CHILE'S TAKEOFF: FACTS, CHALLENGES, LESSONS

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Resumen

Chile ha vivido una profunda transformación en sus políticas, estructura económica y desempeño material durante las dos últimas décadas. El país ha logrado unirse al pequeño grupo de naciones cuyo despegue económico les ha permitido romper con el estancamiento asociado a bajas tasas de crecimiento. Como socio reciente y único miembro latinoamericano de este grupo, la experiencia de Chile ofrece lecciones sobre el diseño y la efectividad de políticas que pueden ser útiles a otros países reformadores. Este trabajo provee evidencia empírica acerca del papel crucial jugado por la estabilización macroeconómica y las reformas estructurales en Chile para su alcance de altas tasas de ahorro, inversión y crecimiento y presenta una evaluación de las perspectivas de crecimiento futuro. El estudio identifica los mayores riesgos y retos de política que quedan por abordar para asegurar un crecimiento elevado y sostenido. Finalmente se derivan lecciones de la experiencia chilena para otros países reformadores.

Abstract

A major change in policies, economic structure and performance has taken place in Chile during the last two decades. Chile joined the small number of takeoff countries that have been able to break away from stagnation. As a newcomer to the club and its only Latin American member to date, Chile's experience offers lessons in policy design and effectiveness that may be useful to other reforming countries. This paper provides empirical evidence on the crucial role played by macroeconomic stabilization and structural reform in the country's attainment of high rates of saving, investment, and growth, and offers an assessment of future growth prospects. The paper identifies major risks and policy challenges that remain to be addressed to lock in sustained high growth. Final lessons are drawn from Chile's experience for other reforming countries.

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Introduction

A major change in policies, economic structure, and performance has taken place in Chile during the last two decades. The clearest evidence of the country's better performance is its attainment of high and sustained economic growth, supported by similarly higher national saving and investment rates. But achieving sustained economic success has neither been easy nor without setbacks. Severe foreign shocks and serious domestic policy mistakes have punctuated the country's progress since the start of the reform efforts in the mid 1970s. Neither is the country's current growth path without risks. Chile still faces significant policy challenges to reduce the latter risks and lock in high growth for the long haul.

In an international context, Chile joined the small number of takeoff countries that have been able to break away from the past by reaching sustained rates of high growth, saving, and investment. As a newcomer to the club and its only Latin American member to date, Chile's experience offers lessons in policy design and effectiveness that may be useful to other reformers, particularly in the Latin American and Caribbean region.

This paper documents Chile's takeoff, focusing on the stylized facts of saving, investment, and growth (section 1) and providing a model-based interpretation of the role of policies in the country's takeoff (section 2). Then the paper identifies major risks and policy challenges that remain to be addressed to lock in sustained high growth (section 3). Final lessons are drawn from Chile's experience for other reforming countries (section 4).

1. Chile's saving-investment-growth takeoff: the facts

1.1 Overview of Chile's takeoff

Chile's saving, investment, and growth (SIG) performance reflects high annual volatility and one major structural break during the last four decades. These salient features are reflected in Figures 1 and 2 and summarized by relevant periods in Table 1. The selected periods reflect distinct regimes of policies and performance. The pre-reform era is characterized by increasing macroeconomic instability and worsening economic performance (1961-74). Serious stabilization efforts and deep structural reforms were started in 1974-75 and have continued to date at varying speeds and intensities as discussed in section 2 below. It is useful to distinguish between the first reform period (1975-81) and the second reform period (1982-89) of the military regime that coincide with two intense recession-recovery cycles. Continued macroeconomic stabilization efforts but less intense structural reform initiatives characterize the high-employment period under democratic regimes (1990-97).

Table 1
Saving, Investment, and Growth (Chile, 1961-97)

	GNS/GDP at curr. prices	FS/GDP at curr. prices	GDI/GDP at curr. prices	GDI/GDP at const. prices	GFKF/GDP at const. prices
1961-74	12.5	2.3	14.8	19.2	19.1
1975-81	11.4	5.6	17.0	17.8	16.0
1982-89	12.1	6.2	18.3	19.2	17.9
1990-97	24.7	2.4	27.0	29.2	25.5

	IA/GDP at const. prices	TFP growth	GDP growth	Per capita GDP growth
1961-74	0.1	1.2	3.3	1.1
1975-81	1.7	2.0	4.4	2.9
1982-89	1.3	-0.1	2.6	0.9
1990-97	3.6	2.7	6.7	5.1

Note: GNS is gross national saving, FS is foreign saving, GDI is Gross Domestic Investment, GFKF is Gross Fixed Capital Formation, IA is Inventory Accumulation, and TFP is Total Factor Productivity.

Source: Central Bank of Chile and author's calculations.

Chile's SIG performance suggests seven stylized facts:

1. *Shocks, policy mistakes, and slow response to reforms.* The response of the economy to the deep stabilization and structural reform efforts started in the mid 1970s was delayed by the severe consequences of both adverse foreign shocks (in 1973-75 and 1980-82) and serious domestic policy mistakes (in 1979-82) during the first reform period. Recessions of depression-like intensity hit Chile in 1975 and 1982-83, reflected in double-digit GDP losses and very high unemployment rates. It took almost two decades before unemployment rates fell to full-employment levels. An 8.0% unemployment rate was attained only in 1989 and its level has averaged 7.2% during the 1990s, not exceeding 8.2% in any given year.

2. *Pro-cyclical productivity, saving, and investment.* Total factor productivity growth (g_{TFP}), the gross national saving (GNS) rate, and the gross domestic investment (GDI) rate have displayed a highly pro-cyclical behavior as suggested in figures 1-2. This is confirmed by the following partial correlation coefficients between the latter variables and GDP growth (g):

corr (g_{TFP}, g)	corr (GNS/GDP, g)	corr (GDI/GDP, g)
0.933	0.525	0.535

3. *The takeoff.* Chile's SIG takeoff is reflected by significant trend breaks with past behavior observed since the late 1980s. The NS ratio attains 24.7% of GDP during the 1990s, twice the average level observed during the preceding three decades. The current-price (constant-price) GDI ratio reaches 27.0% (29.2%) of GDP during 1990-97, exceeding substantially its historical level. The gross fixed-capital investment (GFKI) ratio rises by less, to 25.5% of GDP during 1990-97, as inventory accumulation jumps to 3.6% in the 1990s. TFP growth attains 2.7% per year in the 1990s, a figure that exceeds substantially the meager 1.2% recorded in 1961-74 or the 0.9% observed in 1975-89. As a result of higher investment and TFP growth, GDP growth attains 6.7% per year in the 1990s, twice its historical level.

4. *Dating the trend* break. When does Chile's SIG takeoff start? Dating the trend break is not an easy task without controlling for saving, investment, and growth determinants other than economic policies -- a task left to the next section. However figures 1 and 2 suggest that investment and TFP growth started a modest pick up during the first reform period (1975-81) but their gains were reversed during the bust-recovery years of 1982-86. The turning point is reached in 1987, when both GDI and NS ratios rise to historically unprecedented levels. From 1987 onwards, both ratios exceed every year the levels recorded in every year of the 1961-86 period. TFP and GDP growth rates also reach sustained higher levels from 1987 onwards. Sustained high growth is maintained after high (full) employment is reached in 1990.

5. *Large foreign saving inflows.* Foreign saving (FS) played a crucial role during 1978-87, a decade when it exceeded 5% of GDP in each and every year. Voluntary private foreign resource inflows financed an exploding private investment-saving gap from the mid-1970s through early 1982. The LDC debt crisis triggered by the Mexican default in August 1982 dried up further private voluntary lending. Although the debt crisis implied a drastic regime change, Chile was able to secure substantial involuntary private capital inflows (as a result of debt rescheduling agreements) and loans from multinational financial institutions during 1983-87. But since 1988 foreign saving has fallen to less than 5% of GDP, declining to an average 2.4% during 1990-97. The latter level of current-account deficits, while similar to the 1961-74 average, is low when considering that Chile has full access to foreign financing in the 1990s as opposed to the 1960s and early 1970s.

6. *Significant foreign - national saving substitution.* The relations between GDI, GNS, and FS are distinctly different in 1961-77 (low FS, GNS, and GDI ratios) from the 1978-87 decade (high FS, very low NS, and moderate GDI), and from the 1988-97 decade (low FS, and high NS and GDI). The 1961-97 partial correlation coefficients for FS and NS and GDI are the following:

corr (FS/GDP, GNS/GDP)	corr (FS/GDP, GDI/GDP)
-0.566	-0.185

The large absolute correlation between foreign and national saving ratios reflects a high substitution between both variables observed in particular during the 1978-87 decade. The correlation between foreign saving and gross domestic investment ratios is low but surprisingly of a negative sign. This suggests that at times of foreign saving abundance the latter is more of a substitute of national saving than a financing source for capital formation.

7. *High saving-investment* correlation. Low saving-investment levels in the pre-reform period 1961-74 and high saving-investment levels in the post-reform period 1990-97 -- with basically unchanged foreign saving -- suggests that Chile should be no exception to the well-known high saving-investment correlation that is observed internationally. This is confirmed by the following Feldstein-Horioka (1980) type of regression (t-statistics in parenthesis):

GDI/GDP	=	7.906	+	0.719 NS/GDP	$R^2 = 0.76$	1961-97
		(10.43)		(6.93)		
GDI/GDP	=	3.855	+	0.899 NS/GDP	$R^2 = 0.92$	1961-97 (excl. 1978-87)
		(16.65)		(3.95)		

The saving-investment correlation is much stronger when excluding the 1978-87 decade of high resource inflows. A number of explanations have been provided for the Feldstein-Horioka puzzle. They include national barriers to international capital flows, binding foreign source constraints, domestic policies targeted at low current accounts, home bias in international portfolio selection, and common factors affecting both national saving and foreign investment in the same direction (Obstfeld and Rogoff 1996). When decomposing the rise in saving and investment according to causal factors in section 2 below, I identify some common factors that provide part of the answer to the high correlation confirmed above.

1.2 International comparison

Chile's SIG performance and takeoff can be compared to the relevant international experience, considering three relevant country groups: OECD countries, non-takeoff developing economies, and 9 (mostly East Asian) takeoff countries (Figures 3.1-3.3). The latter group is comprised by those countries that started as low-performing LDCs in the (early) 1960s but since then have been able to raise and sustain their saving, investment, and growth rates to levels that are unprecedented both in comparison to their own past and the contemporaneous performance of other developing and industrial economies.[1]

The following facts emerge from this comparison.

[1] Takeoff countries include eight Asian economies (China, Hong Kong, Indonesia, Korea, Malaysia, Singapore, Taiwan (China), Thailand) and one African economy (Mauritius). Another high-performing African country (Botswana) has been excluded from this sample because of lack of complete data. A more detailed discussion of takeoff experiences in these countries is found in Schmidt-Hebbel and Servén (1997).

(i) Chile was a systematic under-achiever until the mid-1980s. The country's saving and investment rates were below those of the lowest-performing country group (the non-takeoff LDCs) in each and every year during 1961-86. Per capita GDP growth was similarly mediocre.

(ii) Chile has surpassed the saving and investment performance of the second-best country group (the OECD countries) and has significantly exceeded per capita growth of the latter since 1989.

(iii) Chile's break with the past is much more recent than the takeoffs started by the 9 countries at different times between the early 1960s (Korea) and 1980 (China). However, large gaps remain between the takeoff countries' and Chile's saving rate (10 percentage points) and investment rate (6 percentage points) during the 1990s. The gap between Chile's and the takeoffs' per capita growth rate is relatively smaller (1%), suggesting that Chile's TFP growth is similar to average TFP growth in the takeoff economies. In the absence of TFP growth rates for the specific group of 9 takeoff countries, the data for Asian LDCs (where most takeoff economies are located) shows a 2.9% TFP growth rate for 1982-91, the same figure Chile recorded during the 1990s (Table 2).

Table 2
GDP and TFP growth in Developing Countries and in Chile

	1971-81	1982-91	1992-97
All developing countries			
GDP growth	6.0	4.2	
TFP growth	1.3	1.0	
Asia			
GDP growth	6.2	6.8	
TFP growth	1.9	2.9	
Latin America and the Caribbean			
GDP growth	6.2	1.6	
TFP growth	1.3	-0.7	
Chile			
GDP growth	3.0	3.2	7.2
TFP growth	1.1	0.3	2.9

Source: Agénor and Montiel (1996), Central Bank of Chile.

