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Resumen

Desde mediados de los ochenta, el crecimiento económico en Chile ha destacado por su alto nivel y persistencia. Este trabajo intenta dar luces sobre los factores que estuvieron detrás de ello y analizar en qué medida pueden ser sostenidos a futuro. La primera parte del trabajo presenta algunos hechos estilizados. Conjuntamente, éstos sugieren que el salto en el crecimiento fue generado por políticas y condiciones macroeconómicas que afectaron la productividad global de la economía. La segunda parte del trabajo utiliza el enfoque tomado por la literatura empírica reciente sobre crecimiento que usa base de datos mundiales para examinar el grado en que este enfoque puede explicar el desempeño chileno. Formulamos y estimamos econométricamente (usando técnicas adecuadas para estimar paneles dinámicos) un modelo básico que contiene las variables más usadas en esta literatura. Este modelo permite explicar cerca del 45% del cambio en la tasa de crecimiento entre 1970-85 y 1986-1998, el cual fue 4.74%. Mientras que un modelo expandido al incluir la calidad del sistema político y la gobernabilidad, la extensión y complementariedad de las reformas, y la disponibilidad de servicios públicos e infraestructura, podemos explicar un 73% de la mejora del crecimiento. Finalmente, se evalúan fuentes potenciales de crecimiento, en primer lugar, proyectando la tasa de crecimiento para los próximos 10 años bajo varios supuestos, y luego, proponiendo algunas áreas con retornos potencialmente elevados.

Abstract

Economic growth in Chile since the mid 1980s has been remarkable for its high level and persistence. This paper attempts to shed light on the factors behind it and analyze the extent to which they can be sustained in the future. The first part of the paper presents some stylized facts. Taken together, they suggest that the jump in growth was driven by policies and macroeconomic conditions that affected the economy's overall productivity. The second part of the paper considers the recent empirical growth literature to examine the extent to which a cross-country approach can explain Chile's growth. We formulate and estimate – using techniques suited for dynamic models of panel data— a basic model containing the most popular variables in the literature. Our basic model allows us to explain about 45% of the change in the growth rate between 1970-85 and 1986-1998, which was 4.74%. When we expand the basic model to include the quality of the political system and governance, the comprehensiveness and complementarity of policy reforms, and the availability of public services and infrastructure, we can explain 73% of the growth improvement. The last part of the paper starts the evaluation of possible new growth sources for Chile by, first, projecting the country's growth rate for the next decade under various assumptions and, second, proposing some areas with potentially large returns.

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INTRODUCTION

This paper studies Chile's economic growth performance in the last four decades. For this we follow a macroeconomic perspective and use regional and world trends as benchmarks for comparison. Economic growth is a particularly interesting subject matter because of Chile's remarkable growth performance between 1985 and 1998, in which the country's growth rate was in the top four of the world. Equally remarkable is that this high rate resulted from a sharp turnaround in economic growth. In fact, the *change* in Chile´s per capita GDP growth rate between 1985-98 and the previous 15 years was, by far, the highest in the world. Consequently, the first objective of the paper is to consider a series of questions and hypothesis to explain Chile's growth improvement. Explaining economic growth in Chile is important not only for academic reasons but also because it could shed light on the sustainability of the high rates of growth in the country. Thus, a second objective of the empirical analysis is to assess what can be expected for Chile's growth rate in the future –and with the pre-conditions for continued growth.

The outstanding macroeconomic performance of Chile in the late 1980s and 1990s has been portrayed as an example of successful market-oriented policies and, as such, has been the subject of numerous studies. See, for instance, Bosworth, Dornbusch and Labán (1994); Corbo, Luders, and Spiller (1998); Perry and Leipziger (1999); and Solimano (1999). There is a large empirical literature that attempts to explain the determinants of Chile's growth achievement. According to their methodology, we can classify these articles in four categories. In the first, papers take a time-series econometric approach. That's the case of Coeymans (1999); Jadresic and Zahler (2000); and Rojas, López, and Jiménez (1997). The second group uses growth accounting to identify the relative contribution of production factors and total factor productivity. In this group are Chumacero and Fuentes (2001); Corbo, Luders, and Spiller (1998); De Gregorio (1997); Marfán and Bosworth (1994); Solimano (1996); Roldós (1997); and García (2001). The third category uses calibrated analytical models to study economic growth in Chile. Among them we find Bergoeing and others (2001); Braun and Braun (1999); and Schmidt-Hebbel (1999). The fourth category—and the most related to this paper—uses cross-country evidence to study the Chilean experience. The most recent of

these papers are Meller, O'Ryan, and Solimano (1996), Barro (1999); De Gregorio and Lee (2000); and Lefort (1997).

Most exercises based on Solow-style decompositions find that TFP has played an important role in the period of high growth and the corresponding improvement with respect to previous periods. The majority of the studies agree that external conditions, such as favorable terms of trade and greater availability of foreign capital, have contributed to the improved growth performance in Chile. Some papers point to the beneficial impact of the market-friendly reforms implemented in Chile since the mid-1970s. They argue that these reforms are what explains the remarkable increase in total factor productivity and what prepared Chile to make the best from the international conditions it faced.[1]

This paper belongs in the group of cross-country growth studies and tries to extend them along the following lines. First, it updates previous cross-country research by expanding the sample period up to 1998. Second, it explicitly considers in the regression analysis the periods before and after 1985, which allows for direct evaluation of the factors behind the jump to high growth. Third, it extends the traditional empirical framework by including non-standard variables that help explain the marked growth improvement in the last 15 years. Fourth, it motivates the study of growth in Chile by presenting a series of stylized facts regarding the pattern, composition, and sources of growth in the country relative to the Latin America region and the world.

Most papers based on cross-country regressions under-predict the Chilean performance during the period of high growth. For example, Barro's (1999) regression model projects a per-capita growth rate of 3.4 % per-year in 1985-95, while the actual rate was 5.0%. This underestimation may contaminate future projections if the Chilean residual is a feature of long-run growth, rather than a transitory phenomenon. We study this issue by including an expanded set of growth determinants in our empirical analysis.

Although we still underestimate the growth improvement in the golden period in Chile, our expanded empirical model of cross-country growth is able to explain a large fraction (about 73%) of this improvement. Apart from the direct effect of the standard

growth determinants (better education and health, deeper financial markets, less government-induced distortions, and more favorable international conditions), indicators of the quality of the political system and governance, the comprehensiveness and complementarity of policy reforms, and the availability of public services and infrastructure appear to play important roles. In particular, according to our estimates, a country that implements *jointly* a series of growth-promoting measures ("policy complementarities") gains an additional bonus of more than 1 percentage-point in its growth rate, even after controlling for the isolated effect of those measures. This factor appears to be important not only in the case of Chile but also in other high-performing countries such as Ireland, Korea, the Netherlands, and Thailand.

Maintaining the high growth rates of the last 15 years will be challenging for Chile. The strong "convergence" effect that results from decreasing marginal returns to capital indicates that, *ceteris paribus*, Chile's growth rate should start to decline. Therefore, an important task is to find new and continuing sources of growth for the country. The last part of the paper starts the evaluation of possible growth sources by, first, projecting Chile's growth rate for the next 10 years under various assumptions and, second, proposing some areas with potentially large returns. Some of them are improvements in the quality of schooling, infrastructure, technology adoption, and government efficiency.

The plan of the paper is the following. Section I describes the main stylized facts of growth in Chile from four different macro perspectives. We first review the long-run growth trends in the country, Latin America, and the world by decades from the 1960s to the 90s. Then, we examine the sectoral composition of growth in Chile to determine the extent of its structural transformation. Next, we carry out a decomposition of growth in Chile into its sources related to capital accumulation, expansion of the labor force, and total factor productivity growth. Finally, we study the dynamic relationship between saving, investment, and growth, using a VAR methodology applied previously by Attanasio et al. (2000) in a cross-country panel setting.

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[1] Naturally with different emphasis, for example while Rojas, Jiménez, and López (1997) and Coeymans (1999) highlight trade openness, Bergoeing and others (2001) stress the role of financial reform and new bankruptcy laws.

In section II, we attempt to explain the economic growth performance in Chile from a cross-country perspective. We follow the approach in Barro and Lee (1994) and Easterly, Loayza, and Montiel (1997), which consists of linking aggregate economic, political, and social variables to growth rates in per capita GDP for a large sample of countries. The estimated model is then used to forecast the growth rate in the country and examine whether its performance has been close to expected values. Since our basic model is not able to fully take account for the change of the growth rate in Chile, we then extend the model to incorporate a group of variables recently proposed in the endogenous growth literature.

Section III presents some projections for Chile's future growth considering the cross-country empirical results and using a variety of assumptions. In this connection, we also start an evaluation of further sources for growth in the country. Section IV concludes.

I. STYLIZED FACTS

1. Long-Run Growth Trends in Chile, Latin America, and the World

Figure 1 presents the per capita real GDP growth rate in Chile before and after 1985. For comparison purposes, it also presents the growth rates of the median countries in Latin America and the Caribbean (LAC) and the world, respectively. While Chile lagged behind the typical countries in these groups in 1961-85, its growth rate of per capita GDP soared to above 4.5% in 1986-99, far surpassing the regional and world medians. Surely, there were periods of high growth in Chile before 1985, one of the most notables of which occurred between 1976 and 1981. However, they were usually short-lived and preceded and followed by sharp recessions. The "golden" period for growth in Chile is remarkable for its extension and stability.

Conversely to the Latin American experience, the 1980s was not a "lost decade" for Chile. Even though Chile's GDP fell drastically in the aftermath of the regional debt crisis and its own banking crisis, it fully recovered in the second half of the 1980s and continued to grow in most of the 1990s. Not only did Chile experience high growth rates

in average since 1985, but also the volatility of its growth rate was small when compared to a worldwide sample of countries (see Figure 2).[2]

After 13 years of sustained high growth rates, Chile experienced a slowdown in 1998. While it is uncertain whether this represents a decrease in Chile's trend growth or a prolonged cyclical downturn, Chile's growth prospects for the future continue to lead the Latin America region and most emerging countries.

The increase in Chile's growth rate is an important stylized fact and, as such, must be analyzed. We do this in section II, where we take a cross-country-regression approach to explain the changes in growth rates before and after 1985. For this, we consider the effect of various domestic and international conditions, whether policy determined or not.

2. Sectoral Composition of Output Growth

Table 1 presents the average output growth rates of primary, industry, and service sectors before and after 1985 in Chile. We also present growth rates by further disaggregated sectors. The increase in the growth rate after 1985 is a phenomenon shared by all major productive areas of the economy. In fact, the primary, industry, and service sectors have more than doubled their growth rates in the last fifteen years (see Figure 3).

Considering further disaggregated sectors, the growth jump is particularly noticeable in the areas directly affected by the privatization of public enterprises, namely, the utilities (gas, electricity, and water) and transport and communications. However, other sectors have also achieved remarkable growth. For example, banking, commerce, and construction have grown by more than 6% per year since 1985, and so have the primary activities of fishing and mining. In addition, the dispersion of growth rates by sectors has declined with respect to the previous period.

Contrary to the experience of other developing countries, the primary sector in Chile has not shrunk as the economy grew. In fact, in the last forty years industry has lagged behind the other sectors, although by a small margin. This has produced a slight gain in the primary and service shares of value added at the expense of industry (see Figure 4). However, all in all, economic growth in Chile has been balanced across most productive sectors, particularly in the period of high growth after 1985. This suggests

[2] Notice that the line in Figure 2 shows that higher growth is negatively correlated with the variability of growth rates. This point is analyzed in more detail in Fatás (2001).

that Chile is an economy that is internally integrated and diversified, despite its small size.

