

GROWTH AND PRODUCTIVITY IN COLOMBIA

(Abstract)

This paper focuses on the so-called “engines of growth”, where growth explanations are related to the effects of adequate economic policies rather than to exogenous factors, such as geography, demography, or institutional instabilities. The idea is to explain patterns of growth and productivity as a direct result of economic policies dealing with openness to international trade, exchange rate regimes, taxation, all of which play a crucial role in determining the capital/labor ratio and the total factor productivity trends.

Our main conclusion is that long-term growth (1950-2002) in Colombia has been associated with the rate of investment, showing a unitary elasticity, and the openness to international trade (as captured by the current account, but not through the quantitative restrictions). As expected, labor and total factor productivity show pro-cyclical behavior. The real exchange rate does not appear as a determinant of long-term productivity and seems to be the result of the general macro-policies. We also provide some preliminary estimates of the short-term impact of productivity behavior on the central-bank interest rate reaction function, where we postulate variations of the so-called Taylor-rules.

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I. Introduction

The recent growth literature has revived a two-fold debate. The first one deals with factors of growth that help explain sustainable development, where geography, institutions and economic policy interact. For instance, Easterly and Levine (2002) and Rodrik et.al. (2002) remark on how institutional factors (apparently) would be more important than geographical factors (including initial endowments) or the actions derived from economic policies. According to them, institutional organizations “explain” better the levels of income *per-capita*. Similar results were also obtained by Acemoglu et.al. (2001 p.1370) when analyzing different types of European settlements over Africa and America.

These findings somehow throw “cold-water” on the aspirations of policy makers, especially in Latin America, where relatively “orthodox” policies attempted to be imposed during the 1990s. Was the failure of the so-called “Washington Consensus” in Latin America a result of bad implementation of such policies? Or another example that the lack of “Anglo-Saxon” type of institutions structurally impede such implementation? Or a problem of design in the agenda that maintains Latin America longing for the “promise land” (Hausmann y Rodrik, 2002)? Or simply a mix of all of the above?

Argentina comes immediately to our minds as a counter-example to the institutional dominance theory, where initial endowments were abundant, conditions were favorable for a non-extractive settlement, and public education has functioned well. How could a first world country (G-7 type in the 1920s) fall to a third-class world in the late 1990s, after attempting to adopt structural reforms (not exactly the Washington Agenda)?

Another counter-example, now going from low to high development, are given by South Korea (1950s) and Chile (1980s), where poor institutions and weak democracies were over-run by good economic policies, imposed under autocratic-regimes. In the case of Chile, development occurred in spite of a historical record of poor income distribution. Or think of the interesting case of Spain (1980s), where good economic policies were adopted after the weakening of and autocratic regime (see Botero, 1997; Clavijo, 1998; Uribe, 2002).

So it is very hard to accept the apparent dominance of institutions over economic policy, at least during the last 50 years. If true, what is left for policy makers? Fortunately, empirical tests showing such dominance are, in our readings, rather weak. Take the case of Easterly and Levine (2002):

1. Variables that intent to capture the effect of economic policy do not include any indicator of the stance of fiscal policy. However, Latin America has been widely criticized for running huge fiscal deficits that finally lead to increasing the size of the State, up-to the point of public-debt default, while causing the contraction of private investment. By not capturing the essence of bad economic policies, the adopted methodology pays leap service to the contesting hypothesis, with a clear bias against giving importance to economic policy.
2. In the case of trade policies, the proxies are not good enough (even understanding the limitations that arise by working a panel-data of several countries). The use of deviations of the real exchange rate from PPP is a dynamic concept, very hard to capture in a multi-country historical study. Rodrik, et.al. (2002) worked hard in order to improve these readings, but results did not improve much, leaving most of the story to be captured by “institutions”.
3. Even the basic definition of institutions can be challenged, as noted by Easterly and Levine (2002 p.7). For some authors, institutions refer only to the Executive branch, while others include Judicial branches. Historical analysis approach institutions by way of characterizing settlements. However, including technology as a component of institutions seems to us rather odd and at counter with the economic theory that postulates that technology is the result of economic policy dealing with taxes, tariffs, exchange rates, etc. Why not construct a good proxy of the “cost of use of capital”, which encompasses these factors, instead of attributing technology to a result of institutions? This is another methodological error that biases results against economic policy and in favor of the rest (“institutions”). A better approach is to recognize that good economic policies generate a flow effect and that cumulative effects would show as institutions, as mentioned by Rodrik et.al. (2002 p.20).
4. Finally, postulating real income per-capita might not be a good dependent variable for approaching economic development, since economic recovery would show in a rapid *rate of growth*, independently of the historical lagged that the level of income could show at certain stages. As discussed with Rodrik, a better approach is to think that the real income per-capita requires to analyze steady-state determinants (basically endowments and settlements), while rates of growth induces to think about developmental factors, where economic policies are key to explain so many different out-comes.