Table 3 reports period average levels and standard deviations of SIG rates for the world, the OECD countries, and all developing countries, as well as for Chile, for 1965-92. A distressing fact to note is that SIG performance in LDCs is on average inferior to OECD

countries not only in regard to first moments but also to second moments. In particular average per capita growth in LDCs is half the size observed in OECD countries while growth volatility is almost twice as large.

Table 3
Saving, Investment, and Growth in the World and in Chile:
Average and Standard Deviations (1965-1992, unless indicated otherwise)

	Average			Standard Deviation		
	GNS/GDP	GDI/GDP	Pc GDP gr	GNS/GDP	GDI/GDP	Pc GDP gr
World	15.4	21.4	1.8	6.3	5.0	4.6
OECD Countries	23.3	23.8	2.8	3.1	3.2	2.9
All LDCs	13.3	20.8	1.5	7.1	5.5	5.0
Chile: 1965-92	13.7	17.6	1.8	6.3	4.9	6.2
1961-74	12.5	14.8	1.1	3.8	2.9	3.9
1975-87	10.0	16.7	1.1	4.3	3.9	7.7
1988-97	24.3	26.4	5.4	1.4	1.8	2.3

Source: Schmidt-Hebbel, Servén, and Solimano (1996b), and Central Bank of Chile.

Chile's historical (1965-92) saving and investment volatility has been equal to that observed in the world. However Chile's growth volatility has been much larger than both in the world at large and in LDCs in particular. But reaching a high SIG plateau has allowed a significant reduction in Chile's instability. Standard deviations have declined substantially during the last decade (1988-97) for saving, investment and growth rates, to values well below historical standard deviations observed in OECD countries. Higher levels and low volatility are reflected in a dramatic improvement in Chile's coefficients of variation. For instance the coefficient of variation of per capita GDP growth has fallen from 7.0 during 1975-87 to 0.43 during the last 10 years. Lower volatility of investment and growth -- a reflection of more stable macro policies, improved micro incentives, and more stable rules of the game -- may reinforce the virtuous cycle of a high saving-investment-growth performance.

2. Policy Reforms and Saving-Investment-Growth Performance

A growing literature is analyzing the cross-country evidence on Granger causality of saving, investment, and growth, and the relation between policy regimes and SIG.[2] For Chile there is a growing body of studies assessing the country's overall policy reform

[2] Amomng the cross-country studies are Carroll and Weil (1994) and Attanasio, Picci, and Scorcu (1997). Reviews of causality issues and the relation between SIG performance and policies can be found in Schmidt-Hebbel, Servén, and Solimano (1996a, b).

experience and its relation to SIG performance.[3] A compact account of the main policy reforms implemented by Chile is presented next. Then the focus shifts on the determinants of Chile's SIG takeoff.

2.1 Policy Reforms

After decades of inadequate macroeconomic and microeconomic management by an ever-growing state that climaxed during the Allende government, the military regime started a program of macroeconomic stabilization and structural reform in 1974-75. The first reform phase (1974-1981) combined macroeconomic stabilization with a large number of deep and generally successful structural reforms that were of unusual radicalism for the 1970s. However major policy mistakes (a fixed exchange rate with backward wage indexation, and ineffective bank regulation and supervision) led to a classic "twin banking-cum-external crisis" (Kaminsky and Reinhart 1996) triggered by adverse foreign shocks in 1981-82. After the 1982-84 period of deep recession, large macroeconomic imbalances, and partial reform reversals (including government takeover of bankrupt financial institutions and temporary increase in tariffs), the military government started a second reform phase that both corrected the macroeconomic and structural errors that led to the preceding crisis and deepened reforms in other areas.

Since 1990 the democratic governments have maintained a strong fiscal stance and the newly independent Central Bank of Chile has gradually reduced inflation to the lowest level in half a century. Public spending on social programs has increased sharply. Structural reforms have proceeded at a slower pace, with progress recorded in areas of trade reform and privatization.

Next I focus briefly on a small set of summary indicators of macroeconomic stabilization, structural reform, and tax reform that will be used below to assess the effect of policies on Chile's SIG performance. The massive improvement in fiscal stance -- started in 1976, interrupted during 1982-85, and continued subsequently through 1997 -- is reflected in significant non-financial public sector surpluses (see Figure 4). In fact, Chile has been able to record a systematic non-financial public surplus of 1.7% of GDP since 1987.[4] With regard to inflation, Chile has pursued a very gradualist but effective price stabilization program: it has taken 23 years to reduce average annual CPI inflation from 375.9% in 1974 to a 6.1% in 1997.[5] Significant inflation progress was recorded during the first reform phase of the military government but during the 1980s no further progress was

[3] Among the studies of Chile's policy reforms are Edwards and Edwards (1987), Bosworth, Dornbusch and Labán (1994), Larrain (1994), Corbo, Lüders, and Spiller (1997), and Cortázar and Vial (1998). Among studies that focus more specifically on the relation between Chile's policies and SIG performance are Marfán and Bosworth (1994), Larraín and Rosende (1994), Morandé and Vergara (1997) and the papers therein, and Marshall and Velasco (1998).

[4] The series of Chile's non-financial public surplus depicted in Figure 4 excludes the amortization of implicit pay-as-you-go pension debt since 1981 and the Central Bank's cuasi-fiscal deficit. Inclusion of the first would raise the corrected public surplus measure while inclusion of the latter would reduce it.

[5] Figure 4 presents a normalized measure corresponding to the cost of inflation (π), defined as $\pi/(1+\pi)$.

achieved. Only during the 1990s a gradual convergence toward international levels of inflation is being successfully pursued.

A number of recent studies at the World Bank and the Inter American Development Bank have evaluated policy reform progress and results in the Latin American and Caribbean region, putting together a large set of country reform indicators.[6] Here I make use of Lora's (1997) aggregate index of structural reform progress. This measure combines reform progress in five areas: trade policy, tax policy, financial policy, privatizations, and labor legislation.[7] Extending Lora's figures for Chile for the years before and after his 1985-95 time period yields the time series depicted in Figure 4. The result shows a poor structural policy stance for the 1960s (at an average figure close to 10), a sharp deterioration in 1970-73 reflected by an index value of zero, and a massive improvement during the military government's first reform phase, reaching a value of 50 in 1980-82. After small partial reversals in the early 1980s, further but slower progress was reached during the military government's second reform period and continued by the democratic governments to the present.

Due to their importance for saving and investment behavior, let's refer briefly to the major tax reforms performed since the mid-1970s.[8] The reforms of 1974, 1984, and 1989 simplified and rationalized tax codes, reduced import duties, introduced value-added taxation, and lowered top marginal tax rates on personal income and corporate retained earnings (Figure 5). Although the current tax base for individuals is their consolidated personal income, the dominance of VAT as the major revenue source in Chile and the various tax incentives for personal saving makes the tax system a predominantly consumption-based tax regime. The 1984 tax reform provided tax exemptions and credits on various forms of personal financial savings and their returns. These personal saving incentives were complemented by significant tax incentives for corporate saving (or investment) by establishing generous depreciation allowances and significant differences between corporate tax rates and top personal income rates, and between corporate tax rates on retained and distributed profits. The 1991 tax reform reintroduced accrued total corporate earnings as the tax base at a 15% rate, which implied an increase of the tax rate on retained earnings from zero to the latter rate. The 1994 tax reform reduced top marginal tax rates on personal income from 50% to 45%. However Chile's current 30% difference between the top marginal tax rate and the tax rate on corporate retained earnings is the largest in the world (Zee 1997), providing a powerful incentive for personal incorporation to postpone taxation to the future.

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[6] See in particular Burki and Perry (1997), Loayza and Palacios (1997), Lora (1997), and Inter American Development Bank (1996).

[7] Lora (1997) uses partial policy reform sub-indeces (with equal weight) to construct each of his five policy reform areas. Partial and overall policy reform indicators are ranked from zero (lowest) to 100 (highest). I have extended for Chile his Lora's five partial and overall policy reform progress indicator backward (for 1961-84) and forward (for 1996-97), based on available quantitative and qualitative information. The resulting 1960-97 time series for Chile's overall structural policy reform indicator is depicted in Figure 4.

[8] For an account of the 1974-1994 tax reforms see Edwards, Flores, and Williamson (1996).

2.2 Saving

A major shift in the structure of national saving has taken place in Chile (Figure 6). Large policy shifts and intense business cycles have been reflected on the saving rate of the central government, a variable that has stabilized at an average 4.5% of GDP in the 1990s. Public enterprise rationalization adopted since 1974 did raise public enterprise saving to positive levels but subsequent privatizations led to a trend decline of SOE saving levels. Chile's radical 1981 pension reform led to a gradual increase in mandatory personal pension saving that stands today at 3.7% of GDP. However the most radical change is observed in voluntary private saving. After a dozen years of sub-standard saving performance -- from 1985 to 1986 -- the private sector has raised quickly its voluntary saving rate, from 4.5% of GDP in 1986 to an average 14.4% of GDP throughout the 1990s. There is preliminary evidence that most of this increase has taken place in the corporate sector while households are saving little more than in the past.[9]

A number of recent studies have provided econometric evidence on Chile's private saving behavior.[10] Based on this literature and other empirical work on worldwide saving,[11] I specify and estimate an equation for voluntary private saving for Chile. The econometric results, reported in Appendix 1, are used to decompose the rise in voluntary private saving that took place between the 1961-1974 pre-reform period and the 1990-97 period, when a significant part of the reforms had been completed and saving had taken off.

Figure 7 shows that the doubling in the national saving rate is due to a rise in non-financial public sector saving (from 4.9% to 6.6% of GDP), the emergence of mandatory private pension saving at an average 3.7% of GDP, and the large increase in voluntary private saving (from 7.7% to 14.4% of GDP). The latter increase is decomposed using the regression coefficients reported in Appendix 1 and the corresponding changes in saving determinants.

Fiscal adjustment -- as reflected by the aforementioned increase in total public saving -- was only partially offset by lower private saving and by a low amount (0.5% of GDP) reflecting low public-private saving offset coefficient of 0.26. This rejection of Ricardian equivalence implies that public saving is a very powerful tool to raise aggregate saving.

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[9] See Agosín, Crespi and Letelier (1997). Due to the preliminary nature of the data in the latter study and its limited time span, and considering that I focus below on the determinants of aggregate voluntary private saving (and not its composition), no further reference is made to the corporate - household saving composition.

[10] These studies include Morandé (1996), Corsetti and Schmidt-Hebbel (1997), Agosín, Crespi and Letelier (1997), Hachette (1997), and Haindl (1997).

[11] Recent cross-country studies on saving include Edwards (1995), Masson, Bayoumi and Samiei (1995), and Schmidt-Hebbel and Servén (1997), (1998).

The substantial personal and corporate savings incentives provided by the tax reforms of the 1980s may have affected not only the composition of private voluntary saving but also its aggregate level. The tax incentives for corporate saving and investment discussed above lead to higher aggregate voluntary saving as long as firm owners do not offset the increase in corporate saving by lowering their personal saving levels. Further effects through higher personal saving may result from the substantial tax incentives provided to various forms of financial savings. The combined effect of the tax reforms and saving incentives is reflected in a 3.5% rise in voluntary private saving -- a quite substantial amount.[12] [13]

Now let's turn to non-policy saving determinants. Although foreign saving is a statistically and numerically significant private saving determinant with a 0.89 offset coefficient, the small increase in foreign saving from 1961-74 to 1990-97 contributes to a tiny 0.1% in private saving. Much more important is the effect of Chile's demographic transition. As baby-boom cohorts are moving from childhood in the 1960s to mature adulthood in the 1990s, demographic dependency has fallen substantially, explaining 2.0 % of the private sector's saving increase.

I have left the effect of growth on saving to the end. There are many reasons why GDP growth (or, alternatively, the highly growth-correlated level of per-capita income) may raise private saving, including the declining share of people below subsistence consumption levels, the declining share of borrowing-constrained people, the presence of consumption habits, the rise in saving for offspring as bequests are valued as luxury goods, the rise in intertemporal substitution in response to higher income, or the income-responsive substitution of wealth for consumption in individual preferences (see Schmidt-Hebbel, Solimano and Servén 1996, Schmidt-Hebbel and Servén 1997, 1998). Whatever combination of the latter are behind Chile's rise in private saving, GDP growth is an adequate first-order proxy for these explanations. And the doubling of GDP growth from the 1960s to the 1990s explains a final 2.1% of GDP of Chile's private saving rise.