3. Growth Accounting

The next exercise on stylized facts is a Solow-style decomposition of output growth into the contributions of capital, labor, and productivity growth. We use two methods to derive the Solow decomposition. In both of them, the contribution of total factor productivity is obtained as a residual once the contributions of capital and labor on output growth are imputed. The difference between the two methods is that the second one adjusts for the utilization of capital and labor and adds human capital as a factor of production.

Consider a neoclassical production function that depends on physical capital K, labor L, and the level of total factor productivity A. Assuming, for simplicity, a Cobb-Douglas production function, we have,

$$Y = AK^{a} L^{1-a}$$

To solve for the growth rate of productivity, we take logs and time derivatives. Following the international study by Bernanke and Gurkaynak (2001) and the study on Chile by Coeymans (1999), we assume a capital share (a) of 0.4. Solving for the growth rate of productivity, we have,

$$TFP1 = GdpGrowth - 0.4 * CapGrowth - 0.6 * LaborGrowth$$

This is our first Solow decomposition, in which capital growth consists simply of cumulated investment and labor growth comprises only the expansion of the working-age population.

The second Solow decomposition makes the following adjustments. First, we incorporate human capital as a factor of production, H, in the aggregate production function. Second, we control for the rate of utilization or employment of capital and labor.

Following Bernanke and Gurkaynak (2001), we consider the following human-capital-augmented variation of the previous production function,

$$Y = AK^{a}(HL)^{1-a}$$

where we assume that the measure of human capital (H) interacts multiplicatively with the size of the labor force for output production. That is, we model human capital as analogous to labor-augmenting technological progress. We use the average years of schooling in the adult population (from Barro and Lee 2000) as proxy for the human capital stock in the economy.

Next, we control for the extent of capital and labor employment. We adjust for the degree of capacity utilization of the capital stock by using, as proxy, the rate of labor employment. Regarding labor, we adjust for employment by, first, deducting from the working-age population the number of inactive and unemployed people and, second, adjusting for the number of hours actually worked (from the Occupation and Employment Surveys of University of Chile 1960-2000).

As before, we assume that a=0.4. We then solve for the second measure of growth in TFP (*TFP2*),

$$TFP2 = GdpGrowth - 0.4 * CapGrowthAdj - 0.6 * (LaborGrowthAdj + SchoolGrowth)$$

where *CapGrowthAdj* is the utilization-adjusted growth rate of capital, *LaborGrowthAdj* is the employment-adjusted growth rate of labor, and *SchoolGrowth* is the growth rate of the average years of schooling.

Table 2 presents the growth accounting results. Its main purpose is to show the differences in the sources of growth for the periods before and after 1985. Similarly, Figures 5a and 5b present, respectively, the simple and the adjusted growth decompositions before and after 1985.

According to the simple decomposition, the increase in the GDP growth rate after 1985 was due primarily to a very large expansion of total factor productivity and secondly to an increase in the contribution of physical capital. While total factor

productivity was barely a source of growth in the period 1961-85, it became the dominant source in 1986-2000. On the other hand, before 1985 labor was the most important factor behind economic growth in Chile, but in the more recent period its contribution fell in absolute and relative terms.

If the utilization of capital and labor improve over time and if human capital expands, then the imputed contribution of TFP to growth should decrease once these adjustments are considered. This is exactly what happens when we perform the Solow growth-accounting exercise for Chile using the second method. Considering the adjustment for quality and utilization, the three sources of growth contributed similar shares after 1985, with physical capital and labor taking a moderate lead. The contribution of total factor productivity still rose manifold after 1985, but the contribution of capital and labor also expanded strongly. This was due not only to new investment and growing population, but also to improvements in factor utilization (see memo section of Table 2). After 1985 the stock of physical capital (particularly machinery and equipment) grew by more than 6% a year, and the rate of capital utilization enlarged (rather than shrank, as it happened before 1985). In the case of labor, the working-age population increased less after 1985 than in the previous period; however, the strong increase in the employment rate after 1985 more than compensated for the weaker population increase. Larger employment growth coupled with higher growth in educational attainment after 1985 resulted in a net increase in the contribution of labor to output growth in the latter period compared to the first.

The main conclusion from the growth accounting exercise is that the large *increase* in the growth rate after 1985 was due primarily to an expansion of total factor productivity. However, before rejecting "capital fundamentalism" altogether, we should highlight the second conclusion which is that after 1985, labor, capital, and TFP provide a balanced contribution as sources of growth in Chile. Physical and human capital and the labor force are still the predominant factors accounting for growth in the country.

4. Growth, Saving, and Investment

We now explore the dynamic relationship between the growth rate and the saving and investment ratios. Following Attanasio, Picci, and Scorcu (2000), we study these relationships by running VAR systems on annual data. We consider three bi-variate

systems, namely, Investment-Growth, National Saving-Growth, and External Saving-Growth. The VARs include one lag of each variable (further lags do not enter significantly in the regressions and are, thus, excluded in the final estimated system.)

Table 3 presents the results. The dynamic relationship between investment and growth at annual frequencies reveals that investment has a high degree of inertia and is significantly predicted by past growth. The latter result can be explained by considering that past growth creates incentives to new investment by making future growth more likely. In turn, growth also has some inertia but, surprisingly, is not significantly predicted by past investment. In fact, judging only by the sign of the coefficient, lagged investment appears to have a negative link with growth. This result may appear to contradict the cross-country evidence, which finds a positive effect of investment on growth. However, the two results are not necessarily contradictory given that the dynamic relationship estimated here considers effects over relatively short-horizons (a few years) while the cross-country analysis focuses on long periods. Attanasio et al. (2000) and Blomstrom, Lipsey, and Zejan (1996) find a negative (short-run) link between past investment and current growth. They explain it by either considering that investment is limited by saving, which anticipates growth negatively, or taking into account that growth behaves cyclically, with high growth and investment preceding low growth.

The dynamic relationship between national saving and growth in Chile appears to be not significant at short horizons according to our estimated VARs. Both saving and growth are predicted by their respective past values, but the degree of inertia is higher in the case of saving. It is surprising that growth does not Granger-cause saving and vice versa, although in the case of Chile Gallego, Morandé, and Soto (2001) find a similar result. This may indicate that cyclical effects are transmitted within the same year or that long-run relationships take horizons of substantially more than a few years to materialize (specially in a context of underdeveloped financial markets, as was the case in Chile up to the 1990s).

The dynamic relationship between foreign saving and growth is more interesting. Again, both variables show significant inertia, which is higher in the case of foreign saving. Most noteworthy is that whereas foreign saving does not help predict economic growth, an increase in growth is significantly associated with a rise in foreign saving.

While this result is not inconsistent with a long-run positive effect of foreign saving on domestic growth, it does indicate that in short horizons international capital flows are driven by higher domestic returns, rather than the other way around.

The main conclusion from the dynamic analysis at annual frequencies is that growth helps predict investment and foreign saving, but is not Granger-caused by these macroeconomic variables.

To summarize, the main stylized facts on growth in Chile are, first, the rate of output growth became significantly higher and more stable after 1985 than in the past; second, this high growth occurred not only in a few sectors but was shared by most of the economy; third, changes in investment and foreign saving do not precede but follow changes in output growth; and fourth, the jump in economic growth after 1985 reflected mostly a large improvement in total factor productivity. Taken together, these stylized facts suggest that the jump in growth was driven by policies and macroeconomic conditions that affected the economy's overall productivity. The next section will use cross-country comparative analysis in an attempt to identify and quantify the factors behind Chile's growth improvement.

II. DETERMINANTS OF GROWTH

In this section, we attempt to explain the economic growth performance in Chile from a cross-country perspective. We follow the approach in Barro and Lee (1994) and Easterly, Loayza, and Montiel (1997), which consists of linking aggregate economic, political, and social variables to growth rates in per capita GDP for a large sample of countries. The estimated model is then used to project the growth rate in the country and examine whether its performance has been close to expected values.

Setup

The regression equation to be estimated is the following:

$$y_{i,t} - y_{i,t-1} = \alpha y_{i,t-1} + \beta' X_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \qquad (1)$$

where y is (log of) per capita output, X is a set variables postulated as growth determinants, μ_t is a period-specific effect, and η_i represents unobserved country-specific

factors, and e is the regression residual. The subscripts i and t refer to country and time period, respectively.

The sample consists of a balanced panel of 46 countries for three periods over the years 1960-98. In order to smooth out transitory fluctuations, we work with averages over periods at least longer than a decade. Specifically, the three periods correspond to the years 1960-70, 1971-85, 1986-1998. This partition allows us to compare growth before and after 1985, while maintaining the minimum number of consecutive observations per country (i.e., three periods) required to run the instrumental variable procedure outlined below. Our sample is determined by the availability of data on relevant variables, and not by arbitrary selection. It includes 22 developed and 24 developing countries (see Appendix A for a complete list). The region of Latin America and the Caribbean is over-represented in the sample.

The growth regression equation (1) is dynamic, in the sense that it can be rewritten as a lagged-dependent variable model. The inclusion of the initial level of per capita output ($y_{i,t-1}$) follows from the neoclassical growth model and captures the transitional convergence effect. The time-specific effect, m_t, allows to control for international conditions that change over time and affect the growth performance of countries in the sample. The term h_i accounts for unobserved country-specific factors that both drive growth and are potentially correlated with the explanatory variables.

There is a large variety of economic and social variables that can be proposed as growth determinants, X. We use the variables that are most popular in the empirical growth literature given both their quality as indicators of development in specific areas and their data availability. The list of explanatory variables is the following (see Appendix B for details on definitions and sources),

- Initial level of per capita GDP –to capture transitional convergence.
- The initial average years of schooling of the adult population –to proxy for human capital in the working force.
- Life expectancy –to proxy for human capital.
- The ratio of domestic credit to the private sector to GDP –to measure financial development.

- The ratio of the trade volume (real imports plus exports) to real GDP –to measure trade orientation and dependence on international markets.
- The ratio of government consumption to GDP –to measure the burden of government size and taxation to private activity.
- The black market premium on foreign exchange –to proxy for relative price distortions and government intervention in external markets.
- Terms of trade shocks –to account for the effect of international conditions on the country's trade markets.

These variables make up our basic regression model. Figure 6 shows the values of the explanatory variables in the basic model for Chile and the typical (median) country in the world before and after 1985. As we will see, the basic regression cannot fully explain the change in Chile's growth rate before and after 1985. To do so we will augment the model by including variables related to the political system, public infrastructure, and policy complementarities. Figure 7 shows the values of these additional explanatory variables for Chile and the world median over the periods in question.

The proposed growth regression poses some challenges for estimation. The first is the presence of unobserved period- and country-specific effects. While the inclusion of period-specific dummy variables can account for the time effects, the common methods to deal with country-specific effects ("within" or differences estimators) are inappropriate given the dynamic nature of the regression. The second challenge is that most explanatory variables are likely to be jointly endogenous with economic growth. That is, we need to control for the biases resulting from simultaneous or reverse causation. In the following paragraphs we outline the econometric methodology we use to control for country-specific effects and joint endogeneity in a dynamic model of panel data.

Econometric methodology

We use the Generalized-Method-of-Moments (GMM) estimators developed for dynamic models of panel data that were introduced by Holtz-Eakin, Newey, and Rosen (1990), Arellano and Bond (1991), and Arellano and Bover (1995). Taking advantage of the data's panel nature, these estimators are based on, first, differencing regressions and/or instruments to control for unobserved effects, and, second, the use of previous

observations of the explanatory variables as instruments (which are called "internal" instruments).