After considering these methodological shortcomings, a consensus should arise in the sense that institutions, geography, and economic policy all interact in determining social and economic development. Attempting to separate the effects is a very complex task and results are likely not to be robust. While policy makers should be alert to stir economic changes through interest rates, taxes, tariffs and regulations, institutions provide the structural basis for maintaining the curse, as pointed recently out by Greenspan (2002b, p. 1), among others. This idea is just a variation of Madisson (1991) and North (1990) thinking about the difference between “immediate” (policy) and “remote” (institutions) causes of development. Reviving Rostow’s (1960) debate about the “high-way of development” and the “cultural over-determination” seems a rather sterile route to follow.

The second debate has to do with the so-called “engines of growth”, where growth explanations are related to the effects of adequate economic policies rather than to exogenous factors, such as geography, demography, or institutional instabilities. The idea is to explain patterns of growth and productivity as a direct result of economic policies dealing with openness to international trade, exchange rate regimes, taxation, all of which play a crucial role in determining the capital/labor ratio and the total factor productivity trends.

In this paper we shall focus on the “engines of growth” for Colombia, analyzing the determinants of growth and productivity trends. Section II is devoted to explaining stylized facts regarding growth and productivity in Latin America, with particular emphasis in Colombia and Chile. Section III presents econometric estimates for Colombia over the period 1950-2002. Section IV presents preliminary estimates of the short-term impact of productivity behavior on the central-bank interest rate reaction function, where we postulate variations of the so-called Taylor-rules.

Our main conclusion is that long-term growth (1950-2002) in Colombia has been associated with the rate of investment, showing a unitary elasticity, and the openness to international trade (as captured by the current account, but not through the quantitative restrictions). As expected, labor and total factor productivity show pro-cyclical behavior. The real exchange rate does not appear as a determinant of long-term productivity and seems to be the result of the general macro-policies.

II. Macroeconomic Reforms: Latin America, Colombia, and Chile

Real growth and productivity performance^{1/}

During the 1980s, Latin America's average growth rate was 1.2 percent per year, which was significantly lower than the 5.2 percent rate achieved during the 1975-80 period, or the 6.4 percent observed during the pre-oil shock period 1966-74. Although there was a recovery during the 1990s, to an average rate of 2.4 percent during 1990-2002, a slowdown is expected in the immediate future.

In most instances, Colombia and Chile have surpassed these regional averages, both recording 3.2-3.7 percent real growth during the 1980s and more recently in the 1990s with 2.6 and 5.3 percent, respectively. The growth performances of Colombia and Chile were practically double the rates observed in the rest of Latin America during the 1980s and this still holds for the 1990-2002 in the case of Chile (see Table 1).

The acceleration in economic growth in Chile (1990-2000) and Colombia (1990-95) was clearly related to the adoption of structural reforms, which lead to an opening of their economies and relative increases in their labor productivity over those years. However, in the case of Colombia the period 1996-2002 was marked by political turmoil which negatively affected economic growth and productivity performance.

As shown in Table 2, increases in labor productivity during 1990-2002 averaged 4 percent in Chile but only 0,4 percent in Colombia. In the case of Chile, this figure compares quite favorably with the contraction observed in the early 1980s. In the case of Colombia, although it represents an improvement with respect to the 1980s, it is well below the 3,2 percent achieved in the period 1967-74.

^{1/} This section is based on Clavijo (1995).

Table 1: Real Growth in Latin America, Chile, and Colombia
(Annual Rates of Growth)

Periods (Averages)	Real GDP-Growth		
	Latin America	Colombia	Chile
1950-66	5.2	4.6	4.1
1967-74	6.4	6.3	2.1
1975-80	5.2	4.7	4.4
1981-89	1.2	3.7	3.2
1990-02	2.4	2.6	5.3
Summary: 1950-80	5.5	5.1	3.6
1981-02	1.9	3.1	4.5
1950-02	4.0	4.2	4.0
Recent Years:			
1980	6.0	4.3	7.4
1981	-0.2	2.2	6.5
1982	-0.7	1.2	-12.1
1983	-2.6	1.8	-3.7
1984	3.7	4.1	5.7
1985	2.9	4.0	4.1
1986	4.5	7.3	5.4
1987	3.3	5.5	6.0
1988	0.3	4.2	7.2
1989	0.9	3.4	9.8
1990	-0.6	3.8	3.4
1991	3.8	2.0	7.3
1992	3.0	3.7	10.9
1993	3.6	4.6	6.6
1994	5.3	6.1	5.1
1995	1.1	5.2	9.0
1996	3.7	2.1	6.9
1997	5.2	3.4	6.8
1998	2.2	0.5	3.6
1999	0.3	-4.1	-0.1
2000	4.1	2.7	4.9
2001	0.3	1.6	2.8
2002(e)	-1.1	1.5	2.0

Source: ECLA and Our Computations.