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[12] I have made use of a common tax reform dummy dated at the important 1984 tax reform that imposed the main changes in tax rates and saving incentives. Due to the high collinearity between top marginal income tax rates for individuals, corporate tax rates on retained earnings, and the provision of the 1984 saving incentives for individuals, the latter variables were not found to be individually significant in preliminary regressions (not reported in Appendix 1).

[13] Exact offsetting of higher mandatory pension saving since the 1981 pension reform through lower voluntary personal saving is unlikely to occur when a fraction of pension savers are borrowing constrained and household saving is as low as in Chile. Even additional voluntary saving could be observed as an effect of pension reform if the latter raises awareness about caring for retirement. Preliminary evidence on the net effect of then pension reform on voluntary saving reported elsewhere is very mixed (Morandé 1997, Corsetti and Schmidt-Hebbel 1997, Schmidt-Hebbel 1997) but the latter study confirms that the overall effect of tax and pension reforms on voluntary saving has been positive.

2.3 Investment

As in the case of saving, a major shift in the structure of gross domestic investment (at constant prices) has taken place in Chile (Figure 8). Gross fixed capital investment (GFKI) by the central government fell from 7.6% of GDP in 1960-74 to an average 3.0% of GDP after 1974, with little further variations or structural breaks. Public enterprise GFKI shows a trend decline reflecting the decreasing share of public SOEs in GDP as a result of large-scale privatization. Inventory accumulation is highly erratic and close to zero up to 1983 and stabilizes at a couple of percentage points of GDP afterwards. As in the case of saving, private GFKI shows a massive structural break. However, as opposed to saving, private investment started already in the late 1970s to rise well beyond its historical level, probably in response to the early period of macro stabilization and structural reform. However this progress was interrupted by the 1982-83 twin crisis and recession, restarting again in 1984. From the latter year through 1995 private GFKI rises almost monotonically to reach a peak 22.5% of GDP. Throughout the 1990s average private GFKI attains a historically unprecedented level of 20.8% of GDP.

Based on empirical work on worldwide investment,[14] a specification and regression result for private investment is provided in Appendix 1, including a number of relevant economic and policy variables. I use the empirical results to decompose the rise in Chile's private investment rate from 7.8% in 1961-1974 to 20.8% in 1990-97.

Figure 9 shows that the 10.0%-of-GDP rise in gross domestic investment is due to an increase of inventory accumulation (from 0.1% of GDP to 3.4% of GDP), a large decline in overall public sector GFKI (from 11.3% to 4.7% of GDP), and the large above-mentioned rise in private GFKF.

Overall public investment enters with a negative sign the private investment equation reported in Appendix 1. This suggests that the substitution effect of SOE investment dominates the complementarity of central government investment (public infrastructure). Therefore the massive cut in overall public investment has crowded in private investment, by an amount of 1.6% of GDP. Separately, the large reduction in the corporate tax rate on retained earnings that took place between the 1960s and 1990s has contributed to a 3.2%-of-GDP rise in private investment -- a magnitude that is similar to the one contributed by overall tax reforms to the rise in private saving.

Macro stabilization, as measured by the decline in the volatility of inflation, contributed a meager 1.7% of GDP to higher private investment. Additional small benefits from macroeconomic improvement were reaped as a result of lower real interest rates (0.4% of GDP). However this gain was more than offset by the negative effect of a slightly higher external debt ratio to GDP in the 1990s -- as compared to 1961-74 -- that reflects a strong negative effect from debt overhang (-0.7% of GDP).

[14] See for instance Servén (1997).

Better structural policies explain most of Chile's private investment takeoff. The investment ratio increases by 6.4% of GDP in the 1990s as a result of the combined effect of improved performance in the five policy areas included in the overall policy quality index. This important result reflects that almost half of the rise in private investment is due to the contribution of structural and microcconomic policy reforms to the improved incentive framework faced by private firms in Chile.

Finally GDP growth has had a modest independent effect on private investment (+1.4% of GDP), a likely result of the positive influence of growth on private sector expectations about future rates of return on their investment projects.

2.4 Growth

How could Chile's recent takeoff experience and future growth prospects be assessed? In order to encompass a richer growth process than the one provided by the simple exogenous-growth framework used above and in preceding growth studies for Chile, here I use a production function that allows for endogenous growth, transitional dynamics (as in the exogenous-growth case), broad capital, and non-reproducible natural resources. This specification seems appropriate for Chile because it encompasses endogenous growth, a dynamic transition from current growth rates to sustainable stationary growth levels, a distinction between physical and non-physical capital, and a role played by natural resources.

As developed in more detail in Appendix 2, output per unit of raw labor or per capita (y) is obtained as an aggregate of three production processes or sectors. The first embeds an AK-type endogenous-growth process with constant returns to broad capital per worker (k). The second sector reflects a Cobb-Douglas technology in broad capital and raw labor with declining returns to broad capital. The third represents a Cobb-Douglas technology in physical capital per capita (f) and non-reproducible natural resources per worker (nr) with declining returns to physical capital as well. Hence output per capita is determined by the following equation:

$$y = Z\left[Ak + Bk^{\alpha} + Cf^{\beta}\, nr^{1-\beta}\right] \tag{1}$$

where broad capital per capita is defined as a Cobb-Douglas aggregate of physical capital per capita and non-physical capital per capita (h). The latter is a combination of human capital, ideas, technology, and any other reproducible factor of production. Hence broad capital is defined as:

$$k = f^{\gamma}\, h^{1-\gamma} \tag{2}$$

where: $0 < \alpha, \beta, \gamma < 1$; and A, B, C, Z > 0.

Subsequently we use different versions of equations (1) and (2) to assess Chile's takeoff and future growth prospects.

Traditional sources of growth

Lets start by considering a conventional exogenous-growth version of equations (1)-(2) where output is produced by the second technology and broad capital is restricted to physical capital only. This requires having $Z = 1$, $A = C = 0$, and $\gamma = 1$. An income share of physical capital (α) equal to 0.40 is used.[15] Coefficient B is reinterpreted as a measure of total factor productivity (TFP), growing at an exogenous rate g_{TFP}. The latter rate -- the standard Solow growth residual -- is obtained by subtracting the contribution of the increase in physical capital and raw labor from GDP growth.

Table 4
Sources of Growth (Chile, 1961-97)

	Capital Growth	Labor Growth	TFP Growth	GDP Growth
1. Unadjusted Capital and Labor				
1961-74	2.5%	1.7%	1.2%	3.3%
1975-81	1.3%	2.9%	2.0%	4.4%
1982-89	2.3%	3.0%	-0.1%	2.6%
1990-97	6.4%	2.4%	2.7%	6.7%
2. Quality-adjusted Capital and Labor				
1961-74	1.2%	2.6%	1.2%	3.3%
1975-81	1.3%	4.6%	1.0%	4.4%
1982-89	2.6%	4.8%	-1.2%	2.6%
1990-97	9.0%	3.2%	1.3%	6.7%

Source: author's calculations.

Table 4 reports standard growth accounting results -- including the Solow residual -- for relevant sub-periods in Chile. The first set of results uses raw capital and labor data (not adjusted for changes in quality) while the second set is based on capital and labor series adjusted for estimated changes in quality.[16] Adjusting factor inputs for quality improvements reduces the contribution of TFP growth in the 1990s from 2.7% to 1.3% per

[15] This figure is consistent with the share of capital in Chilean national accounts and is widely used by other studies (cf. Corbo. Lüders, and Spiller 1997, De Gregorio 1997, Roldós 1997, Morandé and Vergara 1997).
[16] The quality adjustment follows the methods and series reported in Roldós (1997).

year. The latter figure -- a measure of "residual" Solow residual -- is similar to residual TFP growth rates observed in the 1960s and 1970s (1.0%-1.2% per year).

Overall the results confirm the finding reported above that it took Chile more than a decade of post-reform experience before investment and TFP growth (or factor quality growth) responded significantly and on a sustained basis to the policy reforms started in the mid 1970s.

The Solow growth equation can be slightly restated by separating the growth rate of physical capital into the rate of physical investment (*inf*), the average product of physical capital (*apf* ≡ y/f), and the rate of capital depreciation (δ):

$$g = \alpha \left[invf \; apf - \delta \right] + (1 - \alpha) \; n + g_{TFP} \tag{3}$$

where g is aggregate GDP growth, and n is employment growth.

The latter equation allows to explain Chile's growth takeoff -- in the frame of the simple exogenous-growth model -- in the following way (see Table 5). The significant increase in the rate of growth of physical capital -- from 2.5% in the 1960s to 6.4% in the 1990s -- is due to both a higher GFKI ratio and a larger average productivity of capital. GFKI/GDP -- after declining during the 1975-89 reform period -- has increased by 6.4% of GDP in the 1990s as compared to 1961-74. And the average product of capital -- which already started to rise during the reform period -- is 14% higher in the 1990s as compared to the 1960s.

Steady-state GDP growth is determined by the sum of exogenous TFP growth and employment growth in the Solow model. When using each period's observed values for the latter variables it is straightforward to conclude that actual GDP growth during 1961-74 (3.3%) was only slightly above the stationary growth level that could be achieved under pre-reform conditions (2.9%). This stands in contrast to the 1990s when actual growth (6.7%) exceeds significantly the steady-state growth level (5.1%). This larger difference can be attributed to the rather recent rise in the investment rate which implies that Chile has still a long way to go before reaching its stationary growth rate if current post-reform conditions are maintained.

By how much could Chile's growth rate increase if the country were able to raise its investment rate by, say, another 2.5% of GDP? The answer provided by the simple Solow growth model is straightforward: short-term GDP growth would increase by 0.4% to attain 7.1% (Table 5). However the long-term stationary growth level is unaffected by any change in the investment rate -- a result of declining returns to capital in the Solow model.

Table 5
Chile's Growth according to the Simple Exogenous-Growth Model

	GFKI/ GDP (*invf*)	GDP/ capital (*apf*)	Deprec. Rate (δ)	Capital growth (g_K)	Empl. growth (n)	TFP gr. (g_{TFP})	Current GDP growth (g)	Steady-state GDP gr. (g^*)
1961-74	19.1%	0.393	5%	2.5%	1.7%	1.2%	3.3%	2.9%
1975-89	17.0%	0.400	5%	1.8%	3.0%	0.9%	3.3%	3.9%
1990-97	25.5%	0.447	5%	6.4%	2.4%	2.7%	6.7%	5.1%
Higher invstmt.	28.0%	0.447	5%	7.5%	2.4%	2.7%	7.1%	5.1%

Source: author's calculations.

Table 6
Potential Growth Estimates by Various Authors

Author	Range of Potential Growth Rates: Low Growth	Key Assumption	High Growth	Key Assumption
Marfán and Bosworth (1994)	4.2	Investment: 20%	7.5	Investment: 27.5% TFP Growth: 3%
Chumacero and Quiroz (1996)	-	-	8.1	-
Rojas et. al. (1997)	-	-	7.0	Investment: 30%
De Gregorio (1997)	6.5	Investment: 25% - 30% Labor Growth: 1.5% TFP Growth: 3%	7.0	Investment: 25% - 30% Labor Growth: 1.5% TFP Growth: 2.5%
Roldós (1997)	6.4	Investment: 24% Labor Quality: 0.6% Capital Quality: 0.0% TFP Growth: 1.9%	7.5	Investment: 29% Labor Quality: 0.6% Capital Quality: 0.5% TFP Growth: 2.4%

Various authors have estimated Chile's potential growth rates, most of them based on a similar Solow growth decomposition exercise to the one presented above. Not surprisingly, their results (see Table 6 for a summary) are also very close to those reported above.[17] For TFP growth rates in the range from 2.0% to 3.0% and investment rates from 24% to 30% of output, potential growth rates are obtained in the range from 6.4% to 7.5%.

[17] One should note that these results are short-term potential growth rates, not steady-state growth rates.

Productivity Gains

As in the case of saving and investment, I specify and estimate empirical equations for TFP growth and the average product of capital -- the two key productivity variables of the Solow growth model reported in Table 5. As above I use the regression coefficients reported in Appendix 1 to explain the rise in productivity variables (Fig. 10).

