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CHILE

Selected Issues

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Approved by the Western Hemisphere Department

July 13, 2005

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INTRODUCTION[1]

1. The four papers presented in this volume provide background information to the staff report for the 2005 Article IV consultation. The first chapter assesses the long term outlook of Chile's private pension system. The second chapter reviews experience with Public-Private Partnerships. The third chapter analyzes bank profitability and competition in Chile from an international perspective. The fourth chapter compares Chile's external private debt across industrial and emerging market economies and analyzes implications for external vulnerability.

The Long-Term Outlook for Chile's Pension System

2. Since 1981, Chile has been at the forefront in the area of pension reform, with a switch from a public pay-as-you-go system of pre-defined benefits to a defined-contribution system of fully-funded individual accounts managed by the private sector. To a large extent, the pension reform has been successful in addressing the problems of the old-state supported system and has contributed to an increase in national saving and financial sector development.

3. There is some concern, however, that the new pension system has not lived up to some of the promises made at the time of the reform. This chapter examines some of these concerns, including the low participation rates of women and the self-employed, along with the prospect that some retirees will have relatively lower retirement pensions than expected at the time of the reform. To shed light on these concerns, this chapter also analyzes the longer-term outlook for the pension system, including how well it will perform for the average retiree and the size of fiscal outlays for government old-age programs.

4. The results suggest that around half of retirees face the risk that they are not saving enough for retirement, primarily because of infrequent contributions to their accounts. Compounding this problem, few will qualify for the main government safety net, which requires workers to have contributed to their individual accounts for at least twenty years. Given the growing elderly population, the current old-age social safety net system may need to be expanded. The chapter concludes with suggestions to encourage greater participation to the pension system, including by the self-employed, and to broaden benefits of the social safety net program—particularly through pre-funding any expansion.

Experience with Public-Private Partnerships

5. This chapter provides an overview of Chile's recent experience with PPPs, focusing on the design of its institutional framework. Chile's experience with PPPs, currently covering 44 projects with a total value in investments equivalent to about 6 percent of 2004 GDP, has been successful. This success has been underpinned by a solid institutional framework, well-developed procedures for evaluating and tendering projects, fair sharing of risks between the

[1] This report has received valuable research assistance from Maria Fernanda Pazmiño.

public and private sectors, and reforms to ensure the availability of private financing for projects.

6. Notwithstanding this success, there are a few areas where the PPPs program could be strengthened going forward. Particularly important is the need to improve conflict resolution procedures, further improve the institutional setting to eliminate conflicts of interests, and expedite work on the development of public sector comparators for proposed PPPs. In addition, there is a need to ensure that the detailed project appraisal techniques applied to traditional public investment are extended to proposed PPPs, and that information on PPP contracts is made available to the public in a transparent manner.

Competition in the Chilean Banking Sector: A Cross-Country Comparison

7. The concentrated structure and high profitability of the Chilean banking sector has raised concerns of insufficient competition. The Chilean banking sector is relatively concentrated and banks enjoy persistent high interest margins, despite recent entries to the market of several banks specialized in consumer lending.

8. This paper compares concentration, competition, and profitability in the Chilean banking market with a group of thirty other countries. Cross-country comparisons show that bank concentration trend in Chile does not stand out as an exemption from an international perspective. Nonetheless, the profitability of Chilean banks is above what can be explained by macroeconomic and banking sector characteristics. The higher profitability of Chilean banks is also consistent with the lower estimated level of competition in Chile. In turn, the lower competition level appears to be driven by high effective entry costs—in the form of higher capitalization ratios—despite low regulatory barriers to entry, still limited competition from other non-bank financial intermediaries, and regulatory restrictions on the investments of private pension funds (the largest institutional depositors).

Perspectives on Chile's Private External Debt

9. Chile's sovereign debt is rated investment grade by all major rating agencies. However, perceptions of financial vulnerability linked to high levels of private external debt have generally been cited as a constraint for further upgrades. This paper analyzes the size and structure of Chile's external debt from an international perspective, and investigates whether perceptions of financial vulnerability are justified or not.

10. The analysis suggests that the fairly high level of private external debt does not pose significant short-term risks to financial stability. The level of external indebtedness largely reflects the high degree of financial integration between Chile and the rest of the world. Factors mitigating the risks associated with the still-high—but declining—level of private external debt are a favorable maturity and ownership structure, high net international reserves, a low external public sector debt, and the increasing availability of financial instruments to hedge against exchange rate risk. In the period ahead, the growth of domestic currency-denominated debt and the development of the markets for currency derivatives are expected to help further reduce remaining vulnerabilities.

I. Addressing the Long-run Shortfalls of the Chilean Pension System[2]

A. Introduction

1. ***Over the past twenty-five years, Chile has undertaken an ambitious and pioneering pension reform, based on individual control and responsibility over retirement.*** In the late-1970s, the old public pension system had become in serious imbalance and was acting a hindrance to the economy. In 1981, Chile introduced a new retirement system based on personal accounts that allow workers to accumulate personal assets to fund retirement. At the same time, it reduced the role of the State, so that these personal accounts would become the primary means of support for most retirees. This reform was also aimed at preventing the costs of the system from exploding as the population aged.

2. ***This chapter reviews the history of reform and current experience of the pension system.*** The new pension system has helped lift national saving, promoted the development of the domestic financial market, and removed significant barriers to growth in the economy. Nevertheless, it is facing challenges, including from a lack of competition in the market for managing the retirement accounts and, more seriously, from infrequent contributions by workers.

3. ***The system will likely meet the needs of the average retiree over the medium term, but benefits will subsequently gradually decline in the long term.*** According to estimates presented here, the average worker's pension income would replace about 60 percent of the final salary over the medium term (2030–40). However, over the long term, the average replacement rate would substantially decline to just over 40 percent, well below the level required for a healthy standard of living during retirement. These replacement rates are significantly lower than the 80 percent level promised at the time of the reform.

4. ***The system will risk leaving many workers without enough for retirement, especially among women.*** The average replacement rates mask considerable variation across retirees; nearly one-half of women and one-quarter of men would have replacement rates lower than 20 percent. Also, it is estimated that close to one half of the retired-age population would not qualify for the government's main safety net program, because they would not have contributed frequently enough to the pension system. These trends will likely force changes in the future, and this chapter concludes with suggestions to improve the current system and potentially help relieve social pressure.