Total factor productivity (TFP) shows a similar trend than that of labor productivity, but in the case of Colombia remained a negative figure over the period 1990-2002, meaning, -0,6 percent or -0,4 percent if adjusted for capacity utilization. In the case of Chile, TFP increased from -0,3 percent during the 1980s to 1,5 percent during 1990-2002.

Structural reforms

In this section we will summarize the timing of the structural reforms leading to the opening of the Colombian and the Chilean economy. Most of Chile's structural reforms occurred during the years 1974-79:

- (i) domestic financial markets were deregulated as early as May 1974, when interest rates were freed;
- (ii) foreign trade was liberalized in 1976, when all non-tariff barriers on imports were lifted;
- (iii) import tariffs were progressively reduced to ranges of 0-35 percent by 1977, and to 0-10 percent by 1979 (with few exceptions); in late 1990s the average tariff was close to 6 percent.
- (iv) liberalization of the capital account included removal of restrictions on FDI in 1975, partial removal of those related to private external investment in 1977, and on those pertaining to domestic banks' foreign investment in 1979 (although reserve requirements and limits on capital flows have remained in force most of the time to discourage short-term indebtedness);
- (v) Liberalization of the labor market with the labor reform of 1979, which reduced uncertainty about dismissals and hiring costs and partially reintroduced collective bargaining (banned after 1973). This was later complemented with the well-known social security reform of 1981, which established the privately administered funded system.^{2/}

In Colombia, most of the structural reforms took place during the years 1989-94:

- (i) domestic financial reform scheduled to take place as early as 1975 had to be delayed because of disruptive financial flows caused by a coffee bonanza until 1980, when interest rates were freed; a more comprehensive deregulation of the financial system occurred only until 1990-93;
- (ii) foreign trade began to be liberalized in 1989, when nearly half of the non-tariff barriers were eliminated; in the second semester of 1990 this process was accelerated, covering 97 percent of the import items;
- (iii) import tariffs had been reduced by the end of 1992 to the range of 5-20 percent, with the average rate of about 12 percent;

^{2/} For more details see Bolsworth et al. 1994.

Table 2: Labor and Multifactor Productivity in Chile and Colombia
(Annual Rates of Growth)

(Averages)	Labor Productivity		Multifactor Productivity		
	Colombia	Chile	Colombia	Colombia	Chile
				Adjusted	
1950-66	1.6	1.5	0.6	na.	1.2
1967-74	3.2	2.9	2.0	na.	0.7
1975-80	0.3	0.6	-0.2	na.	0.3
1981-89	-3.0	-0.4	-2.7	-2.2	-0.3
1990-02	0.4	4.0	-0.6	-0.4	1.5
Summary: 1950-80	1.8	1.7	0.8	na.	0.9
1981-02	-1.0	2.2	-1.5	-1.1	0.8
1950-02	0.6	1.9	-0.2	na.	0.8
Recent Years:					
1980	-1.4	2.1	-1.3	na.	4.4
1981	-1.5	-1.4	-2.7	1.6	1.1
1982	-12.3	-7.2	-9.8	-8.9	-8.7
1983	-3.1	-2.0	-3.7	-2.1	-4.9
1984	-0.8	2.0	-1.4	-2.9	6.0
1985	1.9	-5.0	0.1	-0.4	-5.3
1986	-0.4	1.1	0.2	-1.0	-0.8
1987	-1.2	2.7	-0.3	-1.2	3.0
1988	-8.9	1.4	-5.5	-5.2	2.4
1989	-0.4	4.7	-0.8	0.1	4.5
1990	3.2	1.4	1.6	1.3	-0.2
1991	-1.7	6.3	-1.8	-1.4	3.8
1992	-1.2	7.4	-0.7	-1.8	7.0
1993	1.8	1.2	0.9	1.2	0.2
1994	2.9	4.8	1.4	1.3	1.4
1995	3.1	9.3	1.4	1.6	5.1
1996	2.5	5.6	-0.3	1.6	1.8
1997	0.9	5.4	-0.5	-1.2	1.9
1998	-2.2	2.1	-3.2	-0.9	-1.6
1999	-2.7	-0.8	-4.7	-2.4	-2.9
2000	-1.0	6.4	-0.6	-3.8	2.0
2001	-0.3	2.8	-0.9	-0.1	0.8
2002(e)	-0.2	0.4	-0.8	-0.3	0.1

Source: Marfán and Bosworth (1994), Hofman (2001), Chumacero and Fuentes (2002) and our calculations.