After accounting for the time-specific effects, we can rewrite equation (1) as follows,

$$y_{i,t} = a\, y_{i,t-1} + b' X_{i,t} + h_i + e_{i,t} \qquad (2)$$

In order to eliminate the country-specific effect, we take first-differences of equation (2),

$$y_{i,t} - y_{i,t-1} = a\left(y_{i,t-1} - y_{i,t-2}\right) + b'\left(X_{i,t} - X_{i,t-1}\right) + \left(e_{i,t} - e_{i,t-1}\right) \qquad (3)$$

The use of instruments is required to deal with (1) the likely endogeneity of the explanatory variables, and, (2) the problem that, by construction, the new error term, $e_{i,t} - e_{i,t-1}$, is correlated with the lagged dependent variable, $y_{i,t-1} - y_{i,t-2}$. Taking advantage of the panel nature of the data set, the instruments consist of previous observations of the explanatory and lagged dependent variables. Given that it relies on past values as instruments, this method only allows current and future values of the explanatory variables to be affected by the error term. Therefore, while relaxing the common assumption of strict exogeneity, our instrumental-variable method does not allow the X variables to be fully endogenous.

Under the assumptions that (a) the error term, e, is not serially correlated, and (b) the explanatory variables, X, are weakly exogenous (i.e., the explanatory variables are assumed to be uncorrelated with future realizations of the error term), the GMM dynamic panel estimator uses the following moment conditions.

$$E\left[y_{i,t-s} \cdot \left(e_{i,t} - e_{i,t-1}\right)\right] = 0 \quad for\ s \geq 2; t = 3, \ldots, T \qquad (4)$$

$$E\left[X_{i,t-s} \cdot \left(e_{i,t} - e_{i,t-1}\right)\right] = 0 \quad for\ s \geq 2; t = 3, \ldots, T \qquad (5)$$

The GMM estimator based on these conditions is known as the *difference* estimator. Notwithstanding its advantages with respect to simpler panel data estimators, there are important statistical shortcomings with the difference estimator. Alonso-Borrego and Arellano (1996) and Blundell and Bond (1997) show that when the explanatory variables are persistent over time, lagged levels of these variables are weak instruments for the regression equation in differences. Instrument weakness influences the asymptotic and small-sample performance of the difference estimator. Asymptotically, the variance of the coefficients rises. In small samples, Monte Carlo experiments show that the weakness of the instruments can produce biased coefficients.[3]

To reduce the potential biases and imprecision associated with the usual difference estimator, we use a new estimator that combines in a *system* the regression in differences with the regression in levels (developed in Arellano and Bover 1995 and Blundell and Bond 1997). The instruments for the regression in differences are the same as above. The instruments for the regression in levels are the lagged *differences* of the corresponding variables. These are appropriate instruments under the following additional assumption: although there may be correlation between the levels of the right-hand side variables and the country-specific effect in equation (2), there is no correlation between the *differences* of these variables and the country-specific effect. This assumption results from the following stationarity property,

$$\begin{aligned} &E\left[y_{i,t+p}\cdot \eta_i\right] = E\left[y_{i,t+q}\cdot \eta_i\right] \quad \textit{and} \\ &E\left[X_{i,t+p}\cdot \eta_i\right] = E\left[X_{i,t+q}\cdot \eta_i\right] \quad \textit{for all } p \textit{ and } q \end{aligned} \tag{6}$$

The additional moment conditions for the second part of the system (the regression in levels) are:[4]

$$E\left[\left(y_{i,t-1} - y_{i,t-2}\right)\cdot\left(\eta_i + \varepsilon_{i,t}\right)\right] = 0 \tag{7}$$

[3] An additional problem with the simple *difference* estimator relates to measurement error: differencing may exacerbate the bias due to errors in variables by decreasing the signal-to-noise ratio (see Griliches and Hausman, 1986).

$$E\left[\left(X_{i,t-1} - X_{i,t-2}\right)\cdot\left(h_i + e_{i,t}\right)\right] = 0 \qquad (8)$$

Thus, we use the moment conditions presented in equations (4), (5), (7), and (8) and employ a GMM procedure to generate consistent and efficient parameter estimates.

Using the moment conditions presented in equations (4), (5), (7), and (8), we employ a Generalized Method of Moments (GMM) procedure to generate consistent estimates of the parameters of interest and their asymptotic variance-covariance (Arellano and Bond 1991, and Arellano and Bover 1995). These are given by the following formulas:

$$\hat{q} = (\overline{X}' Z \hat{\Omega}^{-1} Z' \overline{X})^{-1} \overline{X}' Z \hat{\Omega}^{-1} Z' \overline{y} \qquad (9)$$

$$AVAR(\hat{q}) = (\overline{X}' Z \hat{\Omega}^{-1} Z' \overline{X})^{-1} \qquad (10)$$

where q is the vector of parameters of interest (a, b), $\overline{y}$ is the dependent variable stacked first in differences and then in levels, $\overline{X}$ is the explanatory-variable matrix including the lagged dependent variable (y_{t-1}, X) stacked first in differences and then in levels, Z is the matrix of instruments derived from the moment conditions, and $\hat{\Omega}$ is a consistent estimate of the variance-covariance matrix of the moment conditions. [5]

Consistency of the GMM estimator depends on the validity of the instruments. To address this issue we consider a specification test of the Sargan type. This test of over-identifying restrictions examines the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation process.

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[4] Given that lagged levels are used as instruments in the differences specification, only the most recent difference is used as instrument in the levels specification. Using other lagged differences would result in redundant moment conditions (see Arellano and Bover 1995).

[5] In practice, Arellano and Bond (1991) suggest the following two-step procedure to obtain consistent and efficient GMM estimates. First, assume that the residuals, $e_{i,t}$, are independent and homoskedastic both across countries and over time. This assumption corresponds to a specific weighting matrix that is used to produce first-step coefficient estimates. Then, construct a consistent estimate of the variance-covariance matrix of the moment conditions with the residuals obtained in the first step, and use this matrix to re-

Basic Results

Table 4 presents the basic estimation results. The Sargan test cannot reject the null hypothesis of correct specification of our model. The estimated coefficients on most explanatory variables have the expected sign and are statistically significant. First, economic growth is affected by economic characteristics of development. Thus, the growth rate rises with a lower initial level of output (relative convergence effect), better education and health of the population, and deeper financial markets. Although openness to international trade has a positive estimated coefficient, it is not statistically significant in the basic regression (but it becomes so in the expanded model). Second, economic growth is shaped by the country's type of government. Consequently, the growth rate rises with smaller government size and lower black-market premium (less relative price distortions). Third, current international conditions also determine economic growth. Thus, the growth rate is higher in countries that face positive terms of trade shocks. The negative and significant coefficient on the period dummy variable indicates that the period 1985-1998 was less propitious for growth throughout the world than the previous fifteen years were.

Our regression model can be used to explain the *changes* over time in economic growth for any country in the sample. We cannot, however, explain the *levels* of growth given that we do not estimate the unobserved country-specific effects (although we control for them). We are interested in assessing the extent to which our model can account for the different growth performance before and after 1985. We use the regression point estimates and the actual changes in the explanatory variables to construct the regression projections.

We present the projection results for Chile and a few other Latin American countries in Table 5. The accuracy of the projection is not satisfactory in most cases. Only for Colombia and Mexico the projected growth difference approximates closely its actual value. Brazil and Ecuador performed considerably below what the regression projected, while Argentina, Peru, and especially Chile performed beyond their projections.

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estimate the parameters of interest (i.e. second-step estimates). Asymptotically, the second-step estimates are superior to the first-step ones in so far as efficiency is concerned.

The actual improvement in Chile's growth rate after 1985 with respect to the previous 15 years was 4.74 percentage points. Our basic regression can account for only about 45% of the growth acceleration. The growth residual for Chile is 2.67 percentage points and is one of the highest in comparison to other sample residuals. (In fact, it is found in the 12% upper tail of the distribution; see the histogram of residuals in Figure 8.)

In Table 7, we assess the contribution of each explanatory variable to the projected difference in Chile's growth rate. The variables that represent international conditions had contrasting effects that almost cancel each other. Thus, while positive terms of trade shocks contributed to more than a 1 percentage-point increase in the growth rate after 1985, negative international growth conditions subtracted more than 1 percentage point from Chile's growth acceleration over the same period. The combined effect of the human capital variables (education and life expectancy) was slightly over 1 percentage point. The increased depth of Chilean financial markets contributed about 0.75 percentage points to the growth acceleration, and a similar contribution resulted from the combined effect of the reduction in the government-distortion variables (government consumption and black-market premium). The conditional-convergence effect actually played in favor of growth after 1985 given that the initial level of income per capita in this period was slightly lower than in the early 1970s.

Expanded Regression Model

Given that the basic model left unexplained more than half of the growth improvement in Chile after 1985, we now expand the regression model, continuing to follow a cross-national approach. We do it by considering three aspects of economic reform and development that have received considerable attention in the recent literature. The first area concerns the political system and governance. This large area comprises several aspects of the institutional quality of government, including the respect for civil and political rights, bureaucratic efficiency, absence of corruption, enforcement of contractual agreements, and prevalence of law and order. After the seminal work by Mauro (1995) and Knack and Keefer (1995), the political system and governance have received increasing attention as a key determinant of economic growth. See, for instance,

Barro (1996), Kaufman, Kraay, and Zoido-Lobatón (1999b), and the survey in Przeworski and Limongi (1993).

The recent empirical growth literature has used various subjective indices to measure different aspects of the political system and governance and compare them across countries and over time. In general these indices are highly mutually correlated, which suggests that the underlying processes they measure are very interdependent. We use the popular Gastil's civil liberties index from Freedom House as representative of all measures of political system and governance. In robustness exercises, we also consider the indices produced by Business Environmental Risk Intelligence (BERI) and Political Risk Services in their publication *International Country Risk Guide* (ICRG). The correlation coefficients between Gastil's index and the BERI and ICRG indices are 0.69 and 0.78 respectively, and the correlation between any of the three variables and their first principal component is at least 0.9.

The second area involves the availability of public services and infrastructure. The importance of productive public services in generating long-run growth has been highlighted in the theoretical work of Barro (1990) and Barro and Sala-i-Martin (1992), among others. These, and other papers, have taken a variety of strategies to model the role of public services. Some treat government services as classic public goods, while others consider that they may be subject to congestion. In some models public services and infrastructure enter directly as inputs of the production function, in others they serve to improve total factor productivity, and still in others public services affect the expected rate of return on investment by protecting property rights. In any case, their theoretical importance has been well established. Empirical studies confirm this conclusion. The work by Loayza (1996) and Calderón, Easterly, and Servén (2001) provides evidence on the positive role of public services and infrastructure in promoting economic growth.

There are a few alternative measures of public services and infrastructure. Among them, the variables with the largest cross-country and time-series coverage focus on the provision of infrastructure. We choose to work with telecommunications capacity, measured by the number of main telephone lines per capita. In robustness exercises, we consider alternative aspects of public infrastructure, namely, energy generation capacity (as megawatts of electricity produced per capita) and transport facilities (as kilometers of

paved roads per capita). The correlation coefficient between telephone lines and electricity generated and paved roads are 0.80 and 0.72, respectively. The correlation between any of the three variables and their first principal component is at least 0.9.

