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Chile's Rapid Growth in the 1990s: Good Policies, Good Luck, or Political Change?

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Chile's Rapid Growth in the 1990s: Good Policies, Good Luck, or Political Change?

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Abstract

Chile's average economic growth between 1990 and 1998 was above 7 percent per year, more than double than in previous decades, and higher than in any other Latin American country in the same period. This paper assesses empirically the main hypotheses suggested in the literature about the factors underlying this rapid growth: good economic policies, good luck in the external sector, and the country's return to a democratic system of government. The statistical and quantitative results indicate that Chile's rapid growth during the 1990s was due to good policies and the improved political situation.

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I. INTRODUCTION

The growth of the Chilean economy during the 1990s was remarkable. As shown in Figure 1, between 1990 and 1998 output growth averaged there more than 7 percent per year.[2] This was more than double the average growth observed in Chile in the previous three decades. It also was higher than in any other country in Latin America in the same period.

This impressive growth performance has called the attention of many national and foreign analysts, most of which have interpreted it in terms of the *good policies hypothesis*. This hypothesis states that the rapid growth of the 1990s is largely the consequence of the market-oriented structural reforms that began in the mid 1970s and continued and deepened in the 1980s and 1990s, which because of adverse external circumstances, internal policy mistakes, and the time needed by those reforms to deliver results, only began to have a significant effect on productivity growth in the late 1980s or early 1990s. An extended version of this hypothesis asserts that last decade's rapid growth also should be attributed in part to a low-inflation environment made possible by prudent macroeconomic policies.[3]

As noted by Calvo and Mendoza (1999), however, little formal empirical evidence has been provided linking Chile's rapid growth in the 1990s to economic policies. Thus it cannot be discarded a priori that it was the result of other developments. In fact, another possible explanation of last decade's rapid growth is provided by the *good luck hypothesis*. This hypothesis argues that this accomplishment was to a large extent the result of a favorable external environment, characterized by abundant capital inflows due to a temporary decline in industrial-country interest rates, and allegedly favorable terms of trade.[4]

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[2] Because of data availability when the empirical part of this paper was prepared, we refer to the 1990s to the period 1990-98. Adding preliminary estimates for 1999 imply that average output growth during the 1990s was slightly smaller because the economy was in recession in that year. (Estimates of the growth of potential output during 1990-99, however, are close to the 7 percent per year figure mentioned above).

[3] The contribution of good economic policies has been emphasized by Bosworth, Dornbusch, and Labán (1994a), Corbo and Fischer (1994), Krueger (1994), Perry and Leipiziger (1999a), Schmidt-Hebbel (1999), and others.

[4] This hypothesis was suggested by Calvo and Mendoza (1999). Also see Spilimbergo (1999).

Figure 1. Average Output Growth per Decade

percent per year

8
7
6
5
4
3
2
1
0

1961-69   1970-79   1980-89   1990-98
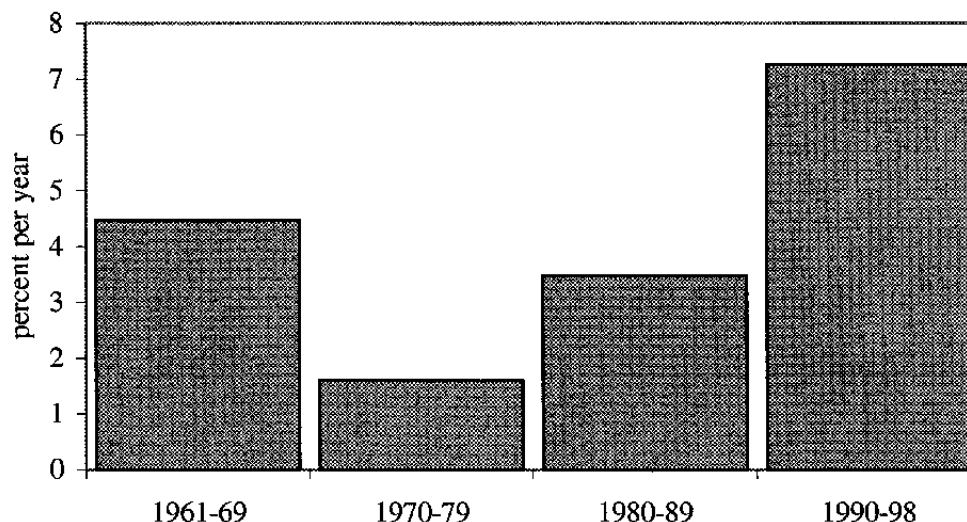
Yet another interpretation of the rapid growth of the 1990s that has been suggested in the previous literature is provided by the *political change hypothesis*. This hypothesis maintains that the rapid growth was triggered by the country's return to a democratic system of government since 1990. The reasoning is that this political change substantially reduced the uncertainty about the sustainability of the rules of the political and economic game, thus lengthening the time horizon and reducing the risk of investment and innovation decisions to both national and foreign investors. Since at the same time the new democratic governments maintained and further improved economic policies, the overall result was an unprecedented increase in quantity and quality of capital accumulation and growth.[5]

This paper examines the factors underlying the rapid growth of the Chilean economy in the 1990s. Besides summarizing the main economic policies, political conditions, and external scenario that conditioned the evolution of the economy during the last four decades, the main contribution of this paper is to assess empirically the relative relevance of the above hypotheses in the explanation of the rapid growth in the 1990s. For that purpose, the paper specifies tests and examines the quantitative implications of a formal time-series model of the determinants of productivity growth in Chile during the last four decades.

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[5] This hypothesis is suggested, for instance, by the analysis of Foxley (1995), Vial (1995), Labán and Larraín (1995), Ffrench-Davis (1999), and Larraín and Vergara (2000a).

To anticipate the main findings of the paper, the statistical and quantitative results presented below support the hypotheses that the rapid growth of the Chilean economy in the 1990s was due to both to good economic policies and the improved political environment. At the same time, they provide evidence against the view that it was the result of favorable external circumstances.

The remainder of this paper is organized as follows. Section II briefly describes the economic policies and the political and external conditions in Chile during the last four decades. Section III contains the core analysis of the reasons underlying the rapid growth observed during that decade. Section IV reports the robustness of the results to a number of extensions. Section V provides concluding remarks. An Appendix provides the sources for the data used throughout the paper.

II. ECONOMIC AND POLITICAL BACKGROUND

This section describes the evolution of economic policies, political rights, and external conditions during the last four decades. The charts depicted in Figure 2 complement the text of this section.

A. Economic Policies[6]

During the 1960s, and until 1970, Chile followed basically the same policies of the previous twenty years, i.e., import substitution coupled with an active state role in the economy. Except for an agrarian reform, no significant structural reforms were implemented in that period. Macroeconomically, the country suffered a tendency towards fiscal imbalances and chronic inflation, the latter fluctuating in a range of 20 to 30 percent per year. And in spite of efforts to diversify the export base and liberalize some trade restrictions, copper continued to represent more than 70 percent of total goods exports and the country experienced recurrent balance of payments crisis.

In 1971-73, the Allende government attempted to overcome the fundamental deficiencies of the Chilean economy by deepening and accentuating the above mentioned policies. These, in addition to widespread nationalization and acceleration of agrarian reform resulted in expansionary fiscal, monetary and wage policies, which in combination with generalized price controls led to a major economic crisis. In terms of structural reforms, these years saw a reversal of the stagnant situation of the late 1960s.

