

Report No. 25666-CL

Chile New Economy Study

(In Two Volumes) Volume I: Executive Summary and Policy Recommendations

February 18, 2004

Finance, Private Sector and Infrastructure
Latin America and the Caribbean Region



Document of the World Bank

CURRENCY EQUIVALENTS
US\$1.00=0.00138 Chilean Pesos
(March 2003)

FISCAL YEAR
January 1 – December 31

MAIN ABBREVIATIONS AND ACRONYMS

CTC	<i>Compañía Telefónica de Chile</i>
CFT	<i>Centros de Formación Técnica</i>
CONICYT	<i>Comisión Nacional de Investigación Científica y Tecnología</i>
CORFO	<i>Corporación de Fomento de la Producción</i>
FAT	<i>Fondo de Asistencia Técnica</i>
FDI	Foreign Direct Investment
FDT	<i>Fondo de Desarrollo de Telecomunicaciones</i>
FONCAP	<i>Fondo Nacional de Capacitación,</i>
GDP	Gross Domestic Product
GNI	Gross National Income
IADB	Inter-American Development Bank
IALS	International Adult Literacy Survey
ICT	Information and Communications Technologies
IMF	International Monetary Fund
IP	<i>Institutos Profesionales .</i>
IPR	Intellectual Property Rights
MSMB	Micro, Small and Medium Business
NPV	Net Present Value
OECD	Organization for Economic Cooperation and Development
PCS	Personal Communication Services
SENCE	<i>Servicio Nacional de Capacitación y Empleo</i>
SIMCE	<i>Sistema de Medición de la Calidad de la Educación</i>
TFP	Total Factor Productivity
TIMSS	Third International Mathematics and Science Study
WEF	World Economic Forum
WLL	Wireless Local Loop
WTO	World Trade Organization

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Executive Summary and Policy Recommendations**

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ACKNOWLEDGEMENTS

This report was prepared by a team composed of Danny Leipziger, Marialisa Motta, Carl Dahlman, Peter Scherer, Anuja Utz, Douglas Zeng, Aimilios Chatzinikolaou, Charles Kenny, James Hanna and Robert Vickers. The report benefited from background papers prepared by Lauritz Holm-Nielsen, Alejandro Jadresic, Natalia Agapitova, Thomas Nikolaj Hansen, and Patricia Garcia, Zuniga. At various stages, Pablo Fajnzylber (World Bank), Eduardo Bitrán (Fundación Chile), Guillermo Perry, Daniel Lederman, Bill Maloney, Juan Gaviria, Susan Goldmark and Luis Guasch (World Bank) provided valuable inputs and advice. Cara Zappala, Mauricio Cifuentes, Katia Nemes, and Julio Gonzalez offered precious editorial and document production support. The report was prepared under the general supervision of Myrna Alexander and Axel van Trotsenburg—Country Directors for Argentina, Chile, Paraguay and Uruguay.

The team received thoughtful contributions from many Chileans and international experts. Special thanks go to the *Secretaría de Economía* and the *División de Desarrollo Productivo de la Secretaría* for guiding the team and providing organizational support during the missions; to *Fundación Chile* for organizing a seminar that gave the team the opportunity to receive inputs on the scope and the contents of the work from distinguished representatives of the Chilean private and public sectors; to the Vice Minister of Economy Alvaro Díaz, Jaime Gré Zegers (*Secretaría de Tecnología de Información y Comunicación*), Ricardo Hernández (*Subtel*), Alejandro Jadresic and Oscar Cabello (*Alfa Centauro*) for their advice on and contributions to the ICT chapter; to Carlos Alvarez and Gonzalo Rivas (CORFO) for their advice on the Knowledge Economy Chapter; and to Mario Castillo (CORFO), John Dryden (OECD), Graham Vickery (OECD, Paris), Rafael Hernandez (GICT, World Bank), and Carlos Sanchez (IBM, Santiago) for their help on the section on micro and small businesses.

The work also received invaluable insights from a Quality Enhancement Review Panel consisting of Eric Banda (OECD), John Dryden (OECD), Carlos Braga (ISGIF, World Bank), Bill Maloney (LCSPP, World Bank), Harry Patrinos (HDNED, World Bank) and Sebastian Mocerrea (IBM; Latin America Policy Unit). The team sincerely thanks Alain Colliou and Manuel Penalver for their professionalism in organizing and conducting the QER.

Peer reviewers are Jordan Schwartz (PSAPP, World Bank), Carlos Braga (ISGIF, World Bank) and Pablo Fajnzylber (DEC, World Bank).

CHILE NEW ECONOMY STUDY: EXECUTIVE SUMMARY AND POLICY RECOMMENDATIONS

I. Introduction

1.1 Background, objectives and scope of the study. Chile faces the challenge of increasing its economic growth rate, which faltered in 1997 after a decade of remarkable 7.7% annual growth. In the last six years, the rate of economic growth has declined to an average of 2.5% per year.¹ Chile's GDP recovered to 3.2% in 2003, and the outlook for the short term is positive – the economy is expected to grow at around 4% in 2004.² Nevertheless, restoring even higher growth rates would allow Chile to gain a place among developed nations, reduce its poverty rate and improve its social indicators. The objective of this study is to assess Chile's performance in areas that could affect productivity and growth in the future. The study does not attempt to stipulate a comprehensive and final set of policy reforms. Rather, it should be considered a first step toward further research intended to support the Chilean Government in devising a reform agenda for the coming years.

1.2. Organization of the study. The study is divided into three main chapters. The first chapter assesses the performance of Chile in the *knowledge economy*, where knowledge is a critical factor for competitiveness and growth. It examines progress to date and remaining challenges with respect to three factors (the *knowledge variables*): (1) the economic incentive and institutional regime, (2) science and technology, and (3) the education system. The second chapter looks at Chile's Information and Communication Technology (ICT)—the infrastructure of the knowledge economy. The third chapter evaluates the potential use of ICT by local firms, with special focus on micro, small and medium businesses (MSMBs), which represent the bulk of the Chilean productive sector. The focus of the overall analysis is on the role of *Knowledge* in improving the productivity of the private sector. There are two main reasons for the emphasis on ICT compared to the other knowledge factors: (1) a complementary Bank study – *Closing the Gap in Technology and Education in Latin America* – has already evaluated the role of innovation and education in supporting participation of Latin American countries in the Knowledge Economy, (2) given the limited budget of the study, the team could conduct an in-depth assessment of *only one* knowledge variable. Similarly, the study's main focus on improving productivity of the private, rather than the public sector, is motivated by the fact that a recent World Bank Public Modernization loan addresses key issues in improving the effectiveness and efficiency of the Chilean public administration. It is our conviction that the audience of this study would benefit from an integrated reading of all these Bank reports, and that further work could be done to assess how policy recommendations included in various studies could be integrated to support the Chilean Government in designing a comprehensive policy agenda to reinvigorate the economy.

¹ IMF (2003) real GDP growth.

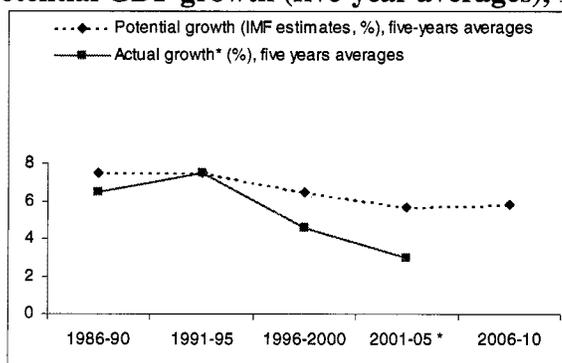
² Chile Central Bank for 2003 actual – third quarter figures – and World Bank for 2004 projections.

II. The Path Toward Restoring High Economic Growth in Chile: A Vision for the Future

1.3. During the second half of the 1980s and the first half of the 1990s, Chile's economy was one of the fastest growing in the world. Between 1986 and 1997, GDP annual growth was 7.7% (see Figure 1), which was more than twice the average in Latin America and higher than any other individual country in the Region. This was the result of successful market-oriented policies, a sound macroeconomic framework and effective governance.³ Chile's remarkable economic growth led, in turn, to significant reductions in poverty and improvements in social indicators. Income poverty dropped by more than half, from about 40% of the population in 1987 to 17% of the population in 1998. By the end of the 1990s, only 4% of the total population was indigent, life expectancy and infant mortality rates had reached OECD levels, and participation in primary education was almost universal.⁴ A recent World Bank report on poverty in Chile confirmed that economic growth was the main determinant of poverty reduction, responsible for 73% of the observed decline in poverty in the country between 1987 and 1998.