The third area deals with the comprehensiveness and complementarity of policy reforms. Its main idea is that joint progress in the determinants of growth carries a premium over and above the sum of their independent effects on growth. This premium is derived from the positive interactions and synergies that occur among the factors that promote economic growth. The early theoretical work by Hirschman (1958) shows how stronger linkages among various productive sectors can lead to higher economic growth. More recently, Ortiz (1996) and Acemoglu and Zilibotti (2001) underscore the interaction between human capital and technological adoption in producing productivity improvements. Likewise, Dollar and Burnside (2001) stress the connection between institutional development and external aid in the growth process of poor economies. Aziz and Wescott (1997) attempt to measure empirically the premium derived from joint progress in several areas and its importance in explaining growth differences across countries. These are only a few examples of a rich literature that stresses the interactions between various factors such as foreign direct investment, education, institutional development, and financial depth in generating a growth premium.

As proxy for the joint progress in policy-related growth determinants (i.e., "policy complementarities"), we use a dummy variable that takes the value of 1 in countries where all measures of a set of policy indicators have values better than the corresponding world median. These indicators are taken from the basic model's explanatory variables, and they are related to openness, black market premium, government consumption, financial development, life expectancy, and education. In the last period (1986-98), the countries with a value of 1 in the "policy-complementarities" dummy variable are Belgium, Chile, Ireland, Korea, The Netherlands, Philippines, and Thailand.[6]

Figure 7 presents the evolution of the civil liberties index, the number of telephone lines per capita, and the policy-complementarities binary indicator for Chile

[6] In 1960-70, they are Belgium, Japan, and Norway; and in 1971-85, they are Greece, Ireland, Israel, Japan, The Netherlands, and Spain.

and the world in the periods 1970-85 and 1986-98. Regarding the three variables, Chile's improvement is nothing short of remarkable.

Table 6 presents the results of the expanded regressions. In the first three columns, each of the additional explanatory variables is included in turn. In the fourth column, all of them are included jointly. Civil liberties, telephone lines per capita, and the dummy variable for policy complementarities enter significantly in their respective regressions and with a positive sign that denotes a growth-improving effect. The sign and significance of their growth effects are maintained when the three variables are jointly included in the regression, although the point estimates are somewhat reduced. The estimated coefficients on the other variables have the same sign as in the basic model, but their size and significance changes in a couple of cases. The coefficient on openness increases in size and becomes statistically significant, while the opposite occurs with the ratio of private domestic credit to GDP.

We also conduct some robustness exercises on the additional variables of the expanded model. Regarding the political system and governance, we replace the civil liberties index with, in turn, the ICRG index, the BERI index, and the first principal component of the three indices. In each case, the estimated coefficient is positive and statistically significant. Regarding public services and infrastructure, we replace the number of telephones per capita with, in turn, the measures of paved roads and electricity generation, as well as the first principal component of the three infrastructure indicators. In all cases the corresponding estimated coefficient is positive, but it is statistically significant only when the number of telephone lines and the first principal component are used. Finally, on the policy complementarities indicator, to dispel fears that it may be simply representing a Chile-specific dummy variable, we run the regression excluding Chile from the sample. The results are basically unchanged, and, moreover, the estimated coefficient on policy complementarities remains significantly positive and even increases in absolute value.

With the additional explanatory variables, we reassess the regression's ability to account for Chile's growth improvement after 1985 with respect to the previous 15 years. The corresponding results are presented in the second column of Table 7. By including the variables on the political system and governance, public services and infrastructure,

and policy complementarities we can account for 73% of the growth improvement. The contribution of public infrastructure to the growth acceleration in Chile is similar to the contribution related to the increase in openness, the expansion of education, or the diminution of the black market premium. The contribution of civil liberties is even higher, similar to that of the reduction in government consumption. The most remarkable result in the expanded regression is given by the large contribution of policy complementarities, which at 1.26 percentage points surpasses that of larger positive terms of trade shocks and enhanced life expectancy. This indicates that there is an important premium of a reform strategy that is comprehensive and targets all policy fronts. This is a premium over the positive, independent effect of isolated policy improvements, and it appears to be an important growth determinant in other high-performing countries, such as Ireland, Korea, the Netherlands, and Thailand.

Although the additional variables have improved the regression's explanatory power, we have failed to account for about 27 percent of the actual increase in the Chilean growth rate after 1985. It is, however, unlikely that a cross-country approach would advance more in this regard. We have already included the most relevant variables for this type of econometric exercise, and other variables are likely to be highly correlated with those already present in the model. Still, one possibility is that we have left out some important variables that are difficult to measure and that relate specifically to Chilean economic development. The other possibility, which we consider more likely, is that some of the growth gains after 1985 do not reflect long-run developments but a cyclical recovery from the recessionary period of the early 1970s and early 1980s.[7]

III. GROWTH IN THE FUTURE

What can be expected for Chile's economic growth in the future? Or put it differently, what is Chile's growth potential? A proper answer to these questions calls for a comprehensive, multifaceted approach. In this section, we address the issue of Chile's future growth from the perspective of cross-national empirical results. That is, we use the estimates obtained in our cross-country, panel regressions to forecast

[7] Another potential explanation has to do with error of measurement in GDP. Preliminary estimates show that in 1997-1998 the old National Accounts over-estimated GDP growth in roughly 0.75% per year.

economic growth in Chile in the next 10 years. To do so, we work under alternative assumptions for the behavior of the variables that drive growth.

First we project growth under the assumption that the explanatory variables continue their past trends into the next decade. Therefore, we first estimate a linear, logarithmic or quadratic trend, whichever provides the best fit, to each explanatory variable. The exceptions are *initial* income per capita and average years of educational attainment, for which we simply take a value at the start of the forecasting period, specifically an average of the years surrounding 2000. Second, we use the estimated regression coefficients to project the contribution of each variable to growth in the next decade. The results are presented in the first panel of Table 8. The first column shows the values of the explanatory variables corresponding to the period 1986-1998, and the second column shows their respective values used in the growth projection for the next decade. The last two columns present the growth forecast under the simple and expanded models, respectively. The main conclusion from this exercise is that, if the evolution of growth determinants follows the same trends as in the past, the per capita GDP growth rate in the next decade will be between one-half and three-quarters of a percentage point *less* than it was during 1986-98.[8]

Thus, under the "continuing trend" assumption, we project a slight decrease in Chile's growth rate. The fall in the growth rate occurs despite an improvement in most explanatory variables. The only one of them that is projected to reduce growth is the terms of trade, which are expected to present less favorable shocks in the future. Improvements in human capital, government efficiency, financial market, and particularly public infrastructure are projected to have a beneficial impact on economic growth. However, this combined positive effect is not large enough to overcome the forces of conditional convergence stemming from decreasing marginal returns. The fact that the initial income by 2001 is more than twice as large as the initial income by 1986 weighs heavily against growth in the next decade.

The second projection for Chilean growth in the next decade is based on the assumption that Chile is able to jump at least to the 90^{th} percentile of the world

distribution for each variable that drives growth in our model. We also assume that the current level of income remains unchanged while other growth determinants improve. This is clearly an unrealistic set of assumptions, particularly because improvements in human capital, government efficiency, infrastructure, financial depth, and governance constitute a process that normally accompanies income expansion. However, we perform this exercise because it may be useful in establishing some upper bounds for what can be expected for growth in Chile under a strong process of development and economic reforms.

The second panel of Table 8 presents the results of the second projection. The areas where Chile is currently below the top 10 percent in the world are education, financial depth, openness, and public infrastructure. Chile is already in this elite category in the areas of life expectancy, government size, and price distortions. According to the basic model, by accessing the top 10 percent in growth determinants, Chile would obtain 0.7 percentage-points higher growth than in the past 15 years. This growth acceleration would be due mainly to the improvements in schooling and financial intermediation. The expanded model is even more optimistic as it predicts an increase in the growth rate of 2.7 percentage points. In this case the main contributors are improvements in schooling, openness, civil liberties, and most importantly, public infrastructure. As mentioned above, progress in public infrastructure is concomitant to income expansion. Therefore, we should balance the predicted effect of public infrastructure under our "sharp progress" assumptions with the growth-decreasing forces of conditional convergence, which we do not consider in this exercise.

In our search for factors that explain the remarkable growth acceleration in Chile after 1985, we concentrated on those variables for which we had data for the various periods under consideration. This may have excluded some relevant variables for which only cross-country data were available. Given that our focus in this section is on the prospects for growth in Chile, we can go back to the question of what drives growth and consider variables for which we only have cross-sectional information. We then consider three new areas. The first one is the quality of education. As Barro (2001) and Hanushek

[8] It is important to remember that the expanded model underestimates the GDP growth rate. Although the residual is not statistically significant, it represents more than 1 percentage-point by year, which is

and Kimko (2000) point out, the average number of schooling years is only a rough proxy for human capital in the educational dimension. It needs to be complemented by measures of actual achievement, such as those derived from standardized test scores. We use the series in Barro and Lee (2000) and Hanushek and Kimko (2000), complemented by the TIMMs international test scores, to construct an index of the quality of education for a sample of 42 countries (see the appendix for details).

The second new area concerns microeconomic restrictions, more precisely, the regulatory obstacles to the establishment of new enterprises. As Hernando de Soto and coauthors (1986) vividly illustrated in their study on red tape in Peru, entry restrictions for new enterprises can be a serious obstacle to economic development. Following de Soto's ideas, Djankov and others (2000) recently constructed a measure of entry restrictions for a large sample of countries. We use this measure and include it in our growth regressions.

Finally, the third area is related to technological adoption. Whether a country develops or copies new technologies, its capacity and willingness to assimilate new methods of production are bound to affect its growth potential. See, for instance, Young (1989, Ch. 6), Romer (1992), Beaudry and Green (2001), and Keller (2001). In a recent paper, Caselli and Coleman (2001) used the number of imported computers as a proxy for technological adoption in a sample of countries. We follow their example and use this measure in our growth regressions.

Our purpose here is to obtain an estimate of the beneficial growth impact of Chile's advancing in the areas of educational quality, microeconomic restrictions, and technological adoption. For this, we first need an estimate of the effect of each of these variables on growth, which we obtain by adding each variable to our basic model, one by one. The results are presented in Table 9. The estimated coefficients are significant, carry the expected sign, and appear to be economically important, as discussed below.[9] We should note, however, that since these coefficients are estimated considering only the

economically significant.

[9] It is interesting to note that when the quality-of-education variable is added to the basic regression, the coefficient on average years of schooling becomes negative. This could give some support to the view that the quality more than the quantity of education is important for economic growth.

basic model, part of their effect might be captured by the variables of the expanded model or the variables representing the other new areas.

Following our "sharp progress" assumptions, we measure the growth impact if Chile were to jump to the top 10 percent of the world in the three new areas. The results are presented in the third panel of Table 8. As the comparison between the second and first columns shows, Chile is still far behind the best countries in the areas of educational quality, microeconomic restrictions, and particularly technological adoption. This large gap coupled with the size of the regression coefficients produce the result that there are potentially large gains from advancing in the three areas, particularly the quality of education. Thus, improvements in microeconomic restrictions would increase growth by three-quarters of a percentage point; in technological adoption, by a little over one percent; and in educational quality, by close to one and a half percentage point (see column 3).

IV. CONCLUSIONS

Economic growth in Chile since the mid 1980s has been remarkable for its high level and persistence. The country, however, has not been immune to the wave of international crises in the late 1990s, and many people now wonder whether the golden period of growth in Chile is a thing of the past. In this context, this paper attempts to shed light on the factors behind the high growth rates of the last 15 years and analyze the extent to which they can be sustained in the future.