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[6] Economic policies in the 1970s, 1980s and 1990s are discussed in detail in the collections of essays in Bosworth, Dornbusch and Labán (1994b), Perry and Leipziger (1999b), and Larraín and Vergara (2000) and the numerous references therein. Also see Edwards and Edwards (1991) and Corbo, Lüders and Spiller (1997). An in-depth analysis of Chilean economic policy in the 1950s and 1960s can be found in Ffrench-Davis (1973).

Figure 2. Selected Economic and Political Variables
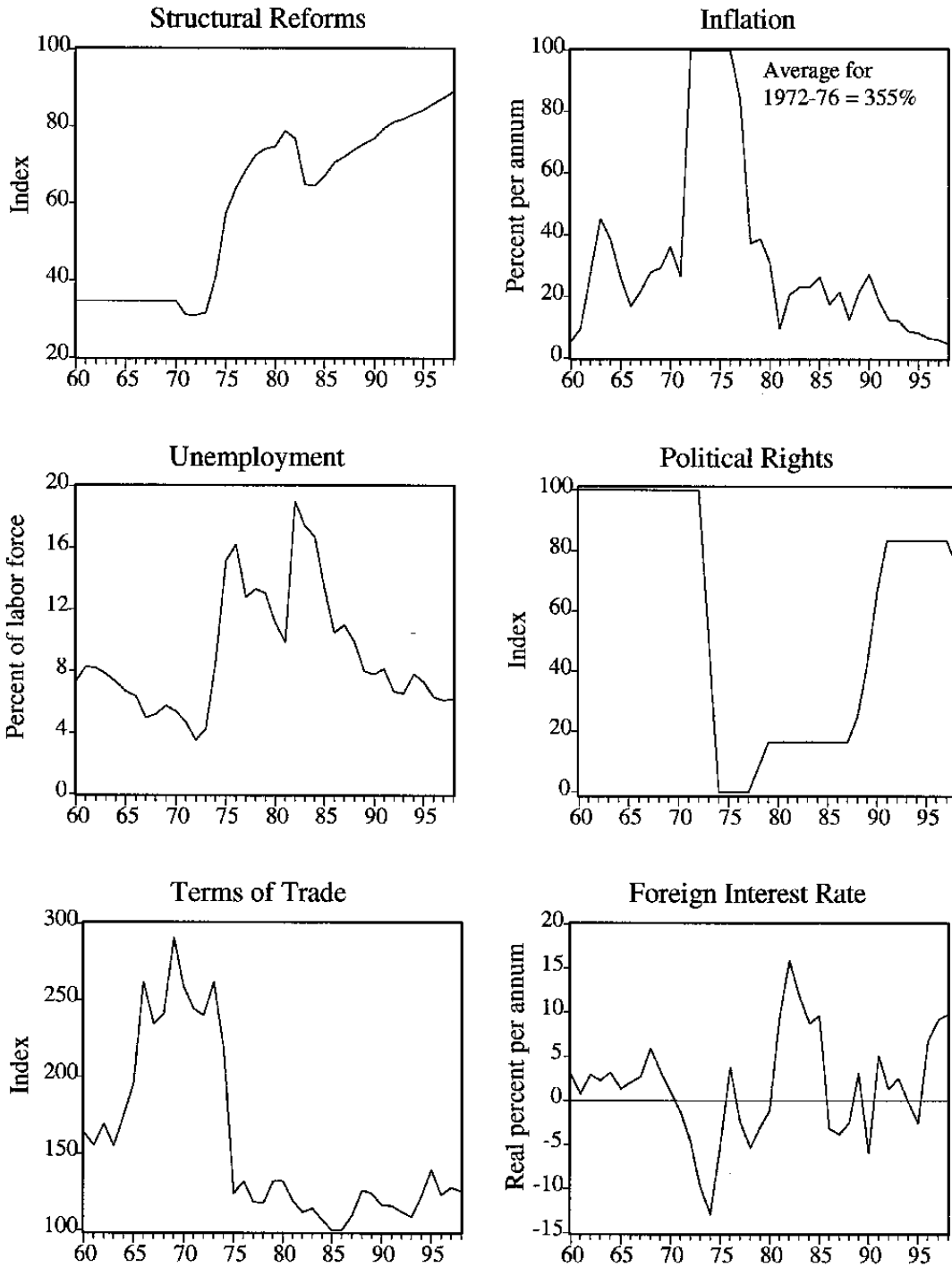
The military regime (1973-89) initially attempted to restore macroeconomic balances through restrictive fiscal and monetary policies. Although major macro disequilibria were in fact controlled and reverted, unemployment was very high, inflation remained at double digits for most of the period and the economy suffered two significant external crisis, first in 1975 and later in 1982. The latter was accompanied in 1983 by a major financial crisis, with virtual bankruptcy and nationalization of the bulk of the private banking system.[7] Only during 1985-89 was there a more coherent overall macroeconomic policy approach, although still with annual inflation fluctuating around 20 percent.

But the policies of the military regime went beyond attempting to restore macroeconomic balances. In fact, they pursued a "foundational" transformation of Chilean politics and society, and a consequent radical transformation of Chile's economy. In the second half of the 1970s and early 1980s major structural reforms oriented towards having a more open, competitive, private-sector-driven and price-deregulated market economy were implemented. These reforms included privatization of state-owned enterprises, dismantling the protectionist state, regulatory framework changes to make it consistent with a more open and competitive economy, trade liberalization, tax, financial and social security system reforms and overall market liberalization.

The 1982-83 crisis made clear that some of the above mentioned reforms, especially those related to financial liberalization, were naively conceived and/or inappropriately implemented. In particular, in the second half of the 1970s and early 1980s little consideration was given to elements such as initial imbalances and the appropriate speed and sequencing in reform implementation.[8] The crisis implied a partial reversal of some of the reforms but they were reinitiated forcefully, in a much more realistic and pragmatic manner, in the second half of the 1980s. Together with a drastic change in exchange rate policy to face the foreign sector crisis, the main components of the reform effort in 1985-89 were a further impulse to privatization, a new banking law, and the establishment of an independent Central Bank, which in December 1989 became an autonomous entity.

Since 1990 the democratic administrations gave high priority to overall macroeconomic equilibrium and to the control and reduction of inflation.[9] At the same time, they maintained and improved most of the structural reforms of the previous fifteen years, continuing and reorienting that process. Trade reform was extended; new capital markets and banking laws were promulgated; concession of public works were given a big impulse;

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[7] Corbo (1985) and Zahler (1985) analyze the macroeconomic policy errors that contributed to this crisis.

[8] See Zahler (1980 and 1983).

[9] See Zahler (1998).

environmental legislation was initiated; privatization's continued; education reform was deepened; the judicial system began to be modernized and made more efficient; and integration with world financial markets was increased.[10]

B. Political Rights

From 1940 to 1973 Chile had a well functioning democratic system. Political rights had been present in the 1925 Constitution and were reinforced by constitutional reforms and legislation that assured freedom of thought, speech and opinion, free press, free elections, universal suffrage, freedom to associate as well as separation of powers and reasonable institutional checks and balances. In that period Chile made progress in urbanization and in broadening access to education, health and housing of wide sectors of the population.

However, economic dynamism was only moderate and there was an increasing demand for a major economic and social change, which gave way to two important attempts to satisfy those demands. In 1965-70, with Eduardo Frei's Christian Democrat administration, a reformist "middle of the road" approach was followed. And in 1971 the *Unidad Popular* (Salvador Allende's) government, backed principally by the Socialist and Communist parties, tried to implement a more radical and revolutionary program, within the democratic system of government. The economic chaos during the Allende government, with rationing, queues, agrarian reform acceleration and overall expropriations, and the consequent social upheaval tensioned the democratic political system to an extreme. In 1973 the economy was in the verge of hyperinflation, the fiscal deficit soared to near 25 percent of GDP and international reserves were depleted. The increasing perception of significant threats to private property and even to the maintenance of democracy by important and numerous groups also contributed to the September 1973 *coup d'etat*, which gave way to a military regime that lasted until March 1990.

