.151	0.305
	9.2	0.018	−0.035	0.168	0.059	0.115	0.238
	9.3	0.043	0.014	0.188	0.072	0.093	0.194
	9.4	0.033	0.016	0.200	0.078	0.082	0.178
	9.5	0.034	0.059	0.219	0.088	0.100	0.211
	9.6	−0.027	−0.035	0.191	0.096	0.159	0.272
Peru	10.1	0.035	NA	0.168	0.143	0.202	0.428
	10.2	0.044	−0.026	0.147	0.133	0.218	0.454
	10.3	0.022	0.036	0.136	0.138	0.193	0.395
	10.4	0.020	0.051	0.119	0.142	0.170	0.335
	10.5	−0.006	0.007	0.117	0.170	0.188	0.379
	10.6	−0.038	−0.011	0.097	0.171	0.195	0.378
Uruguay	11.1	0.030	NA	0.140	0.128	0.092	0.194
	11.2	−0.015	0.016	0.112	0.131	0.121	0.266
	11.3	−0.003	−0.018	0.085	0.151	0.149	0.271
	11.4	0.010	0.022	0.083	0.174	0.129	0.262
	11.5	0.042	0.018	0.164	0.162	0.171	0.377
	11.6	−0.059	−0.020	0.150	0.167	0.194	0.394
Venezuela	12.1	0.042	NA	0.130	0.059	0.325	0.558
	12.2	0.017	−0.043	0.091	0.070	0.331	0.561
	12.3	0.012	−0.050	0.069	0.064	0.302	0.496
	12.4	−0.031	0.143	0.091	0.088	0.287	0.482
	12.5	−0.027	0.065	0.175	0.151	0.301	0.605
	12.6	−0.046	0.019	0.152	0.151	0.282	0.493

Appendix Table: Basic Data (continued)

OBSE	P	VP	OO	PSC	SSC	FI	YO
1.1	0.181	0.143	1	NA	NA	0.0029	3069
1.2	0.398	0.335	1	98	23	0.0152	3069
1.3	0.253	0.052	1	101	28	0.0021	3069
1.4	0.332	0.207	1	105	44	0.0003	3069
1.5	2.064	1.097	1	109	56	0.0030	3069
1.6	3.355	2.366	1	107	65	0.0110	3069
2.1	0.902	0.531	2	NA	NA	NA	881
2.2	0.273	0.397	2	64	12	NA	881
2.3	0.060	0.041	2	73	18	0.0069	881
2.4	0.184	0.223	2	76	24	-0.0097	881
2.5	0.163	0.146	1	92	40	0.0068	881
2.6	22.515	42.695	1	90	41	0.0081	881
3.1	NA	NA	3	NA	NA	NA	1115
3.2	0.338	0.121	3	95	11	NA	1115
3.3	0.536	0.244	3	108	16	0.0030	1115
3.4	0.203	0.047	3	82	22	0.0144	1115
3.5	0.481	0.170	3	93	31	0.0020	1115
3.6	1.420	0.532	3	102	35	0.0000	1115
4.1	0.455	0.231	1	NA	NA	0.0120	2893
4.2	0.208	0.107	1	109	24	0.0123	2893
4.3	0.312	0.103	1	124	34	0.0004	2893
4.4	1.707	1.909	1	107	39	-0.0202	2893
4.5	1.312	1.255	3	116	51	0.0073	2893
4.6	0.238	0.083	3	108	61	0.0100	2893
5.1	0.047	0.045	3	NA	NA	0.0020	1348
5.2	0.087	0.049	3	77	12	0.0010	1348
5.3	0.145	0.098	3	84	17	0.0067	1348
5.4	0.141	0.064	3	108	25	0.0044	1348
5.5	0.242	0.049	2	127	44	0.0024	1348
5.6	0.231	0.040	2	121	47	0.0166	1348
6.1	0.020	0.030	3	NA	NA	0.0060	1652
6.2	0.020	0.010	3	96	21	0.0103	1652
6.3	0.018	0.017	3	106	24	0.0155	1652
6.4	0.100	0.099	3	110	28	0.0249	1652
6.5	0.097	0.060	2	107	45	0.0193	1652
6.6	0.342	0.266	2	101	44	0.0209	1652
7.1	0.005	0.030	NA	NA	NA	0.0069	1125
7.2	0.018	0.013	NA	83	12	0.0076	1125
7.3	0.044	0.010	NA	91	17	0.0105	1125
7.4	0.107	0.062	NA	97	22	0.0454	1125
7.5	0.123	0.017	NA	108	47	0.0071	1125
7.6	0.256	0.122	NA	115	54	0.0044	1125
8.1	0.018	0.021	3	NA	NA	0.0007	1272
8.2	-0.000	0.012	3	45	7	0.0141	1272
8.3	0.004	0.008	3	50	8	0.0101	1272
8.4	0.058	0.067	3	57	8	0.0139	1272
8.5	0.111	0.015	2	65	14	0.0158	1272