1.4. However, during the 1990s, growth rates suddenly declined, and the gap between Chile's expected performance and its actual performance began to widen – a trend that has been only partly reversed by signs of recovery during 2003. Chile's economy took a sudden downturn after 1997, reaching its nadir in 1999. After a quick recovery in 2000, the rate of growth faltered again in 2002, to 2.1%. Economic activity accelerated somewhat during 2003, to 3.2%. Although this was short of the Government's projections of 4% for the year, it indicates a potential recovery that is likely to strengthen in 2004 – when GDP growth is again projected to reach 4%.⁵ Nevertheless, the recent recovery and the positive short-term outlook do not compensate for the wide gap between potential and actual growth in Chile. While growth was on target in the early 1990's, it has been well below potential since the late 90's – see Figure 1.

Figure 1: Actual and potential GDP growth (five-year averages), 1986-2010



Sources: IMF for potential growth⁶ and Chile Central Bank for actual growth. * Actual rates for 2001-2002 and 2003 only.

³ For a detailed discussion of successful policies in Chile during the 1980s, see Leipziger, D. and G. Perry (1999).

⁴ World Bank, 2001.

⁵ Chile Central Bank for actual – third quarter figures for 2003 – and World Bank for 2004 projections.

⁶ The potential output is estimated by using the production function approach. Future potential growth rates presented in Figure 1 (5.7% for the years 2001-2005 and 5.8% for the years 2006-10) are averages of IMF optimistic and pessimistic scenarios. The assumptions of the pessimistic scenario are: no increase in the participation rate and a 2% p.a. deceleration in Total Factor Productivity (TFP) growth. The assumptions of the optimistic scenario are:

1.5. There is no confirmed single cause for the Chilean economic downturn. External shocks, a possible slowdown of Government policy response, and erosion of the benefits of past structural reforms are all possible, albeit tentative, explanations.⁷ In an attempt to shed light on the future path to recovery, several theories have tried to explain the causes of the Chilean economic slowdown that started in the early 90's.⁸ One possible explanation is a cyclical downturn caused by the Asian crisis, which resulted in terms-of-trade loss (down 15% between 1997 and 1999) and reduction of capital inflows to the Chilean economy. The negative effects of the Asian crisis were further exacerbated by continuing global and regional downturns induced by the Russian, Brazilian and Argentinean crises, as well as by the recent recession in the US. A second hypothesis attributes the Chilean slowdown to a lack of coordination between fiscal and monetary policies in response to the deterioration of the external environment in the second half of the 1990s. The underlying assumption of this hypothesis is that Government measures, which have consisted of a mix of moderately expansionary fiscal measures (the 1998 budget, which was approved on the assumption that the economy would keep growing at 7%, coupled with 40% increase in the minimum wage and a 6% increase in public sector wages), and tight monetary measures (high interest rates, which had a detrimental effect on the productive sector), might have hindered, rather than helped, overall economic growth⁹. A third possible explanation is a decline in the beneficial effects of structural reforms that were implemented between 1985 & 1995 and had resulted in marked increases in productivity¹⁰. Successful reforms included reducing tariff and non-tariff barriers to trade, introducing a legal framework supporting FDI, including private parties in the infrastructure and telecom sectors, and improving financial supervision and regulation¹¹.

1.6. The very recent growth of the Chilean economy and the positive short-term outlook should not deter the Government from embarking on further reforms aimed at improving the productivity of the private sector – these changes are necessary regardless of the relative importance of external shocks, macroeconomic policies or structural factors in explaining Chile's economic deceleration over the last decade. Productivity (TFP) increase was the main factor behind Chile's growth in the second half of the 1990s (TFP contribution to GDP growth between 1990 and 1995 was 44%). It is widely acknowledged that sound and stable economic and social policies, coupled with effective and efficient institutions, were responsible for the jumps in Chile's TFP and GDP during the golden age of growth. Similarly, reforms aimed at enhancing the efficiency with which available resources are used are likely to boost economic growth in the future. In light of recent research on this subject, this report

1% p.a. increase in participation rate and a 3% p.a. recovery in TFP growth. In both scenarios, the structural unemployment rate is assumed to remain unchanged and the capital to output ratio to gradually increase, reflecting the perception of above-average rate of return on investment in Chile (IMF, 2001).

⁷ See summary of various growth studies presented at the January 2002 Conference "Natural Resources and Economic Growth in Chile" promoted by the Central Bank, at <http://www.bcentral.cl/Estudios/Conferencias/2002RN/rnn.htm>.

⁸ On determinants of growth in Chile in recent decades, see: Gallego and Loayza (2002); Schmidt-Hebbel K. (2001); and Beyer B., Vergara R. (2001).

⁹ IMF (2001); Corbo and Tessada (2001).

¹⁰ Beyer B. & R. Vergara (2001); Gallego and Loayza (2001).

¹¹ For a detailed discussion of successful policies in Chile during the 1980s, see Leipziger, D. and G. Perry (1999).

assumes that future improvement in productivity and economic growth in Chile is likely to be influenced by four main variables (the *knowledge variables*):

- a. Favorable institutional and regulatory frameworks coupled with an incentive regime conducive to business innovation;
- b. Advanced national science and technology systems;
- c. An education system that can create a highly skilled labor force; and
- d. An advanced information and communication technology (ICT) infrastructure that can accelerate the communication, dissemination and processing of information.

Although a comprehensive assessment of the impact of each variable on GDP growth in Chile is not available, Table 1 presents some quantitative evidence of the potential effects of several factors underlying each variable. The next sections include a brief diagnostic and specific policy recommendations for each of these factors. As mentioned in the introduction, particular attention is dedicated to the ICT variable and to the use of ICT by MSMBs.

Table 1: Determinants of GDP Growth in Chile: Evidence from Econometric Analysis

Explanatory Variables	Projected change in growth
Institutional and regulatory frameworks and Incentive regime for private sector development	<u>Governance</u> (<i>Gallego and Loayza, 2001-2010</i>). Proxy: simple average of: bureaucratic delay, contract enforceability, nationalization risk, and infrastructure quality. (Each component measured on a scale from 1 to 4). Assumed change: from 0.71 to 0.79 (90 th percentile of the World distribution) 0.71%
	<u>Government size</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: Government consumption (% GDP). Assumed change: from 9.2% to 7.3%. 0.21%
	<u>Reduction of microeconomic distortions</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: number of different bureaucratic procedures necessary to open a new business. Assumed change: from 12 to 5 procedures. 0.74%
	<u>Openness</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: ratio of the sum of real exports and real imports to real GDP. Assumed change: from 94% to 120%. 0.22%
Education	<u>Quality of education</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: students' performance in math and science tests (TIMSS). Assumed change: from current scores to the scores of the countries in the 90 th percentile. (Bayer and Vergara). Assumed change: from current scores to the scores of Malaysia, Bulgaria, Thailand (average performers) 1.48% (effects on TFP and labor growth)
	<u>Research and development</u> . (<i>Bayer and Vergara</i>). Proxy: Research and Development expenditures (% GDP). Assumed change: from 0.68% to 0.95% of GDP 0.60% (increase in TFP only)
Science, Technology and innovation	<u>Research and development</u> . (<i>Bayer and Vergara</i>). Proxy: Research and Development expenditures (% GDP). Assumed change: from 0.68% to 0.95% of GDP 0.15%
Information and Communication Technologies /a:	<u>Telephone use</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: main telephone lines per worker. Assumed change: from 109 to 253 telephones per 1000 workers. 0.99%
	<u>Computer use</u> . (<i>Gallego and Loayza, 2001-2010</i>). Proxy: number of imported computers per worker. Assumed change: from 15 to 191. 1.09%

Source: Staff elaboration on the basis of Gallego and Loayza (2002) and Bayer and Vergara (2002).

/a: Telephones as a proxy for infrastructure

III. An Incentive Regime Conducive to Private Sector Development and Innovation: When Favorable Institutional and Regulatory Frameworks Are Not Sufficient

1.7. Chile's institutional framework ranks above those of all other Latin American countries, and is close to those of OECD countries. Chile's overall institutional framework is more advanced and stable than those of its neighbors, and is comparable to those of OECD countries. This is reflected in Chile's high overall political stability, respect for the rule of law and low level of corruption. While the analysis of Chile's macroeconomic environment (price stability, cost of internal and external financing, tendencies in the real exchange rate, and saving rates) is outside the scope of this study, overall rankings and recent IMF reports show that Chile's performance on macroeconomic variables is also sound.¹² The overall stability of the Chilean macro and institutional environments seems to indicate that all conditions are in place for Chile to have a well-developed, highly productive private sector. However, the decrease in economic growth that triggered this analysis suggests the need to have a closer look at why Chile has not progressed as fast as its macro and institutional variables would indicate.