During the first years of the military regime most civil liberties and political rights were suppressed and basic human rights were systematically violated. Changes occurred only gradually through time. A new Constitution, of questionable legitimacy (for reasons both of content and of procedural vote), was approved in 1980. And after a plebiscite lost by the military government in October 1988, some constitutional reforms were introduced to mildly reduce the many authoritarian enclaves built in the Constitution.

The first free election after the military regime occurred in December 1989. In spite of their many efforts, democratic governments have not been able to correct the shortcomings of the Constitution of 1980. However, significant changes occurred during

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[10] See Labán and Larraín (1995), and the collection of papers in Pizarro, Raczynski, and Vial (1995) and Larraín and Vergara (2000).

the 1990s relative to the political practices of the previous sixteen years, in particular, the exercise of free speech, free association, free press and free elections were fully restored, and human rights violations ended.

C. External Conditions

The main determinant of Chilean terms of trade has been the international price of copper and to a much lesser extent the world price of cellulose and, on the import side, the price of oil.

During the late 1960s and early 1970s, Chile benefited from a historically high international copper price, about 50 percent higher in real terms than the price prevailing in the early 1960s and late 1970s.[11] In the early 1980s the real price of copper fell, and continued to fall, although at a lesser pace, throughout the rest of that decade and during most of the 1990s. Overall, during the 1990s Chile's terms of trade of goods and services were 3.6 percent higher than in the 1980s.

On the financial side, during the late 1960s real international interest rates declined quite significantly, becoming negative in the 1970s. As is well known, this fact together with the economic cycle in the industrial countries and the allocation by international banks of petrodollars, explains the significant net financial inflows to emerging markets, and in particular to Latin America, until 1981. At the beginning of the 1980s international interest rates increased dramatically, driven by the strict monetary policy of the United States. This fact, together with the significant build up of foreign debt during the 1970s, was a major determinant of the Latin American debt crisis of the early 1980s. While remaining high for historical standards, international interest rates decreased towards their traditional trend values by the end of the 1980s. The impact of the Latin America's debt crisis reflected itself in the very sharp fall in net capital flows to the region during the whole decade.

The cycle in the industrial countries explains the further fall in international real interest rates during the first years of the 1990s and a recovery, but still at low levels relative to historical trends, until 1995. Following the expansionary cycle in the industrial countries, international interest rates continued to increase during the second half of the 1990s. Latin America's structural reforms, improved economic management, and lower political country risk explain the abrupt change in the trend and the huge net capital inflows increases to the region during the first half of the 1990s. That process came to a halt with the Mexican crisis of December 1994. And after a small recovery following a fall in net inflows, Latin America registered a decrease in foreign financing during the second half of the 1990s, due basically to the impact of the Asian crisis on the region.

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[11] Deflated by the United States consumer price index.

III. EXPLAINING THE RAPID GROWTH OF THE 1990S

Simple accounting indicates that the rapid economic growth observed in Chile during the 1990s stems from an extraordinary improvement in the growth of average productivity per worker. This is illustrated in Figure 3, which shows how much of the growth of output during each of the last four decades corresponds to employment growth and how much to productivity growth. Between 1990 and 1998 the growth of employment was similar to the average of the previous decades. In contrast, the growth of productivity during the same period, roughly five percent per year, was substantially larger than the almost nil growth of productivity observed during the 1970s and 1980s, as well as significantly larger than the productivity growth observed in the 1960s. Because of this, all of the increase in the average rate of output growth during the 1990s relative to the previous decades can be attributed to faster productivity growth.

But what caused the rapid productivity growth of the 1990s? As noted in the Introduction, a long body of literature has suggested three main possible answers to this question. These include the *good policies hypothesis*, the *good luck hypothesis*, and the *political change hypothesis*.

A. On Assessing the Basic Hypotheses

Standard growth-accounting exercises *a la* Solow (1960), while useful for other purposes, are not very illuminating for assessing the empirical merits of the three basic hypotheses. Indeed, when applied to the recent Chilean growth experience, the main result of this type of exercise is that the proximate sources of the faster productivity growth in the 1990s were both a faster rate of capital accumulation and a more rapid growth of total factor productivity (i.e., a more rapid growth of the component of output growth that cannot be directly attributed to employment growth or capital accumulation).[12] This finding, however, does not take us very far in our inquiry: any of the above mentioned hypothesis could explain a simultaneous increase in total factor productivity and investment.[13]

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[12] The low growth of total factor productivity and capital accumulation during previous decades, especially in the seventies and eighties, and the rapid growth of both variables during the 1990s, are by now well established facts of Chile's growth experience. See, for example, Coeymans (1999a).

[13] A more disaggregated growth-accounting exercise is unlikely to provide a satisfactory empirical assessment of the basic hypotheses on its own. For example, Roldós (1997) found that part of the recent increase in Chile's total factor productivity can be attributed to an increase in the quality of capital, which, in turn, seems to have been largely due to a fall in the rental price of machinery. This is an interesting result, but for our purposes it only replaces one question with another: which of the three hypotheses explains the fall in the rental price of machinery?

Figure 3. Contributions of Employment and Productivity Growth
to Output Growth
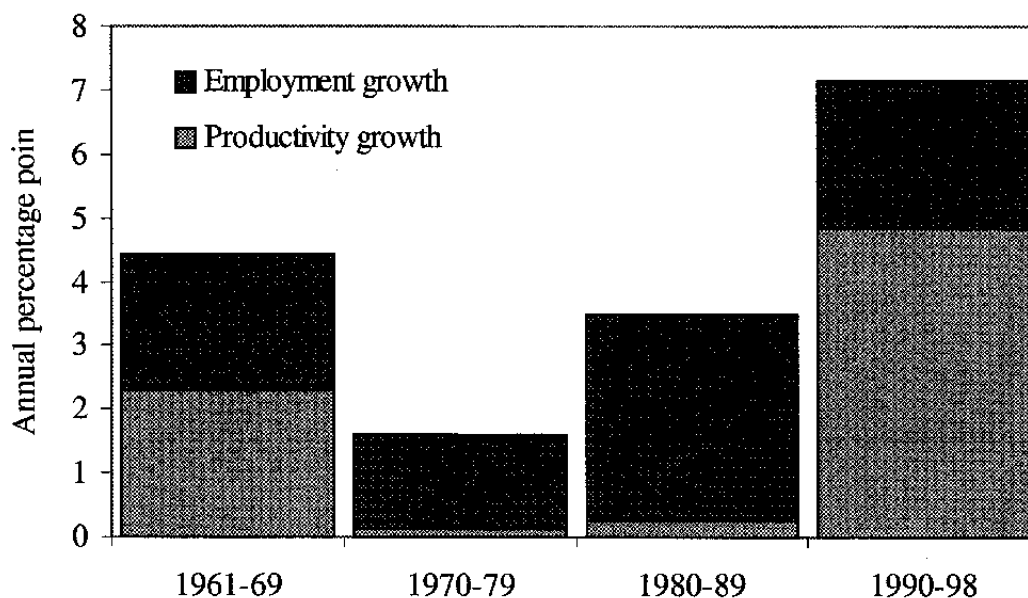
Another approach that does not easily permit to discriminate between the above basic
hypotheses is to examine the implications of standard cross-country growth-equations when
using data for Chile.[14] De Gregorio (1997) undertook this type of exercise on the basis of the
cross-country regression results obtained by Barro (1991), De Gregorio (1995), and De Long
and Summers (1991). Disappointingly for our purposes, his results imply that, when the
1990s are compared to the period 1960-85, most of the improvement in growth is either
unexplained by the equations, or has to be attributed to an exogenous increase in the rate
of investment in physical capital.