TFP growth (as measured by its 3-year moving average) tripled during the last three decades, rising from 0.9% during 1961-74 to 2.9% in 1990-97 (Fig. 10). Controlling for the very negative effect of deteriorated terms of trade, TFP growth has been raised by macroeconomic stabilization (contributing 1.3% through lower inflation) and better structural policies (contributing 1.6% as measured by the large improvement of the overall policy index). Hence Chile has been able to more than compensate the effects of "bad luck" (the large permanent decline in the terms of trade suffered in the early 1970s) on productivity by adopting better policies.

The quality of capital -- as measured by the average product of physical capital -- increased by 14% between 1961-74 and 1990-97 (Fig. 11). Most of this increase is due to better structural policies (the same variable that had the largest effect on raising the quantity of capital investment), controlling for the influence of labor quality and employment levels. These results provide strong evidence that macroeconomic stabilization and structural reform have been the main determinants of Chile's productivity gains.

Endogenous Growth with Transitional Dynamics

To overcome the limitations of the simple Solow model I now make use of the full endogenous-growth model with transitional dynamics, broad capital, and non-reproducible natural resources, embedded in the production function of equations (1)-(2) above. The corresponding growth equation is the following:

$$(4)\quad g = \frac{mpf}{apf}\left[invf\ apf - (n+\delta)\right] + \frac{mph}{aph}\left[invh\ aph - (n+\delta)\right] + \frac{mpnr}{apnr}\, g_{nr} + n$$

where *mpf* (*mph*, *mpnr*) is the marginal product of physical capital (non-physical capital, natural resources), *apf* (*aph*, *apnr*) is the average product of physical capital (non-physical capital, natural resources) and g_{nr} is the rate of growth of natural resources per capita.

Chile's current growth process -- that is growth in the 1990s -- can be explained according to the contribution of the growth determinants reflected by this model. This requires parameterizing production coefficients, sector shares, and factor growth rates. While the full detail on parameter assumptions is provided in Appendix 2, let's briefly refer here to some key parameters. The current share of sector 2 (declining returns to broad capital) is fixed at 5%. The current share of sector 3 (production based on non-reproducible natural resources) is 15%, the sum of the current share of mining and fisheries

in GDP (9.7% during 1990-97) and an estimate of the GDP share of manufacturing sectors based directly on natural resources (5.3%). The growth rate of use of non-reproducible natural resources (g_{NR}) is 7.2%, slightly above the current weighted average rate of growth of mining and fisheries (5.9% during 1990-97). The ratio of investment in non-physical capital (that is human capital, R&D, ideas, etc.) to GDP is posited at 10% of GDP which is twice the share of education and health in GDP during the 1990s (cf. Table 10).

Transitional growth exceeds stationary growth for two reasons. First the marginal and average products of all factors of production are larger during the transition than at the final steady-state growth equilibrium. Second, by the very definition of non-reproducible natural resources (mostly comprised by mining deposits and fishing stock in the case of Chile), the growth rate of the latter converges to zero in steady state. Hence stationary GDP growth is characterized by the following equation:

$$(5) \qquad g^* = \frac{mpf^*}{apf^*}\left[invf\ apf^* - (n+\delta)\right] + \frac{mph^*}{aph^*}\left[invh\ aph^* - (n+\delta)\right] + n$$

where starred variables denote steady-state values of the corresponding variables defined above.

Table 7 reports the main variables governing GDP growth in the 1990s and its long-run convergence toward the steady-state level consistent with this model's structure and parameter values. Figure 12 depicts the corresponding interpretation of Chile's growth takeoff since the 1960s, growth in the 1990s, and subsequent transitional convergence to the stationary equilibrium. At current structural conditions, growth converges gradually from 6.7% now to 5.0% in the distant future.

How much more investment in both physical capital and non-physical capital is required to ensure that the current level of GDP growth (6.7%) is maintained in the very long term? If the rate of GFKI is raised by 2.5% (from 25.5% to 28.0% of GDP) and, at the same time, spending on human capital, technology, and ideas is similarly expanded by 2.5% of GDP, short-term growth would increase to 8.5%, ensuring a subsequent convergence to a new stationary growth level of 6.7% (see Table 7 and Figure 12).

Therefore natural resource-based growth -- which explains 0.6% of the current 6.7% growth rate but will gradually vanish as a long-term source of growth -- provides a window of opportunity to shift the growth base toward reproducible resources. Hence further policy reforms to boost the growth of the latter resources -- physical capital, human capital, knowledge, and ideas -- should be high on the policy agenda.

Table 7
Chile's Current and Future Growth Prospects according to a Model of Endogenous Growth with Transitional Dynamics, Broad Capital and Non-Reproducible Natural Resources (percentage)

	Physical investment rate (*invf*)	Non-physical investment rate (*invh*)	Non-renewable nat. resource growth (g_{NR})	Current GDP growth (g)	Steady-state GDP gr. (g^*)
1990-97	25.5	10.0	7.2	6.7	5.0
Higher Investment	28.0	12.5	7.2	8.5	6.7

Source: author's calculations.

3. Ten future challenges

Chile has shown an extraordinary record, reflected in a decade of saving-investment-growth takeoff that has enabled the country to join the small set of successful emerging economies. How could the country's current growth momentum be extended well into the future? Chile's own recent history and international experience suggest that the country's policy makers face 10 macroeconomic and sector policy challenges to make this possible.

1. *Ensuring convergence to low inflation while attaining high price flexibility.* Continuation of the Central Bank's efforts in attaining a successful convergence from current inflation levels close to 6% toward international inflation levels prevalent in OECD countries is a necessary condition for maintaining high investment and growth rates. This should be achieved while attaining a larger flexibility of relative prices, including real wages, the real exchange rate, and non-traded goods prices. More price flexibility could be achieved as a result of adopting forward-looking wage and price contracts, nominalizing monetary policy instruments, and preserving decentralized wage bargaining.

2. *Maintaining a conservative fiscal policy stance.* While the public sector has shown consistent public sector surpluses during the last decade, the consolidated non-financial and financial (central bank) public sector position has weakened recently, as reflected by a slight consolidated global public deficit anticipated for 1997. Ensuring global public surpluses in the future would strengthen the macroeconomic policy stance and contribute to higher national saving and growth, as documented in the preceding section.

3. *Overhauling tax incentives for saving and investment.* Lower taxes have contributed to the rise in private saving and investment rates, as reported above. However the current tax structure still displays significant shortcomings and distortions, including excessive reliance on incentives provided to particular saving and investment instruments instead of across-the-board incentives, a world-record gap between the top marginal personal income tax rate and the corporate tax rate, a significant gap between tax rates on foreign and national investment, and a number of low-yielding special taxes on particular activities or transfers. Several tax reform proposals have been put forward in anticipation of the government's tax reform announced for early 1998.[18]

4. *Keeping financial sector soundness.* The ongoing Asian crisis suggests that banking fragility is typically a necessary and often a sufficient condition for causing a financial and external crisis with major and prolonged growth and welfare costs. Chile's strict financial regulation and supervision have paid off as reflected by the health of the country's banking sector. One contribution to keeping a sound financial sector during a period of increasing bank competition and expansion into new services and regions could be made by complementing traditional banking supervision with the adoption of market-based insurance mechanisms and lender-of-last-resort facilities as implemented recently by Argentina.

Table 8
Public Enterprise Output and Public Infrastructure Investment Shares in GDP
(percentage)

	1990	1996
CODELCO Value Added	8.8	4.4
Other Public Enterprise Value Added	5.2	3.2
Public Investment in Infrastructure	1.0	1.6

Note: The shares are calculated at current prices, reflecting large copper price fluctuations in the case of CODELCO.
Source: Ministry of Finance of Chile.

5. *Privatizing public enterprises and the provision of infrastructure investment.* The share of public enterprise output -- at 8 to 10% of GDP, depending on the price of copper -- is still quite large in Chile (Table 8). Public investment in infrastructure represents another 1.6% of GDP. The government is currently involved in partial privatization of public water and sanitation companies and public ports. Building and/or operation of major infrastructure projects -- including highways, tunnels, and airports -- are currently transferred to the private sector through auctions and competitive concessions. Full privatization of all public enterprises and transfer of most infrastructure projects to the private sector -- subject to adoption of adequate

[18] Among the tax reform proposals are Serra (1997) and Vergara and Larraín (1997).

regulatory and supervisory frameworks in the case of natural monopolies -- would provide a further and significant boost to growth.

6. *Reforming education.* Chile's indicators of educational attainment have improved during the last decades (Table 9) but a large education gap separates Chile from East Asian high-growth economies and OECD countries. Insufficient human capital seems to be the Achilles heel of Chile's growth prospects, requiring a massive expansion of the quantity and quality of conventional primary and secondary education as well as of technical education and vocational training. The government is currently implementing a major education reform to raise the quantity and quality of public and private education. Further improvements in the quality of education could be achieved by extending privately supplied education (currently at a 55% of total education expenditure, see table 10) by either raising the share of subsidies to private education or adopting a program of voucher-based education.

Table 9
Educational Attainment

Year	Literacy Rate	Student Coverage		Year	Average Years of Schooling
		Primary School	Secondary School		
1960	83.6	n.a.	n.a.	1988	8.3
1970	89.0	93.3	49.7	1990	8.6
1980	90.8	95.3	65.0	1992	9.0
1990	94.6	98.2	79.9	1994	9.5
1995	95.4	95.7	79.3	1996	9.8

Source: National Institute of Statistics (INE); Ministry of Education.

Table 10
Public and Private Education and Health Expenditure Shares of GDP
(percentage)

	Public Education	Private Education	Total Education	Public Health	Private Health	Total Health
1990	1.60	1.75	3.35	0.69	1.46	2.15
1995	1.14	1.36	2.50	0.63	1.32	1.95
1996 (e)	1.07	1.31	2.38	0.60	1.30	1.90

Source: Central Bank of Chile.

7. *Reducing Poverty.* Chile has made large strides in reducing poverty during the 1990s (Table 11). This has been largely the result of high growth and only partly the consequence of social expenditure programs (Larrañaga 1994). At the same time,

however, little progress has been achieved in reducing the relative gap between rich and poor (Table 12). Significant poverty and large income differences put Chile at a significant distance from most other high-growth takeoff countries. However the international experience suggests that overcoming wide-spread poverty -- through improved access to better education and well-designed and targeted social programs -- is a necessary condition for maintaining a stable political environment required for high private investment and growth.

Table 11
Population Below Poverty Line (percentage)

1987	1990	1992	1994	1996
44.6	40.1	32.7	28.5	24.0

Source: CASEN.

Table 12
Income Distribution Indicators

Gini Coefficient		Income Distribution Shares by Quintiles			
Year	Gini Coefficient	Year	Lower 40%	Middle 40%	Upper 20%
1968	45.6	1969	11.7	31.3	57
1971	46.0	1978	9.7	29.5	60.8
1980	53.2	1987	7.5	24.0	68.5
1989	57.9	1991	10.1	28.8	61.0
1994	56.5	1994	10.5	30.6	58.9
		1997	10.0	30.5	59.5

Source: Gini coefficient: World Bank. Income Distribution Shares: University of Chile; quoted in Marcel and Solimano (1994) for 1969-87, and provided by Jaime Ruiz-Tagle for 1991-97.

8. *Reforming the state.* Significant reforms have been undertaken to improve state efficiency, including establishment of technical bodies (superintendencies) to supervise private enterprise behavior in sectors with externalities and market imperfections and adoption of an independent central bank. However there are various areas of state administration and decisions that are in urgent need of reform, including the judiciary, the distribution of authority and spending decisions between central and decentralized government levels, and the cabinet structure of the central government.

9. *Deepening trade opening.* Chile has followed during the 1990s a two-pronged trade reform strategy, combining unilateral reduction in external tariffs with bilateral and multilateral trade agreements. While unilateral trade opening tends to report larger

output and welfare gains than selective trade agreements, [19] there could be hard-to-quantify additional market-accession gains of selective trade agreements. Continuation of this strategy is reflected by a unilateral tariff reduction announced by the government for 1998 and continued work on bilateral and multilateral trade agreements (with the U.S., Mercosur, APEC, and the European Union). This strategy puts Chile closer to the goal of complete free trade with the rest of the world.