1.8 Chile's innovation and microeconomic indicators could be further improved to ensure that Chile reaches the level of its most advanced income comparator countries and reduces its gaps with OECD countries. According to the competitiveness rankings of the World Economic Forum (WEF)¹³, Chile performs better than all other Latin American countries on microeconomic and innovation indicators, including introduction of new technologies, technology transfer, quality of the business environment, and company strategy and operation. However, some similar-income countries in East Asia and East Europe –e.g., Malaysia, Thailand and Latvia – perform better than Chile in these areas. Their overall investment climates are more conducive to business development – thanks to, among other things, highly skilled labor forces, better access to business information, more advanced infrastructures, and more competitive environments. Their overall innovation frameworks are also more sophisticated, as proven by greater attraction of foreign technology through licensing and FDI, greater investments in public and private R&D and – most importantly – successful collaborations between scientific institutions and local firms.

1.9 To improve its overall competitiveness, Chile may want to encourage microeconomic reforms supporting private sector development and innovation – both by supporting creation of new firms and by facilitating firms' productivity improvements. Possible areas for intervention include: (a) promoting venture capital, (b) reducing time and costs for business registration, (c) increasing the flexibility of the labor market, (d) increasing knowledge-intense FDI and its spillovers into the local economy, and (e) using cluster analysis strategically. Each proposed measure is briefly discussed in the sections below. While non exhaustive, these policies represent possible means to promote Chile's productivity growth within the context of its excellent market-driven economy. A detailed survey focusing both on Chile's business environment and on incentives needed to increase business productivity and

¹² IMF, 2001, World Bank, 2003.

¹³ World Economic Forum, 2004.

growth could shed better light on the importance of the factors listed below and point to other relevant elements.¹⁴

1.10. Creation of innovative businesses in Chile is restrained by the lack of Venture Capital (VC) and the absence of a highly entrepreneurial culture.¹⁵ Developing a VC industry in Chile will require policies addressing both supply and demand. As in the rest of Latin America and most developing countries, the venture capital industry is virtually non-existent in Chile.¹⁶ In the last few years, some “risk capital funds” have emerged, but their role is still very limited.¹⁷ The Chilean Government has recently undertaken a variety of initiatives to overcome existing constraints (see Table Four in Chapter One), including financial and legal reforms to increase the liquidity of the capital market and facilitate free inflows and outflows of capital from the country. These reforms have been coupled with matching grants offered by the Government (CORFO) to encourage investments from private VC Funds (*Capital de Riesgo* Program). In spite of the fact that Chile’s program is well designed¹⁸, only a few VC Funds have participated. To support development of the VC industry in the future, initiatives must be undertaken on both the supply and the demand sides of the VC equation.

1.11. To improve supply, policies could be geared towards increasing high risk, high return investments. This could be achieved by allowing pension funds to invest directly in young companies, and by changing the funds’ incentive structure to induce pension fund managers to undertake higher-risk investments. To increase the number of financial intermediaries, joint ventures between local and foreign VC funds should be encouraged. Chile could become a VC hub for the Latin America Region; its sound and stable macro economic and institutional environment make it a more appealing target country for foreign VC funds than most other Latin American countries.¹⁹ This would help mitigate the size and remoteness of the country. After more financial intermediaries are operating on the Chilean market, CORFO’s *Capital de Riesgo* Program could be expanded. For this measure to be successful, joint ventures between Chilean and foreign firms should also be encouraged. Once linked to foreign companies, Chilean firms will be more able to attract foreign VC—not least because international VC funds would much rather invest in deals led by US firms, or in which US firms are investing a significant amount. Attracting human resources who have the skills to manage VC funds is also essential.

¹⁴ Two important determinants of the quality of the business environment that were not analyzed in the course of the study are the intensity of competition and the depth of the financial sector .

¹⁵ The Venture Capital industry specializes in equity-backed investments for privately-owned small and medium size firms that offer the prospect of above average earnings growth coupled with above average levels of investment risk.

¹⁶ As Eduardo Bitran of *Fundación Chile* emphasizes: “It is worrisome how in Chile, we have not developed capital markets that generate seed capital, venture capital and the conditions needed for developing all types of opportunities.” *The Washington Times* (2002): <http://www.internationalreports.com/archives/00/chile/13.html>

¹⁷ The total value of these funds was estimated at about \$100 million in 1998. Among developing countries, East Asian countries stand out for their more advanced VC industry. In developing Asia, the outstanding stock of VC stood at \$6 billion at the end of 1995 (and the VC pool in Malaysia alone was already about \$380 million in 1985).

¹⁸ The design of the CORFO Program is consistent with international best practice, such as Israel’s Yozma Ltd program. See Chapter One and Gilson, R. (2002).

¹⁹ The Israeli experience shows that the willingness of local investors to risk their capital is important for attracting foreign investors. In Israel, foreign sources of capital became available only after the funds demonstrated a certain level of success.

1.12. To improve demand, it is important that Chile support innovation in the private sector, protect the rights of minority shareholders, and introduce regulation of stock options, which are not yet covered by Chilean legislation. Finally, it is critical that Chile increase entrepreneurial education at all school levels, improve the quality of business programs and increase entrepreneurs' awareness of the structure of VC contracts. Comparisons with countries like Malaysia, which do not inherently have a greater entrepreneurial culture, might be undertaken to see why they have been relatively more successful.

1.13. Creating a single contact point for business registration would reduce time and costs of business set up. Business registration times and costs in Chile are above those in OECD countries, as well as those of similar income countries (e.g., Malaysia and Hungary).²⁰ To start a business in Chile today, an entrepreneur must complete 10 procedures taking at least 28 business days, and pay \$620 in fees, equivalent to about 13% of per-capita GDP. (Compare this with Canada, where establishing a new business requires 2 procedures, 2 days and a total cost of \$280, equivalent to 1% of per-capita GDP.) Some measures that would help are setting up a single contact point where businesses can register, instituting a single business identification number system and creating a single business registration form. The Government could also allow businesses to reject requests for duplicate information filed with other government agencies and introduce a system whereby an application is deemed to be approved if the administration does not meet its deadline.²¹ It is notable that, in an effort to reduce the time and costs of regulation, the Chilean Government has already undertaken an initiative to allow business registration through the Internet.

1.14. A more flexible labor market is likely to reduce the costs of labor, increase employment and firms' productivity. Unemployment has risen in Chile from 5.3% in 1989 to 8.95% in 2002.²² Key changes that have affected the Chilean labor markets in recent years include: (a) the fact that investment (and output growth) in the 1990s was largely concentrated in capital-intensive sectors (finance, transport, electricity and mining), while investment (and output growth) in labor-intensive sectors (construction and manufacturing) decreased; and (b) the fact that institutional rigidities—such as the high cost of unemployment, termination and job protection policies and increases in minimum wages—might be having a negative impact on the level and distribution of employment, especially of young workers. Costs of employment termination and mandatory job security (advance notice and indemnity for dismissal) in Chile are high.²³ In addition, the marked increases in the minimum wage that followed the two sets of labor reforms introduced in Chile in the last two decades may have made the minimum wage binding, which could be limiting job creation. Recommended policy measures in this area include reducing the costs of employment termination and using caution in adjustments to the minimum wage.²⁴ The Government should also look for ways to support labor market flexibility more generally, while ensuring safety nets for the poor and the most exposed groups. Employers,

²⁰ Djankov, La Porta, Lopez, Shleifer, 2002.

²¹ OECD, 2002.

²² IMF, 2003.

²³ Chile's mandatory job security costs are higher than the Latin American average and above Mexico's, Argentina's and Brazil's, IADB (2001).

²⁴ IMF (2002).

employees and the government could promote cooperative and productive labor relations by creating forums for social dialogue (both at firm and intra-firm levels), removing barriers to high-performance incentive regimes, and investing in the education of managers and union leaders.²⁵ Strengthening permanent venues for dialogue between employers and employees, as well as improving the decision-making of employers and union representatives, is likely to improve labor and productivity growth.

1.15. Integrating economic policies and FDI policies would ensure that FDI is channeled toward increasing the value added to Chile's current products and services. This would require moving away from a "more is better" strategy and toward a focused FDI strategy consistent with the country's development priorities.²⁶ Thanks to a very stable institutional setting, good governance and very transparent regulation, FDI has been a major engine of growth for the Chilean economy in the last few years. Between 1995 and 2000, the average annual FDI growth rate in Chile was 8.3%, one of the highest in the world. Overall, Chile (like most other Latin American countries) seems to have followed a "more is better" approach that has been very successful at increasing FDI, but not as successful at attracting and channeling investments into areas consistent with national development priorities.²⁷ The recommended strategy—which has been used by most Asian economies—is to increase FDI's long-term impact on economic growth by attracting selected "knowledge intensive" FDI as a key conduit for technology transfer while ensuring that FDI policies include initiatives aimed at strengthening spill-over effects on the local economy (especially small and medium businesses).