In this paper, we assess the relative validity of the above hypotheses using standard
time-series econometric techniques. Specifically, we estimate and test a time-series model
that links Chilean productivity growth linearly to a number of explanatory variables deemed
important under each hypothesis, and then use the results to gauge the contribution of each
of those variables to the rapid growth observed in the 1990s. This approach shares in
common with several previous empirical papers on Chilean growth the use of formal time-
series analysis including, among others, Jadresic and Sanhueza (1992), Marfán and
Bosworth (1994), Figueroa and Letelier (1994), Rojas, López and Jiménez (1997),

[14] Specifically, this approach involves examining the extent to which the changes in the
values of the explanatory variables observed in the case of Chile, multiplied by the
corresponding cross-country parameters, explain the changes in Chile's average growth.

Roldós (1997), Schmidt-Hebbel (1999) and Coeymans (1999a, 1999b). Our analysis differs, however, because several of the variables we include have not been considered in previous studies. In addition, in our basic analysis, we only introduce explanatory variables directly associated with each of the three contending hypotheses (although in Section IV we also examine the effects of adding additional variables).

B. The Model

As it was noted above, our starting point is a model of productivity growth that includes the variables deemed important by each of the basic hypotheses about the rapid growth of the 1990s. The specific model we consider conjectures that, in the long-term, Chile's productivity growth (g) has been determined as follows:

$$g = \alpha_1\ sr\ +\ \alpha_2\ inf\ +\ \alpha_3\ \varDelta tt\ +\ \alpha_4\ r\ +\ \alpha_5\ pr\ +\ \text{constant}, \qquad (1)$$

where sr measures the degree of progress on structural reform, inf the level of inflation, $\varDelta tt$ the (log) change in terms of trade, r the (real) foreign interest rate, and pr the existing degree of political rights,. Of course, sr and inf are the variables deemed important by the *good policies hypothesis*, $\varDelta tt$ and r the variables deemed important by the *good luck hypothesis*, and pr the variable deemed important by the *political change hypothesis*. Consistency with these hypotheses requires the parameters α_1, α_3, and α_5 to be positive (or at least nonnegative), and the parameters α_2, and α_4 to be negative (or at least nonpositive).

It is easy to see that, if the above model is validated by the econometric analysis, it provides a coherent framework to gauge the statistical and quantitative importance of the above-mentioned hypothesis. Indeed, given an econometric estimate of equation (1), the assessment can be done by testing whether the coefficients associated to the variables deemed important under each hypothesis are significantly different from zero, and by calculating the contributions made by the changes in the right hand side variables to the changes in productivity growth in the 1990s relative to previous decades. Validating such analysis, however, also requires testing whether the data supports the existence of a long-term relationship such as the one posited in equation (1).

In the next section, we examine formally the existence of such a long-term relationship using the cointegration tests developed respectively by Engle and Granger (1987) and Johansen (1991). The series used in the analysis are depicted in Figure 2 and Figure 4, and the data sources are described in the Appendix. Because in some years inflation was quite large (see figure 2), this variable was defined as the log-change in the price level (multiplied by 100) rather than as the percentage-change in the same variable. The effects of using alternative definitions of inflation, as well as other changes in specification, are reported further below. The data is annual for the period 1960-98.

Figure 4. Annual Productivity Growth and Output Growth

—— Productivity growth   —— Output growth
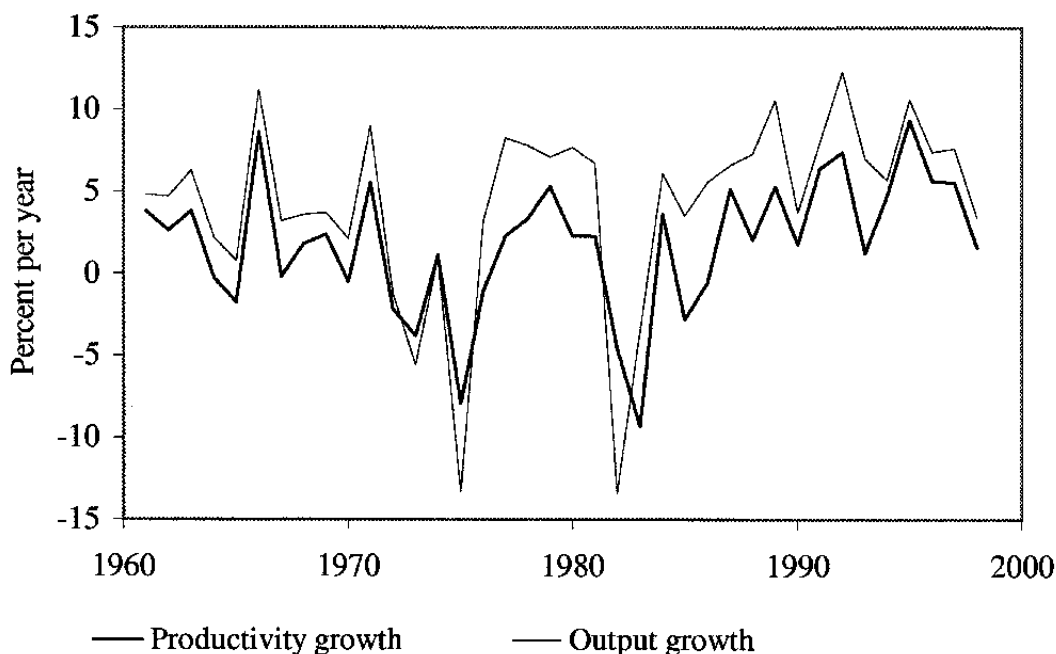
C. Cointegration Tests

Prior to verifying the existence of a cointegrating equation of the form of (1), we examined the order of integration of the basic series included in the analysis. The results of the augmented Dickey-Fuller (ADF) tests used to test for the existence of unit roots in those series are reported in Table 1. The tests cannot reject the hypotheses that the series are integrated of order one, except for the change-in-terms-of-trade variable, in which case the unit root hypothesis is clearly rejected. Some doubt arise in the case of the productivity growth series, which appears to be stationary when using the Dickey-Fuller test with one lag, but integrated of order one when using the ADF test with two lags. However, this doubt is dissipated by the results of the Johansen system procedure reported below, which support the characterization of this series as having a unit root rather than as being stationary. Given these results, in the remainder of this section we assume that all the basic variables are integrated of order one, except for the change-in-terms-of-trade variable.[15]

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[15] Since unit roots tests are known to have low power, however, the next section examines the effects of assuming that all the variables in the analysis are stationary.

Table 1. Unit Root Tests on Productivity Growth and Other Variables
(Augmented Dickey-Fuller Test)

	Levels		First Difference -	
	(1 lag)	(2 lags)	(1 lag)	(2 lags)
Basic Variables:				
Productivity growth	-3.08*	-2.08	-7.39**	-3.62**
Structural reform index	-1.02	-0.77	-3.54*	-2.73
Inflation (log changes)	-2.41	-2.08	-4.11**	-2.95*
Terms-of-trade change	-4.31**	-3.00*	-7.55**	-5.54**
Foreign interest rate (real)	-2.66	-2.80	-4.49**	-4.07**
Political rights index	-1.69	-1.77	-3.73**	-3.04*
Other Variables:				
Output growth	-3.47*	-2.59	-6.66**	-4.06**
Unemployment rate	-2.09	-1.76	-4.61**	-3.87**
Net capital flows to L. America	-2.34	-2.07	-4.70**	-3.29*
Fiscal surplus (percent of GDP)	-3.02	-3.28	-4.13*	-3.78*
Current Account Surplus (percent of GDP)	-2.27	-1.65	-6.48**	-3.62*

* (**) Rejection of unit-root hypothesis significant at 5 percent (1 percent); see
MacKinnon (1991).