10. *Addressing the political economy of remaining reforms.* It is not trivial to overcome effective opposition by well-organized interest groups that loose from reforms that provide positive welfare and growth gains to a large but non-organized population. Strong unions and interest groups in both the public sector (for instance, in education and health sectors and in public enterprises) and the private sector (for instance, sales agents of private pension management companies) often attempt to block structural reforms that may affect negatively their short-term interests. This requires the government to strike a difficult balance between conflict and negotiation with both affected interest groups and congress in order to be able to carry the necessary reforms.

4. Ten lessons from Chile's experience

Chile's 22-year experience of broad and deep policy reforms and its decade-long saving-investment-growth takeoff provide a number of significant lessons to other reforming countries. Next I draw 10 lessons from the evidence provided in this paper and other work on Chile quoted above, as well as from both reform evaluations for Latin America (including Burki and Perry 1997 and Inter American Development Bank 1996) and developing countries at large (Corbo and Fischer 1995, Rodrik 1996).

1. *Good policies -- not good luck -- trigger and sustain a growth takeoff.* The empirical evidence reported in this paper shows that Chile's takeoff is due mostly to the massive macroeconomic and structural policy improvements achieved during the last two decades. In fact, the policy reforms were able to contribute much more than what was necessary to compensate for the "bad luck" of Chile's permanent terms-of-trade loss suffered in the early 1970s. Saving mobilization, capital investment, and productivity gains have responded positively and strongly to a stable macroeconomic environment and the right incentive framework.

2. *Watch for hidden policy distortions.* Hidden build-ups of implicit and contingent public liabilities -- ranging from implicit public PAYG debts to increasing weaknesses in banking systems that requiring future bailouts -- are often worse than explicit public deficits and debts because they hide sector distortions, cause moral-hazard behavior, and do not convey market signals that induce the necessary corrections or reforms. Hidden relative price inflexibilities can be as bad as the former

[19] See the caluclations by Harrison, Rutherford and Tarr (1996) for Chile.

because their extent and costs are only apparent when the economy is hit by a severe adverse shock, at a time when it is difficult -- and often very late -- for adopting the necessary reforms. Chile's 1979-83 experience shows that the combination of both -- accumulation of implicit guarantees provided to a defaulting banking sector and inflexible exchange rates and wages -- is particularly costly.

3. *Natural resource-intensive growth -- a window of opportunity.* Trade opening often triggers a specialization of production and exports in natural resource-intensive sectors. The rents obtained from extracting non-renewable resources -- ideally at a sustainable rate -- provide a window of opportunity for investing them in reproducible resources. This calls for a public policy that provides good incentives for investing in physical capital, human capital, knowledge, and ideas. The evidence for Chile reported in this paper supports strongly the notion that a well-designed tax system is key for a strong saving and investment response, and provides more indirect proof that better education is a key element in maintaining the country's growth momentum.

4. *Avoid industrial policy.* With very few exceptions Chile does not have an industrial policy. Instead the country has focused on providing a symmetric treatment to all production sectors, focusing on raising the overall supply of productive inputs instead of benefiting a particular resource or sector of production. This strategy -- shared by many other Latin American reformers -- seems to be paying off, in contrast to the more activist industrial policies pursued by many East Asian economies so far.

5. *Response lags: be prepared for the long haul.* Depending on reform speed, reform mistakes, adverse shocks, and investment maturity lags in the new expanding sectors, the saving, investment, and growth response to reforms ranges from very short (as in Argentina after 1992) to very long (as in Chile). This uncertainty about response lags to reforms should caution reformers to be prepared for the long haul.

6. *Optimal reform sequencing, speed, and timing are dead.* Chile provides a strong example that the conventional recommendations on optimal reform sequencing, timing, and speed are dead and buried. This conclusion complements similar inferences reached, for instance, by Corbo and Fischer (1996) for New Zealand or the Inter American Development Bank (1996) for other Latin American countries. The reason why real-world reform experiences contradict so strongly the optimality prescriptions provided by the literature is that the latter are based on narrow models that abstract from the complexities of incentive structures, political-economy features, and reform processes. The only remaining truth of the optimal sequencing literature is that macro stabilization should not come after structural reform -- but it can be achieved simultaneously. No other important recommendations on reform sequencing, speed, and timing have stood the test of successful real-world reforms.

7. *Corollary: reform broadly and quickly and take advantage of reform synergy.* A corollary of the preceding point is that reformers should adopt as many reforms and as soon as possible -- subject to certain pre-conditions on specific reforms (such as

putting in place an adequate regulatory framework and an effective supervisory body), availability of competent technical teams for reform design and implementation, and existence of at least some political support. Governments should take advantage of reform synergy because there are declining marginal costs in planning and selling reform plans. In addition there are externalities of individual reforms for other reform areas; the sum of total reform benefits exceeds the sum of individual reform gains. Chile's experience confirms both points.

8. *Reform reversal and lack of credibility -- not a problem.* Lack of credibility and expectations of reform reversals play an important role in the theoretical literature while they do not seem to be very important in many country experiences. Although some Chilean reforms faced initial problems of imperfect credibility (as in the case of the 1975-79 trade reform and, possibly, the 1981 pension reform), and some reforms were partially and temporarily reversed (trade reform and bank privatization during 1983-84) these were the exceptions rather than the rule. Reforms adopted during the last dozen years have not faced significant problems of credibility.

9. *Reforms are feasible in democratic regimes.* Chile's post-1989 experience shows that continuation of macroeconomic stabilization and structural reforms are feasible under a democratic regime but are sometimes more difficult to carry out, slowing the reform pace. A cross-country example of this is pension reform. While the most radical pension reform to date was the one adopted by Chile's military government in 1981, all subsequent pension reforms adopted in the world -- negotiated by democratic governments with their parliaments and, often, with affected interested groups -- are less radical in their substitution of pre-existing public pay-as-you-go systems. Argentina provides, to a certain extent, a counter-example to the preceding point. In fact, Argentina's stabilization and overall structural reform efforts adopted since 1992 have been much quicker and, in some cases, deeper than Chile's.

10. *Overcoming reform opposition.* In order to overcome opposition to growth-improving reforms by well-organized interest groups and lobbies that loose from the changes, democratic governments have to be careful in their reform design, selling, and implementation. The literature on optimal reform strategies is split on this point (Rodrik 1996). While some authors argue that reforms should be adopted as a result of bottom-up consensus building and negotiation by all involved groups, other authors argue that it is more effective to impose or sell top-down reforms developed by technical teams without much negotiation with reform opponents. Chile's experience since 1990 suggests that a difficult balance has to be struck between both extremes, where the mix of carrots (compensating reform losers) and sticks (denouncing the reform opponents' welfare-deteriorating actions) is determined by the relative political weight of the government, reform opponents, and reform supporters.

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Appendix 1: Estimation Results

The subsequent regressions are based on annual data for 1960 (1961) - 1997, available on request. Data definitions and sources are noted at the bottom of each regression table.

Table A1
Voluntary Private Saving Ratio to GDP (VPRSAV)

	Coefficient	t-statistic
C	10.358	1.95
SGROWTH	1.477	6.69
PUBSAV	-0.259	-2.64
FORSAV	-0.886	-6.07
DEPEND	-0.095	-1.50
D84	3.508	2.98
D74	7.292	3.94
MSAV	-	-
R^2 adjusted	0.879	
F	40.19	
DW	2.12	

Estimated by Two-Stage Least Squares. FORSAV, the foreign saving ratio to GDP (source: Central Bank of Chile) has been instrumented by the following instruments: PRINV, the private investment ratio to GDP (source: see Table A2), STRUCPOL, the Structural Policy Indicator (source: see Table A2), TOT, the terms of trade (source: see Table A4), CORPTAX, the corporate tax rate (source: see Table A2), and the top individual tax rate (source: based on Edwards, Flores, and Williamson 1996).
Other variables are: VPRSAV: Voluntary private saving ratio to GDP (source: author's calculations based on Central Bank of Chile data and on PUBSAV), SGROWTH: Exponential Smoothed Growth (author's estimation based on Central Bank data), PUBSAV: Public Saving Ratio to GDP (author's estimation based on: Dirección de Presupuesto, various issues; Dirección de Presupuesto 1997, Larraín), FORSAV: Foreign Saving Ratio to GDP (source: Central Bank of Chile), DEPEND: Dependency Ratio (source: National Institute of Statistics (INE)), D84: Tax Reform dummy variable for 1984, D74: dummy variable for 1974, and MSAV: Mandatory Saving Ratio to GDP (source: Superintendence of Private Pension Fund Management Companies).

Table A2
Private Investment Ratio to GDP (PRINV)

	Coefficient	t-statistic
C	14.107	3.81
SGROWTH	0.943	4.02
PUBINV	-0.243	-1.10
CORPTAX	-0.076	-3.03
STRUCPOL	0.118	3.20
UCK	-0.218	-2.43
EXTDEBT	-0.088	-5.54
INFVOL	-0.283	-3.18
R^2 adjusted	0.951	
F	101.58	
DW	1.59	

Estimated by OLS.
PRINV: the private investment ratio to GDP (source: author's calculation based on Central Bank data and the public investment ratio to GDP), SGROWTH: Exponential Smoothed Growth (source: see Table A2), PUBINV: Public Investment Ratio to the GDP (sources: Dirección de Presupuesto, various issues; Dirección de Presupuesto 1997, Larraín 1994), CORPTAX: Corporate tax rate (author's estimation based on Edwards, Flores, and Williamson 1996), STRUCPOL: Structural Policy Indicator (source: Lora 1997, extended by author's estimation), UCK: User Cost of Capital (source: Central Bank), EXTDEBT: External Debt ratio to GDP (source: Central Bank), INFVOL: Inflation Volatility (annual standard deviation of Consumer Price Index, Central Bank data).

Table A3
Average Productivity of Capital (y/k)

	Coefficient	t-statistic
C	-45.572	-7.72
STRUCPOL	0.106	4.07
E	0.743	9.72
LQI	0.089	2.31
D7182	3.449	5.76
R^2 adjusted	0.913	
F	94.42	
DW	1.50	

Estimated by OLS. STRUCPOL: Structural Reform Indicator (source: see Table A2), E: Employment Rate (source: National Institute of Statistics), LQI: Labor Quality Index (source: Rojas et. al. 1997), D7182: Dummy variable equal to 1 for 1971 and 1982, 0 otherwise).

Table A4
TFP Growth (gTFP)

	Coefficient	t-statistic
C	0.101	0.05
STRUCPOL	0.029	1.36
INF	-0.074	5.91
TOT	0.016	1.75
D7779	5.011	5.97
D82	-6.177	-4.31
R^2 adjusted	0.713	
F	18.85	
DW	1.95	

Estimated by OLS. STRUCPOL: Structural Reform Indicator (source: see Table A2), INF: Standarized CPI Inflation Rate (source: author's calculation based on based on Consumer Price Index, Central Bank data), TOT: Terms of Trade (source: Central Bank data), D7779 Dummy variable equal to 1 for 1977, 1978, and 1979, 0 otherwise, D82: dummy variable for 1982.

Appendix 2: Endogenous Growth with Transitional Dynamics, Broad capital, and Non-Reproducible Natural Resources

How can Chile's recent takeoff experience and future growth prospects be assessed? In order to encompass a richer growth process than the simple exogenous-growth case, I use a production function that allows for endogenous growth, transitional dynamics (as in the exogenous-growth case), broad capital, and non-renewable natural resources. The subsequent model generalizes a framework for endogenous growth with transitional dynamics that allows for growth convergence (as in Barro and Sala-i-Martin 1995, chap. 1) by adding a non-reproducible natural-resource based production sector, which is most relevant for Chile.

The Model

Gross domestic product (Y) is obtained as an aggregate of three production processes or sectors. The first embeds an AK-type endogenous-growth process with constant returns to broad capital (*K*). The second sector reflects a Cobb-Douglas technology in broad capital and raw labor (*L*) with declining returns to broad capital. The third represents a Cobb-Douglas technology in physical capital (*F*) and non-reproducible natural resources (*NR*) with declining returns to physical capital as well. By contrast L is raw labor. Hence:

$$Y = Z\left[AK + BK^{\alpha} L^{1-\alpha} + CF^{\beta} NR^{1-\beta}\right] \tag{A1}$$

K represents here a broad form of capital that encompasses physical and human capital, as well as technology and ideas:

$$K = F^{\gamma} H^{1-\gamma} \tag{A2}$$

where $0 < \alpha, \beta < 1$; and A, B, C, Z > 0.