B. History of the Chilean Pension Reform

5. ***By 1980, Chile's old, state-supported pension system had become unsustainable.*** The old system was a partial pay-as-you-go system and was intended to be self-funding, due

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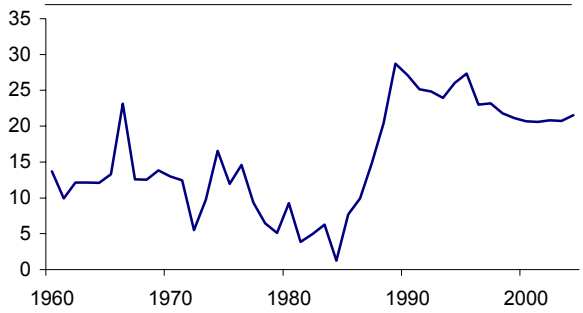
[2] Prepared by Chris Faulkner-MacDonagh (WHD). I would like to thank Alberto Arenas de Mesa, Solange Bernstein, Pamela Gana, and Gonzalo Reyes—along with all of the participants in the 2005 Joint BCCh/IMF Seminar Series—for their very helpful comments. This study has used information from the 2002 *First Social Protection Survey*, and the author is indebted to the Under Secretary of Social Security for access to this data. All results of this study are the sole responsibility of the author.

to high contribution rates, equivalent to about 22 percent of wages. However, the system fell into chronic deficits, reflecting poor returns and overly generous benefits to selected groups (Cheyre, 1991). By 1980, the public pension scheme required annual government support of 2¾–3 percent of GDP (SAFP, 2003), and there was a recognition that the ageing of the population would further weigh on the system.[3] Estimates prepared at the time suggested that the system could require annual state support of around 20 percent of GDP by the year 2000 (Wagner, 1983). Since public debt was about 90 percent of GDP at the time, urgent action was required to reduce the fiscal cost.

6. ***The old pension system was also imposing constraints on the labor market.*** Workers faced a very complex pension system, with over 100 different plans offered by 32 different pension funds. Benefits varied significantly from one regime to another; some workers were able to retire with inflation-indexed pensions at age 42, while many blue-collar workers had to wait until age 65 to retire (Edwards, 1996). The heavy payroll tax also weighed on job creation, and it also became difficult to switch from one industry to another, as workers competed for jobs in industries with generous retirement schemes.[4] Finally, there was widespread dissatisfaction associated with the fact that pensions covered only 62 percent of the labor force.

7. ***There was also a need for the economy to generate more saving, to increase the pool of domestic capital for investment.*** By 1980, national saving had fallen sharply—to under 10 percent of GDP (Figure 1). In addition, the financial system was also quite small, with total assets under management equivalent to only around 50 percent of GDP. Reformers hoped to raise the saving rate, which would help reduce domestic borrowing costs. More importantly, it was thought that higher private saving would also stimulate the demand for financial products, thereby encouraging development of the financial industry.

Figure 1. Trends in National Saving
Gross national saving, in percent of GDP



8. ***In 1981, Chile introduced a pioneering pension program, which replaced the government-backed system with a system based on individual retirement accounts.*** The new system was designed to allow workers to accumulate assets during their working life into individual private accounts. The law required that workers contribute 10 percent of wages (along with fees, that have totaled 2–4 percent of wages), each month, into a private account, effectively halving the contribution rate for pensions. Reflecting many systems at the time, the retirement ages for men and women were set differently, at age 65 and 60, respectively.

[3] The deficit of the civilian system was around 1¾ percent of GDP, and the system for the military the police ran a deficit of around 1-1¼ percent of GDP.

[4] Total payroll taxes (pension, health, and other social insurance) amounted to 35 percent of wages in 1980 (Cheyre, 1991).

9. ***Private administrators were created to collect pension contributions and manage the individual accounts.*** These firms (*Administradoras de Fondos de Pensiones*, or AFPs) were designed to collect and manage the funds, but with strict regulatory oversight over their investments.[5] The system allowed the AFPs to charge contributors a fee for collecting the fees and managing the funds. Since workers could freely select which fund to join, it was hoped that competition among pension funds would keep costs down. Initially, however, the fees, including the costs for the disability insurance, were quite high (around 4 percent of wages), reflecting in part startup costs.

10. ***When the new pension system was created, the old one was closed to new contributors, and the government offered incentives to switch.***[6] Workers who had joined the labor force before 1982 had five years to decide whether to join the new system or to stay under the old one. The government put in place three important incentives to encourage workers to move. First, the government lowered contribution rates dramatically, and workers saw substantial pay increases under the new scheme—averaging around 12 percent. Second, all contributions to the new system were made tax deductible. Third, the government left the benefits levels under the old regime largely unchanged, so that many people who participated in the less generous plans switched to the new one (which also makes comparisons of benefits under the old and new systems difficult).

11. ***To compensate the transferees from the old to new system, the government put in place a system of recognition bonds that partially reflected past contributions.*** The recognition bonds, designed to represent accumulated contributions to the old system, carried a real interest rate of only four percent, well below market rates (real rates on 90-day bank deposits averaged nearly twice that level during 1975–1990). As a result, the effective value of the bond did not represent the full value of the workers' contributions. These bonds will play an important role for those retiring in coming years, representing 50–70 percent of the retiree's pension account balance—with the remaining coming from contributions to the new program (Arellano, 1985 and Arenas de Mesa and Marcel, 1993).

12. ***To help ensure that workers do not outlive their account balances, the program also required that workers withdraw retirement income gradually, through either an annuity or a series of programmed withdrawals.*** Plan designers realized that retirees typically underestimate how much income they will need for retirement. As a result, they required that, at retirement, contributors use their individual accounts to purchase an annuity from insurance companies or draw down on their individual accounts in pre-specified amounts, to ensure that their balances are not drawn down too quickly.

13. ***Those retirees who choose to annuitize their account balances thus depend on the development of a well-functioning annuities market.*** Because workers are self-funding their retirement, they need protection against the risk that they may live longer than expected. By

[5] Until 2002, investors only had two investment options that were nearly identical across AFPs. Since 2002, the AFPs have offered investment options ranging from a fund with 80 percent equity weight (type A) to a fund with no equities (type E). Investors could then choose among a mix (subject to age restrictions) of funds.