The finding that, unlike the remainder variables, the change-in-terms-of-trade variable is stationary, implies that it makes no statistical sense to include it as part of an eventual long-term relationship such as the one posited in equation (1). Indeed, the stationarity of this variable implies that, sooner or later, its values tend to return to the mean. Therefore, this variable cannot explain a permanently faster or lower productivity growth than the one that would be implied by the behavior of the remaining variables considered in that relationship. Of course, this does not imply that the fluctuations in the terms of trade may have not been an important factor in the short-term determination of productivity growth. But it does imply that, for the purposes of examining the determinants of productivity growth in the long-term, we should dispense with this variable. We thus proceed to exclude it from this section's subsequent analysis.[16]

The simplest way to estimate and test the validity of equation (1) (amended to exclude the change-in-terms-of-trade variable) is to apply the two-stage procedure proposed by Engle and Granger (1987); i.e., to estimate it directly using ordinary least squares (OLS), and then apply a unit-root test on the residuals of the regression.

When implementing this procedure, the result of the OLS regression gives:

$$g \ = \ \underset{(1.9)}{0.063 \ sr} \ - \ \underset{(-2.9)}{0.048 \ inf} \ - \ \underset{(-3.5)}{0.351 \ r} \ + \ \underset{(2.3)}{0.038 \ pr} \ - \ 1.86, \tag{2}$$

where the number in parenthesis are t-statistics, T = 38 [1961-98], R^2 = 0.50, and dw = 2.9.

Consistently with the priors, these results indicate that, in the long term, productivity growth increases with progress in structural reform, lower inflation, increased political rights, and lower foreign interest rates. Also, if one is willing to make the assumption that the innovations to the right-hand side variables are uncorrelated with the regression residual, the sizes of the t-statistics associated to the coefficients between -1.9 and -3.5 are encouraging. Since such an assumption may be unfounded, however, it is preferable to defer an assessment of the statistical significance of the coefficients until after applying Johansen's procedure.

Most important for our purposes, the residuals implied by the regression results summarized in equation (2) appear to be stationary. Indeed, implementing the ADF test statistics on these residuals gives ADF(1 lag) = -7.1 and ADF(2 lags) = -4.0. Both of these values are larger in absolute value than the corresponding Mackinnon (1991) critical values for rejection of hypothesis of a unit root at the 5 or 1 percent significance level (respectively -2.9 and -3.6). Thus it can be concluded that, according to the Engle-Granger test, there

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[16] The analysis in the next section shows that the results in this section remain basically unchanged when the change-in-terms-of-trade variable is brought back to the analysis.

indeed exists a cointegrating equation linking productivity growth with the remaining variables considered in the analysis.

While the Engle-Granger procedure is easy to implement, it is well know that it has some defects. In particular, its results depend on which variable is put on the left-hand-side when estimating the cointegrating equation, it does not permit to investigate the number of cointegrating equations that may be present in the data, and it relies on a two-step estimator so that any error introduced in the first step is carried into the second step. Fortunately, the above problems can be dealt with by using the Johansen procedure, which we apply next.

Table 2 presents the results of the Johansen rank tests for the hypotheses that the variables under consideration are not cointegrated against the alternatives that there are at most 1, 2, 3 or 4 cointegrating equations. Following the Schwarz criteria, the test-VAR used to perform the tests includes one lag.[17]

Table 2. Johansen Rank Cointegration Test for Base Specification 1/

Eigenvalue	Likelihood Ratio	Critical Value		Hypothesized No. of Cointegrating Equations
		5 percent	1 percent	
0.763	89.0	68.5	76.1	None**
0.407	37.2	47.2	54.5	At most 1
0.332	18.4	29.7	35.7	At most 2
0.075	3.84	15.4	20.0	At most 3
0.028	1.03	3.76	6.65	At most 4

1/ The system is a first-order VAR of g, sr, inf, r, and pr. The test allows for intercepts in the cointegration equations and the test-var.

**Rejection significant at 1 percent

As shown in Table 2, the Johansen rank test rejects the hypothesis that productivity growth and the remaining variables under consideration are not cointegrated. At the same time, the test cannot reject the hypothesis that there is at most one cointegrating equation. The estimated equation is:

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[17] Since the test-VAR was defined in terms of first differences of the variables, this is equivalent to including two lags in a test-VAR defined in terms of the levels of the variables.

$$g \quad = \quad 0.051 \; sr \; - \; 0.056 \; inf \; - \; 0.464 \; r \; + \; 0.038 \; pr \; - \; 0.58$$
$$\qquad\qquad (4.8) \qquad (-7.4) \qquad (-11.2) \qquad (6.7) \qquad\qquad\qquad (3)$$

The coefficients in this equation all have the expected sign, and their magnitudes are similar to the ones obtained when using the Engle-Granger procedure. The main difference is that the t-statistics in this equation are much larger, with absolute values roughly between 5 and 11. Since under the Johansen methodology these t-statistics have the standard asymptotic distribution, this implies that the estimated coefficients are different from zero at very high levels of significance.

To summarize, the formal empirical analysis shows that there has indeed existed a long-term relationship between productivity growth and the degree of progress in structural reforms, the level of inflation, the foreign interest rate, and the degree of political rights. Moreover, the econometric estimates show that the coefficients characterizing this relationship are statistically significant, and have signs consistent with the priors embedded in the three basic hypotheses about Chile's rapid growth during the 1990s. In the next section we proceed to use these estimates to examine quantitatively the sources of that growth.

D. The Sources for the Rapid Growth of the 1990s

While the results in the previous section discarded that the fluctuations in the terms of trade had any long-lasting effects on productivity growth, they also showed that all the other variables considered in equation (1) played a role that was statistically significant. Since the latter includes variables representative of each of the three hypotheses about the rapid growth in the 1990s, it follows that, from a purely statistical viewpoint, none of those hypotheses can be dismissed. However, the question remains regarding what was the relative contribution of each of the relevant factors.

To answer this key question, in Table 3 we use the estimated model to obtain a summary account of the sources of productivity growth during the last four decades. Since assigning absolute values in an accounting exercise like this requires some type of normalization, we measure the contribution of each explanatory variable during a given decade relative to their contribution during the full sample period. Specifically, we compute the contribution of each explanatory variable by multiplying the variable's average deviation from the full sample mean during the given decade by the long-term multipliers specified above. In this context, the contribution of the constant is set equal to the average growth of productivity during the sample period. "Other" correspond to the difference between the sum of the above contributions and actual productivity growth. The specific coefficients we use in the calculations are the ones obtained with the Johansen methodology (equation (3)).