(iv) capital account liberalization in 1991 included a drastic change in foreign exchange practices that had been in place since 1967, including the easing of procedures governing FDI and the substitution of the crawling peg system for a floating regime beginning in 1999

(as in Chile, reserve requirements and limits on capital inflows have been maintained in order to discourage excessive short-term indebtedness);

- (v) Labor reform in 1990 and again in 2002 eased the way to more open contracting by eliminating a cumbersome severance payments regime, and this was complemented with a social security reform in 1993 and again in 2002, which has been gradually phasing-in a dual pay-as-you-go/fully funded system.^{3/}

In short, there has been a difference of 11-13 years between the adoption of policy reforms in Chile and Colombia, and the countries are consequently at different stages of the reform process. In Chile, the consolidation of reforms enabled the country to achieve an average real growth rate of 5.3 percent during the 1990s, and labor productivity increased at a pace of 4 percent per annum.

Colombia's adoption of structural reforms permitted her to shift from low growth path with stagnating productivity to an average growth rate of 5.5 percent per annum together with productivity increases of 2.9 percent a year on average over the 1993-95 period; however, during the period 1996-2002 the economy experienced low rates of economic growth and productivity stagnation, as previously illustrated.

In spite of events in Mexico during 1995 and the contagion effects of the Asian crises during 1997-98, Chile and Colombia are finding that the structural reforms they have instituted are thus far enabling them to continue receiving both FDI and medium- and long-term external borrowing as the main source of financing for their growing stock of capital.^{4/}

Colombia, however, has faced more volatility of capital flows due to security concerns, which aggravated during 1998-2002. There have been additional concerns regarding the sustainability of such investment rates with regard to the recent behavior of the gross national savings. For

^{3/} More details on the opening process of Colombia can be found in Cohen and Gunter 1992.

^{4/} Recent studies suggest that FDI is an important vehicle for the transfer of technology, contributing relatively more to growth than what domestic investment does. This is especially true when the host country has a good threshold stock of human capital (see Borensztein, et al., 1994).

instance, in the case of Colombia a sharp decline was observed in the savings/GDP ratio from nearly 20 percent in the early 1990s to 14 percent during the late 1990s as private savings weakened. Aggregate demand was boosted by both trade and financial liberalization, but higher taxes affected private savings. It is hard to assess the net effect on private savings that might result out of the recent social security reforms in Colombia (including the one enacted in late 2002), but for the medium term, as in most developing countries, the main determinants will continue to be output growth, real interest rates, and changes in the terms of trade (IMF, 1995, p. 75; Clavijo, 1998).

With this background in mind, in the next sections we attempt to quantify the growth determinants of Colombia during the period 1950-2002.

III. Growth Determinants in Colombia

Specification

In an interesting study, Syrquin (1984) found that, given the income per-capita and the size of the Colombian economy, export and import shares in GDP exhibited a gap of nearly 30% with respect to the international 'standard'. He also found that, investment, surprisingly, was only 9% below such benchmark in the mid-1980s.

These historical observations would lead us to expect exports and imports to be important determinants of Colombian real growth; by contrast, investment, given its typical behavior and relative stability (Fainboim, 1990), would not be an important element in explaining growth (or income) variations.

Khan and Reinhart (1990) provide an interesting framework for testing these hypothesis. Starting from a Cobb-Douglas production function, they estimated equation [1], where Y: Real Gross National Product ; I: Net Real Investment in Fixed Assets; L: Employed Labor Force; Z: Real Export and/or Imports of Goods and Services; d: operator of absolute changes in time.

$$\frac{dY}{Y_{t-1}} = \alpha_0 + \alpha_1 \frac{I}{Y_{t-1}} + \alpha_2 \frac{dL}{L_{t-1}} + \alpha_3 \frac{dZ}{Z_{t-1}} \quad [1]$$

The expected signs of the α coefficients are all positive, since they can be interpreted as α_0 : average productivity changes; α_1 : marginal productivity of capital (where $I=dK$); α_2 : elasticity of output to labor; α_3 : elasticity of output with respect to external variables (eg. Exports and/or Imports).

The economic rationale for expecting positive partial effects from productivity, investment, and labor is widely known in close economy analyses. When extending it to small open economies, simple intuition would also lead us to expect $\alpha_3 > 0$ for the case of exports; however, this sign would only be positive in the case of imports if the productive structure of Colombia happens to be complementary (ie. higher growth could only be achieved by increasing imports of raw materials and machinery). In fact, recent studies have emphasized the importance of this 'complementary effect' for the case of Colombia, given its classification as a country with a 'big, primary, and inward trade orientation' (Syrquin and Chenery, 1989, p.164), at least up-to the 1980s.