1.16. Suggested measures to ensure integration of economic policies and FDI policies include: (a) defining long-term national development priorities based on the country's current comparative advantages, in collaboration with the private sector; (b) assessing how FDI can influence these priorities; (c) identifying and directly targeting foreign investors in specific industries; (d) monitoring the impact of FDI on national development priorities; and (e) evaluating the results of current programs to promote FDI, including their beneficiaries, the amounts disbursed, and the consistency of the investments with the overall national strategy. Adopting elements of an infant-industry strategy may have a high payoff, especially if it can support development of industries in which Chile has comparative advantages. To implement the strategy, incentives (in the forms of matching grants and tax assistance) could be provided to induce foreign companies to locate skilled and capital-intensive sections of their value chains in Chile. The Chilean Government has recently moved in this direction, especially by sponsoring initiatives aimed at attracting high technology investments. Because Chile lacks advantages in the high tech sector, FDI in this area might not materialize (see Chapter II, Section VII). A more feasible strategy would be to focus on attracting FDI in the natural resource, service or traditional

²⁵ IADB (2001). Recent research on the links between the quality of work relationships and labor productivity shows that factors such as worker motivation, the quality of management, union agreements, restrictive work practices and absenteeism are important in explaining cross-country differences in labor productivity. In a survey conducted by *LatinoBarometro*, fewer than 15% of Chilean employees claimed to have good relationships with their employers (compared with 30% in Mexico), and only 11% of employees thought that their employers were honest (compared with 27% in Mexico).

²⁶ For a review of the main development stages of FDI strategies and their characteristics, see the UN (2001) World Investment Report *Promoting Linkages*.

²⁷ Costa Rica is an exception in this regard, in that its FDI policies are clearly integrated with its development strategy—to strengthen the electronic and medical goods industries.

manufacturing industries by embedding advanced technology in production processes and final products.

1.17. Suggested measures to increase linkages between FDI and the local economy include implementing general policies aimed at improving education of the labor force, fostering collaboration between local firms and universities, and improving the quality of local products. Such measures are essential to avoid a situation where foreign investors outsource most of their inputs to more advanced, foreign-owned suppliers. Additional possible measures include creating specific linkage programs involving a combination of different policies (such as providing market or business information, matchmaking, managerial and technical assistance, or training) targeting selected industries and firms. In this respect, CORFO might want to review and compare its current programs with the Linkage Programs set up by Ireland, Singapore, Thailand, Malaysia and the UK.²⁸

1.18. Cluster analysis²⁹ could be used as a diagnostic tool and to support innovation in industries where the country has significant comparative advantages. In the last few decades, some innovative clusters have developed in Chile, mainly related to natural-resource industries (fruit, wine and mining). Innovation came from collaboration between private firms and universities and research institutions, as well as from related improvements at all levels of the production chain. These successes, mostly driven by private firms with some direct support from the public sector (CORFO), are limited to a few industries and do not seem easy to duplicate. Clusters have not developed even in industries in which Chile has a comparative advantage. For example, the strong Chilean banking sector and high concentration of micro and small businesses have not been complemented by development of software in support of these target markets, as happened in Uruguay and Brazil. Similarly, firms have not created links in the wood industry. Evidence from many countries shows that “existing successful clusters are the result of private entrepreneurship that has been buttressed by open trade regimes and strong domestic legal and financial institutions and with a small facilitator role from the government.”³⁰ In other words, the role of the Government in promoting clusters should be minimal. Cluster analysis should be used as a diagnostic tool—i.e., to identify overall constraints to firms’ growth—as well as to motivate participation of key private sector partners in the policy process. In addition, Government initiatives could be undertaken along the lines of recent public-private working groups instituted by the Government for selected industries (e.g., wine, tourism, ICT and biotechnology). Rather than aiming at picking winners, Government support should aim at identifying sectors in which linkages between various firms, or between firms and research institutions, are missing or could be strengthened, with the goal of fostering innovation, learning and increased productivity.

1.19. However, building clusters in areas in which the country lacks knowledge and experience is a risky and sub-optimal strategy. Chile should refrain both from picking winners and from supporting creation of entirely new clusters in areas in which it has no comparative advantage (e.g., *high-technology*). Leap-frogging has proven to be an expensive proposition with limited success (in East Asia, for example). Such interventions are likely to cause a sub-optimal

²⁸ See UN World Investment Report (2001), *Promoting Linkages*.

²⁹ Traditionally, clusters refer to collections of firms and support institutions related to each other through the supply chain production and distribution processes, as well as through provision of services.

³⁰ Closing the Gap in Education and Technology, Latin America and the Caribbean Studies, World Bank (2002).

use of resources by diverting them from more important, general private sector development policies.

IV. National Science and Technology Systems: the Need for Coordination and Rationalization

1.20. The previous section focused on creating a conducive environment for private sector development. This section complements the previous one by identifying Chile's main challenges in science and technology. Rather than focusing on the application of these factors in the private sector, this section takes a broader perspective and suggests possible policies to improve the national science and technology systems and their institutional framework.

1.21. The main shortcomings of the Chilean public decision-making system in matters related to science and technology are the lack of an overall Government policy framework or coherent organizational structure, coupled with a lack of evaluation of the results of existing programs. Responsibility for formulating and overseeing Chile's strategy for scientific and technological development is vested formally with the National Commission of Science and Technology (CONICYT) and the Presidential Scientific Advisory Commission. However, several ministries currently coordinate or participate in science and technology initiatives. As a result, Chile has developed myriad policies, programs and policy instruments for research and innovation. (See Figure 9 in Chapter I.) The Government would benefit from devising an overall strategy and coordinating its initiatives in these fields, aligning managerial responsibilities with accountability for results, and introducing consistent budgeting and monitoring process. To make the strategy more effective, representatives of the beneficiaries—such as research institutions, universities and private firms—should be involved in the design and implementation of this strategy. Before designing a science and technology strategy, however, the Government should evaluate the impacts of existing science and technology programs; this evaluation should include an assessment of the results achieved by private institutions operating in this field (e.g., *Fundación Chile*) and an evaluation of the potential for replicating these initiatives on a broader scale.

1.22. Investment in Research and Development (R&D) and private participation in the sciences should be increased. Revising the current Intellectual Property Rights (IPR) Act, reducing piracy, and improving procedures for patent approval are key prerequisites for increasing the role of the private sector in science. These broad initiatives could be coupled with direct incentives for firms willing to invest in research.³¹ Chile invests 0.6% of its GDP in R&D – equivalent to \$29 per capita, versus \$42 in Brazil and \$36 in Argentina. Econometric evidence shows that Chile's appropriate level of investment in R&D is about twice as much as it is investing currently.³² More importantly, private participation in R&D, which would ensure alignment of science and technology initiatives with the needs of the private sector, is very limited: currently, only 22% of research in Chile is financed by private local firms. (Compare this with 40% of research in Brazil and 69% of research in the USA.) Changes to the policy framework would encourage innovation and facilitate private participation. Revising and ratifying the IPR act would be a useful measure—despite having been modified several times

³¹ Drawn from Chapter I and Holm Nielsen L et al. (2002), background paper.

³² Lederman D. and Maloney W. (2002).

(most recently to ensure consistency with WTO regulation) it still does not provide adequate protection for confidential test data, nor does it provide for enforcement against piracy and counterfeiting. The Government would also benefit from specific measures to reduce piracy, such as increasing police interventions for copyright and anti-piracy violations, investigating piracy operations and manufacturing and distribution centers, enforcing prohibitions against the sale of pirated materials in the street, and better coordinating the actions of police with customs officials.³³ Finally, reducing administrative burdens on patent approval (it takes 2-4 years and costs \$5,000-\$10,000 to have a patent approved) would likely increase the number of patents filed and approved in Chile (3,600 patents were approved in Chile between 1992 and 2000, about one tenth of the number approved in Mexico). In addition to undertaking broad policy reforms, the public sector could also provide direct incentives—such as tax rebate schemes and competitively allocated matching grants—to private firms investing in R&D.

1.23. Allocating public funds for research through transparent competitive systems and expanding pre-competitive research would reduce the role of the public sector in the sciences and increase return on its investments. In addition to being the main investor in research in Chile, the public sector is responsible for a disproportionate share of research execution (47% of the total execution, compared with 11% and 7% in Brazil and the USA respectively). In Chile, as in most other countries, Government activities are focused on basic research (more than 50% in the decade 1990-99), which is often disconnected from the needs of the private sector and unlikely to have short- or medium-term impact on productivity. Rather than playing a major role in research execution, the public sector could allocate research funds through transparent, competitive bidding processes that encourage private institutions and firms to participate in the bidding. The selection criteria should be based on institutions' past proven performance, and, for public institutions, on ability and intent to cooperate with private firms. This measure could be coupled with increased pre-competitive research to identify missing links in production chain development.