For the purposes of our analysis, the main results contained in Table 3 can be found in its three bottom rows. These rows show the contribution to the changes in productivity growth made by the different explanatory variables when the 1990s are compared respectively with the 1960s, 1970s, and 1980s. Note that, since these rows take

the difference between contributions in different decades, they are unaffected by the specific normalization used to obtain the absolute contributions reported for each decade.[18]

The results in the bottom three rows indicate that the assessment of which where the sources for the rapid productivity growth in the 1990s depends on whether the situation of that decade is compared to the situation of the 1960s, the 1970s, or the 1980s. Specifically:

- When comparing with the 1960s, the faster productivity growth of the 1990s is explained essentially by the cumulated structural reforms, whose contribution to the increase in productivity growth is similar to the latter's total increase. Productivity growth in the 1990s could have been even higher due to a lower level of average inflation, but this was prevented by a somewhat less favorable situation on political rights. Also, since in average the (real) foreign interest rate was similar in both decades, this variable explains very little of the differences in productivity growth in the 1990s relative to the 1960s.

- If the 1970s are used as standard of comparison, the bulk of the faster productivity growth in the 1990s stems from the substantially lower level of average inflation that prevailed in the latter decade. Given that the 1990s were characterized by a higher degree of progress in structural reforms and a better situation in political rights, the differences in productivity growth could in fact have been much larger, but the cheap foreign credit available in the 1970s permitted to counterweigh those differences.

- Relative to the situation in the 1980s, most of the increase in productivity growth observed in the 1990s is explained by the improvement in political rights. The positive effect of democracy was supplemented by the deepening of the structural reforms during the 1990s, lower average inflation, and lower real foreign interest rate (factors which contributed respectively with 12, 9, and 20 percent of the faster productivity growth in the 1990s relative to the 1980s).

Putting these results together, it follows that, from an historical viewpoint, the key factors underlying the rapid productivity growth in the 1990s were the structural reforms began in the mid 1970s and continued and deepened in the 1980s and 1990s, the relatively low-inflation environment that prevailed during the nineties, and the improvement of political rights observed since the late 1980s. Only when compared with the 1980s it can be argued that productivity growth in the 1990s benefited somewhat from a more favorable external environment through lower foreign interest rates. However, the latter explains

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[18] The disaggregation corresponds to the formula $\Delta g = \alpha_1 \Delta sr + \alpha_2 \Delta inf + \alpha_4 \Delta r + \alpha_5 \Delta pr + others$, where the Δ's are defined over the average of the decades being compared.

Table 3. Sources of Productivity Growth During 1961-98
(Average percentage points per year, unless otherwise indicated)

Period	Constant	Structural Reforms	Inflation	Foreign Interest Rate	Political Rights	Other	Total
Average value of each variable:							
1961-69	-	0.35	0.24	2.7	1.00	-	-
1970-79	-	0.51	0.92	-3.9	0.38	-	-
1980-89	-	0.72	0.19	4.8	0.20	-	-
1990-98	-	0.83	0.11	2.9	0.81	-	-
Contribution to productivity growth:							
1961-69	1.8	-1.3	0.8	-0.5	1.6	-0.1	2.3
1970-79	1.8	-0.5	-3.0	2.6	-0.8	0.1	0.2
1980-89	1.8	0.6	1.0	-1.5	-1.4	-0.2	0.3
1990-98	1.8	1.2	1.5	-0.6	0.9	0.1	4.9
Contribution to changes in productivity growth							
1990-98 vs 1961-69	-	2.5	0.7	-0.1	-0.7	0.2	2.5
1990-89 vs 1970-79	-	1.7	4.5	-3.2	1.6	0.0	4.6
1990-89 vs 1980-89	-	0.6	0.4	0.9	2.3	0.3	4.5

only a minor part of the differences between productivity growth in the two decades, and, in any case, it was due to uncommonly high foreign interest rates in the first half of the 1980s rather than to uncommonly low foreign interest rates in the 1990s (see Figure 2 and Table 3).

To summarize, the above results support the *good policies* and the *political change hypotheses* about the reasons for the rapid productivity growth of the 1990s. At the same time, they undermine the *good luck hypothesis* as a relevant explanation of that phenomenon.

IV. ROBUSTNESS

It is clear that the above findings hinge on the validity of the parameters of the estimated cointegrating equation. This sections reports the results of developing number of extensions, including the effects of conducting the econometric analysis for output growth instead of productivity growth, incorporating some additional variables, using alternative measures of inflation, and excluding data for the 1960s and for 1996-98. It also reports the effects of assuming that the basic variables are stationary rather than integrated of order one.

Except for the results for the latter analysis, all the results reported in this section were obtained using the Johansen methodology. Since in all these cases the hypothesis of no cointegration was rejected at the standard levels of significance, the following discussion omit the details of those tests and focus directly on the relevant cointegrating equations associated to the systems under consideration, reported in Tables 4 to 7. In most cases, the reported equation corresponds to the only cointegrating equation found for the system under consideration. In the cases in which the cointegration test indicated the existence of two cointegrating equations, the reported equation corresponds to a normalization that solves for productivity growth (or output growth) as a function of the remainder variables in the base specification (i.e., *sr*, *inf*, *r*, and *pr*). These cases are identified in the tables' endnotes. In no case did the tests indicate the need to consider three or more cointegrating equations. As it is customary, the coefficients of the cointegrating equations reported in the tables are normalized such that the coefficient on the variable of interest is unitary and all the variables appearing in the cointegrating equation are put on the same side of the equation.

A. Focusing on Output Growth Instead of Productivity Growth

As noted above, since all of the rapid growth of the 1990s relative to the previous decades stems from an improvement in productivity growth, it was sufficient for our purposes to focus on the determinants of the latter. It is interesting, nonetheless, to examine the consequences of estimating the basic model replacing productivity growth with output growth but maintaining unchanged the specification of the remainder variables in the system.

Table 4. Estimated Cointegrating Equations with Output and Productivity Growth Including and
Excluding the Unemployment Rate 1/

(t-statistics in parenthesis)

System Including:	Output Growth	Productivity Growth (g)	sr	inf	r	pr	Unemployment Rate
Output growth	1.00	--	-0.025 (-1.4)	0.103 (7.9)	0.615 (8.9)	-0.018 (-1.9)	--
Output growth & unemployment rate	1.00	--	-0.084 (-7.2)	0.035 (3.6)	0.503 (8.9)	-0.051 (-3.9)	-0.124 (-0.9)
Productivity growth	--	1.00	-0.051 (4.8)	0.056 (7.4)	0.464 (11.2)	-0.038 (-6.7)	--
Productivity growth & unemployment rate	--	1.00	-0.071 (-4.1)	0.033 (1.7)	0.415 (7.3)	-0.045 (-6.0)	--

1/ Except for the system with productivity growth and the unemployment rate, the reported equations correspond to the only cointegrating equations found for those systems. For the remainder system, the Johansen cointegration test indicated two cointegrating equations; in this case, the reported equation corresponds to a normalization that solves for productivity growth as a function of the variables in the base specification, excluding the unemployment rate. Uninteresting constants are omitted.

As shown in the top row of Table 4, the result of conducting that exercise is that the size of the coefficients on both the foreign interest rate and especially the inflation variable increase, while the size of the coefficients on the structural reforms and political rights variables decline and become statistically insignificant. The next row of Table 4 shows, however, that once the unemployment rate is included in the system, this result is reverted.

It is essentially because of the sensitivity of the cointegrating equations with output growth to including a cyclical variable that above we preferred to focus on productivity growth. As shown in the bottom-two rows of Table 4, the cointegrating equation estimated when focusing on productivity growth is robust to the inclusion of the unemployment rate in the system. In particular, while there is a little bit of redistribution between the coefficients that measure the weights of the variables related to the good policies hypotheses, the coefficients associated to the good luck and the political change hypotheses are fairly stable.