[6] Members of the armed forces and the police were able to keep their defined-benefit system.

purchasing an annuity, it is possible to share the risk across many individuals, with those who die early compensating those who live longer. However, for this market to work well, insurance companies must operate competitively, and they must also be well regulated to guarantee that they will be able to honor the contracts with their annuitants.

14. ***The plan designers also foresaw that the programmed withdrawal option could raise the risk that retirees would outlive their pensions, so the reform also included a safety net—the minimum pension guarantee (MPG)***.[7] The designers of the pension reform also realized that some contributors might not accumulate sufficient assets in their individual accounts to fund an adequate pension. As a result, the government would provide a safety net to workers who have contributed at least twenty years (240 months). After drawing down their accounts completely, qualifying pensioners would then receive the MPG income, to guarantee that their real income remains at fixed level.

15. ***For workers remaining under the old system, the government was committed to providing ongoing fiscal support to fund any revenue shortfalls.*** The old programs were consolidated under one government agency, *Instituto de Normalización Previsional* (INP), and the retirement ages gradually raised to 65 for men and 60 for women across all pension regimes. With the underlying imbalances between contributions and benefits persisting, the government was committed to financing the deficit of the INP. The government has also been providing a small assistance pension to the indigent.[8]

C. Trends in the Operation of the Pension System

Coverage and Participation

16. ***Initially, there was significant interest in the new system, and coverage expanded rapidly.*** Within five years of the start of the system, nearly half of workers were contributing (Table 1). These high rates, attained in such a short period of time, reflected the high level of interest in the new system. Employers liked the elimination of payroll taxes, and employees took advantage of the opportunity to earn higher wages to shift to the new system. In addition, respondents in the First Social Protection Survey report that just over half of those workers that switched did so because it was set as a pre-condition by their employer.

Table 1. Pension System Participation

	1985	1995	2000	2004
	active contributors as percent of:			
Employment	47	56	60	63
Labor force	40	53	55	58

Source: Haver Analytics, SAFP, and staff estimates.

17. ***Pension reformers created the new system on the assumption that workers would contribute most of their working lives.*** The designers of the new pension system thought that, eventually, most workers would have a high contribution density (the ratio of years

[7] The MPG income has averaged around 75 percent of the real minimum wage, although the government has flexibility in setting the precise level (any changes are retroactive).

[8] See Arenas de Mesa (1999, 2004); Participation is limited (to around 410,000 persons in 2004) and benefits are small, equivalent to about 50 percent of the minimum pension guarantee. The program's fiscal cost has been constant at around ½ percent of GDP over the past twenty years.

spent contributing to number of working-years lived). They expected this density to be at about 0.6–0.7—suggesting that workers would contribute for nearly two-thirds of their working lives. As a result, they designed the minimum pension guarantee (MPG) so that the minimum contribution density needed to qualify for it was significantly lower—around 0.44 for men and 0.5 for women.[9] Based on these assumptions, the reformers forecasted that retirees would see dramatic increases in their income—with the new system providing pensions that would replace 80 percent of final salaries.

18. ***A recent, broad survey of households reveals that the actual contribution density of workers has been only 52 percent, with considerable variations across socio-economic categories (Table 2).***[10] As highlighted in Arenas de Mesa, Behrman, and Bravo (2004), the contribution densities vary significantly by income, gender, education, and employment opportunities. In general, the poor, women, the self-employed, workers without a labor contract or with little education all contribute less often to the system. On average, most socio-economic groups—except wage earners and those with labor contracts—do not contribute close to the density levels assumed when the regime was put in place.

Table 2. Contribution Densities
by selected socio-economic variables

	Density
Total	52.4
Gender	
Men	59.8
Women	43.8
Employment categories	
Wage-earner	65.8
Self-employed	45.1
Has labor contract	69.4
Does not have contract	42.9
Schooling	
Incomplete primary	39.5
Primary 1/	52.2
Secondary 1/	55.7
University	63.8
Per-capita household income	
Bottom quintile of incomes	42.7
Quintile 2	46.7
Quintile 3	52.6
Quintile 4	56.8
Top quintile of incomes	60.8

Source: Arenas de Mesa, Behrman, and Bravo (2004), Tables 8 and 10.
1/ Densities of those who have completed schooling.

19. ***The data also suggest that women tend to contribute infrequently, and that many will not qualify for the MPG program.*** The average contribution density for women is only 44 percent, below the minimum level needed to qualify—suggesting that around one-half of women will not qualify for the MPG. This, in turn, reflects the low labor market participation rate for women—about 35 percent, compared with over 70 percent for men.

20. ***For women, low contribution patterns in their young and late years seriously affects their retirement savings.*** Many Chilean women are not in the labor force during their 20s and 30s because they are raising children or taking care of the household.[11] In a system of individual pension accounts, this period is the most important one to

[9] These rates are based on the assumption that all workers enter the labor force at age 20, with men retiring at age 65 and women at age 60. Thus, men would have a working life of 540 months and women of 480 months. The *minimum* contribution density to qualify would be 0.44 for men (240/540) and 0.5 for women (240/480).

[10] These findings are from a 2002 household survey—*First Social Protection Survey*—undertaken by the Chilean government with about 17,000 persons (retired, working, unemployed, and out of the labor force).

[11] See SAFP (2005). For women, family duties account for nearly half the time in inactivity compared with only ½ percent of the time for men. Studying accounts for another 15 percent for women and 39 percent for men.

accumulate assets. By missing the first ten years of contributions, they fail to take advantage of the benefits of compound interest, which effectively cuts their savings in half (Bernstein, Larraín, and Pino, 2004). At the other end of their working lives, retiring at age 60 encourages them to stop contributing sooner and, thus, they accumulate fewer assets. Estimates in Bernstein and Tokman (2005) show that, if women contributed until age 65, their retirement fund would be 30 percent higher.