The advantage of this production process is that it nests four desirable features for characterizing Chile's current growth process: constant returns to capital in the long run (and hence endogenous growth), a convergence toward the steady state along which the returns to broad capital and hence growth decline until reaching the stationary growth level, a distinction between physical and other forms of non-physical capital, and a role for non-reproducible natural resources in transitional growth.

Using small-case letters to denote variables per worker and after substituting equation (2) in (1), output per capita (that is, per unit or raw labor) can be written as:

$$y = Z\left[Af^{\gamma} h^{1-\gamma} + B\left(f^{\gamma} h^{1-\gamma}\right)^{\alpha} + Cf^{\beta} nr^{1-\beta}\right] \tag{A3}$$

The growth rate of physical capital per capita g_f (non-physical capital per capita g_h) is determined by the exogenous physical investment ratio to output *invf* (non-physical investment ratio to output *invh*), the average product of physical capital (average product of non-physical capital *aph*), and the rates of raw labor or population growth (n) and capital depreciation (δ)

$$g_f = invf\ apf - (n + \delta) \tag{A4}$$

(A5) $$g_h = invh\ aph - (n+\delta)$$

The growth rate of aggregate output is:

(A6) $$g \equiv g_y + n = \frac{mpf}{apf} g_f + \frac{mph}{aph} g_h + \frac{mpnr}{apnr} g_{nr} + n$$

where *mpf* (*mph*, *mpnr*) is the marginal product of physical capital (non-physical capital, natural resources) per capita.

After substituting equations (A4)-(A5) into (A6), obtain output growth as:

(A7) $$g = \frac{mpf}{apf}\left[invf\ apf - (n+\delta)\right] + \frac{mph}{aph}\left[invh\ aph - (n+\delta)\right] + \frac{mpnr}{apnr} g_{nr} + n$$

Note that average products and marginal products (as well as their ratios) of physical capital, human capital, and natural resources can be written as functions of the shares of sector 2 (s_2) and sector 3 (s_3), as follows:

(A8) $$ap = \frac{ZA\left(h/f\right)^{1-\gamma}}{1-s_2-s_3}$$

(A9) $$s_2 = \frac{ZB\left(f^{\gamma}h^{1-\gamma}\right)^{\alpha}}{y}$$

(A10) $$s_3 = \frac{ZCf^{\beta}nr^{1-\beta}}{y}$$

(A11) $$\frac{mpf}{apf} = \gamma\left(1-s_2-s_3\right) + \gamma\alpha s_2 + \beta s_3$$

(A12) $$aph = \frac{ZA\,(f/h)^{\gamma}}{1-s_2}$$

(A13) $$\frac{mph}{aph} = (1-\gamma)(1-s_2) + (1-\gamma)\alpha s_2$$

(A14) $$\frac{mpnr}{apnr} = (1-\beta)s_3$$

Transitional growth exceeds stationary growth for two reasons. First the marginal and average products of all factors of production are larger during the transition than at the steady-state equilibrium. Second, by the very definition of non-reproducible natural resources (mostly comprised by mining deposits and fishing stock in the case of Chile), the growth rate of the latter is zero in steady state. Hence stationary GDP growth is characterized by the following equation:

$$(A15) \qquad g^* = \frac{mpf^*}{apf^*}\left[invf\ apf^* - (n+\delta)\right] + \frac{mph^*}{aph^*}\left[invh\ aph^* - (n+\delta)\right] + n$$

where starred variables denote steady-state values of the corresponding variables defined above. Their stationary values are the following (recall that $s_2^* = 0 = s_3^*$):

$$(A16) \qquad apf^* = ZA\left(h/f\right)^{1-\gamma}$$

$$(A17) \qquad \frac{mpf^*}{apf^*} = \gamma$$

$$(A18) \qquad aph^* = ZA\left(f/h\right)^{\gamma}$$

$$(A19) \qquad \frac{mph^*}{aph^*} = 1-\gamma$$

Model Parameterization

Coefficient values: $\gamma = 0.5$, $\alpha = 0.5$, $\beta = 0.2$, $s_2 = 0.05$, s_3=0.15, $\delta = 0.05$

Values of exogenous variables: n = 2.4%, *invf* = 25.5%, *invh* = 10%, *apf* = 0.447 (hence g_f = 4.0%).

Hence the following values for endogenous variables are obtained: *aph* = 1.14 (hence g_h = 4.0%), *mph/apf* = 0.4425, *mph/aph*= 0.4875, g_{nr} = 4.8% (obtained residually from growth equation (A7), *apf** = 0.358, *aph** = 1.083.

Substituting the preceding values in the current growth equation (A7) and the steady-state growth equation (A15) allows to obtain the corresponding values for 1990-97 and the higher-investment scenario, reported in Table 6.

Figure 1
Real GDP Growth, TFP Growth, and Unemployment Rate (Chile, 1961-97)
(percentage)

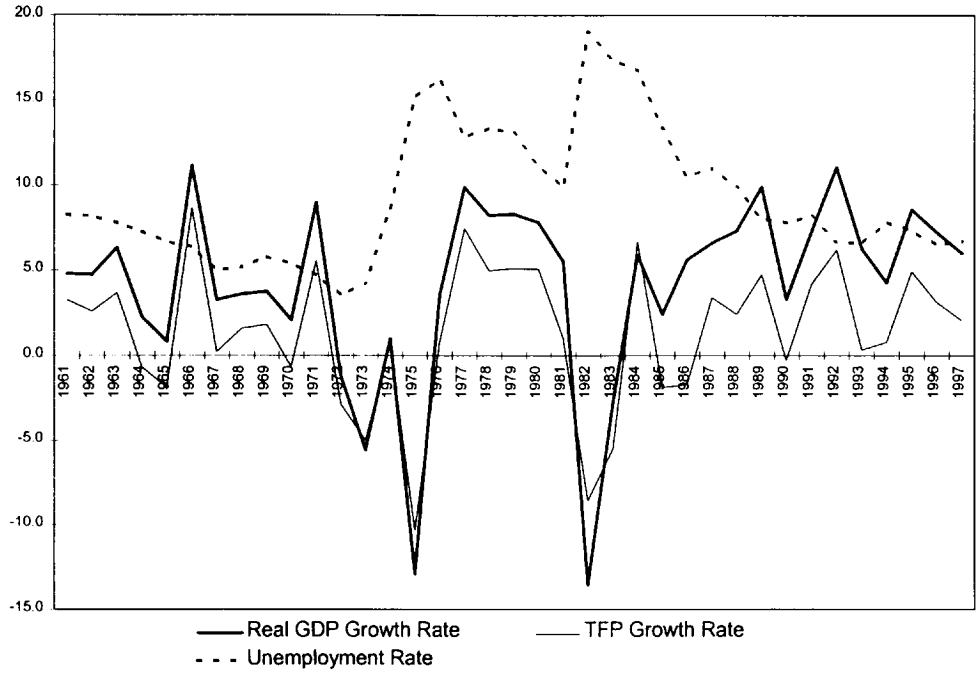


Figure 2
Gross Domestic Investment, National Saving, and Foreign Saving Rates (Chile, 1960-97)
(percentage of GDP)

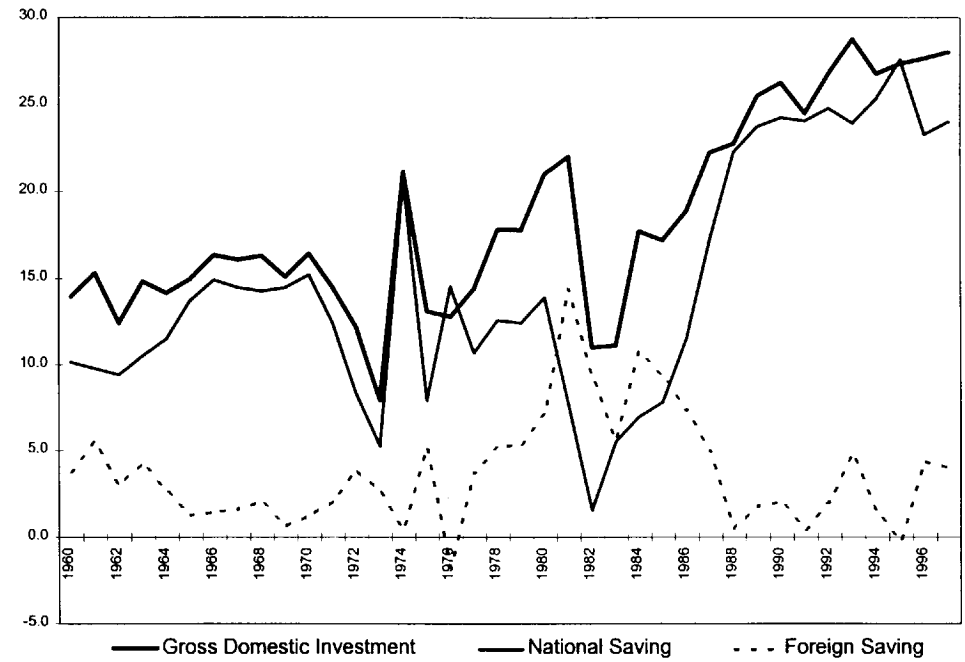


Figure 3.1
Gross National Saving Ratio to GDP
in Major World Regions and in Chile (1970-94)

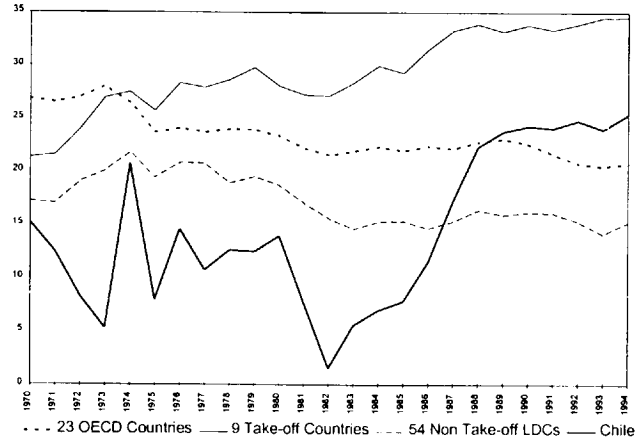


Figure 3.2
Gross Domestic Investment Ratio to GDP
in Major World Regions and in Chile (1970-94)

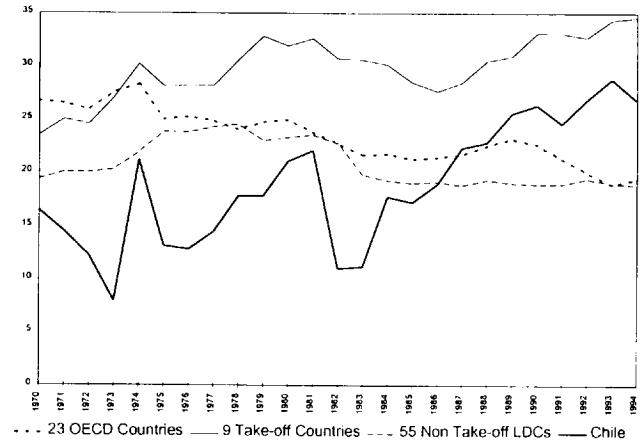


Figure 3.3
Per Capita Real GDP Growth
in Major World Regions and in Chile (1970-94)

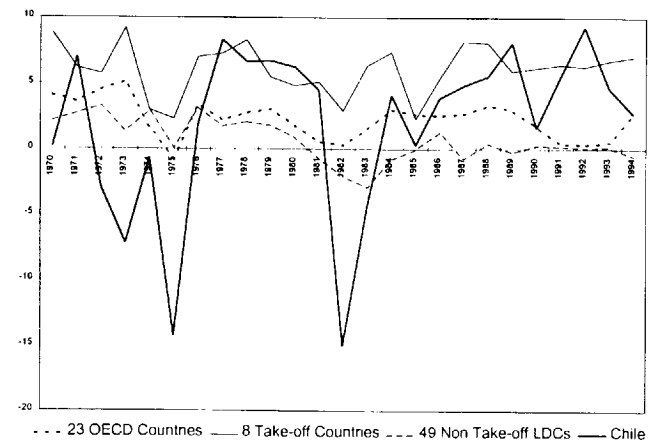


Figure 4
Macroeconomic Stabilization and Structural Reform Indicators (Chile, 1960-97)