In terms of the assessment of the sources of the rapid growth of the 1990s, these results imply that focusing on output growth does not affect the essence of the above findings if one also includes in the system a variable measuring cyclical fluctuations, such as the unemployment rate. Indeed, it is easy to see that, given the size of the coefficients estimated in the cointegrating equation for output growth including the unemployment rate, repeating the growth accounting performed above gives results similar to those reported in Table 3.

B. Incorporating Additional Variables

There are variables that were not included in the test nor in the estimation of the cointegrating equations found in the previous section, and that could perhaps have been included in the analysis. Table 5 shows the consequences of adding a number of those variables: the change-in-terms of trade variable omitted earlier (to allow for the possibility that when applying a system procedure this variable does not appear to be stationary and does really belong into the cointegrating equation), the level of the terms of trade (to allow for the admittedly hard-to-justify possibility that it is the level rather than the rate of change of the terms of trade what matters for long-term growth), a variable measuring the supply of net capital flows to Latin America in percent of regional GDP (which because of market imperfections or measurement problems may provide a better measure of the conditions faced by Chile in the international capital markets than the foreign interest rate), and a dummy variable equal to unity during all of the 1990s and zero in earlier years (to capture the idea that there might be an omitted variable which is peculiar to this decade and which is the one that really explains the rapid growth of the 1990s). Table 5 also includes the effects of incorporating into the system the fiscal and the external current account balances in percent of GDP (as surpluses or smaller deficits in these accounts may have an independent effect on productivity growth, say by improving market confidence).

Table 5. Estimated Cointegrating Equations in Systems With Additional Variables
(t-statistics in parenthesis)

System Including: 1/	g	sr	inf	r	pr	Additional Variable 2/
Terms-of-trade change	1.00	-0.054 (-5.4)	0.055 (7.4)	0.472 (12.3)	-0.038 (-7.2)	--
Terms-of-trade level	1.00	-0.041 (-2.6)	0.081 (10.4)	0.575 (11.8)	-0.033 (-5.4)	-0.371 (-0.3)
Net capital flows to Latin America	1.00	-0.050 (-5.0)	0.057 (7.8)	0.447 (9.8)	-0.040 (-7.0)	--
Dummy 1990s	1.00	-0.053 (-4.5)	0.053 (5.5)	0.450 (9.8)	-0.039 (-6.6)	--
Fiscal surplus	1.00	-0.046 (-4.7)	0.058 (8.0)	0.440 (10.3)	-0.037 (-7.2)	--
Current account surplus	1.00	-0.048 (-5.6)	0.064 (7.9)	0.405 (10.2)	-0.030 (-4.1)	-0.093 (-1.0)

1/ The systems include the variables in the base specification (g, sr, inf, pr, and r) plus the variable indicated in the first column. The cointegrating equation reported for the system including the terms-of-trade level and the current account surplus correspond to the only cointegrating equations found for those systems. For the remainder systems, the Johansen cointegration test indicated two cointegrating equations; in these cases the reported equations correspond to a normalization that solves for productivity growth as a function of the variables in the base specification (thus excluding the additional variable introduced by each alternative system). Uninteresting constants are omitted.

2/ Respectively, the terms-of-trade level and the current account surplus.

As the comparison of the equations in Table 5 with equation (3) quickly reveals, the estimation results do not change much when these additional variables are included in the analysis. Of course, this also implies that the growth accounting results reported in Table 3 are not affected significantly when these variables are considered.

C. Alternative Measures of Inflation

As noted above, the base specification measures inflation in terms of log-changes of the price level. Table 6 reports the effects on the cointegrating equation of measuring inflation in the traditional way as the change in the price level relative to the *past* price level. It also shows the effects of measuring inflation as the change in the price level relative to the *current* price level. These alternative ways to measure inflation make little difference when inflation is low, say less than 10 percent per year, but can lead to very different numbers when inflation is high such as it was in Chile in most of the 1970s.

As shown in Table 6, changing the way to measure inflation has little effect on the coefficients attached to the foreign interest rate and political rights variables, but redistributes a bit the weights of the coefficients attached to the structural reforms and inflation variables. A quantitative examination of the effects of these changes on the analysis of the sources of growth, however, shows that they tend to compensate each other. The implication is that choosing alternative ways to measure inflation can affect a bit how much of the rapid growth of the 1990s should be attributed to the cumulated structural reforms and how much to the low-inflation environment prevailing in that decade. But the way inflation is measured does not affect significantly the assessment about the role played by economic policies relative to the role played by the changes in the external and political circumstances.

D. Excluding Data for Selected Periods

As noted in the Appendix, the index of structural reform calculated by Morley, Machado, and Pettinato (1999) is not available for the periods 1960-69 and 1996-98, so that we extrapolated it using the simple assumptions that the index had been constant prior to 1970, and growing according to the 1990-95 trend from 1996 onwards. These assumptions seem broadly consistent with the discussion in Section II and the references therein, and permit not to lose too many degrees of freedom in the econometric analysis. Nonetheless, it is useful to explore whether the results depend on these assumptions.

The simplest approach to examine the importance of these assumptions for the basic results is to reestimate the basic model excluding all the data for the periods for which the structural reforms index was extrapolated. The corresponding results are summarized in Table 7. The comparison with equation (3) reveals that using the equations estimated without that data leads to a qualitatively similar assessment of the main hypotheses about the rapid growth of the nineties.

Table 6. Estimated Cointegrating Equations Using Alternative Measures of Inflation 1/
(t-statistics in parenthesis)

Inflation Measured as:	g	sr	inf	r	pr
In base specification: log(P$_t$/P$_{t-1}$)	1.00	-0.051 (-4.8)	0.056 (7.4)	0.464 (11.2)	-0.038 (-6.7)
Price changes w/r to *past* price level: (P$_t$-P$_{t-1}$)/P$_{t-1}$	1.00	-0.063 (-6.6)	0.023 (7.7)	0.439 (11.0)	-0.040 (-7.7)
Price changes w/r to *current* price level: (P$_t$-P$_{t-1}$)/P$_t$	1.00	-0.039 (-3.1)	0.098 (6.0)	0.429 (9.8)	-0.037 (-5.8)

1/ The systems include the variables *g, sr, inf, r, and pr*, with inflation measured as indicated in the first column. The Johansen cointegration test indicated the existence of only one cointegrating equation in each case. Uninteresting constants are omitted.

Table 7. Estimated Cointegrating Equations Excluding Data for Selected Periods 1/
(t-statistics in parenthesis)

Period Excluded	g	sr	inf	r	pr
1960-69	1.00	-0.050 (-4.3)	0.055 (8.1)	0.482 (13.4)	-0.039 (-8.1)
1996-98	1.00	-0.036 (-3.2)	0.056 (8.3)	0.487 (12.6)	-0.031 (-5.5)
1960-69 and 1996-98	1.00	-0.038 (-3.8)	0.054 (10.4)	0.495 (17.3)	-0.032 (7.8)

1/ The systems include the variables *g, sr, inf, r, and pr*. The Johansen cointegration test indicated the existence of only one cointegrating equation in each case. Uninteresting constants are omitted.

E. Assuming the Basic Variables are Stationary

The unit root tests in Section III indicated that for all variables but the change-in-terms-of-trade-variable the unit root hypothesis cannot be rejected. Following standard practice, the subsequent analysis assumed that the basic variables are integrated of order one and proceeded to use a cointegration approach. It is well know, however, that standard unit root tests have small power in small samples. We now consider the effects of assuming that the basic variables are stationary.