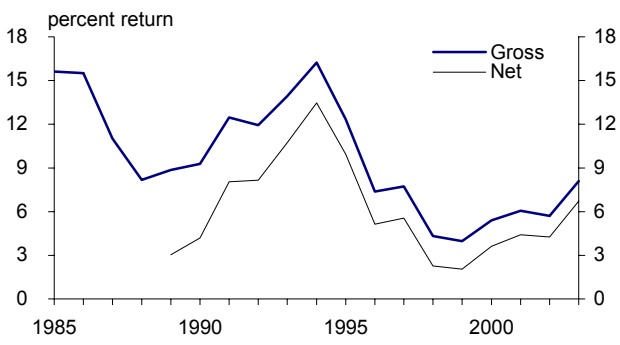
21. ***The self-employed is the other major group that fails to contribute regularly.*** Under current rules, the self-employed (about 25 percent of employment) are not required to make social insurance contributions for pension, health, and disability. In all, these contributions amount to 23 percent of wages.[12] According to surveys, the self-employed do not wish to contribute out of concern that they would not be able to access their pension savings during months when income is low. Surveys also show that they tend to think—mistakenly—that, if they contribute to the system one month, they have to pay into the system every month. As a result, over three-fourths of the self-employed contribute infrequently or not at all.

22. ***Finally, records from the pension system administrator suggest that contribution densities may be even lower than reported in the survey.*** The household survey relied on individuals to self-report the frequency of contributions to the system on a monthly basis from 1980 to 2002. The regulator of pension funds has, in coordination with the Ministry of Labor and Social Welfare, matched the respondent's answers to actual AFP data and found that respondents systematically overestimated how often they had contributed.[13] As a result, actual contribution densities may be even lower than reported here.

Rates of Returns and Fees

23. ***Gross returns to the pension fund system were strong initially, due to exceptional circumstances in the financial markets.*** Gross real returns averaged around 12 percent from 1981 to 1997 (Figure 2). The system managed produced such strong returns because the pension funds experienced two windfalls. First, pension funds held a large stock of bonds, whose prices surged as inflation fell and interest rates declined. Second, they realized a large capital gain on equity shares bought during the privatization

Figure 2. Pension System Returns
Real returns by AFPs, 5-year rolling average, both gross and net of administrative costs and insurance premia.



Sources: SAFP (2002).

[12] According to SAFP (2003, Chapter 1), the total social insurance bill includes: 10 percent for pension contributions; 2½-3 percent for AFP management fees and insurance costs; 7 percent for the health system; and 3 percent for unemployment insurance (about 2½ percent is paid by the employer).

[13] This matching process was done in a way to maintain the confidentiality of the information of individual account holders.

drive of the 1980s. Since 1997, however, gross returns have fallen sharply, averaging only around 6½ percent in 1998–2003.

24. ***Net returns have been significantly lower than gross returns, due to high management fees.*** Net returns averaged only around 3 percent into the late 1980s, reflecting fees equivalent to 6 percentage points of returns.[14] High start-up costs were to be expected, because there were significant fixed costs, including the establishment of complex computer systems to manage millions of individual accounts. The AFPs also conducted expensive marketing campaigns to convince contributors to switch to the private pension system. Net returns have increased during the 1990s and in more recent years, averaging just over 8 percent a year from 1991–1997 and just over 5 percent in recent years.

25. ***Although management costs have declined substantially in recent years, they remain high, at around ¾ percent of assets.*** Since the mid-1990s, management fees have fallen, thanks in large part to regulatory pressure to limit wasteful marketing.[15] The current fee (of around 2½ percent of wages), equivalent to 0.6-0.8 percent of total assets under management, is still high when compared to low-cost providers in other countries. For example, the U.S. federal civil servant Thrift Savings Program, which offers only five funds (similar to the current regime in Chile), costs around 0.07 percent of assets (CBO, 2004). Low-cost private providers, such as Vanguard and Fidelity, charge approximately 0.2-0.3 percent of assets for their broad index funds to the individual retail investor, and fees are even lower for large account holders. Current Chilean costs are at about the same level as U.S. mutual funds, which offer a very wide range of choices in investments.[16]

26. ***There is scope to lower costs somewhat further, even though the average account is small.*** The median account balance is approximately US$2,900. With such small accounts, even the cheapest retirement fund in a low-cost U.S. provider would impose a low balance fee that would bring the expense ratio closer to 0.5 percent of assets. This suggests that, although the current system may not be able to reach the lowest costs of the U.S. industry, costs could be reduced by around 0.2 percent of assets, which would represent substantial savings of around 25 percent.

27. ***Fees could also be lowered by increasing competition within the AFP industry and taking advantage of economies of scale.*** Currently, there are only six AFPs, which are the dominant players in the financial system. The 2004 FSAP for Chile has recommended steps to increase competition between these AFPs. It also pointed out that the AFPs are responsible for some administrative functions (such as collecting contributions) that have natural economies of scale, and the report suggested further cost saving by centralizing operations (IMF, 2004).

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[14] Net return is a somewhat artificial measure; it reflects the difference between the five-year moving average of the return on the fund and the total fees paid to the AFP (in percent of assets).

[15] SAFP (2002), Chapter 5.

[16] In 1998, the cost for full-service U.S. mutual funds averaged 0.71 percent of assets (ICI, 2003).

Replacement Rates

28. ***Currently, the system seems to be performing relatively well against the ultimate measure, i.e. generating sufficient income for its retirees.*** According to the World Bank (1994, p. 75), the *minimum* target replacement rate should be 60 percent of lifetime wages, which—given the lifecycle of Chilean earnings—is equal to 50 percent of final salaries. By this measure, the system appears to be performing well for the average retiree. Aggregate data from Primamérica (in Chile) on the average value of pension income suggest that the 2002 replacement rate was around 60-65 percent. However, more disaggregated data using the household survey suggest that replacement rates may be somewhat lower, at around 50-55 percent. While these average replacement rates may be sufficient to maintain a standard of living in retirement, they are also substantially below the 80 percent promised at the time of the reform in the early 1980s.