Results

Table 3 illustrates the estimates of equation [1] for Colombia during the period 1951-2002, where the dependent variable is the percentage change in GDP. The step-wise estimation, appearing in the first column, shows results in line with those that intuition would have dictated based on Syrquin (1984), since the export and import growth rates play a role in determining real growth. Note that the simple two factor model (capital and labor) would not be relevant for Colombia, since the hypothesis of $\alpha_0 = \alpha_3 = 0$ is rejected at the 99% confidence level. Intuitively, it was already known that in most LDCs labor was 'infinitely' abundant, so finding $\alpha_0 = 0$ should not be a surprise. However, this first estimation presents problems of high autocorrelation, as revealed by the Q-Statistics.

Table 3: Real GDP Estimates for Colombia 1951-2002

(Dependent Variable: Real Rate of Growth)

Independent Variables:	Period 1951-2002		Sub- Period 1967-2002	
	(1)	(2)	(3)	(4)
Constant	0.025 * (5.12)	-0.003 (0.293)	-0.056 (2.38)	-0.055 (2.33)
Investment / PIB (I / Y t-1)		0.320 * (2.79)	0.874 * (3.71)	0.84 (3.53)
Labor (dL / L t-1)				0.05 (0.57)
Exports (dX / X t-1)	0.024 (1.23)	0.039 * (2.05)	0.0414 (1.94)	0.04 (1.86)
Imports (dM / M t-1)	0.059 * (3.10)			
Dummy (< 1980 = 1)	0.020 * (3.17)	0.022 * (3.28)	0.026 * (2.87)	0.027 (2.95)
Adjustment Indicators:				
R2	0.421	0.401	0.548	0.538
degrees of Freedom	47	47	31	30
RMSE	0.013	0.013	0.008	0.007
SBIC	-4.02	-3.98	-4.42	-4.33
Rho	0.312 * (2.05)	0.311 * (2.06)	0.45 * (1.93)	0.43 (1.94)
DW	2.05	2.06	1.93	1.94
Q	0.223	0.348	0.828	0.827

Note: (*) Significant at 95%; t-statistics in parenthesis.

Column two shows alternative estimations, where the hypothesis of the simple two factor model is also rejected, but where the investment rate plays a crucial role in explaining long-run growth. Note that investment is apparently substituting for the effect of imports, which is a natural result given that most of the machinery that supports the investment figure is actually imported. This

result is somehow at counter with that expected from Fainboim's (1990) observation, whereby investment was not a limiting factor for growth in Colombia.

The growth rate of productivity, represented by the constant, apparently would not play any significant role in explaining real growth when referring to the whole sample period. However, if one takes into account the structural change observed in multifactor productivity in the early 1980s, (Clavijo, 1990), and consequently implements a dummy variable (D) such that $D=1 < 1980$, then the 2.2% (average) productivity growth rate would be positively associated with the higher real growth that took place during the 1951-1979 period.

The magnitude of the export elasticity (0.04), however, seems rather low when compared to the 21% export elasticity obtained in a study of 24 LDCs (including Colombia) for the 1970-79 period (Khan and Reinhart, 1990). However, in the case of the investment elasticity our estimation is higher (0.32) than the 0.15 reported for the whole sample.

Estimations for the sub-period 1967-2002 (where data is of better quality) tend to ratify these results regarding a relatively high growth elasticity to the investment ratio and to exports, where nearly 50% of the variation of GDP is now accounted for. Note in columns 3 and 4 that the investment elasticity is now around 0.80, but exports elasticity is kept rather low at 0.04. The productivity decline after the 1980s shows even more clearly under this estimation, where the dummy variable reports a value of 2,7% before the 1980s and the combined value of the constant and the dummy variable reports a negative value of -1,8% for the whole period 1951-2002.

IV. Productivity Determinants in Colombia

In the previous section we came to the conclusion that productivity moved along with real growth, but the framework was limited in the sense that we had to assume productivity as an exogenous variable that grew at a constant rate. In this section we attempt to analyze productivity as being determined by 'wealth' and policy variables. A historical analysis of the productivity series used here appears in Clavijo (1990) and GRECO (2002).

Specification

Following Mundlak (1988) and Garcia and Jayasurika (1997), we adopted a reduced form function for the level of productivity (P), as shown in [2], which includes real per-capita income (Y/N) and the Capital/Labor (K/L) ratio as determinants of technological availability, while the price signals are given by the real exchange rate (RER) and the Index of Import Liberalization (IIL) --ie. the ratio of items with approved import license to total imports--. Historically, nearly 50% of productive investment in Colombia corresponds to imported tools and machinery.

$$P = f[Y/N, K/L, RER, IIL] \quad [2]$$

The expected sign of all partial derivatives is positive: 'wealth' and/or more availability of capital would impulse productivity (labor is supposedly the abundant factor); a higher price ratio of the tradeable/non-tradeable goods would lead to a better allocation of resources, while lower obstacles to free trade (ie. a higher IIL) would induce international competition and gains in productivity.