Under the assumption that the basic variables are stationary, a simple estimable model for productivity growth that is consistent with the basic hypothesis we want to assess is provided by the following autoregressive distributed lag model:

$$g_t = constant + \sum_i \sum_{s=0}^{p} \alpha_{is} x_{it-s} + \sum_{s=1}^{p} \lambda_s g_{t-s} + \varepsilon_t \tag{4}$$

where $\{x_{it-s}\}_i = \{sr_{t-s}, inf_{t-s}, pr_{t-s}, dtt_{t-s}, r_{t-s}\}$, α_{is} and λ_s are the coefficients to be estimated, p denotes the number of lags, and ε_t is white noise.

If one has an estimate of equation (4), and provided that the parameters λ_s satisfy the stability condition that their sum is smaller than unity in absolute value, it is straightforward to use this model to assess the contributions to the long-term changes in productivity growth of the remainder variables in the system. Indeed, these contributions can be obtained from the long-term multipliers associated to equation (4), which are given by:

$$\frac{\partial g}{\partial x_i} = \left(1 - \sum_{s=1}^{p} \lambda_s \right)^{-1} \sum_{s=0}^{p} \alpha_{is}. \tag{5}$$

For the purposes of assessing the sources of the long-term changes in productivity growth, these multipliers play a similar role as the coefficients of the cointegrating equations estimated above. Therefore, a simple way to assess the consequences of assuming that the variables are stationary is to compare the value of these multipliers with the value of the coefficients in the cointegrating equations (multiplied by minus one).

Table 8 shows the results of estimating the autoregressive distributed lag model (4) under the assumption that the variables are stationary. Two results stand out. First, the values of the implied long-term multipliers are all remarkably similar to the value of the coefficients in the cointegrating equation (3) (multiplied by minus one). Thus assuming that the basic variables are stationary does not change the basic results obtained in the previous section.

Table 8. Estimated Autoregressive Distribute Lag Model Under the Assumption that the Basic Variables are Stationary 1/
(t-statistics in parenthesis)

	g	sr	inf	Δtt	r	pr
Coefficients on current values	1.00	-0.311	0.061	-0.067	0.167	-0.008
		(-1.5)	(2.4)	(-1.4)	(1.4)	(0.1)
Coefficients on first lag	0.387	0.226	0.005	0.040	0.295	-0.049
	(2.2)	(1.1)	(0.2)	(0.8)	(2.3)	(0.8)
Implied long-term multipliers	--	0.061	-0.048	0.077	-0.333	0.041
		(2.5)	(-2.1)	(1.3)	(-3.1)	(3.1)

R2=0.70

dw=2.25

p-values for Ljung-Box Q-statistics: 0.41 (1 lag), 0.17 (2 lags), 0.30 (3 lags)

1/ Estimated on the basis of ordinary least squares. An uninteresting constant is omitted.

Second, while the long-term multiplier for the change-in-terms-of-trade variable is positive, its value is not significantly different from zero at the standard levels of significance, and its magnitude is quantitatively small (if the annual growth of the terms of trade increases by one percentage point, annual productivity growth increases by only 0.077 percentage points). Therefore, assuming that the basic variables are stationary does not modify the conclusion that the term of trade variable has not been important for the determination of productivity growth in the long term.

V. Concluding Remarks

Several explanations for the rapid growth of the Chilean economy in the 1990s have been proposed in the literature. However, little formal evidence has been provided about the relative relevance of those explanations. To fill this gap, this paper first reviewed the main factors that conditioned the evolution of the economy during that period, and then estimated and examined the implications of a formal model of productivity growth.

The paper's statistical and quantitative results imply that Chile's recent rapid growth was essentially due to good policies and an improvement in the country's political situation. The importance of good policies is revealed by the finding that, when taking a long term perspective such as the one given by a comparison with the 1960s, essentially all of the increase in productivity growth can be attributed to the structural reforms began in the mid-1970s and reoriented, continued and improved in the 1980s and 1990s. It is also supported by the fact that, when compared to the growth of productivity in the 1970s, the increase in productivity during the 1990s can essentially be attributed to the reduction in average inflation. The importance of the political change is revealed by the finding that, when compared to the growth of productivity in the 1980s, more than half of the increase in productivity in the 1990s can be attributed to the improvement in political rights.

The results in this paper also undermine the hypothesis that the rapid growth observed in Chile in the 1990s was due to good luck in the external sector. First, it appears that from a long-term historical perspective, the average real foreign interest rate during the 1990s was not especially low, and neither the level nor the rate of change of the terms of trade improved significantly. Second, the above analysis shows that even if one takes as standard of comparison the particularly unfavorable external circumstances that prevailed in the 1980s, the contribution of the somewhat improved external circumstances of the 1990s to foster productivity growth in that decade was much smaller than the contributions made by the improvements in political rights and the additional progress in structural reform and the reduction of inflation.

Regarding the implications for other experiences, no mechanical extrapolation of these results seems appropriate without due consideration of the initial conditions, stage of development, and institutional specificity's of the particular experience being analyzed. For instance, it should be taken into account that for nearly all of its existence as an independent country before the 1973-89 military regime, Chile had been a democratic country. In countries where democracy has not been the normal state of affairs, the replacement of an authoritarian regime by a democracy may not necessarily reduce the uncertainty about the rules of the political and economic game. While these and other caveats may be made, however, the results in this paper clearly support the view that good economic policies and a suitable political situation can bring substantial economic dividends.

Data Sources

Structural reforms index. We use the general reform index for Chile calculated at the *United Nations Economic Commission for Latin America and the Caribbean* by Morley, Machado, and Pettinato (1999), who build on and extend similar previous work at the *Inter-American Development Bank* by Eduardo Lora (1997). This index is an average of five underlying subindexes that measure the degree of progress on trade reform, domestic financial liberalization, international financial liberalization, tax reform, and privatization (which the authors calculate with a common methodology for 17 Latin American countries for the period 1970-95). For the period before 1970, we assume that there was no change in this index; and for the period 1996-98, we assume that the index evolved according to the same trend observed between 1990 and 1995. We multiplied the original index by 100.

Political rights index. This index, which measures the degree to which people are able to participate freely in the political process, is taken from the Comparative Survey of Freedom produced since 1973 by the *Freedom House*. The data and methodology can be found in the website www.freedomhouse.org, and has been analyzed by Gastil (1990). We converted the original series ranging from 1 (most free) to 7 (least free) linearly to a series ranging between 0 (least free) and 100 (most free). For the 1960s and early 1970s, we assumed that the political rights were the same as in 1972-73; i.e. the index took the maximum value. This assumption is consistent with Bollen's (1980) ranking of Chile's political democracy in 1960 and 1965 as one of the most advanced in the world (with values of 97.0 and 99.7 respectively, for a possible range between 0 and 100).

Foreign interest rate. Corresponds to the 6-month libor rate adjusted by external inflation. The latter is measured by the changes on an index of external prices computed as a weighted average of the producer prices of Chile's main trade partners expressed in dollars (Ffrench-Davis, 1984, and *Central Bank of Chile*).

Net capital flows to Latin America (in terms of regional GDP). We summed up the current account deficit and change in foreign exchange reserves in U.S. dollars in Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Panama, Peru, Uruguay, and Venezuela, and then divided by the total GDP of the above economies in US dollars. The data was provided by Gian-Maria Milesi-Ferretti at the International Monetary Fund. For details on the data, see Lane and Milesi-Ferretti (1999).

Other. The data on real output, employment (used for the calculations of labor productivity), unemployment, terms of trade of goods and services, external current account balance, and fiscal surplus, are from the *Central Bank of Chile*. The price level data corresponds to the Consumer Price Index reported by the *Central Bank of Chile*, except for 1970-78, which is from Cortázar and Marshall (1980) and Yañez (1978).

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