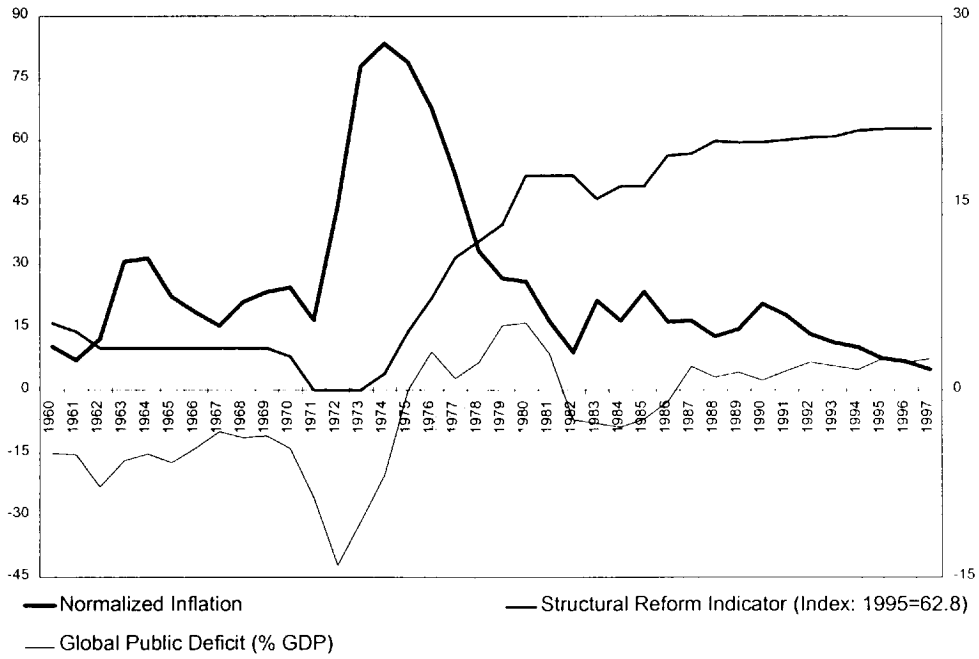


Figure 5
Individual and Corporate Tax Rates (Chile, 1973-97)
(percentage)

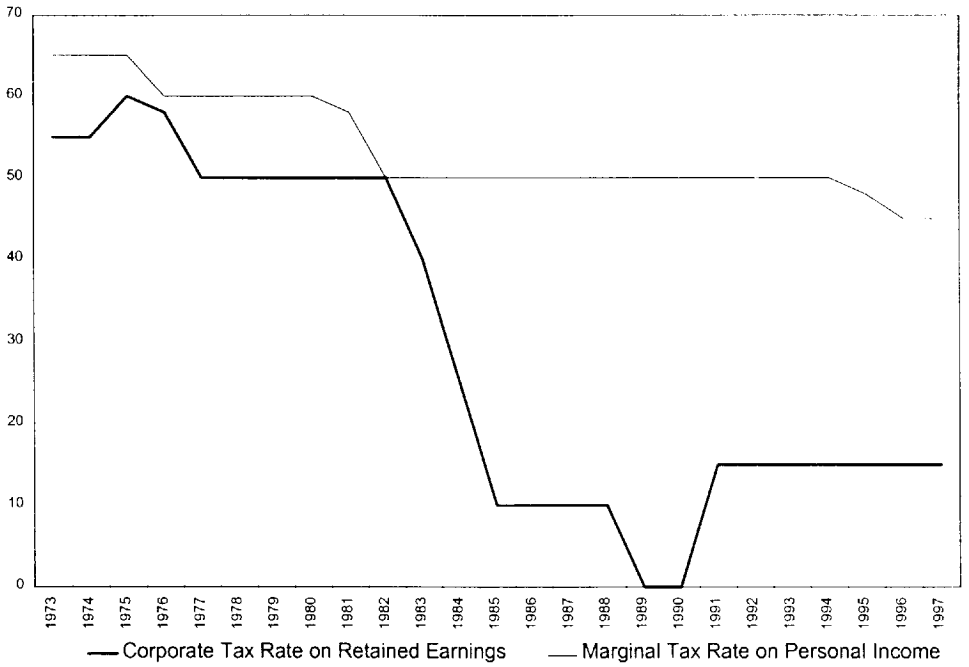


Figure 6
Sector Saving Rates (Chile, 1960-97)
(percentage of GDP)

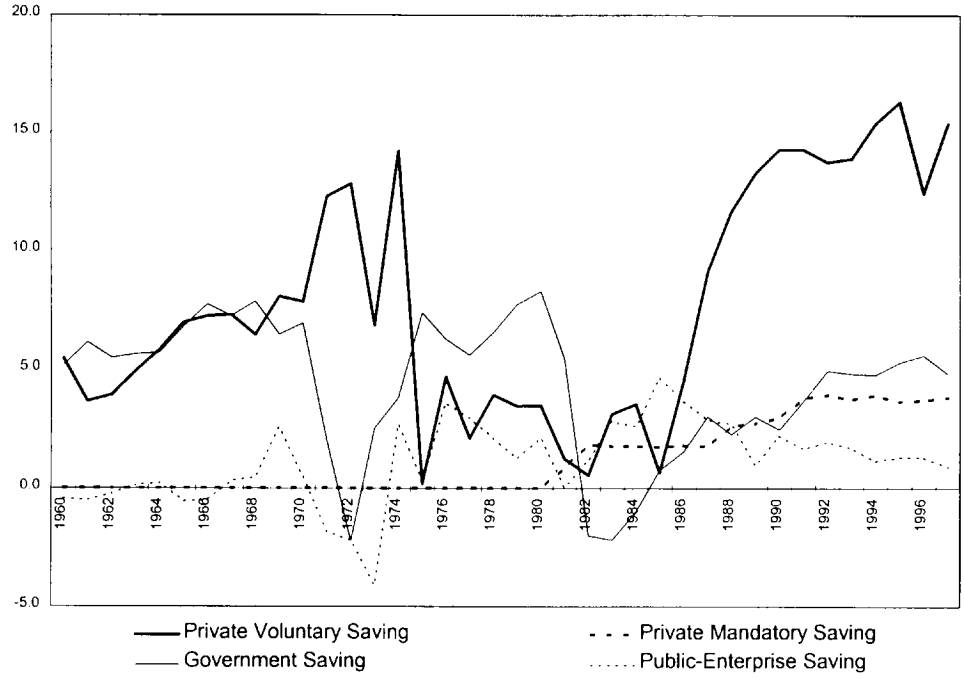


Figure 8
Sector Gross Investment Rates (Chile,1960-97)
(at constant prices, percentage of GDP)

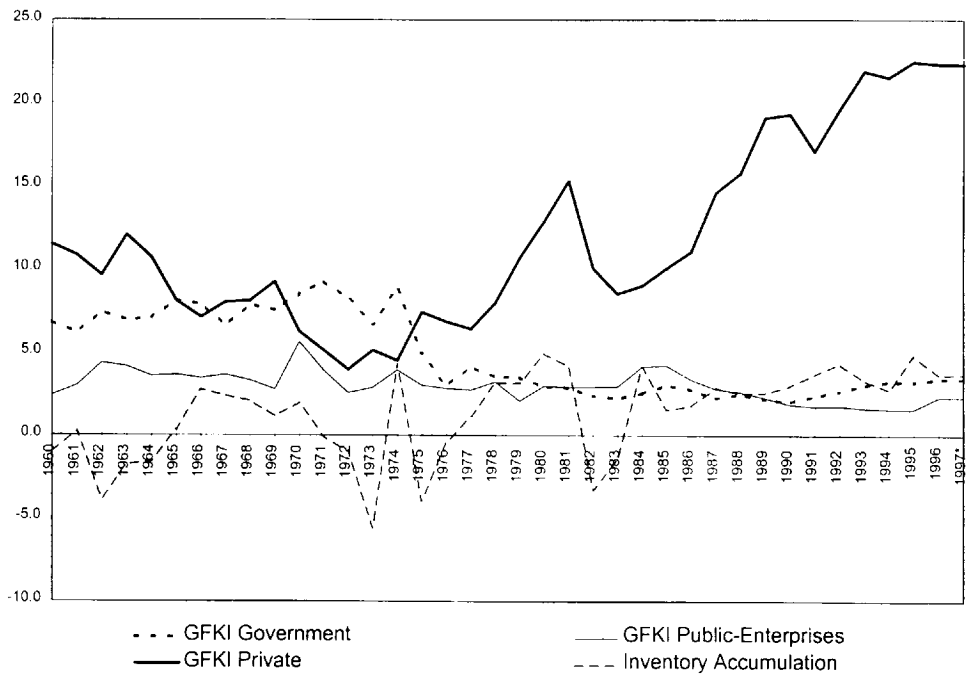


Figure 7
Explaining Chile's Higher National Saving
(percentage of GDP)

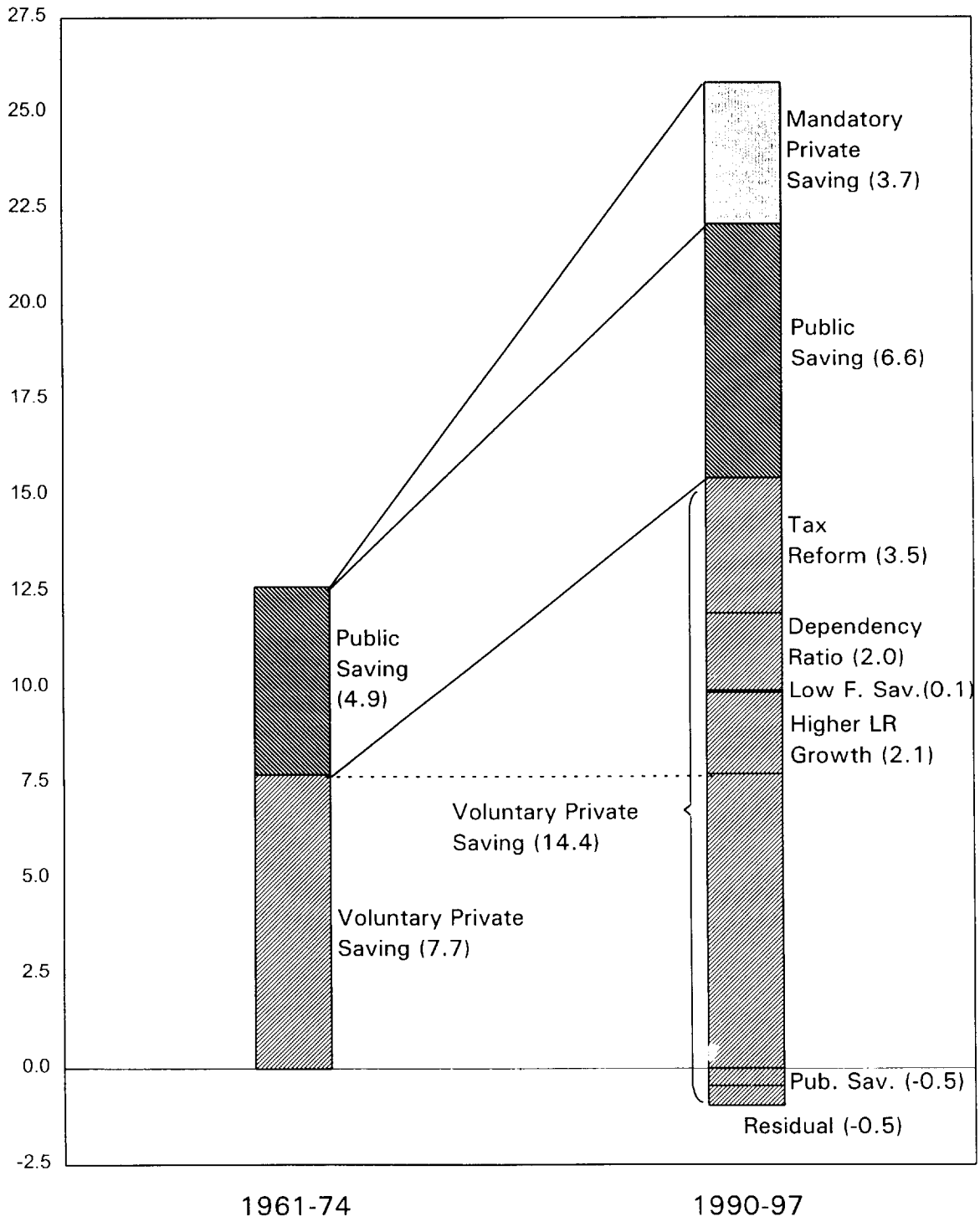


Figure 9
Explaining Chile's Higher Gross Domestic Investment
(percentage of GDP)