1.24. Cultivating university-industry partnerships would ensure that research, science and innovation have spillover effects on the local economy, increasing productivity and growth. In Chile, coordination between the public and private sectors in research and innovation is limited. Joint research conducted to increase the productivity of the private sector has occurred in some industries, such as fruit and mining (for example, the collaboration between the mining sector and the Department of Mining at the University of Chile, or the agreement of *Fundación Chile* with seven private non-profit research agencies in the US and Japan to promote joint research in agriculture, aquaculture, forestry and food processing). However, such examples are exceptions rather than the rule. Two out of three Chilean researchers work in universities, and only 6% operate in private companies, compared to more than a third in leading OECD countries.³⁴ Reforms granting universities the right to file patents and own their research would go a long way to stimulate them to conduct applied research with immediate benefits to the economy. Chile could also offer incentives supporting information sharing, joint research and consulting activities between firms and universities. Such incentives would both pique the interest of private companies in hiring researchers and increase the number of students pursuing masters or doctoral degrees without regarding these programs as strictly leading to academic

³³ International Intellectual Property Alliance (2001).

³⁴ Brunner (2001).

professions. Incubators and technology & science parks are another possible way to enhance public-private collaboration. The Chilean Government has already supported a number of incubators. These initiatives should be carefully evaluated before being replicated. In general, creating incubators and science parks should be approached with care—the success of these kinds of initiatives has not been proven, and there is a risk that they would turn into subsidized real estate ventures.

V. Aligning the Education System with the Needs of the Knowledge Economy: Investing in the Future

1.25. Although notable progress has been made in increasing enrollments and enhancing the skills of Chilean students, further Government intervention is needed to ensure that education and training meet the needs of a knowledge-based economy. Chile has attained almost universal participation in primary education. It has also made significant progress in secondary education, with enrollment increasing from 53% in 1980 to 87% in 1999. Enrollment in tertiary education has also risen, albeit at a lower pace (from 12% in 1980 to 34% in 1998). Although more pupils are attending school, the skills they are developing do not prepare them to meet the needs of an advanced economy; tests show that both hard skills and high-order skills are poor in Chile. (Hard skills include math and science skills. High-order skills include logical reasoning, independent judgment, and the ability to work in teams). Given that the Chilean economy is still mainly based on natural resources, the demand for these skills by local firms is limited. This might warrant Government intervention, because the social returns of developing a highly-skilled labor force that could help transform Chile into a knowledge-based economy are significantly higher than the private returns for individual firms.

1.26. In primary and secondary education, it is important to ensure a match between the skills being taught at schools and the needs of the knowledge economy. In addition, materials and methods should be introduced to teach students “how to learn” instead of occupation-specific knowledge or skills. Through national evaluation initiatives such as SIMCE (*Sistema de Medición de la Calidad de la Información*), Chile has already begun monitoring students’ skills in fields required by an innovative society. In addition, Chile is the only Latin American country participating in the IALS (International Adult Literacy Survey) and TIMSS (Third International Mathematics and Science Study) tests. The IALS test addresses broad skills (prose literacy, document literacy, logical abilities, and math and science competencies), while TIMSS focuses on hard skills (math and science). Recent results of these tests demonstrate that Chile still needs to make significant progress in improving the skills of its population. (Chile ranked 35th among 38 countries in the TIMSS test; according to the IALS test, only 20% of the Chilean population has “reading comprehension sufficient to deal with the demands of everyday life and work in a complex advanced society.”) Furthermore, the math and science curricula in primary and secondary schools are outdated—recent surveys found that Chilean 8th graders are taught less about algebra, geometry, chemistry and physics than students from many other countries. In the last years, progress has been made in improving the hard and higher-order skills of the population through, for example, the new science curricula introduced in primary and secondary schools (by the World Bank MECE-Basic and MECE-Media programs—*Mejoramiento de Equidad y Calidad de Educación*). The results of these initiatives

should be evaluated and, if the initiatives are successful, they should be replicated on a broader scale. In addition to continuing its participation in student testing, Chile should introduce tests to assess whether and how *teachers'* skills could be improved and aligned with the needs of the knowledge economy. In addition to evaluating specific competencies, these tests should attempt to determine the reasons for the lack of confidence that seems to plague Chilean instructors (as shown in the results of the recent TIMSS test).

1.27. A framework should be devised to track the performance of tertiary education, including technical institutions and universities; in addition, improving foreign and industrial partnerships with universities would help ensure consistency between education and the needs of the economy. Although enrollment in tertiary education has increased in recent years, enrollment rates and measures of student satisfaction at tertiary technical institutions (*Institutos Profesionales-IP*) and technical training centers (*Centros de Formación Técnica-CFT*) have remained low. Despite the fact that the quality of university systems is higher than that of IPs and CFTs, Chilean universities have not oriented their curricula (which remain academic and rigid) toward developing the scientific and technical skills that are required by an advanced economy. Finally, enrollment and educational attainment at the tertiary level have not been equally distributed in Chile—major imbalances exist across income quintiles and between urban and rural areas. The Government of Chile, in collaboration with the World Bank (through the Bank's Higher Education Project), has recently made progress toward improving the quality of tertiary education by developing a quality assessment system encompassing universities, IPs, and CFTs. As a first step toward improving the quality of tertiary education, the Government should monitor the results of the Higher Education project and promote follow up initiatives. To improve university curricula, the Chilean Government could also support partnerships between local and foreign universities by establishing exchange programs for students and professors, as well as by attracting renowned foreign educational institutions to open branches in Chile. (The Government of Singapore recently succeeded in attracting Wharton, INSEAD, Chicago Business School and MIT, all of which opened branches in Singapore.) Furthermore, Chile should promote exchanges between local universities and local firms, as well as encourage local firms to participate in the design of university courses and research programs.

1.28. Chile has innovative training policies that separate provision from regulation and certification. Even so, more effort should be devoted to aligning the contents of training with firms' needs, and to better reaching micro and small businesses. The Chilean training system is regulated by the National Training System (SENCE, *Sistema Nacional de Capacitación y Empleo*), under the Labor Ministry. SENCE is currently a pure training regulator—it does not operate training facilities. It administers a tax rebate program (*franquicia tributaria*) for firms that directly provide or contract registered providers to develop training programs for their workers.³⁵ The accreditation systems introduced in the 1990s allow workers to get certified in skills acquired through on-the-job training or experience, making the skills transferable. Despite an advanced institutional design, SENCE's training initiative has had a

³⁵ IADB, 2001.

limited impact to date.³⁶ During 2000, only 12% of the labor force participated in SENCE training courses, and micro enterprises (83% of all firms in Chile) had a participation rate of only 0.4%.³⁷ There also seems to be an emerging consensus that the quality and relevance of the training is not aligned with the needs of firms because of:³⁸ (a) a lack of communication between training suppliers and local firms regarding both the skills needed by the economy and the contents of the available training programs; (b) the lack of an explicit standard for evaluating the quality of training providers; (c) the bureaucratic mechanisms used by the Government to manage tax rebate systems; and (d) the necessity for the training system to teach remedial skills, due to the ineffectiveness of the basic education system. This calls for better coordination between firms and training institutions, for a review and evaluation of current training programs (indicators should be introduced to evaluate not only the outreach but also the quality of the programs) and for the development of performance-based accreditation systems for training institutions. Initiatives to raise awareness of the importance of training among MSMBs should also be promoted.

VI. Fine-tuning the Information and Communication Technology (ICT) Infrastructure

1.29. The Chilean Government's early and sustained commitment to ICT as a force for development has produced considerable results across a number of initiatives. Key challenges for the future are fine-tuning telecom legislation and the industry institutional framework, evaluating existing universal access programs (telephone and Telecenter bidding for subsidies schemes) and supporting use of these technologies among businesses, Government and citizens. Beginning in 1982, Chile was one of the first countries in the world to liberalize its information infrastructure sector, with privatization of telecom companies in 1988.³⁹ As a result of high competition, Chile had a well-developed information infrastructure by the end of 2000. Chile's service rollout, quality, costs and efficiency—although lower than OECD countries'—were the highest in the Latin America Region and above average, at times up to best practice, among income comparator countries. Mobile growth over the last few years has been particularly impressive, especially when compared to fixed network services. Below, we present a brief diagnostic and policy suggestions to address remaining challenges in the ICT field. The suggestions include advice on pending telecom reforms, focusing on the need to increase access to fixed lines, facilitate introduction of new technologies, and modify the telecom institutional framework.⁴⁰ The suggestions also include possible next steps for the universal access initiatives that Chile has already launched (telephone and Telecenter bidding for subsidy

³⁶ The lack of a coherent government strategy has justified the recent launch of a US\$75.5 Mil Bank project on lifelong learning and training. The project is aimed at improving the overall quality of existing technical training programs and at broadening accreditation systems. (<http://www4.worldbank.org/sprojects/Project.asp?pid=P068271>)

³⁷ To address this problem, in 1997 SENCE introduced FONCAP (*Fondo Nacional de Capacitación*), targeting the needs of the most vulnerable groups and small and micro-enterprises, and *Chile Joven*, targeting young unemployed.