Results

In general, labor and multifactor productivity series exhibited high serial correlation, so we adopted an ARIMAX(p,d,q) estimation procedure, where "X" represents the deterministic components of the right hand side of [2].^{5/} After applying Schwartz Bayesian Information Criteria (SBIC) for model selection, we found that p=d=1 and q=0 reported the best estimations.

Labor Productivity. According to the results shown in the first column of Table 4, labor productivity in Colombia exhibited unit elasticity to income per-capita and to the capital/labor ratio over the period 1951-2002. However, it was not significantly affected by the behavior of the RER or the IIL. These results also hold for the sub-period 1967-2002 (see the second column).

Multifactor Productivity. In columns 3 and 4 of Table 4 the above mentioned procedures are replicated for the case of multifactor productivity. The same basic results for the period 1951-2002 hold: positive elasticity to income per-capita and to the capital/labor ratio, although with a lower value in this case. The RER and the indirect measurement of non-trade barriers (IIL) remained insignificant.

In short, the structural deterioration in growth and productivity over the 1980s and 1990s, which some studies have associated correctly with the “ultimate” causes of insurgency and narcotrafic (Cárdenas, 2001), we have identified here as “immediate” results stemming from the decline in the rates of investment and the lack of openness of the Colombian economy. Complementarily, it was found that the behavior of the RER seems to be more a result of the performance of the real sector than an exogenous determinant of productivity trends. This result seems to be in line with previous estimates of the determinants of the RER, as found in Baumol (1992) for USA and Herrera (1997) for Colombia.

Productivity and Monetary Policy: The Short-Run

We have discussed the long-term determinants of growth and productivity in Colombia, which are given by technological factors and capital accumulation. However, central banks have to deal with inflation and economic cycles, where computation of the production-gap is crucial in determining the stance of the monetary policy. In this section we briefly discussed the role of growth and productivity as crucial determinants of the repo-rate of the central bank (or the interbank rate) in the short-term and provide some estimates for Colombia.

The idea is to compute the so-called “Taylor rule”, which intends to capture the reaction function of the repo-rate of the central bank (i) with regards to the “inflation-gap” (g_π) and the “product-gap” (g_y), following equation [3]:

$$i = r^* + g_\pi (\pi - \pi^*) + g_y (Y - Y^*) \quad [3]$$

⁵/ The "q" component was selected in the space 1 to 8 lags, noting that positions 3 and 7 were optimal for labor and multifactor specifications, respectively.

Table 4: Productivity Estimates for Colombia 1951-2002

(Dependent Variable: Rate of Growth of Productivity)

Independent Variables: (Rates of Growth)	LABOR		MULTIFACTOR			
	Periods:		Periods:			
	1951-2002	1967-2002	1954-2002	1951-2002	1967-2002	
-	(1)	(2)	(3)	(4)	(5)	-
Constant	-0.022 *	-0.020 *	-0.027	-0.028	-0.020 *	*
	(4.4)	(3.3)	(3.67)	(4.4)	(4.7)	
Income / Population (Y / N)	0.995 *	0.936 *	1.027 *	1.050 *	0.955 *	*
	(15.5)	(19.0)	(13.7)	[12.6]	(16.7)	
Capital / Labor (K / L)	0.879 *	0.960 *	0.453 *	0.430 *	0.530 *	*
	(20.1)	(31.9)	(9.3)	(7.6)	(15.1)	
Real Exch. Rate (TCR)			0.011			
			(1.05)			
Liberalization Index (ILL)			0.001			
			(0.59)			
Adjustment Indicators:						
R2	0.915	0.97	0.833	0.782	0.93	
Degrees of Freedom	48	32	43	48	32	
RMSE	0.004	0.001	0.004	0.006	0.0014	
SBIC	-5.29	-6.46	-4.98	-4.77	-6.21	
Rho	0.75 *	0.85 *	0.82 *	0.74 *	0.79 *	*
DW	1.46	1.54	1.44	1.67	1.6	
Q	0.14	0.71	0.23	0.75	0.79	

Note: (*) Significant at 95%; t-statistics in parenthesis.

In order to test directly for the effect of productivity on the stance of the monetary policy, we postulate a “productivity-gap”, such that $(g_p) = (P - P^*)$, where ‘P’ refers to the changes in labor productivity or TFP, while P^* is the long-term value of those variables, as determined in the previous sections. In the boom cycle (1950-1979), we estimated that $P^*=3,2\%$ in the case of

labor productivity and $P^*=2\%$ for the TFP. We then replaced the traditional “production-gap” (g_y), as estimated by Misas and López (2000) and Banco de la Republica (2002), with this “productivity-gap” (g_p). We also adapted [3] to consider the “uncovered interest parity condition”, which postulates that a LDC faces capital flight whenever the domestic interest rate is significantly below the external interest rate, adjusted for the expected rate of depreciation of the local currency (more details in Clavijo, 2003).