29. ***The overall average replacement rate is thought to mask sharp differences arising from the wide disparities in incomes and contribution densities***. As Table 2 indicates, there is some correlation between a worker's income and contribution density. Thus, the pension system is reinforcing an already-high level of income inequality in Chile. Preliminary estimates using household survey data suggest that about one-third of the population may have very low replacement rates of 10–20 percent. Replacement rates would be so low because a large number of retirees cannot annuitize their income. Instead, they must draw down their balances using the programmed withdrawal option, which would mean that after several years, their pension accounts would be exhausted. At the other end, well-off contributors would likely experience replacement rates of 80 percent or above.

Fiscal outlays

30. ***The transition costs for the government have been roughly constant, at around 4 percent of GDP (Table 3).*** In Chile, a conscious decision was made to front-load most of the transition costs, and the transition to the new regime has been expensive, especially by Latin American standards (Figure 3). On average, it has required more support in Chile than in the rest of Latin America by about 3 percentage points of GDP. The primary component of the cost has been support to the operating deficit of the old plans. In recent years, following a decline in the number of retirees under the old system, this cost has shrunk by around 1 percent of GDP, to 2¾ percent in 2004. The second component of the transition cost has been the redemption of recognition bonds by retired workers who had switched from the old to new system. This cost has grown by around 1¼ percent of GDP, offsetting the decline in support for the old regime.

Table 3. Government Spending on Pensions
in percent of GDP, by selected years

	1981 -1984	1985 -1993	1994 -2003	2004
Total	**6.2**	**5.7**	**5.5**	**5.8**
Transition	3.8	3.8	3.9	4.0
Operating deficit 1/	3.7	3.4	3.0	2.7
Recog. bonds	0.1	0.4	0.9	1.3
Ongoing	2.5	1.9	1.6	1.8
Armed forces 1/	2.1	1.5	1.2	1.3
Assistance pensions	0.4	0.4	0.4	0.4
Minimum pension	0.0	0.0	0.0	0.1

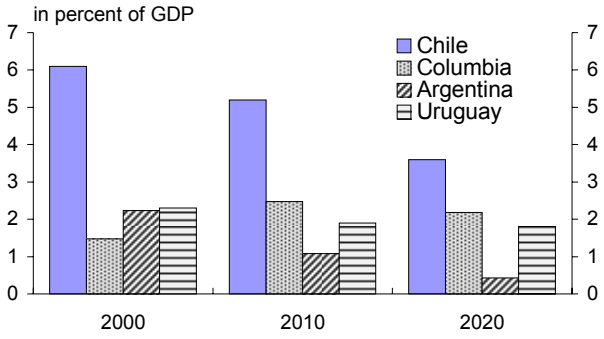
Source: Arenas de Mesa (2004).

1/ Net cost (benefits less contributions).

31. ***The cost of government support to the remaining pension programs has remained moderate, at 1½-2 percent of GDP.*** The system of the armed forces has undergone reforms, to help reduce the cost to the government. During the early 1980s, spending averaged around 2 percent of GDP but, after the reforms, it declined to around 1¼ percent of GDP. The cost of assistance pension programs is only around ½ percent of GDP. Finally, the cost of the minimum pension guarantee has been relatively small (around 0.1 percent of GDP in 2004) because there are still only few retirees under the new pension system.

Figure 3. Spending on Pensions in Latin America, 2000-2020

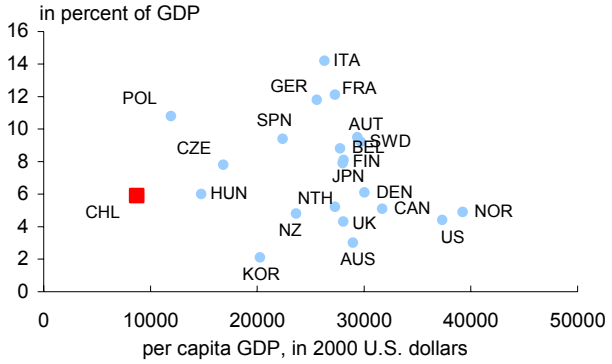
Annual fiscal deficits of the pension systems



Source: Mesa-Lago (2000). Estimates may not agree with tables because of methodological differences.

Figure 4. OECD and Chile Old-age Spending

Gross current expenditures in 2000.



Source: Dang, et. al. (2001), Haver Analytics and staff est.

Pension System Costs in an International Perspective

32. ***By international comparisons, Chile is in an enviable position, as its pension program is not facing explosive costs.*** According OECD estimates prepared by Dang, Antolin, and Oxley (2001), Chile's total public spending on old-age pension programs compares favorably with current spending by OECD countries (Figure 4). The average OECD economy spends around 7 percent of GDP on support for old-age pension programs, or about 1 percentage point more than in Chile. Furthermore, unless OECD countries reform these programs, their costs could nearly double over the medium term. Meanwhile, reflecting the front-loading of the transition, Chile's peak outlays are now likely in the past.

33. ***Chile's average replacement rates are also in line with international experience.*** According to recent estimates, the average replacement rate is 65 percent for retirees in OECD economies (OECD, 2005).[17] Furthermore, if only the public pension programs are considered, the average replacement rate for OECD countries is only 48 percent. Chile's

[17] Canada, Denmark, United Kingdom, and the United States have private supplemental pension systems that boost replacement rates by 20–40 percent. For example, the U.S. Social Security system provides only a 39 percent replacement rate for the average retiree (but as high as 50 percent for low income workers); however, it exceeds 70 percent when income from private plans is included.

replacement rate of around 50-60 percent is in between these averages, suggesting that the current system may not be far outside of international norms.

34. ***Nevertheless, the Chilean system lacks the progressivity that exists in other pension programs.*** The OECD estimates suggest that there is a considerable degree of progressivity in most OECD pension regimes. Indeed, poorer workers in the OECD can expect a replacement rate of over 70 percent, while wealthier workers can expect a rate of around 40–50 percent. In Chile, the situation is broadly reversed—and the system considerably less progressive.

35. ***To address some of the pending issues, in 2002 the authorities introduced a number of reforms aimed at encouraging competition and making contributing easier (Box 1).*** In particular, the multi-fund system has encouraged workers to take a more active role in managing their investment portfolio. Also, higher foreign investment limits (30 percent) should help ensure maintenance of a high rate of return to the system. Finally, the voluntary savings system may contribute to an increase in contributions by the self-employed.