8.6	0.082	0.061	2	74	18	0.0076	1272
9.1	0.085	0.062	2	NA	NA	0.0135	2137
9.2	0.046	0.037	2	80	11	0.0071	2137
9.3	0.027	0.011	2	92	17	0.0082	2137
9.4	0.091	0.071	2	104	22	0.0085	2137
9.5	0.203	0.054	2	115	40	0.0088	2137
9.6	0.564	0.254	2	118	52	0.0080	2137
10.1	0.070	0.022	1	NA	NA	0.0000	1693
10.2	0.082	0.022	1	83	15	0.0000	1693
10.3	0.117	0.045	1	99	25	0.0000	1693
10.4	0.086	0.039	1	107	31	-0.0000	1693
10.5	0.465	0.156	1	113	52	0.0000	1693
10.6	0.973	0.359	1	117	62	0.0000	1693
11.1	0.104	0.032	1	NA	NA	NA	3241
11.2	0.240	0.112	1	111	37	0.0000	3241
11.3	0.680	0.335	1	106	44	0.0000	3241
11.4	0.520	0.324	1	112	59	0.0000	3241
11.5	0.608	0.119	3	106	60	0.0000	3241
11.6	0.489	0.179	3	108	67	0.0000	3241
12.1	0.013	0.027	NA	NA	NA	0.0934	5374
12.2	0.013	0.032	NA	100	21	0.0174	5374
12.3	0.013	0.007	NA	94	27	-0.0015	5374
12.4	0.039	0.020	NA	94	33	-0.0021	5374
12.5	0.111	0.050	NA	103	40	-0.0015	5374
12.6	0.129	0.049	NA	109	43	0.0017	5374

Appendix Table: Basic Data (continued)

COUNTRY	ASSASS	CIVLIB	CONSTCH	COUP	CRISIS	POLRIG	REVCOUP	REVOL
1 ARGENTINA	2.19	3.70	0.12	0.19	1.12	4.60	0.92	0.73
2 BOLIVIA	0.23	3.80	0.22	0.30	0.96	4.60	1.15	0.85
3 BRAZIL	0.08	3.50	0.13	0.04	0.42	3.80	0.12	0.08
4 CHILE	0.46	4.70	0.04	0.04	0.42	5.80	0.19	0.15
5 COLOMBIA	0.38	2.80	0.04	0.00	0.46	2.00	0.04	0.04
6 COSTA RICA	0.00	1.00	0.00	0.00	0.00	1.00	0.00	0.00
7 ECUADOR	0.00	3.30	0.22	0.22	0.23	3.90	0.57	0.35
8 GUATEMALA	2.85	4.10	0.13	0.09	0.46	4.20	0.47	0.38
9 MEXICO	0.12	3.70	0.00	0.00	0.04	3.60	0.00	0.00
10 PERU	0.15	3.90	0.09	0.13	0.46	4.10	0.28	0.15
11 URUGUAY	0.19	4.50	0.09	0.00	0.46	4.90	0.00	0.00
12 VENEZUELA	0.12	2.00	0.04	0.00	NA	1.20	0.31	0.31

COUNTRY	RIOT	STRIKE	HSGVX	TOP20	BOT40	BOT20	ENGI	LITER
1 ARGENTINA	1.54	1.54	0.03	50.30	14.10	4.40	21.95	94.00
2 BOLIVIA	0.88	0.96	0.15	59.00	13.00	4.00	15.78	68.70
3 BRAZIL	0.85	0.23	0.08	62.75	9.20	3.00	17.30	74.04
4 CHILE	1.58	0.42	0.11	51.40	13.40	4.40	34.23	91.50
5 COLOMBIA	0.81	0.27	0.07	59.23	10.83	3.77	22.94	84.70
6 COSTA RICA	0.04	0.00	0.16	54.90	12.00	3.15	14.57	91.53
7 ECUADOR	0.50	0.27	0.10	72.00	5.10	1.90	23.53	78.93
8 GUATEMALA	0.50	0.15	0.05	58.33	13.37	5.17	16.93	50.50
9 MEXICO	1.35	0.08	0.05	59.80	9.90	3.10	28.70	82.40
10 PERU	0.65	0.62	0.10	61.00	7.00	1.90	20.53	81.55
11 URUGUAY	0.69	0.27	0.12	45.50	16.13	5.73	12.72	94.65
12 VENEZUELA	0.73	0.00	0.07	51.93	11.63	3.57	21.82	82.70

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