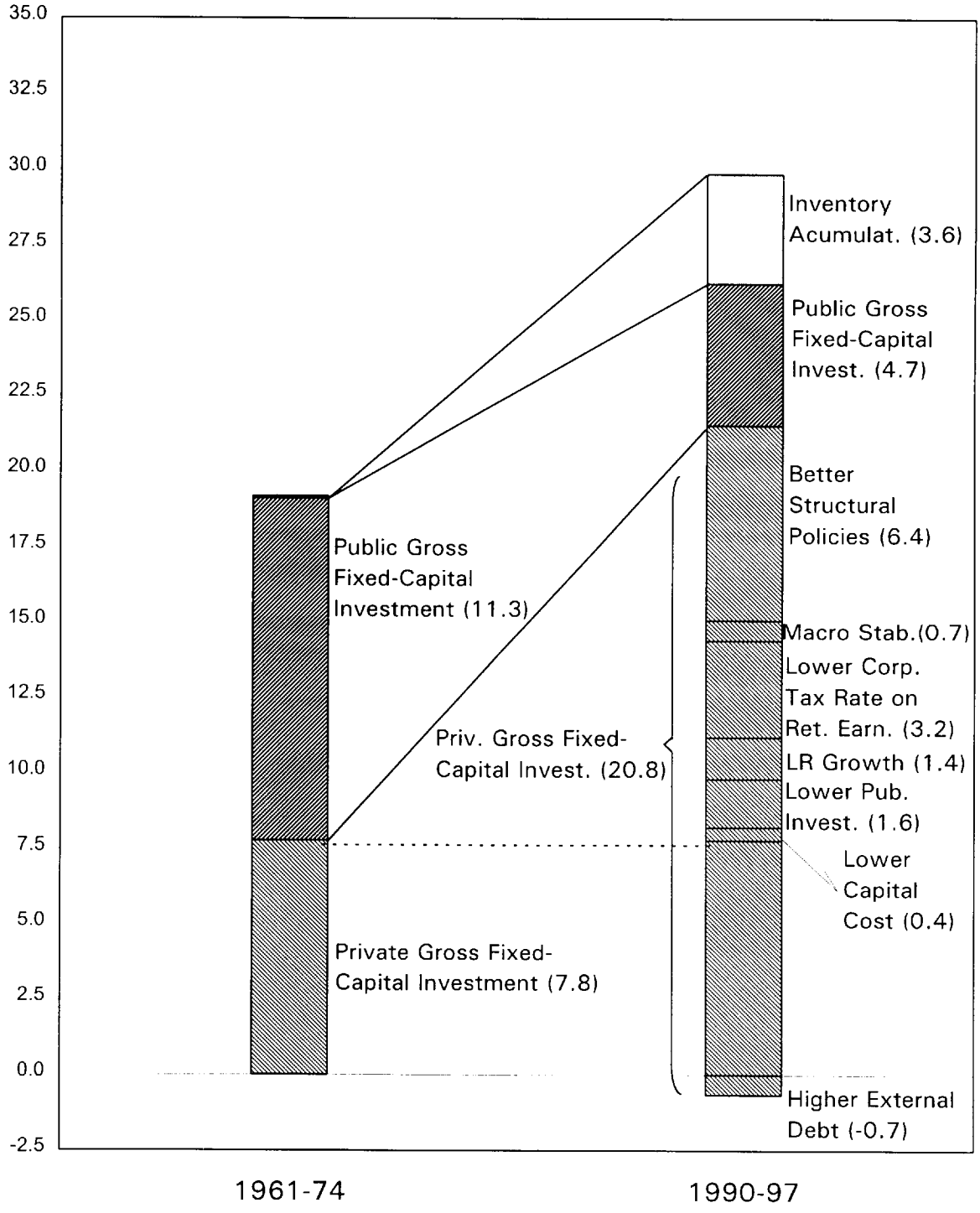
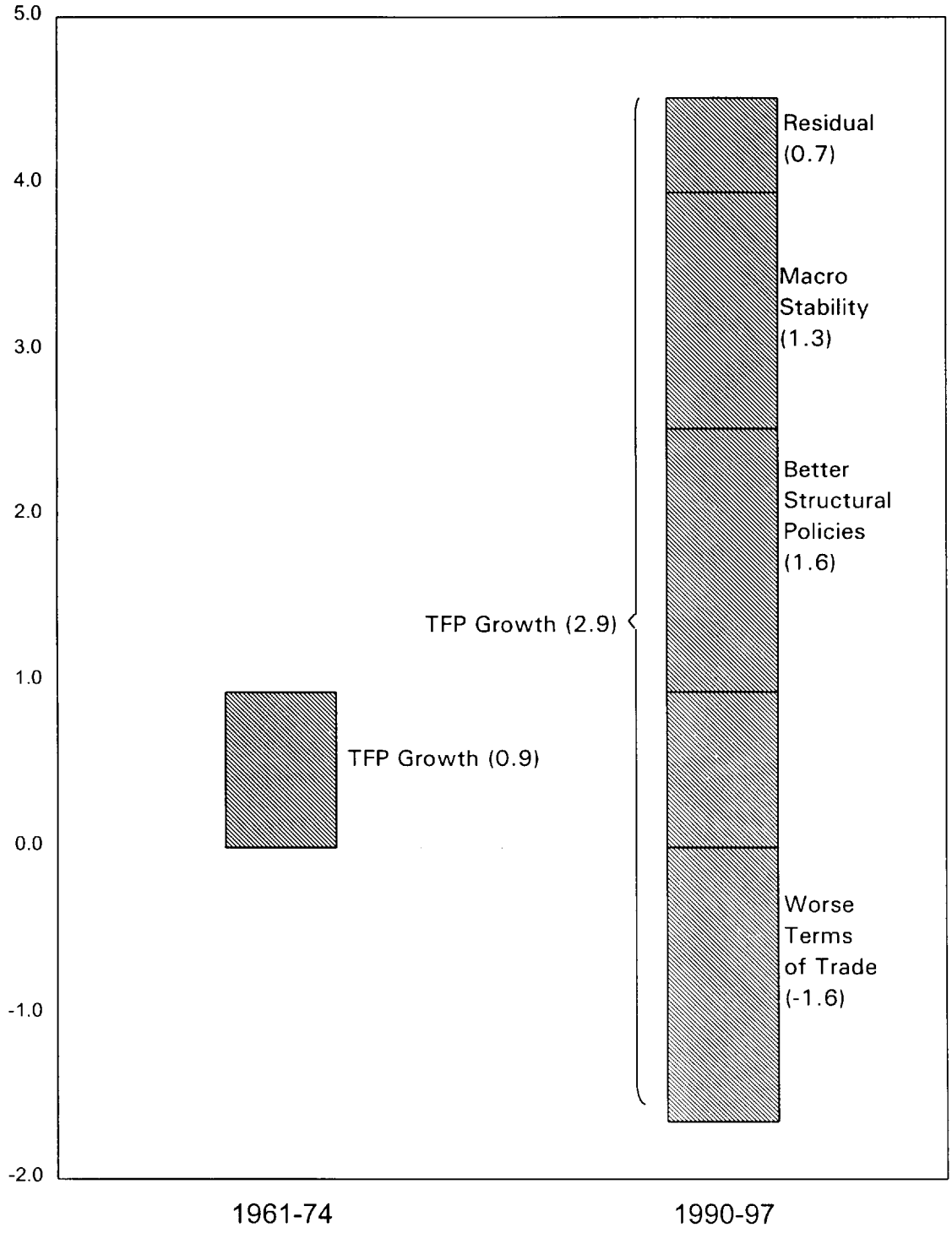


Figure 10
Explaining Chile's Higher TFP Growth



Note: The measure of TFP growth used here and in appendix 1 is a 3 year moving average.

Figure 11
Explaining Chile's Higher Average Productivity of the Capital

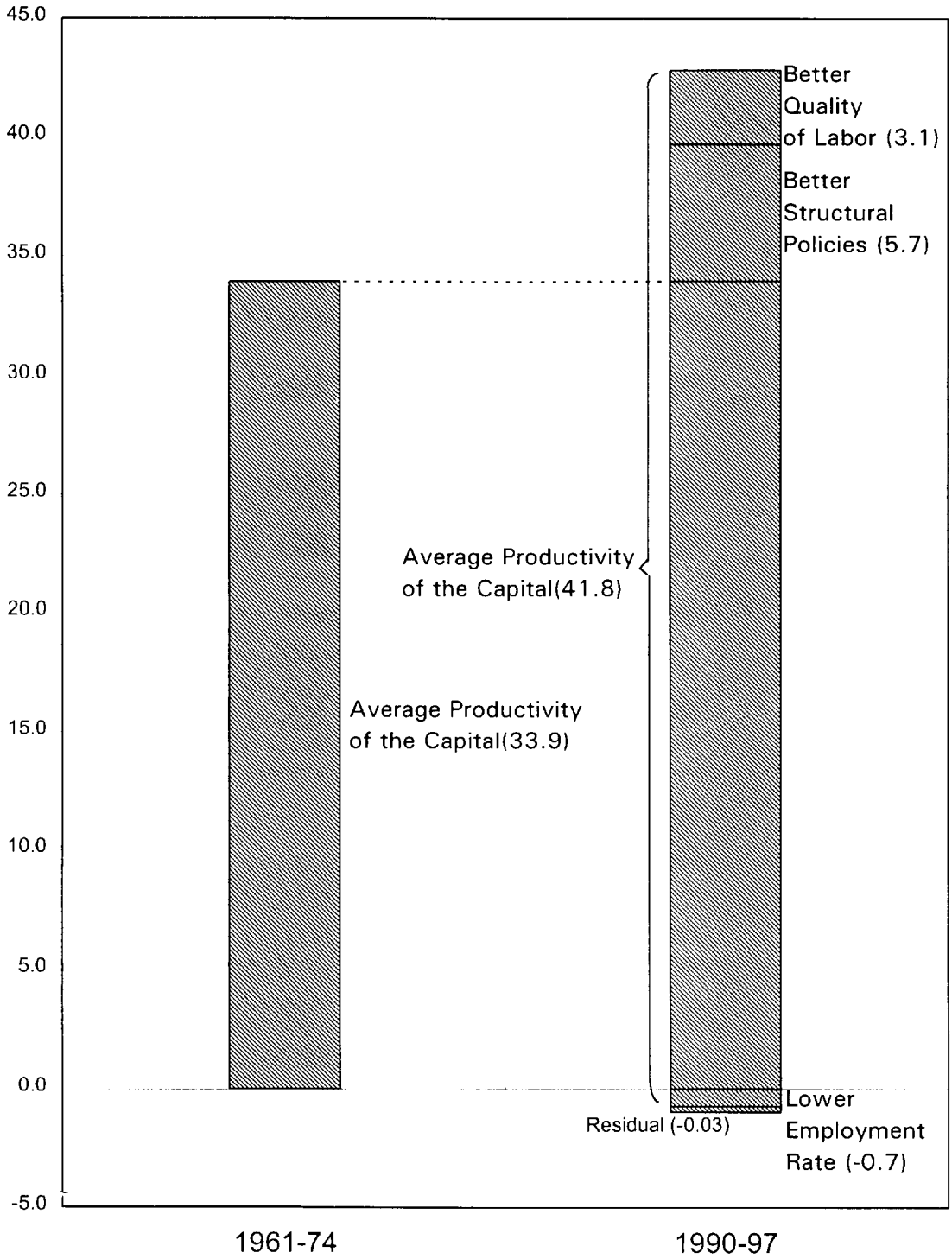


Figure 12
Interpreting Chile's Growth Takeoff and Future Growth Prospects with a Model of Endogenous Growth with Transitional Dynamics