As reported in [4], the interbank rate (driven by the central repo-rate) in Colombia averaged 10,5% over 1998-2002, but apparently it did not react to the contemporaneous inflation gap. However, it showed a positive reaction to the (uncovered) interest parity condition. Although the “productivity-gap” has the expected negative sign, the coefficient turned-out to be insignificant and its absolute value is as low as the one found when using the “product-gap”. It is evident the high-autocorrelation exhibited by the dependent variable (the interbank rate).

Period 1998-2002 (Monthly Data)

$$i = 10,5 + 0.01 (\pi - \pi^*) + 0.12 (i^* + e) - 0.01 (P - 2\%) \quad [4]$$

(1.4) (0.1) (2.1) (0.3)

t-Statistics in Parenthesis; $R^2 = 0.98$; $Dw = 2.02$; $AR(1) = 1.63$; $AR(2) = - 0.65$

We also explored the alternative of allowing for lagged effects. In particular, we tested the joint-hypothesis of contemporaneous and lagged effects of the inflation and productivity gaps over the interbank rate. We found no better results under this approach, but when substituting the interbank rate for the CDs rate we found that the productivity gap was significant at the 93% confidence level, while the interest rate parity was significant at the 84% level. Equation [5] summarizes these findings for the CD-rate as a dependent variable, where the probability values of the Wald-hypothesis are reported in parenthesis.

Period 1999-2002 (Monthly Data)

$$i = 10,5 + \sum_{j=0}^2 0.38 (\pi - \pi^*) + \sum_{j=0}^2 0.08 (i^* + e) - \sum_{j=0}^2 0.15 (P - 2\%) \quad [5]$$

(45%)

(84%)

(93%)

Wald-Statistics in Parenthesis; $R^2 = 0.98$; $Dw = 1.8$; $AR(1) = 1.61$; $AR(2) = -0.64$

In short, we have seen that it is rather premature to postulate the existence of a clear reaction function of the Central Bank of Colombia (BdR) regarding the repo-rate with respect to inflation and product productivity-gaps for the period 1998-2002. There are theoretical and practical reasons to expect that in the near future econometric estimates should improve, especially after taking into consideration the effect of the (uncovered) interest parity condition, which significantly alters monetary policy in emerging markets.

Another strategy which is worth-exploring is the use of forecasting values to compute the gaps that monetary authorities might be reacting to. However, our experience tells us that such forecasting values have been rather inconsistent within a short period of time, so their direct usage in the reaction function of the BdR has not been a practical option up to now. This is one feature of the debate that distinguishes between inflation targeting seen as “an instrument rule” from the one that postulates inflation targeting as a “targeting rule” (Svensson, 2002).

V. Conclusions

We have discussed the so-called “engines of growth”, where growth explanations are related to the effects of adequate economic policies rather than to exogenous factors, such as geography, demography, or institutional instabilities. The idea has been to explain patterns of growth and productivity as a direct result of economic policies dealing with the openness to international trade, exchange rate regimes, taxation, all of which play a crucial role in determining the capital/labor ratio and the total factor productivity trends.

Our econometric estimates lead us to conclude that long-term growth (1950-2002) in Colombia has been associated with the rate of investment, showing a unitary elasticity, and the openness to international trade (as captured by the current account, but not through the quantitative restrictions).

As expected, labor and total factor productivity show pro-cyclical behavior. The real exchange rate

does not appear as a determinant of long-term productivity and seems to be the result of the general macro-policies.

We also provided some preliminary estimates of the short-term impact of productivity behavior on the central-bank interest rate reaction function. In particular, we found that the interbank rate (driven by the central repo-rate) in Colombia averaged 10,5% over 1998-2002, but apparently it did not react to the contemporaneous inflation gap. However, it showed a positive reaction to the (uncovered) interest parity condition. When substituting the interbank rate for the CDs rate, and allowing for lagged effects, we found that the productivity gap was significant at the 93% confidence level, while the interest rate parity was significant at the 84% level. These preliminary results invite for further investigation in the future, as the current “inflation targeting” strategy tends to consolidate.