In the first place, we present a set of stylized facts on economic growth in Chile, which allows us to identify the issues that deserve further investigation. First, Chile's growth performance in the last 15 years has been substantially higher and less volatile than in the typical country in Latin America and the world. For Chile, the 1980s was not a "lost decade" as it was in most of Latin America. Second, an analysis of sectoral value added shows that high growth in Chile was balanced across sectors, which suggests that growth was prompted by suitable general, macroeconomic conditions and policies. Third, growth accounting exercises indicate that the expansion of growth in the latter period is driven by a combination of capital accumulation, labor force expansion, and a significant and new increase in TFP. And, fourth, dynamic analysis suggests that Chilean

high-growth was not caused, but followed, by domestic investment and external financing. Taken together, these stylized facts suggest that the jump in growth was driven by policies and macroeconomic conditions that affected the economy's overall productivity.

Given these stylized facts, our first analytic objective is to explain the sharp change in the growth rate in Chile after 1985. There are several potential ways to address this issue, and given our comparative advantage we chose an international perspective. In fact, considering the large body of recent empirical growth literature, we examine the extent to which a cross-country approach can explain Chile's growth performance. We formulate a basic regression model that contains the most popular variables in the growth literature and estimate it using techniques suited for dynamic models of panel data. Our basic model allows us to explain about 45% of the change in the growth rate between 1970-85 and 1986-1998, which was 4.74 percentage points. We find that the variables that represent international conditions had contrasting effects that nearly cancel each other. The combined effect of human-capital variables was slightly over 1 percentage point. The increased depth of Chilean financial markets contributed about 0.75 percentage points to the growth acceleration, and a similar contribution resulted from the combined effect of the reduction in the variables that accounted for government-induced distortions.

We then extend the basic model in a quest to explain a higher fraction of the growth acceleration. We include variables that have recently received attention in the growth literature. The expanded model explains about 73% of the increase in the growth rate after 1985. Improvements in the political system and public infrastructure contribute a little more than one-half of a percentage point each, while a binary indicator that proxied for the comprehensiveness of policy reforms accounts for more than one percentage point of the increase in the growth rate. The last result is particularly interesting as it indicates that there exists a growth premium for advancing the policy reform agenda in several fronts at the same time.

Continuing to follow a cross-country empirical approach, the last section of the paper assesses what can be expected for growth in Chile in the next decade. We estimate that if the variables that drive growth continued their past trends into the future, the

growth rate of per capita GDP in the next decade would decrease between one-half and three-quarters of a percentage point with respect to the rate in 1986-98. The growth rate would fall despite projected improvements in human capital, government efficiency, financial market, and public infrastructure because their combined positive effect is not large enough to overcome the forces of conditional convergence.

Finally, we attempt to search for new sources of economic growth for a country, like Chile, that has already advanced in the basic determinants of growth. These, rather tentative exercises, indicate that Chile can increase its future growth by focusing on the provision of public infrastructure and the enhancement of the quality of education. Improving governance, eliminating excessive regulatory restrictions, and encouraging technology adoption also appear to be promising venues for higher economic growth.

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APPENDIX A: SAMPLE OF COUNTRIES BY REGIONS

East Asia and Pacific (4)			
Indonesia	Korea	Philippines	Thailand
High-income Economies (22)			
Australia	Austria	Belgium	Canada
Denmark	Finland	France	Germany
Greece	Ireland	Israel	Italy
Jamaica	Japan	Netherlands	New Zealand
Norway	Portugal	Spain	Sweden
United Kingdom	United States		
Latin-America and the Caribbean (15)			
Argentina	Brazil	Chile	Colombia
Costa Rica	Dominican Republic	Ecuador	El Salvador
Guatemala	Honduras	Mexico	Paraguay
Peru	Trinidad & Tobago	Uruguay	
South Asia (1)			
Pakistan			
Sub-Saharan Africa (4)			
Ghana	Niger	Senegal	South Africa

APPENDIX B: VARIABLES AND SOURCES

Variable	Definition and construction	Source
Output		
Real per capita GDP (in 1990 PPP US$)	Ratio of total GDP to total population. GDP is in 1990 US$ and it is corrected in order to make it internationally comparable using PPP	Summers and Heston (1991), The World Bank (2000)
Real GDP (in 1986 Chilean pesos)	Constructed by splicing GDP in 1977 Ch$ (from National Accounts 1960-1985) and GDP in 1986 Ch$ (from National Accounts 1985-2000)	Central Bank of Chile (2001) and authors' elaboration
Sectoral Shares in Total Value Added (% of Total Value Added)	Constructed as percentage of total value added by splicing GDP by economic sector in 1977 Ch$ (from National Accounts 1960-1985) and GDP by economic sector in 1986 Ch$ (from National Accounts 1985-2000)	Central Bank of Chile (2001) and authors' construction
Physical and Human Capital		
Domestic Capital Stock (in 1986 Chilean pesos)	Constructed using the perpetual inventory method. Depreciation rate is 4% by year. It was assumed a ratio of capital to GDP of 2.5 in 1940. Series of gross capital formation are taken from Bennett, Schmidt-Hebbel, and Soto (2000)	Authors' construction using Chilean National Accounts and Bennett, Schmidt-Hebbel, and Soto (2000)
Investment (% of GDP)	Ratio of Gross Domestic Investment (in 1986 Ch$) to GDP (in 1986 Ch$)	Bennett, Schmidt-Hebbel, and Soto (2000) and Central Bank of Chile (2001)
National and Foreign Saving (% of GDP)	Ratio of Gross National (Foreign) Saving (in 1986 Ch$) to GDP (in 1986 Ch$)	Bennett, Schmidt-Hebbel, and Soto (2000) and Central Bank of Chile (2001)
Labor Force, Total	Working-age population taken from several surveys	Central Bank of Chile (2001) and authors' construction
Employment, Total	Number of people actually working taken from several labor surveys	Central Bank of Chile (2001) and authors' construction
Average Worked Hours	Average numbers of hours actually worked by worker	Occupation and Employment Surveys of University of Chile
Average Years of Schooling	Average number of years of schooling in the population	Barro and Lee (2000)
Average Years of Secondary Schooling	Average number of years of secondary schooling in the population	Barro and Lee (2000)
Life Expectancy at birth (years)	Life expectancy at birth indicates the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life	The World Bank (2000)
Labor Force Quality (Index)	Normalized index constructed by combining measures of standardized test scores taken from several sources. In order to make it comparable each observation was normalized by subtracting each test's average and dividing by each test's standard deviation. Hence a value of "n" means the observation is "n" standard deviations distant from the test average.	Authors' construction using Barro and Lee (2000), Hanushek and Kimko (2000), and TIMSS (2000)
External Sector		
Terms of Trade Shocks	Log difference of the terms of trade. Terms of trade are defined as customary	The World Bank (2000) "World Development Indicators".
Openness (% of GDP)	Ratio of the sum of real exports and real imports to real GDP	Summers and Heston (1991), The World Bank (2000)
Finance		
Domestic Credit to the Private Sector (% of GDP)	Ratio of the stock of domestic credit to the private sector to GDP	Beck, Demirguc-Kunt and Levine (2000)

Government-Induced Distortions		
Black Market Premium (BMP)	Calculated as (parallel exchange rate/official exchange rate-1)); Values for industrial countries are added as 0	Wood (1988), International Currency Analysis (various issues)
Democracy and Governance		
Governance (Index)	Qualitative variable measuring the overall quality of governance in the country, including the efficiency and honesty of the bureaucracy, the rule of law, and the peaceful resolution of conflicts. The index goes from 0 (the lowest level of governance) to 1 ((the highest level of governance.) Since there is only one observation available by country, it is tried in empirical estimations as a country specific effect	Kaufmann, Kraay, and Zoido-Lobaton (1999)
Civil Liberties (Index)	Civil liberties are defined as rights to free expression, to organize or demonstrate, as well as rights to a degree of autonomy such as is provided by freedom of religion, education, travel, and other personal rights. Countries are classified in seven categories. The original ranking from one to seven was converted here to a scale from 0 to 1, where 0 corresponds to the fewest rights (rank seven) and 1 to the most rights (rank one).	Freedom House
Microeconomic Distortions (Number)	Measure of the number of different bureaucratic procedures necessary to open a new business. It goes from 2 (the lowest value, Canada) to 20 (the highest value, Bolivia)	Djankov and others (2000)
For-Growth Institutions (Dummy variable)	Dummy variable that takes the value of 1 if a country is above the world median in the following variables: secondary years of schooling, life expectancy, domestic credit to private sector, and openness; and bellow the world median in the following variables: government consumption and black market premium. Otherwise, the variable equals to 0	Authors' construction
Infrastructure		
Main Telephone Lines per 1000 workers	Telephone mainlines are telephone lines connecting a customer's equipment to the public switched telephone network. Data are presented per 1,000 workers for the entire country.	Canning (1998), International Telecommunications Union
Imported Computers per worker	Computer imports in US$ per worker. Computers are defined as imports of assembled computers, as well as imports of key components, such as central processing units, memory chips, storage devices, and peripherals.	Caselli and Coleman (2001)
Government		
Government Consumption (% GDP)	The of government consumption to GDP	Summers and Heston (1991), The World Bank (2000)