³⁸ Araneda and Marin (2002).

³⁹ In July of 1998, President Frei created the *Comisión Presidencial de Nuevas Tecnologías de Información y Comunicación* to evaluate and improve access to and use of ICT in the country. Since June 2000, *El Comité de Ministros de Nuevas Tecnologías de la Información y Comunicación (Comité TIC)*, a multidisciplinary working group led by the Minister of Economy and managed by the *Secretaría de Tecnología de Información (Secretaría TIC)*, has been responsible for promoting ICT in the country.

⁴⁰ Drawn from Chapter II and a background paper from Jadresic, A.

schemes). Section VII focuses on ways to improve the use of ICT by businesses, with an emphasis on MSMBs. It is worth emphasizing that ICT should be considered in the context of the other factors presented in the report. International evidence shows that standalone ICT infrastructure and access programs (e.g., creation of Telecenters) are unlikely to be successful unless they are coupled with improvements in complementary assets (e.g., ICT skills, software applications and content), advanced innovation and education systems, and—most importantly—an enabling environment for business.

1.30. Increasing penetration of fixed lines, which is low relative to other indicators, will require fine-tuning telecom legislation. Roll-out of fixed services has been low compared to roll-out of mobile services, as well as in comparison with similar income countries (there are 24 fixed lines per 1000 inhabitants in Chile, versus 37 in best practice income comparator countries). This might be due to the fact that interconnection charges were set in 1999 to the advantage of mobile and small companies, and to the disadvantage of the incumbent (Telefónica CTC). As a general principle, to increase fair competition in the local segment, interconnection rates should be set so that the same services provided in the same geographical area by any operator are charged the same rates.

1.31. In addition to ensuring further roll-out of existing services, a Government priority for the future is facilitating the introduction of new technologies allowing faster communication. In the past, licensing constraints have slowed the introduction of new technologies (e.g., PCS mobile phones and wireless local loop–WLL). To avoid further delays in the future, the regulator should simplify the licensing system and reform the spectrum management system. Operators should not have to receive special authorizations or go through lengthy bureaucratic procedures to introduce new services. Special authorizations should be required only when there is a need to guarantee efficient use of scarce national resources (such as in the case of radio-electrical spectrum, which is a public good), to comply with international agreements, or to preserve fair competition. The spectrum management system should also be reformed to ensure that spectrum can easily be allocated for new technologies. A first step in reforming the system would be to standardize frequency blocks in terms of bandwidth, geographical scope and duration of authorizations. Standardization would make it possible to implement simple and transparent mechanisms for spectrum trading, including easy procedures for awarding new frequencies. When frequencies are scarce (i.e., when the number of interested parties is greater than the number of available blocks), new frequencies could be allocated by public auctions. Reforms should also include defining the general obligations and rights of operators without restricting the services that can be provided or technologies that can be used, while allowing for constraints on allocation and operation of frequencies if necessary to preserve fair competition. The goal of preserving fair competition also requires eliminating preferential rights. Finally, the levy system on frequencies needs to be reformed in order to make it consistent with the scheme of awarding rights (i.e., to not double-tax the operators).⁴¹

⁴¹ It is possible to implement many of these objectives through managerial and administrative changes, without modifying the law. For instance, it is possible to design public contests minimizing barriers for new entrants (e.g., by allowing many blocks), maximizing market flexibility (e.g., by reducing investment obligations), simplifying administrative procedures, allowing the reallocation of frequencies to new services (e.g., after a minimum number of years) or increasing the probability that a bid will be called for due to equality among the proposals of the contestants. It is also possible to create a public record of frequencies, to dictate regulations restricting grants of preferential rights and to modify the levy system on frequencies. Nonetheless, in the longer run it would be

1.32. Implementing broad institutional reforms coupled with modifying the management systems of the regulator (Subtel) would strengthen the institutional framework in the telecom sector and increase the regulator’s flexibility and decision-making speed. Currently, powers in the telecom field are distributed among several different agencies (e.g., Subtel, the Ministry of Transport and the Ministry of Economy). Combined with Subtel’s lack of autonomy and mixture of policy making, regulatory and controlling functions, this diffusion of authority might be hindering reforms and slowing the regulatory decision-making process.⁴² A first step toward clarifying the institutional framework could be to move Subtel from the Ministry of Transport to the Ministry of Economy.⁴³ In addition, a highly autonomous, independent telecommunications regulator (the *Superintendencia*) should be created. The *Superintendencia* would be in charge of proposing, applying and controlling regulations, and could be financed with a small fee on regulated services. Special requirements and procedures should be established to appoint or discharge the regulator (*Superintendente*). Broad institutional changes should be coupled with modifications of Subtel’s procedures and management systems to ensure that Subtel’s increased autonomy is matched by increased accountability, transparency and efficiency. To increase accountability, the regulator should have an obligation to prepare an annual report of its administrative and financial performance. To increase transparency, mechanisms should be devised to facilitate participation of interested parties in the regulatory processes (e.g., public hearings). An obligation should also be imposed to ensure that all regulatory decisions be duly and explicitly justified, and that a “procedures manual” be published for the regulatory process itself. To increase efficiency and decision-making speed, a “positive administrative silence” criterion should be established, such that requests are automatically accepted if deadlines pass with no answer. In general, these measures do not require legal reform and can be established by a simple decision of the authorities.

1.33. Chile has made significant progress in promoting universal access programs—the telephone and Telecenter bidding for subsidies schemes (FDT 1 and FDT2 respectively) are already well-known around the world. Nevertheless, careful evaluation is needed before moving further with these programs. As in other countries, access to ICT (especially computers and the Internet) in Chile is skewed toward wealthy people and urban areas. Disparities in access to ICT are deeper in Chile than in comparator countries, mainly because of high income inequalities (the Gini index is 0.56 in Chile, versus 0.32 in Poland, for example) and low population density in rural areas (Chile’s rural population density averages 110 people per square kilometer, compared to 268 people per square kilometer in income comparator countries). Even though the penetration of computers and the Internet in the tenth income decile and in urban areas in Chile is similar to that in OECD countries, the poor and people living in isolated areas are effectively excluded from access to these technologies. Consequently, increasing overall Internet usage in Chile will require policies focusing on low-income people and people

convenient to introduce more precise legal provisions to ensure efficient spectrum management, including a market for spectrum trading and a competitive, transparent and non discriminatory mechanism for awarding and renewing frequency rights. When doing so, the acquired rights of those currently operating frequencies must be kept in mind, so they are not unduly discriminated against.

⁴² Jadresic A., (2002).

⁴³ While this has been considered at various times in the past, it has never occurred. Recently, the issue was deemed less important than other more pressing needs for reform - see Navigation Chart prepared by Subtel proposing changes for the next years at Subtel site:

http://www.subtel.cl/servlet/page?_pageid=58&_dad=portal30&_schema=PORTAL30

living in isolated areas. The Government has launched two initiatives in response to these problems: the first *Fondo de Desarrollo de Telecomunicaciones* (FDT1) in 1995 to increase access to telephones, and the second *Fondo de Desarrollo de Telecomunicaciones* (FDT2) in 2002 to increase access to computers and the Internet⁴⁴.

1.34. Further initiatives to increase access to public telephones include evaluating the results of FDT1 and incorporating lessons learned into the launch of a new fund to cover additional rural areas and the low-income urban areas left unattended by FDT1. Between 1995 and 2001, FDT1 provided public telephones to approximately 6,000 rural localities with about 2.2 million inhabitants. The total investment was \$161 Million, of which 86% was funded by private companies. The first step toward further supporting universal telephony access in Chile is conducting a final evaluation of the impact of FDT1—see suggested key criteria in Table 7 of Chapter 2. If the results are positive, as preliminary evidence seems to indicate, a second round of bidding should be conducted. The objectives of this second round would be to increase the availability of public phones in rural areas (15% of houses in rural areas are disconnected, versus only 1% in urban areas) and for urban households. Urban sites remained completely unserved by FDT1 because an initial evaluation of the Net Present Value (NPV) of low-income urban areas was positive, excluding them from the bidding scheme. A later review of the Fund suggested that the cost-benefit analysis underestimated costs of installing and operating public phones in these areas (especially costs related to vandalism) and erroneously suggested that there was no need to provide subsidies for such phones.