BOX 1. 2002 REFORMS TO THE PENSION SYSTEM

The government introduced significant reforms to the pension system to help improve its operation. By the late 1990s, there was a recognition that the system needed additional competition and that the AFPs should be more accountable to their members. The changes included: (i) introducing a multi-fund system of accounts (similar to the index funds in a mutual fund); (ii) raising the foreign investment limits; and (iii) enhancing the role of tax-deferred voluntary saving accounts. Details on the measures are presented in SAFP (2002), Chapter 8.

The multi-fund system was introduced to increase the number of investment options. Previously, contributors could only contribute to one of two types of funds. The lack of options made it difficult for the AFPs to compete on the basis of the rates of return, given the strict limits on the types of investments and amount of shares that the AFPs can hold. At present, the AFPs can offer five different types of funds, with a variety of risks (ranging from one fund that is primarily equities to one that is primarily bonds). Thus, workers can tailor their investment choices based on their willingness to tolerate risk. Workers older than 55 are limited to the more conservative funds, so as to limit their exposure to a sudden market decline.

Foreign investment limits have gradually been raised to 30 percent. Prior to 2002, foreign investment could make up no more than 16 percent of an AFPs assets. This limit was gradually lifted in stages, to 30 percent, by March 2004. Each time the limit was lifted, the AFPs increased their foreign investment quickly, to near the maximum limit.

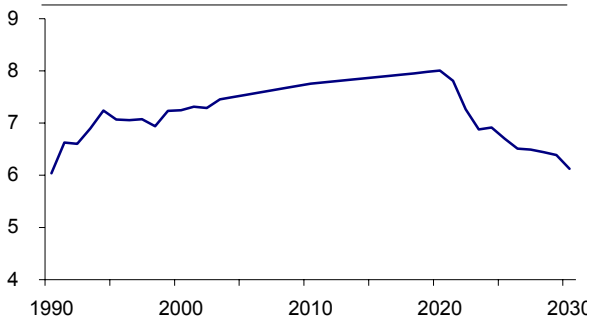
In order to stimulate voluntary savings, reforms made it easier to contribute to, and draw upon, voluntary savings accounts. In the past, it was possible, but difficult, to contribute to a voluntary savings account; furthermore, it was not possible to draw down the account until retirement. Now, workers can draw down on these accounts, subject to a 3-7 percent surcharge, helping to ameliorate concerns of workers that they could not use the money if they became unemployed. In addition, the new law also made it easier for the self-employed and INP members to contribute to these accounts.

D. Medium-Term and Long-Term Outlook

Medium-term outlook for Replacement Rates

36. ***Through the medium term, the system is set to likely to perform well, with the average rate of return drifting upward at least until 2020.*** For those retiring in coming years, the average return on their funds is likely to be high, reflecting the strong asset growth registered through the 1990s. The gross returns for those retiring in the medium term could plausibly increase by one percentage point between 2000 and 2020 (Figure 5).[18] On that basis, replacement rates could trend upward by 10 percentage points, reflecting larger account balances, and peak at about 60-70 percent percent for the average retiree by 2020.[19]

Figure 5. Long-run Returns of the System
Average annual gross real returns, 40-year moving avg.



Source: SAFP and staff estimates. Assumes a 4 percent return before 1981 (reflecting real recognition bonds) and a 5 percent return in the medium term. (after 2004).

37. ***Over the long term, however, replacement rates are projected to fall.*** The increase projected for the medium term would begin to fade after 2020, when the proportion of those who contributed during the periods of exceptional returns would decline. By the end of the medium term, the real rate of return to retiree's account balances would decline gradually and, by 2030, replacement rates would have gradually drifted back down to current levels.

Medium-term fiscal costs

38. ***Total old-age programs could decline through the medium term, due to substantially lower-than-expected costs for the MPG program (Table 4).***[20] Estimates provided by Arenas de Mesa and Marcel (1999) and Schmidt-Hebbel (2001) had suggested that spending on the MPG would increase to 1¼ percent of GDP over the medium term. However, these estimates assumed a constant contribution density of around 0.7 percent, while actual contribution levels are much lower. As a result, government spending on the MPG is expected to be only around ¼ percent of GDP in the medium term.

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[18] Assumes the rate of real return is 5 percent from 2005-2030, similar to other forecasters (Angel, 2003, Table 6). A 5 percent real rate of return is consistent with a ½ percentage point markup over the medium term trend growth rate for the economy (4½ percent), owing to portfolio diversification.

[19] The higher replacement rate is from Acuña and Iglesias (2001); the lower estimate is from a model of individual contributors, using household data.

[20] These estimates exclude spending on two other programs that could increase more sharply as the population ages, but are not strictly "old-age" spending. First, they exclude the disability programs, because this program is self-financed and the qualification rules are complex. Second, these estimates exclude the costs for the public health program. As the population ages, demand for medical services increases rapidly, but unpredictably.

39. ***The low spending on the MPG suggests that it will not constitute the broad safety net that it was intended to be.*** As noted, workers need to contribute a minimum of 20 years to qualify for the MPG. Table 4 shows the large gap between the percentage of the retired-age that would qualify for the MPG and the percentage that would actually receive it. While nearly half of total retirees would qualify for the MPG, only around 10 percent would draw on the program, almost exclusively women. The gender differences arise because men who would contribute for twenty years or longer are forecast to have accumulated sufficient assets in their individual fund not to need the MPG. Furthermore, the contribution levels are so low that men who do not qualify would have contributed, on average, for just 11 years, and women 10 years. This suggests that nearly half of the population, mostly women, are contributing much less often than was assumed when the MPG was designed as a safety net.