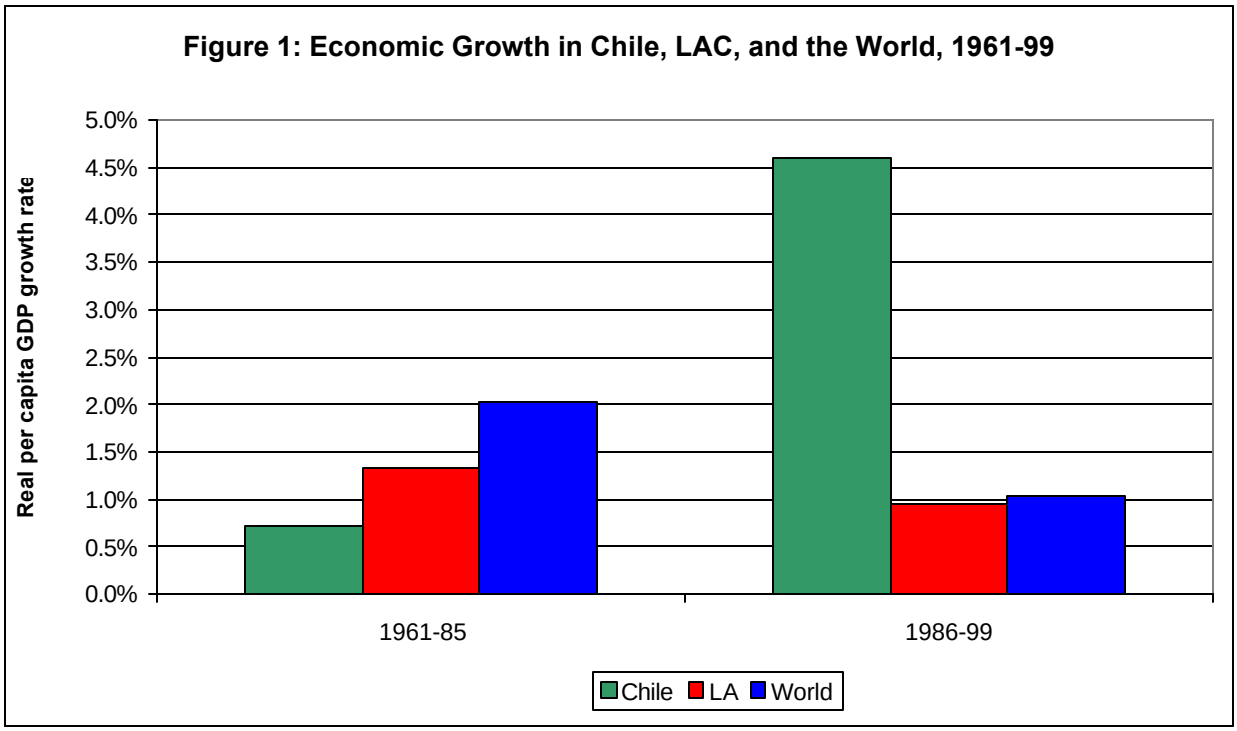


Figure 2: Average level and variability of the growth rate, 1986-99

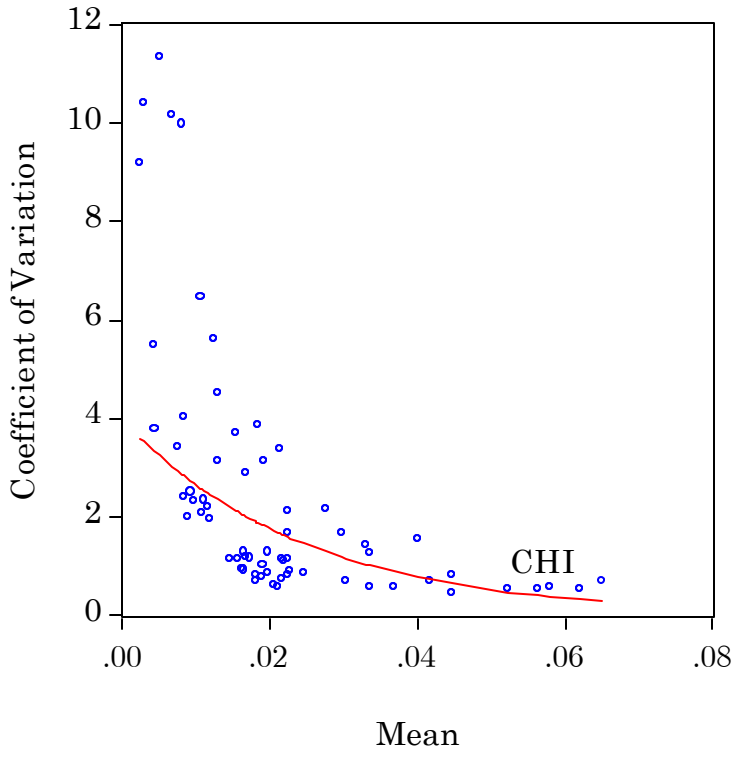


Figure 3: Sectoral Economic Growth in Chile, 1961-2000

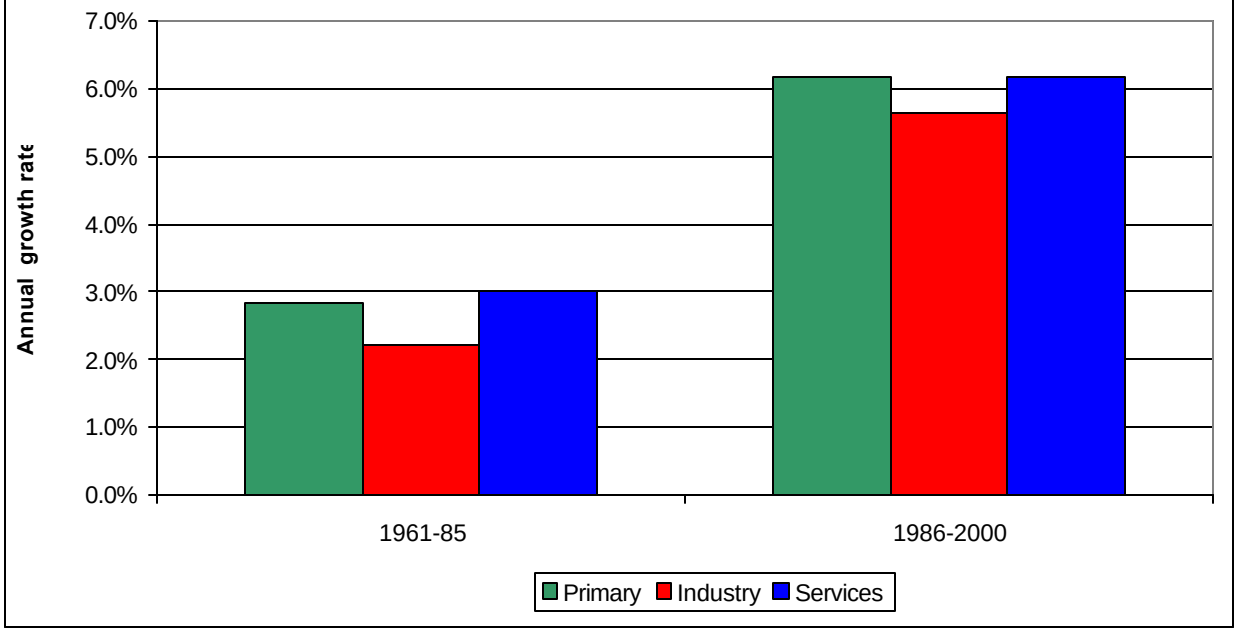


Figure 4: Composition of GDP by Sector, Chile 1960-2000

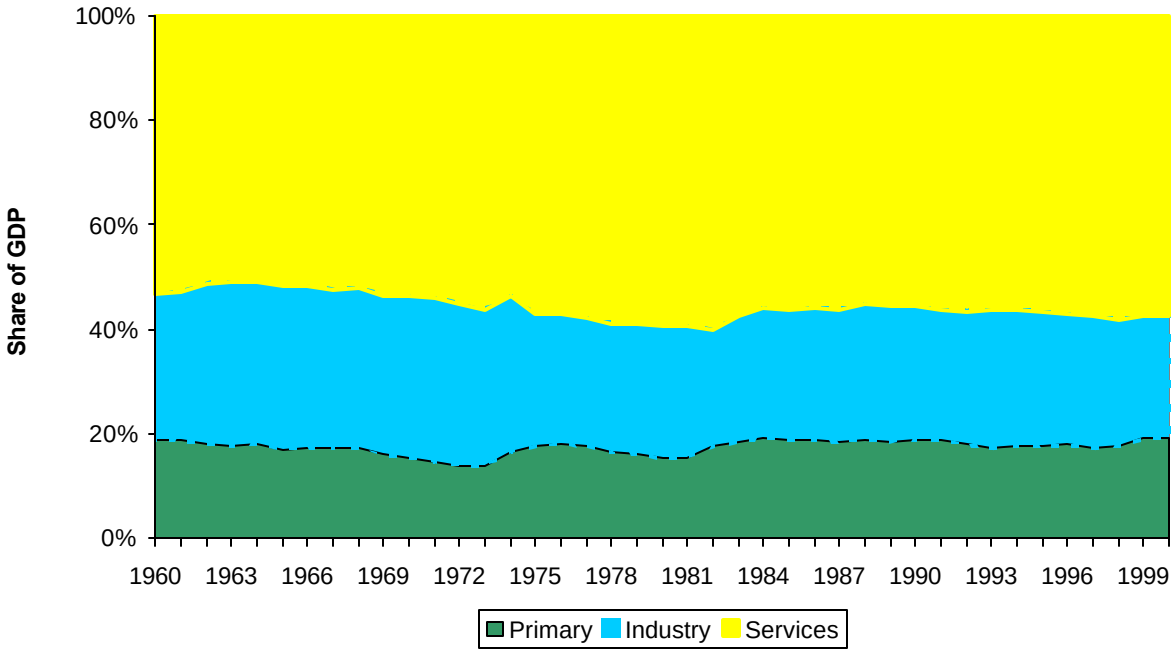


Figure 5A: Growth Accounting in Chile, 1961-2000
(Sollow Residual)

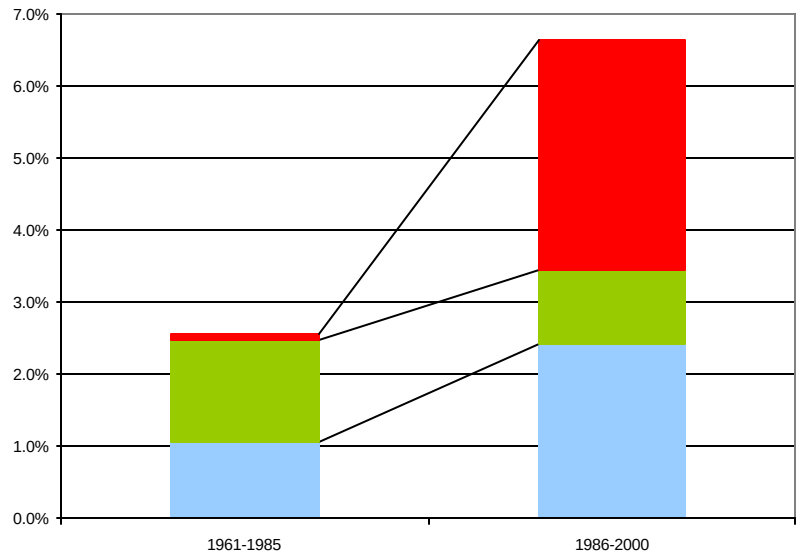


Figure 5B: Growth Accounting in Chile, 1961-2000
(Adjusted Sollow Residual)