1.35. An early evaluation of FDT2 should be conducted before replicating the initiative on a larger scale, because similar initiatives conducted in various countries—as well as some pilots in Chile—have proven unsustainable. In January 2002, to address the issue of limited private access to computers and the Internet, the Chilean Government launched FDT2, a Universal Access Fund to extend public Telecenters into low-income areas (\$4.5 Million was assigned for the first round of bidding). Like FDT1, FDT2 relies on a bidding for subsidies scheme. Subtel should evaluate the results of the first bidding rounds before new rounds are launched. Subtel should assess the sustainability of existing Telecenters by looking at four key criteria. The first criterion is private ownership and management of the Centers—small for-profit local companies with previous experience in the IT field are ideal operators. The results of the first bidding round suggest that public institutions (universities and public-funded projects) have a dominant interest in the Centers,⁴⁵ raising some concerns about sustainability. Second, Centers should be opened in areas where there is strong demand from the local community. Ensuring citizen participation in the design and implementation of the project is critical for assessing and stimulating demand. Third, ICT complementary assets should be in place before opening the Centers. Complementary assets include ICT training, online local content and easy-to-use software tools matching the specific needs and willingness to pay of low-income users. Although the FDT2 Council requires that bidders present a diskette with the design of their portal (including the content that will be provided), it does not specify the types of information

⁴⁴ Both funds were managed by a Council chaired by the Telecommunication Minister.

⁴⁵ While public-private partnership is one of Subtel's key criteria for telecenter biddings, it is difficult to envision how these partnerships will work in practice and, most importantly whether they will be sustainable. On the risk of dominance of public ownership and participation, see Chapter Two, section III.2.

that should be included.⁴⁶ In addition to ensuring the Telecenters' sustainability, the Government needs to ensure coordination among the various public and private Telecenter initiatives currently nascent in the country, including initiatives sponsored by the Ministry of Economy and CORFO (Business Centers for MSBs), *Dirección de Biblioteca Archivo y Museo* (DIBAM) and Enlaces.⁴⁷

VII. From an Advanced Policy Framework to Private Sector Adoption: Promoting the Use of ICT by Chilean Firms

1.36. Anecdotal evidence suggests that access to and use of ICT has the potential to increase business productivity and growth. Econometric evidence about the impact of business use of ICT in Chile or other developing countries is not available, but experience shows that ICT can impact productivity and growth. In addition to giving businesses the opportunity to access additional information, contact new clients and suppliers, and facilitate adoption of new technical and managerial skills, ICT is a key conduit for process innovation. In fact, the results of OECD surveys show that about 50% of the motivation for business use of ICT comes from efficiency improvements, including speed of processing (e.g., through electronic ordering and electronic invoicing), task simplification, process rationalization, and the reduction of costs of conducting financial transactions and interacting with the Government. OECD experience also shows that improvements are more likely to materialize when firms move from basic to more advanced use of ICT. Progress in ICT use can be mapped along an *ICT adoption ladder* with four steps: (1) exchanging e-mail, (2) buying and selling online (*e-commerce*), (3) building online supply chains and managing inbound and outbound logistics (*e-business*), and (4) building working networks or web spaces shared by customers, partners and suppliers.

1.37. Among micro, small and medium businesses (MSMBs), which represent the bulk of the Chilean economy, many factors constrain ICT adoption. MSMBs account for 97% of all firms and for 70% of the total employment in Chile. Indeed, 83% of Chilean firms are microbusinesses (fewer than 10 employees), and microbusinesses employ about 50% of the labor force. These figures suggest that the growth of these firms is essential for the growth of Chile's overall economy. While nearly universal Internet access has been achieved by large and medium firms (93% and 85% respectively), connectivity among small and micro firms is still low (68% and 39% respectively)⁴⁸. Many constraints also limit more advanced use of these technologies among MSMBs, as demonstrated by the paucity of business web-sites, limited use of specialized software applications for data and business management, and low incidence of online transactions among MSMBs. An analysis of the results of a program providing computer access to small firms in Chile (CORFO's FAT Internet program) confirms that connectivity is not the

⁴⁶ See Chapter Two, section III.2. The portal of the Center should be connected with the online pages of the municipality and central administration, and the users should have the opportunity to conduct at least few basic transactions online – e.g., checking status of family certificates, licenses, business registrations – from the first day the Center is in operation. Links to local banks, allowing users to expedite banking procedures online, are also crucial, especially for the higher-income segments of the market. Easy-to-use software targeted for local communities (e.g., tools to conduct financial analysis or accounting, or to develop business plans for micro and small entrepreneurs).

⁴⁷ The *Secretaría de Tecnología de Información y Comunicación* has recently decided to reduce the number of Centers and better coordinate various initiatives.

⁴⁸ Chile Ministry of Economy (2002). Survey of Chilean firms access to and use of ICT.

key to ICT-related productivity improvements: many firms that received a computer through the FAT Program hardly used it, and the main use was e-mail exchange.⁴⁹ Constraints that Chilean firms face when moving up the *ICT adoption ladder* include: (1) the relatively high costs of ICT, (2) legal obstacles, (3) limited awareness about the potential benefits of ICT due to lack of appropriate training and digital tools, (4) the need for cultural, organizational and logistical changes in businesses introducing ICT, and (5) a relative lack of ICT skills. Because ICT access issues were discussed in the overall section on ICT, the next paragraphs examine the other five factors.

1.38. Some specific low-cost legal issues should be addressed to improve Internet use. Chile was late in introducing its law on electronic data interchange (March 2002). Although businesses' lack of interest and initiative in e-commerce has likely been the main reason for the slow growth of online sales in Chile, the lengthy legislative approval process might also have played a role. Further legal measures conducive to e-business development include protection of intellectual property rights —currently, protection of online intellectual property rights in Chile is covered by the same laws and international agreements covering traditional media on the Internet—, as well as increases in online security —Internet security in Chile lags behind other Latin American countries (only 17% of Chilean web sites were “secure” in 2002, versus 20% in Brazil and 25% in Argentina).⁵⁰

1.39. Training and advisory services focused on integrating digital tools into MSMBs' business processes, coupled with development of online information and simplified hardware and software tools, would increase awareness of the importance of ICT among MSMBs. Even though the Chilean Government is making significant efforts downstream to build access to digital tools through facilities and government portals, it needs to strengthen its upstream efforts to generate basic business awareness among the very large number of MSMBs. ICT training should emphasize business value added rather than simple information search, and should help entrepreneurs integrate digital tools into their business processes. Training should be sector-, location-, and (as much as possible) firm-specific, in as much as general ICT training has been found to be ineffective. Intermediaries and business advisors should be involved in defining the contents of training and posting online information specific to firms operating in different sectors. Awareness could also be raised by financing information campaigns, IT workshops, and guides explaining the implications of e-commerce legislation for MSMBs. Because current hardware devices and off-the-shelf software packages available in Chile are relatively complex and geared towards large firms, the Government and the private sector should collaborate to devise new hardware devices (such as voice recognition and touch-screen computers) and software packages (such as easy-to-use tools for business planning, financial analysis, accounting, and warehouse management) that are better-suited to MSMBs. In addition, because

⁴⁹ Sáenz, 2000

⁵⁰ While this is an important issue, it is not the main reason for low take up of e-commerce in Chile (or in other countries). As stated by Hilbert (CEPAL, 2001) on security: “In the long run, security is not a real obstacle (for development of e-commerce). Paradoxically, consumers are accustomed to give credit card information over the telephone or to a waiter in a restaurant. But many are reluctant to give it online for fear that it will be stolen or misused. Of course, the first alternative is a lot more susceptible for misuses. Furthermore, most e-commerce companies take full responsibilities for financial transactions (e.g., Amazon). Finally, new technology devices that can be connected to computers are now able to read fingerprints of the user, transmitting and assuring his identity in real time.”

the investments (and risks) related to developing a web-site and engaging in e-commerce activities are often too high for MSMBs, private-public sector collaboration should be established to develop cluster- and industry-focused portals and marketplaces. Such sites could mediate information exchange, provide links of interest (for example, to online banks), allow MSMBs to create storefronts, support e-procurement and e-commerce, give on-line business advice, and provide information on job supply and demand.⁵¹

1.40. The computer skills of the population could be improved – and should be better monitored. The Government has undertaken several initiatives to increase Chileans' ICT literacy skills, including the Enlaces project, opening "Enlaces schools" to adults in the afternoon, opening Telecenters in low-income areas, and opening business centers targeting MSMBs. The results of these initiatives should be assessed by measuring the impact that ICT has on the quality of education (e.g., the number of students able to use various application programs and the increased understanding of class materials thanks to the use of computers). Merely measuring inputs (e.g., number of computers per school or number of teachers trained) is not sufficient. For the adult population, evaluations should assess the costs of accessing and using computers compared with the benefits of using these technologies. The benefits would preferably be measured in terms of time and costs saved, increased profits (for entrepreneurs), and increased job opportunities.