Table 4. Medium-term Pension System Outlook
Based on current contribution densities

	2004	2005 2009	2010 2019	2020 2030
		percent of GDP		
Total pension costs	**5.7**	**5.5**	**4.3**	**3.3**
Transition	4.0	3.7	2.4	0.8
Operating deficit	2.7	2.4	1.6	0.8
Recog. bonds	1.3	1.3	0.8	0.1
Ongoing	1.7	1.8	2.0	2.5
Armed forces	1.3	1.3	1.4	1.6
Assistance	0.4	0.4	0.4	0.6
MPG	0.0	0.1	0.1	0.3
		Qualifying		Receiving
Percent of retired-age		**54**		**10**
Men		72		0
Women		46		16

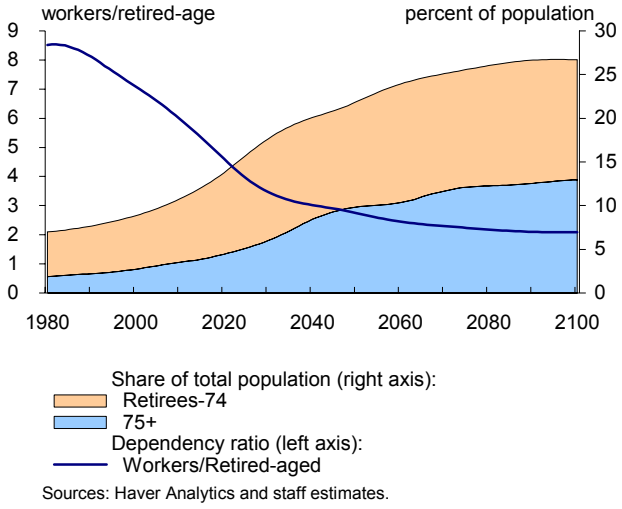
40. ***While the MPG cost estimates are subject to some uncertainty, it is unlikely that they will be much higher.*** The pension system has an option for workers to retire early, if their account balances are large enough. Workers can also withdraw money in a series of programmed withdrawals that tend to be higher than an annuity during the initial years. Both of these options raise the risk to the government that pensioners will outlive their pensions and will need to subsequently rely on the MPG. The fiscal impact of these options may be limited, however, given that about 85 percent of early retirees annuitize their accounts, reducing the risk that they will outlive their pensions. Furthermore, only about one quarter of all retirees choose the programmed withdrawal option (James, 2004).

41. ***Other old-age spending could also increase moderately.*** Spending on the armed forces and assistance pensions could increase slightly, each by around ¼ percent of GDP between now and 2030.[21] The assistance pension has broad coverage, reaching around one-third of the elderly in 2004. However, its costs have not increased substantially over time because payments are relatively small (around US$65 a month in 2004). Furthermore, it is only available to retirees once they have exhausted all other pension income.

[21] Based on the assumption that the military's deficit is assumed to stay constant as a share of real per capita GDP, while the assistance pension is available to all retirees without a pension income.

The long-run outlook

Figure 6. Demographic Trends, 1980-2100
Ratio of workers to retired-aged, and share of retired-age population in the total population.



Sources: Haver Analytics and staff estimates.

42. ***In the long run, however, the ageing of the Chilean population raises concerns that spending on the minimum pension guarantee (MPG) could increase significantly (Figure 6).***[22] The over-75 population is set to double (as a percent of the total population) between 2030 and 2070, when it stabilizes at around 12 percent of the population. Since this group of elderly retirees is the one most likely to outlive their pensions, pressure could build for the government to improve coverage.

43. ***Long-term estimates were built using a simple actuarial model of workers' accounts.*** The model assumes that account balances grow, predictably, as a function of the net rate of return to the pension funds, contribution density, and wages. The model accounts for differences suggested in the *First Social Protection Survey* in income inequality, contribution densities, and gender. It also includes estimates of the impact on contribution densities if the self-employed were brought into the system. Economic variables grow in a deterministic manner, as described in Table A.1. These estimates also consider the effect of broadening the coverage of the assistance pension, currently targeted to the indigent.

44. ***These estimates suggest that, in the long-run, replacement rates could fall substantially, to about 40 percent (Table 5).*** The average replacement rate in the long-run would thus be significantly below the 50 percent goal needed to sustain living standards during retirement. Furthermore, the gender differences in contribution densities would result in substantial disparities, with men having replacement rates 20-30 percentage points higher than for women, who would have a replacement rate of only 30 percent.[23]

45. ***This fall in replacement rates is due in large part to the decline in the rate of return on financial products, which would adversely affect both asset accumulation and the cost of annuities when workers retire.*** This decline in replacement rates, forecast to start between 2020 and 2030, would mirror an increasing share of workers who did not contribute to the pension system during its period of exceptionally high returns. It would lead to smaller account balances, which would thus purchase smaller annuities and lower incomes during

[22] Early estimates (from Wagner, 1991 and Zurita, 1994) place the cost at between ½–3 percent of GDP. More recently, OECD (2003) notes that the MPG costs could be twice as high as forecast.

[23] These replacement rates are calculated for individuals and assume that men choose not to use the survivor options available to them, which would lower their retirement income. Thus, these results should be seen as an "upper bound" on the replacement rates.

retirement. In addition, the decline in the rate of return on financial assets would also affect the annuities market because, with lower rates of return, insurance companies would need to charge more for the annuities to cover their costs. As the cost of annuities increases, replacement rates would be driven down.

46. ***These results could be mitigated if workers increased the frequency of contributions.*** The estimates assume that the contribution densities are fixed at current levels. It is possible that some workers could begin to contribute more to the system, when they realize that they will not have enough for retirement. However, a decline in the rate of return on financial investments may not be properly assessed by contributors, in part because it may be difficult to identify against normal fluctuations in the financial markets. Furthermore, the effects would compound over several decades, making it difficult for workers to judge whether to they need to take action until it is too late.

47. ***In the face of these trends, in the long-term government spending on old-age programs would return to its 2004 levels, of around 5 percent of GDP (Table 5).*** The increase projected to take place after 2020–30 would mostly reflect an increase in payments under the MPG and assistance pension programs (with increases of ¾-1 percent of GDP per program from 2030 onward). The costs to the government of the old system would stop shortly after 2030, just as the long term costs of the MPG rise.