References

- Acemoglu, D., S. Johnson, and J. Robinson (2001) "The Colonial Origins of Comparative Development: An Empirical Investigation" American Economic Review (December).
- Banco de la República (2002) Informe de Inflación (Septiembre).
- Baumol, W.J., S.A.B. Blackman, and E. N. Wolff (1992) Productivity and American Leadership: The Long View (MIT Press, London).
- Borensztein, E., J. De Gregorio, and J. Lee (1994) "How Does Foreign Direct Investment Affect Economic Growth?" (IMF Working Paper, WP/94/110, September).
- Bosworth, B., R. Dornbusch, and R. Laban (1994) The Chilean Economy: Policy Lessons and Challenges (The Brookings Institution, Washington D.C.).
- Cárdenas, M. (2001) "Economic Growth in Colombia: A Reversal of 'Fortune'?" (Center for International Development, Harvard University, November).
- Clavijo, S. (1990) "Productividad Laboral, Multifactorial y la Tasa de Cambio Real en Colombia" Ensayos Sobre Política Económica (Junio).
- Clavijo, S. (1995) "A Survey of Economic Reforms and Macroeconomic Performance: A Comparative Study of Chile and Colombia 1970-94" (IMF Working Paper, WP/95/139, December).
- Clavijo, S. (1998) "Repensando el Desarrollo Colombiano para el Siglo XXI: Lecciones de 35 años de Crecimiento del Sudeste Asiático" Revista Desarrollo y Sociedad (Uniandes-CEDE, Marzo).
- Clavijo, S. (2003) "Monetary and Exchange Rate Policies in Colombia: Progress and Challenges (1991-2002)" (Banco de la República, January, available in internet at: <http://www.banrep.gov.co/junta/publicaciones/Clavijo/polmonen0303.pdf>).
- Cohen, A. and F. Gunter (1992) The Colombian Economy: Issues of Trade and Development (Westview Press).
- Easterly, W. and R. Levine (2002) "Tropics, Germs, and Crops: How Endowments Influence Economic Development" (NBER, Working Paper 9106, August).
- Fainboim, I. (1990) "Inversión, Tributación y Costo del Uso del Capital en Colombia 1950-87" Ensayos Sobre Política Económica (Diciembre).
- García, J. and S. Jayasurika (1997) Courting Turmoil and Deferring Prosperity: Colombia Between 1960-1990 (The World Bank).
- GRECO (2002) El Crecimiento Económico Colombiano en el Siglo XX (Grupo de Estudios del Crecimiento económico Colombiano, Banco de la República-FCE).
- Greenspan, A. (2002) "Productivity" (Remarks at the US Department of Labor and AEI, Washington, October 23; Available at the FRB-WEB).
- Hausmann, R. and D. Rodrik (2002) "Economic Development as Self-Discovery" (Working Paper, Harvard University-Kennedy School of Government).
- Herrera, S. (1997) "El Tipo de Cambio Real y la Cuenta Corriente de la Balanza de Pagos de Largo Plazo en Colombia" Coyuntura económica (Fedesarrollo, Marzo).
- Hofman, A.A. (2001) "Long-Run Economic Development in Latin America in a Comparative Perspective: Proximate and Ultimate Causes" (ECLAC-UN, Series No.8, December).
- Khan, M.S. and C.M. Reinhart (1990) "Private Investment and Economic Growth in Developing Countries" World Development (Vol.18, No.1).
- Madisson, A. (1991) Dynamic Forces in Capitalist Development: A Long-Run Comparative View (Oxford University Press).

- Marfán, M. and B.P. Bosworth (1994) "Saving, Investment and Economic Growth" in B.P. Bosworth, R. Dornbusch, and R. Laban (Eds.) The Chilean Economy: Policy Lessons and Challenges (The Brookings Institution, Washington D.C.).
- Misas, M. y E. López (2000) "La utilización de la Capacidad Instalada de la Industria en Colombia: Un Nuevo Enfoque" Borradores de economía (Banco de la República, No. 153, Junio).
- Mundlak, Y. (1988) Agricultural Productivity: Measurement and Explanations (Washington, D.C.)
- North, D. (1990) Institutions, Institutional Change and Economic Performance (Cambridge University Press).
- Rodrik, D., A. Subramanian, and F. Trebbi (2002) "Institutions Rule: The Primacy of Institutions over Geography and Integration in Economic Development" (NBER Working Paper No. 9305, October).
- Rostow, W.W. (1960) The Stages of Economic Growth: A Non-Communist Manifesto (Cambridge University Press).
- Svensson, L. (2002) "Inflation Targeting: Should it Be Modeled as an Instrument Rule or a Targeting Rule?" NBER Working Paper (No. 8925, May).
- Syrquin, M. (1984) "Resource Reallocation and Productivity Growth " Economic Structure and Performance: Essays in Honor of H.B. Chenery (Edit. M. Syrquin, L. Taylor and L.E. Westphal; N.Y., Academic Press).
- Syrquin, M. and H. Chenery (1989) "Three Decades of Industrialization" The World Bank Economic Review (Vol.3, No.2).
- Uribe, J.D. (2002) "Comentarios a: 'Inequality, Institutions and Long-Term Growth in Colombia' de Clemens, Easterly y Posada" (Seminario Organizado por el Banco de la República, Noviembre).