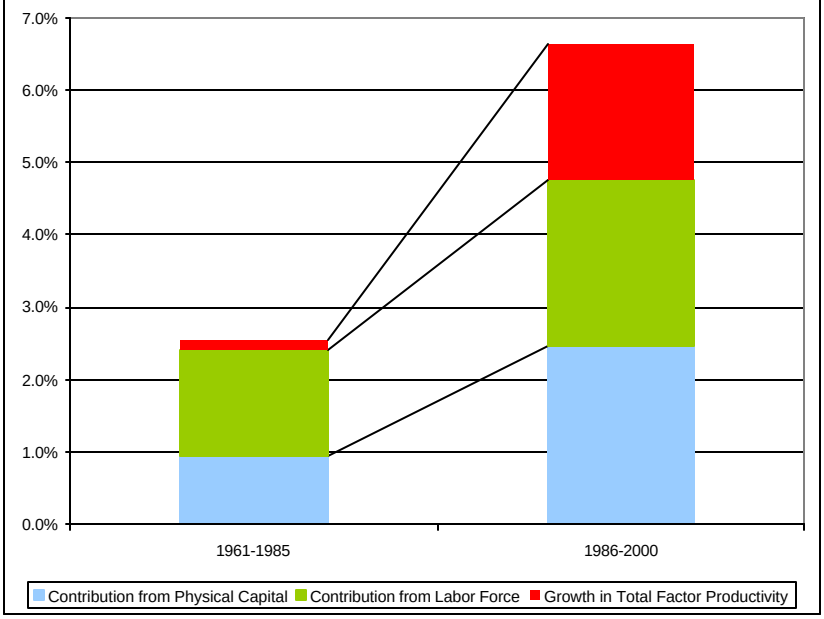


Figure 6: Basic Growth Determinants 1971-1985 vs. 1986-1998

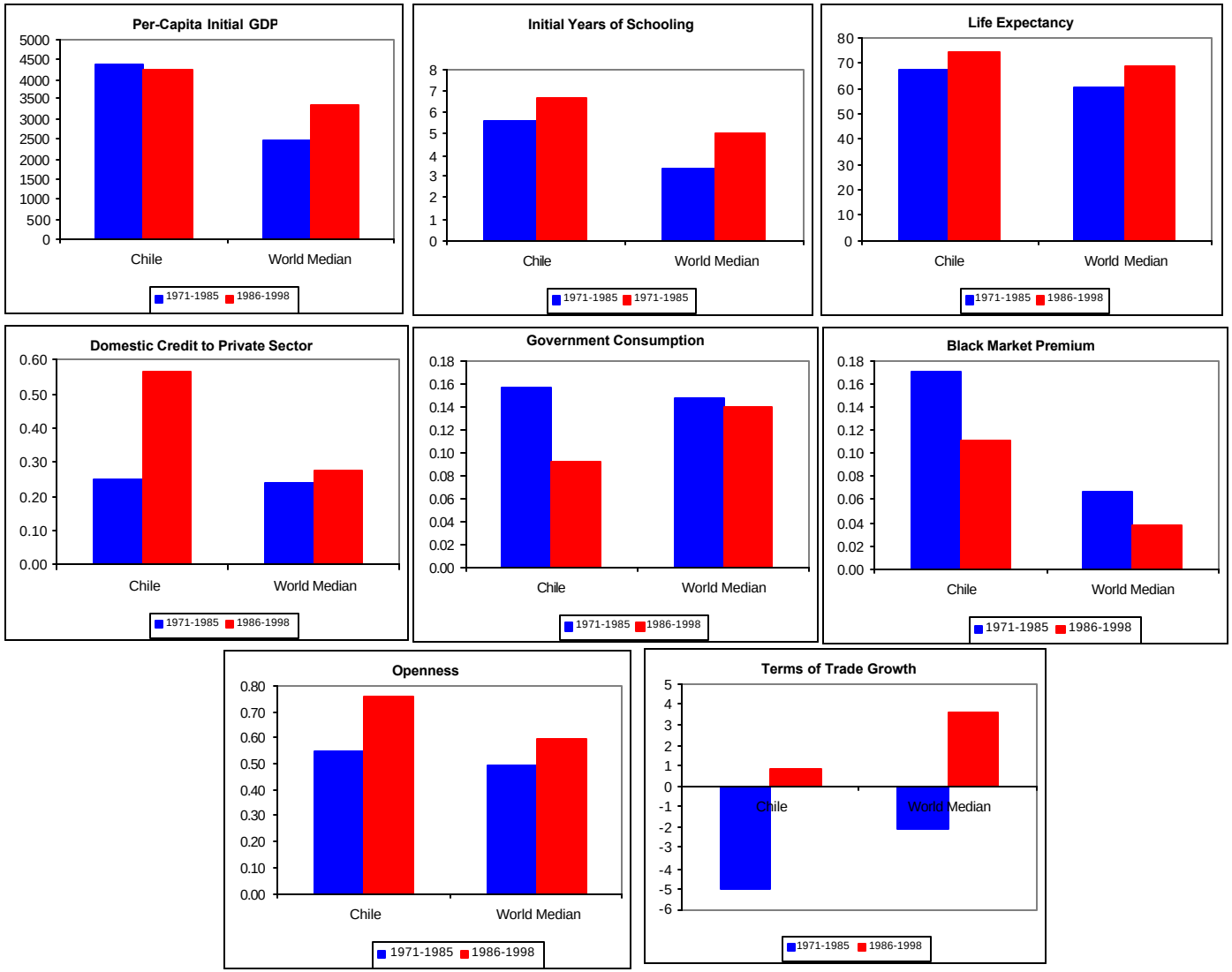
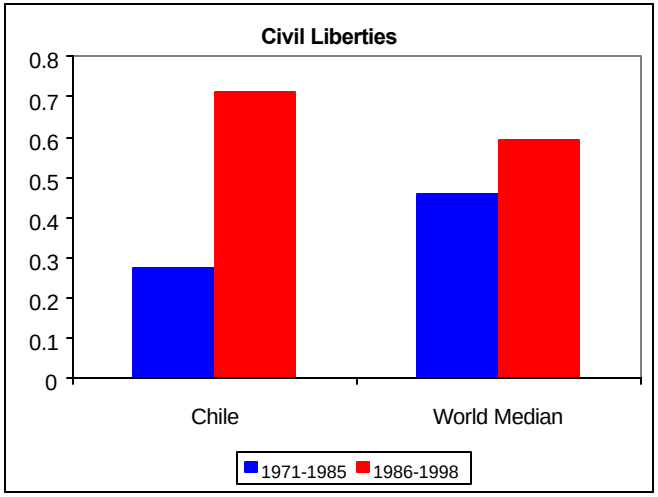
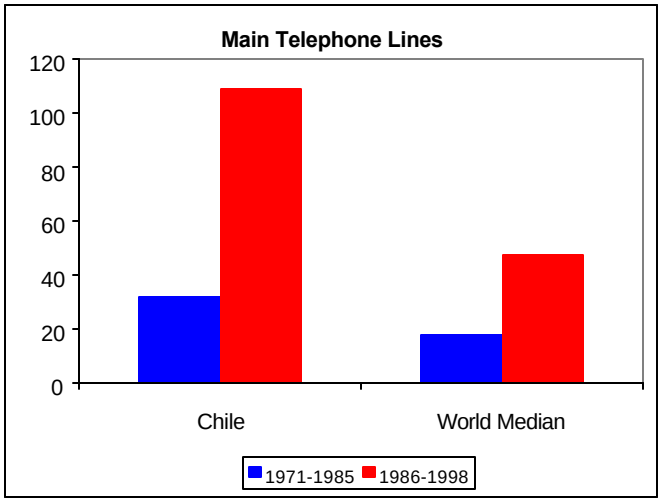


Figure 7: Growth Additional Determinants 1971-1985 vs. 1986-1998





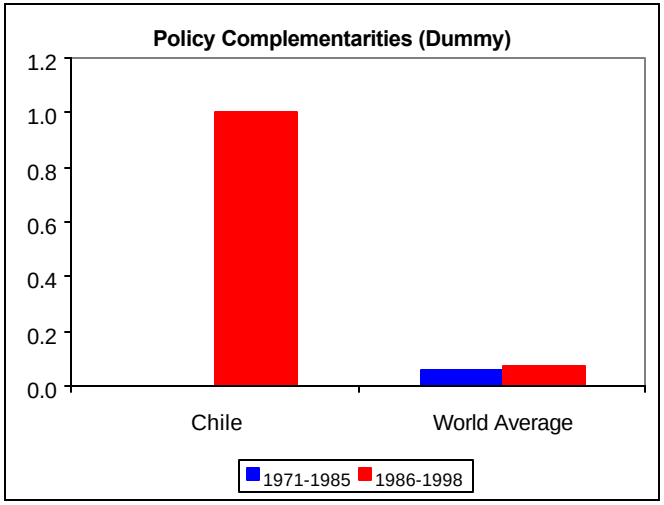


Figure 8: Histogram of Residuals, Basic Regression

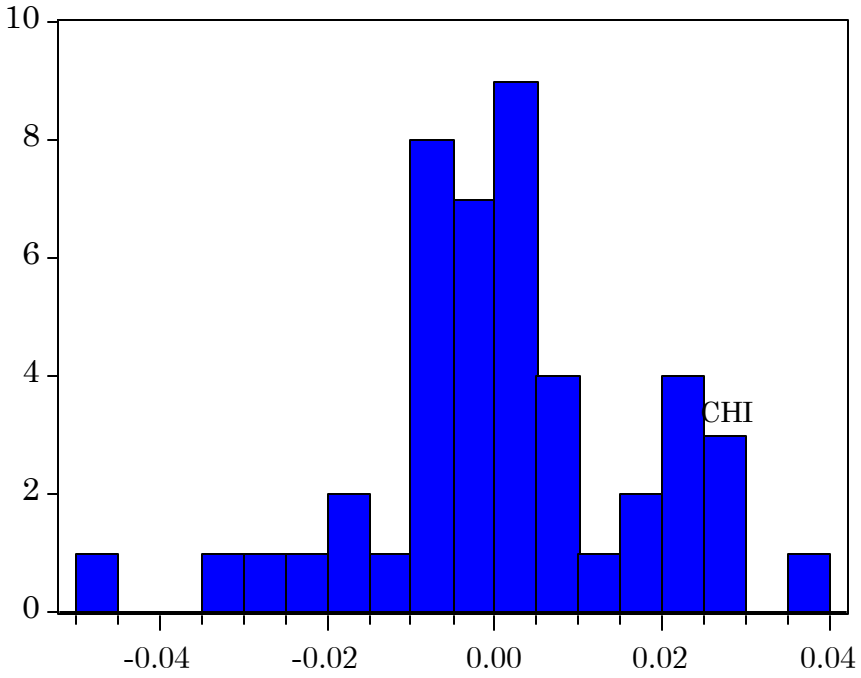


Table 1: Sectoral Output Growth in Chile, 1961-2000

Sector	61-00	61-85	86-00
Primary	*4.1%*	*2.8%*	*6.2%*
Agriculture and Livestock	3.2%	2.0%	5.1%
Fishing	8.0%	6.8%	10.0%
Mining and Quarrying	4.4%	3.2%	6.3%
Industry	*3.5%*	*2.2%*	*5.6%*
Manufacturing	3.4%	2.3%	5.3%
Construction	5.5%	4.9%	6.5%
Gas, Electricity and Wate	3.0%	1.0%	6.4%
Services	*4.2%*	*3.0%*	*6.2%*
Wholesale and retail trade	4.3%	2.3%	7.8%
Transport and Communica	5.8%	3.7%	9.5%
Banking	7.1%	6.8%	7.6%
Public Administration	2.3%	1.6%	3.5%
Other Services	2.3%	2.5%	1.9%
GDP	**4.1%**	**2.5%**	**6.6%**

Source: Central Bank of Chile (2001).

Table 2: Growth Accounting in Chile, 1961-2000

	Output	Physical Capital	Labor Force	Total Factor Productivity TFP1	TFP2
A. Growth Accounting 1: Traditional-Sollow Residual					
A.1 Annual Growth Rates					
1961-1985	2.54%	2.68%	2.34%	…	…
1986-2000	6.64%	6.02%	1.74%	…	…
A.2 Contribution to Output Growth (TFP1 = Solow Residual)					
1961-1985	2.54%	1.07%	1.40%	0.07%	…
1986-2000	6.64%	2.41%	1.04%	3.19%	…
A. Growth Accounting 2: Including Adjustments for Inputs Utilization and Human Capital					
B.1 Annual Growth Rates					
1961-1985	2.54%	2.38%	2.42%	…	…
1986-2000	6.64%	6.16%	3.84%	…	…
B.2 Contribution to Output Growth (TFP2 = Solow Residual after Controlling for Inputs Utilization and Human Capital)					
1961-1985	2.54%	0.95%	1.45%	…	0.14%
1986-2000	6.64%	2.46%	2.30%	…	1.87%

Memo:

	Growth Rates					*Change*
	Maq. and Equ. Capital	Capital Utilization	Years of Schooling	Employment	Worked Hours	Unemployment Rate
1961-1985	2.18%	-0.29%	0.20%	1.59%	-0.19%	7.04%
1986-2000	9.11%	0.14%	0.81%	3.08%	-0.07%	-1.77%

Table 3: Investment, Domestic and Foreign Saving, and Growth in Chile

VAR Estimation, Annual Data, 1961-2000

	VAR (1)		VAR (2)		VAR (3)	
	Investment	Growth	Saving	Growth	Foreign Saving	Growth
Growth (-1)	0.1580 **	0.3302 *	-0.1200	0.3113 *	0.2525 **	0.3058 *
(Std. Error)	(0.0730)	(0.1724)	(0.1553)	(0.1789)	(0.1124)	(0.1630)
Investment (-1)	0.8269 **	-0.0359				
(Std. Error)	(0.0808)	(0.1908)				
Saving (-1)			0.7747 **	0.0105		
(Std. Error)			(0.1287)	(0.1482)		
Foreign Saving (-1)					0.5573 **	-0.0563
(Std. Error)					(0.1350)	(0.1958)
R Squared	0.8076	0.1013	0.5359	0.1005	0.3416	0.1025
Observations	39	39	39	39	39	39

Note: Savings and Investment expressed as ratios to GDP. Growth rate is the real per capita GDP growth rate.