1.41. Cultural, organizational and infrastructure changes are also necessary to ensure that businesses exploit the opportunities offered by ICT. Even when local entrepreneurs are sufficiently educated to use computers and the Internet, they are often unaware of the changes required to ensure that their organizations effectively adopt ICT. These changes include adjustments to the businesses' logistics, production and marketing functions. In this respect, programs are needed to raise awareness among entrepreneurs and employees of the context of ICT change, as is training on modifying business processes. In addition to changes within firms, changes to infrastructure and payment systems are essential for successful use of ICT. Given the country's isolation, investments in the quality and speed of infrastructure and distribution systems are essential – investments in the quality of rural infrastructure are particularly critical. Finally, supporting development of "*medios de micropagos*" (pre-paid cards, debit cards, and payment systems with direct charges to fixed or mobile phones) would also help increase e-commerce penetration.

1.42. The Government would benefit from evaluating the results of current e-business innovation programs, and should continue driving diffusion of ICT among MSMBs through direct use of ICT. Chile has a significant number of programs to support business innovation and digital development. An ongoing World Bank study identified 90 public sector development programs with productive purposes, some of which promote ICT development (e.g., Internet FAT).⁵² According to preliminary findings of the World Bank study, these programs receive favorable ratings from most users but are not broadly known, and significant portions of the allocated funds have gone unused. The Government may want to conduct an evaluation of these programs, including their use of funds for ICT initiatives and their impact on MSMBs. The focus of existing programs supporting e-business adoption by MSMBs could be improved by promoting creation of online production chains linking financial institutions, large

⁵¹ Zonaempresa is an example of marketplace that could be replicated.

⁵² Almeyda and De La Barra, (2002).

firms and MSMBs. This would give small firms better access to larger markets, the opportunity to increase liquidity by receiving advances on their credits, and increased efficiency through faster order processing, reduced error rates and lower transaction costs. In addition to promoting diffusion of ICT in the private sector through innovation programs, the Chilean Government has also promoted ICT through e-Government initiatives aimed at facilitating its interactions with businesses and citizens. OECD evidence shows that direct use of ICT by the Government is one of the most effective measures for facilitating adoption of ICT in the private sector. Thanks to the promotion of online tax payments (through *Servicio de Impuestos Internos* – SII, www.sii.cl), for example, 42% of tax returns in Chile were delivered via the Internet in 2001. This demonstrates that the Government can catalyze the diffusion of ICT. Further efforts could be made in other areas (e.g., procurement, simplification of business operation procedures) with the aim of moving from simple provision of Government information to support of online transactions.

VIII. Conclusions

1.43. This study has highlighted some opportunities to accelerate economic growth in Chile by devising a policy agenda centered on productivity. After more than a decade of 7-8% annual growth, Chile's economy faltered and has only recently begun to recover – the growth rate in 2003 was 3.2%. Notwithstanding recent improvements, restoring a sustained 7-8% growth rate is unlikely as the effects of the past decade's reforms diminish.⁵³ However, a new policy agenda centered on productivity would help strengthen future growth. Strong institutional and regulatory frameworks, which have been the cornerstones of Chile's success in the past, might not be sufficient to guarantee exceptional growth in the future. New incentives are needed to increase the creation, innovation and productivity of local firms. In parallel with this effort, more effective linkages between business, government and labor are also needed, in conjunction with the promotion of an overall industrial strategy. Suggested policy measures are articulated in four areas.

1.44. First, the Government should strengthen its incentive regime to support business creation and productivity. While the ultimate responsibility for starting businesses and increasing their productivity lies with firms (and entrepreneurs) themselves, the Government has important roles to play. It can create an incentive regime that encourages risk taking, promotes venture capital and eases business registration—which will in turn promote start ups. It can attract knowledge-intensive FDI and promote linkages between local and foreign companies to facilitate technology transfers in the local economy. It can increase flexibility of the labor market and support strategic use of clusters (not to pick winners, but to identify industries that could benefit from closer interactions of various actors—customers, suppliers, research centers—and to identify overall constraints to growth). Finally, it can promote use of ICT by firms—especially MSMBs, given that Chile's advanced ICT policy framework does not seem to translate into an equally advanced use of these technologies by the productive sector. All of these measures will help increase productivity, adding value to the largely natural-resource based Chilean economy and helping to overcome the handicaps of Chile's small size and isolation.

⁵³ The fact that the initial income by 2001 was more than twice as large as the initial income by 1986 weighs heavily against growth in the next decade. (See Gallego and Loayza, 2002).

1.45. Second, the Government should review and rationalize its programs in support of science, technology and innovation. Private participation in the sciences should also be encouraged to ensure that research is more relevant to the needs of the private sector. Six Ministries and a number of institutions are currently involved in the sciences. As a result, the system has grown into a patchwork of uncoordinated programs, the results of which have rarely been evaluated. Creating a stronger policy focal point to coordinate all science, technology and innovation activities, defining a comprehensive strategy, and undertaking a systematic evaluation of the results achieved to date are essential steps toward improving Chile's results in these fields. The role of the private sector—both in research financing and research execution—should also increase, and collaboration between the private and the public sector should be promoted. Allocating public research funds to the private sector through competitive systems, modifying the IPR law to allow university ownership of research, and providing incentives to promote consulting and information sharing between universities and firms would go a long way toward enhancing applied research—which will, in turn, increase the value of production.

1.46. Third, the Government should promote further reforms to improve the quality of education. To ensure that the Chilean labor force is prepared to address the needs of a more advanced economy, its programs, materials and methods should be geared towards teaching “how to learn” more than specific occupational skills. Recent assessments of Chilean students (and adults) show that they perform poorly in areas that are essential for an advanced economy—logical reasoning, independent judgment, math and science. Because the demand of Chilean firms for “advanced” skills is still limited, Government intervention is particularly important for future economic improvements. Technological innovation and productivity improvements depend on the capacity of workers to learn, and the social returns of investment to create a highly skilled labor force greatly exceed the private returns for individual firms.

1.47. Fourth, the Chilean Government should fine-tune its ICT policies and promote advanced use of ICT among firms—especially small and micro businesses. Chile has a very well developed information infrastructure, which has recently experienced particularly impressive growth rates in mobile telephony and the Internet. The Government has also increased access to ICT for low income segments of the population through telephony and Telecenter bidding for subsidies schemes. Some adjustments to the policy framework could further improve Chile's performance in ICT. Suggested adjustments include a revision of the telecom law to ensure fair competition between the incumbent and small operators, institutional changes to grant more autonomy to the regulator, and a reform of the licensing and spectrum allocation system to facilitate the introduction of new technologies. The Government should also conduct an evaluation of the results of the universal access funds; an early evaluation of the results of the first bidding for the Telecenter fund is particularly important, because similar initiatives conducted in other countries—as well as some pilots in Chile—have proven unsustainable. Broader policy initiatives should be coupled with initiatives to promote use of ICT among firms, especially MSMBs. Suggested measures include a thorough evaluation of existing Government programs supporting use of ICT by MSMBs, legislative changes (e.g., in the areas of online security) training and advisory services focused on integrating digital tools into MSMBs' business processes, development of sector- and location-specific online information, and creation of simplified hardware and software tools that are useful and easy for MSMBs to

use. The continuous promotion of e-government initiatives and improvements to the quality of overall infrastructure and distribution systems would also play a key role in diffusing use of ICT in the business community.

1.48. A policy agenda to enhance productivity and growth will require close collaboration between the public and the private sector, close coordination among different Government agencies, and a careful evaluation of the results of Government initiatives undertaken to date. The measures suggested above require aligning economic policy, FDI policy, science, technology, innovation, and education and ICT policies. They require establishing close collaboration between the private and the public sectors—to identify potential growth opportunities and areas where Government incentives are needed—and among various Ministries in the public sector. Although the Chilean Government has already made progress in this respect (e.g., the groups established by *Secretaria TIC* on ICT and business, ICT and education, and ICT and public administration), more effort in this direction will be needed. Finally, in order to avoid overlap and duplication, the Government needs to carefully evaluate the results of initiatives undertaken to date before launching new programs.

1.49. The decision to aggressively move the policy agenda in order to recover high rates of growth will require rethinking some economic principles. Chile has been the star example of market economics and prudent, consistent policies in Latin America. The 21st century reality, however, is that Chile is not being compared with—and does not compete only with—its Latin neighbors. In the context of a global economy, there is a price to be paid for complacency and a premium to be gained by being a first mover. A more aggressive industrial policy stance has risks if poorly managed, but Chile's track record in economic policy is superb. Failure to reach out and become a new leader in the knowledge-based economy risks condemning the country to sub-optimal growth performance and unfulfilled social expectations.

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