** (**) Significant at the 10 (5) percent level.*

Table 4: Determinants of Economic Growth, Basic Regression
Estimation Technique: Arellano and Bover (1995)
GMM-IV System Estimator

Dependent Variable: Growth Rate of GDP per Capita		
Constant	0.1405	
	(0.1543)	
Initial GDP per capita	-0.0206	**
(in logs)	(0.0059)	
Initial Average Years of Schooling	0.0226	**
(in logs)	(0.0068)	
Life Expectancy	0.0653	*
(in logs)	(0.0417)	
Domestic Credit to Private Sector	0.0089	*
(as ratio to GDP, in logs)	(0.0049)	
Government Consumption	-0.0772	*
(as ratio to GDP, in logs)	(0.4797)	
Black Market Premium	-0.0620	**
(in log of 1 + bmp)	(0.0274)	
Openness	0.0033	
(as ratio of exports plus imports to GDP, in logs)	(0.0063)	
Terms of Trade Shocks	0.1912	**
(log difference of the terms of trade)	(1.7153)	
Dummy 1986-1998 vs. 1970-1985	-0.0127	**
	(0.0031)	
Sargan Test (p-value)	0.152	
(Ho: Instruments are valid)		
Number of Countries/Observations	46/138	

Numbers in parentheses represent standard errors.
** (**) Significant at the 10 (5) percent level.*

Table 5: Comparison of Actual and Projected Growth Changes for Selected Latin American Countries, Basic Regression

		Actual	Projected	Residual	
Latin American Countries					
Argentina	1986-98 vs. 1970-85	1.98%	-0.06%	2.04%	
Brazil	1986-98 vs. 1970-85	-2.87%	-0.85%	-2.02%	
Chile	**1986-98 vs. 1970-85**	**4.74%**	**2.08%**	**2.67%**	**+**
Colombia	1986-98 vs. 1970-85	-0.96%	-0.55%	-0.41%	
Ecuador	1986-98 vs. 1970-85	-3.67%	0.91%	-4.58%	**
Mexico	1986-98 vs. 1970-85	-0.81%	-0.96%	0.16%	
Peru	1986-98 vs. 1970-85	0.76%	-0.75%	1.51%	

Notes: The standard deviation for the residuals is 0.016478 for the 1986-1998 period.

** (**) {+} indicates that the residual is different from zero at the 10 (5) {12} percent significance level.*

Table 6: Determinants of Economic Growth, Expanded Regression
Estimation Technique: Arellano and Bover (1995)
GMM-IV System Estimator

Dependent Variable: Growth Rate of GDP per Capita	(1)	(2)	(3)	(4)
Constant	0.1465	-0.0438	0.1942	0.2284
	(0.1385)	(0.1397)	(0.1553)	(0.1589)
Initial GDP per capita	-0.0182 **	-0.0534 **	-0.0191 **	-0.0427 **
(in logs)	(0.0065)	(0.0079)	(0.0039)	(0.0064)
Initial Average Years of Schooling	0.0181 **	0.02125 **	0.0222 **	0.0219 **
(in logs)	(0.0088)	-0.0066	(0.0069)	(0.0058)
Life Expectancy	0.0418	0.1890 **	0.1961 **	0.1126 **
(in logs)	(0.0453)	(0.0305)	(0.0576)	(0.0293)
Domestic Credit to Private Sector	0.0086 *	0.0080 *	0.0037	0.0019
(as ratio to GDP, in logs)	(0.0048)	(0.0050)	(0.0035)	(0.0051)
Government Consumption	-0.0682	-0.1136 **	-0.0531 *	-0.1072 **
(as ratio to GDP, in logs)	(0.0463)	(0.0488)	(0.0332)	(0.0342)
Black Market Premium	-0.0443 *	-0.0841 **	-0.0696 **	-0.0857 **
(in log of 1 + bmp)	(0.0232)	(0.0225)	(0.0267)	(0.0177)
Terms of Trade Shocks	0.1613 **	0.1799 **	0.1961 **	0.1540 **
(log difference of the terms of trade)	(0.0497)	(0.0365)	(0.0576)	(0.0300)
Openness	-0.0015	0.0150 **	-0.0031	0.0120 **
(as ratio of exports plus imports to GDP, in logs	(0.0056)	(0.0046)	(0.0050)	(0.0029)
Dummy 1986-1998 vs. 1970-1985	-0.0098 **	-0.0272 **	-0.0122 **	-0.0216 **
	(0.0032)	(0.0034)	(0.0023)	(0.0025)
Civil Liberties	0.0182 **	...	...	0.0161 **
(Gastil)	(0.0084)	...	...	(0.0080)
Main Telephone Lines	...	0.0820 **	...	0.0690 **
(as lines per 1000 workers)	...	(0.0150)	...	(0.0130)
Policy Complementarities	...	...	0.0147 *	0.0126 **
	...	...	(0.0084)	(0.0052)
Sargan Test (p-value)	0.126	0.668	0.248	0.858
(Ho: Instruments are valid)				
Number of Countries/Observations	46/138	46/138	46/138	46/138

Numbers in parentheses represent standard errors.
** (**) Significant at the 10 (5) percent level.*

Table 7: Sources of Growth, Change in Per-Capita Growth Rate 1986-1998 vs. 1971-1985

Sources	Basic	Expanded
Actual Change in Growth	**4.74%**	**4.74%**
Projected Change in Growth	**2.08%**	**3.47%**
Initial Income per capita	0.07%	0.14%
Initial Average Years of Schooling	0.38%	0.37%
Life Expectancy	0.63%	1.08%
Terms of Trade Shocks	1.13%	0.91%
Domestic Credit to Private Sector	0.72%	0.15%
Government Size	0.50%	0.70%
Black Market Premium	0.32%	0.45%
Openness	0.11%	0.39%
Time Dummies	-1.27%	-2.34%
Civil Liberties	…	0.70%
Main Telephone Lines	…	0.53%
Policy Complementarities	…	1.26%
Residual	**2.67%**	**1.27%**

Residual, Alternative Regressions

	Residuals	*P-value*
Simple (Table 4)	2.67%	0.120
Civil Liberties (Table 6, column 1)	2.34%	0.354
Main Telephone Lines (Table 6, column 2)	2.43%	0.263
Policy Complementarities (Table 6, column 4)	1.78%	0.333
All (Table 6, column 5)	1.49%	0.544

Table 8: Growth Forecasts

Change in Per-Capita Growth Rate, Several Specifications

Sources	1986-1998	Projected 2001-2010	Projected Change in Growth	
			Basic	**Expanded**
Actual Per-Capita GDP Growth Rate:	4.52%		**-0.56%**	**-0.70%**
Initial Income per capita*	4,236	9,702	-1.71%	-3.54%
Initial Average Years of Schooling*	6.87	7.55	0.21%	0.21%
Life Expectancy	74.29	77.15	0.25%	0.43%
Domestic Credit to Private Sector	56.5%	87.7%	0.39%	0.08%
Government Size	9.2%	7.3%	0.15%	0.21%
Black Market Premium	11.1%	0.00%	0.65%	0.90%
Openness	75.5%	93.9%	0.00%	0.22%
Civil Liberties	0.71	0.83	…	0.20%
Main Telephone Lines	109.09	253.07	…	0.99%
Policy Complementarities	1.00	1.00	…	0.00%
Terms of Trade Shocks	0.89%	-1.72%	-0.50%	-0.40%

Sources	Projected 2001-2010	Percentil >=90 in the World	Projected Change in Growth	
			Basic	**Expanded**
			0.70%	**2.70%**
Avg. Years Schooling*	7.55	9.27	0.46%	0.45%
Life Expectancy*	77.15	77.15	0.00%	0.00%
Domestic Credit to Private Sector	87.7%	103.4%	0.15%	0.03%
Government Size	7.3%	7.3%	0.00%	0.00%
Black Market Premium	0.00%	0.00%	0.00%	0.00%
Openness	93.9%	119.7%	0.09%	0.29%
Civil Liberties	0.83	1.00	…	0.26%
Main Telephone Lines	253.07	494.79	…	1.67%
Policy Complementarities	1.00	1.00	…	0.00%

Sources (See Table 9)	1986-1998	Percentil >=90 in the World	Projected Change in Growth
Quality of Education	-0.96	0.60	1.48%
Governance	0.71	0.79	0.71%
Microeconomic Restrictions	12.00	5.00	0.74%
Technology Adoption	15.37	191.15	1.09%

The variables are defined as in the cross-country regressions

** Values are intial and non projected*

Table 9: Determinants of Economic Growth, Additional Factors
Estimation Technique: Arellano and Bover (1995)
GMM-IV System Estimator

Dependent Variable: Growth Rate of GDP per Capita	(1)	(2)	(3)
Constant	0.3889	-0.1845	0.0903
	(0.1883)	(0.1419)	(0.1661)
Initial GDP per capita	-0.0091	-0.0126 **	-0.0280 **
(in logs)	(0.0057)	(0.0054)	(0.0062)
Initial Average Years of Schooling	-0.0148 *	-0.0115	0.0187 **
(in logs)	(0.0080)	(0.0090)	(0.0074)
Life Expectancy	0.0375	0.1598 **	0.1108 **
(in logs)	(0.0394)	(0.0246)	(0.0393)
Domestic Credit to Private Sector	0.0012	-0.0059	0.0048
(as ratio to GDP, in logs)	(0.0025)	(0.0041)	(0.0036)
Government Consumption	0.0614 **	-0.0799 **	-0.0408
(as ratio to GDP, in logs)	(0.0216)	(0.0287)	(0.0312)
Black Market Premium	-0.0933 **	-0.0752 **	-0.0748 **
(in log of 1 + bmp)	(0.0123)	(0.0270)	(0.0229)
Openness	-0.0007	0.0145 **	0.0025
(as ratio of exports plus imports to GDP, in logs)	(0.0043)	(0.0044)	(0.0048)
Terms of Trade Shocks	0.1156 **	0.1813 **	0.1708 **
(log difference of the terms of trade)	(0.0482)	(0.0700)	(0.0497)
Dummy 1986-1998 vs. 1970-1985	-0.0028	-0.0137 **	-0.0178 **
	(0.0028)	(0.0022)	(0.0027)
Quality of Education	0.0095 **	...	...
(as a normalized index)	(0.0049)	...	...
Microeconomic Restrictions	...	-0.0011 **	...
(Number of procedures to open a firm)	...	(0.0005)	...
Technology Adoption	...	...	0.0001 **
(Imported computers per worker)	...	...	(0.0000)
Sargan Test (p-value)	0.146	0.261	0.236
(Ho: Instruments are valid)	42/126	37/111	44/132
Number of Countries/Observations			

Numbers in parentheses represent standard errors.
** (**) Significant at the 10 (5) percent level.*

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