Table 5. Long-run Pension System Results
Based on current contribution densities

	Med. Term 1/	Long-run 2/
Medium vs. Long-run Replacement rates		
	in percent of final salary	
Replacement rates	59	41
Men	82	60
Women	45	29
	2005 2019	2020 2030	Long-run
	percent of GDP		
Total pension costs	**4.7**	**3.3**	**5.0**
Transition	2.8	0.8	0.0
Operating deficit	1.9	0.8	0.0
Recog. bonds	0.9	0.1	0.0
Ongoing	1.9	2.5	5.0
Armed forces	1.4	1.6	2.3
Assistance	0.4	0.6	1.6
MPG	0.1	0.3	1.1

1/ 2020-2030
2/ Results when the economy in long-run equilibrium

48. ***MPG spending program would only increase gradually, because many workers have too low contribution densities to qualify.*** Over the long-run, more workers would need the MPG because the account balances would be significantly lower than those who retired before 2030. About one-fourth of retirees would receive some form of MPG payment. This represents an improvement of the medium term coverage of the system, but many of the poorest retirees would still receive no government support. Given that spending on assistance pensions would remain higher than MPG spending, the assistance pension could become the default safety-net, even though it is not necessarily designed to do so, and the program does not have a natural connection with the pension system.

E. Possible Next Steps

49. ***Given the concern regarding the prospects for replacement rates, this section considers possible policy changes to increase participation and broaden benefits.*** Some of the adjustment will have to come from individual workers, in the form of higher

contributions. However, it will be important also to phase-in any changes gradually, to give workers time to adjust their working and retirement plans. At the same time, any reform effort should also aim at broadening benefits by using some of the current fiscal space due to low anticipated fiscal costs and meager benefits under current policies. Additional resources could come from government "pre-funded" accounts that help reduce old-age poverty.

Reforms to increase participation

50. ***Steps could be taken to address the low participation of the self-employed in the social security system.*** Currently, few self-employed participate in the system, and this could be addressed by requiring them to contribute (at a minimum) to the pension system. According to estimates from the First Social Protection Survey, well over 50 percent of the self-employed have never contributed to the social security system; this represents nearly 15 percent of the Chilean work force. Nevertheless, many workers are avoiding making a payment, because doing so would mean that they would need to pay into the entire social security system (around 23 percent of wages). Instead, partial exemptions could be granted, requiring the self-employed to contribute into the AFP system and not the health system. Such a step could raise the replacement rate for men by 10–15 percentage points, but by less for women, because fewer women are self-employed.

51. ***Requiring all self-employed to contribute could be challenging, since many do not file taxes and could take informal jobs.*** Only two-thirds of the self-employed file tax returns, making it difficult for the authorities to know what their actual incomes are (Fuentes, 2004). Alternatively, many self-employed could avoid coverage by taking up informal jobs.

52. ***Replacement rates could also be increased if the retirement age for women were raised to the same level as men.*** By forcing longer contribution periods, more women would likely qualify for the MPG. Furthermore, a later retirement age would increase asset accumulation, lifting replacement rates for women by around 10 percentage points.

53. ***Nevertheless, addressing the gender differences in the coverage of the pension system will be more difficult and would likely require broader changes to labor and social policies.*** Changing the retirement age would likely be politically difficult. Furthermore, women's low labor market participation reflects social decisions, along with economic incentives for women to work. Raising the replacement rates, and the benefits of the system, to women would likely require a number of social policies to encourage women to work, but that are not strictly related to the pension system (such as childcare). However, it is conceivable that some steps could be taken to enhance benefits, such as introducing a system of government contributions to the primary care giver's retirement accounts during early child-rearing years.

54. ***Simulations using the actuarial models suggest that it may be possible to improve replacement rates by switching a system of asset-based fees.*** Currently, AFPs are prohibited from charging fees linked to the size of the assets of account holders. According to simulations conducted using the actuarial model, an asset fee set at 0.65 percent of assets would generate a similar level of income for pension funds as a wage fee of 2¼ percent (Table A.2, in the appendix). However, it would substantially change the incentives of the AFPS, because they would have an incentive to maximize the value of their assets—as

opposed to the current system where they want to maximize the number of high-wage contributors.

55. ***With such a system, safeguards would be needed to ensure that contributors have a very clear idea of the costs.*** While an asset-based fee system can align the incentives of the fund managers with the contributors, there are possibilities for abuse. For example, pension funds could compete in a costly attempt to attract contributors with high balances (as opposed to high wage earners). In addition, asset fees can be more difficult to understand, so contributors would need to be educated on the impact of asset fees, not just on the current cost, but also on the future impact of higher fees on lower account balances. Statements sent to account holders would have to specify clearly how much money is being withdrawn from their accounts. To encourage competition, contributors could be told how much they would save if their accounts were at the cheapest AFP.

Possible steps to improve benefits

56. ***Since workers could face a substantial decline in their replacement rates, future benefits could be pre-funded with a special account.*** The pressures to the replacement rate are not likely to be fully felt for another twenty years, at a minimum. As a result, there is more than enough time to pre-fund an account that could provide benefits to retirees to help make up the difference.

57. ***One option would be for the government to deposit money into the accounts of young workers.*** This would act as a system of forced savings, and take advantage of the fact that the pension funds can diversify their portfolio internationally, and generate higher rates of return than the growth rate of the economy and the tax base. However, there could be intergenerational equity concerns with limiting the program to the future young, especially since the current cohort of workers (25–55 years old) is paying for the transition cost of the old system as well. Mitigating this, however, is the fact that many in the current generation benefited from exceptional returns to the pension funds that are unlikely to be repeated. Also, rules would need to be set up to prevent the grant program from discouraging saving for retirement and to ensure that the subsidy complements workers' contributions—and does not substitute for it.

58. ***The old-age safety net could also be improved, at a moderate fiscal cost, by reducing the time to qualify for the MPG.*** This reform would substantially boost the numbers of pensioners receiving the MPG, which would help relieve forthcoming pressure, as more retirees realize that they may not qualify for the MPG. If the time to qualify was set at 15 years, about one-third of retirees (given current patterns in contribution densities) would still not qualify. As a result, it would cost only an additional ¾ percent of GDP a year to the government to expand the program. The relatively modest fiscal cost suggests that coverage would still not be broad enough for the MPG to serve as a broad safety net.

59. ***There is scope for redesigning assistance pensions so that they serve as an effective anti-poverty old-age program that complements the private account system.*** The current assistance pension program could be redesigned with higher benefits, since the current subsidy is only around one-third of the minimum wage. Unless this level were raised, it would be unlikely that the assistance pension could serve as an effective anti-poverty device.

However, the program would need to be modified, so that the subsidy does not serve to discourage participation in the formal pension system. For example, benefits could start later than the traditional retirement age.

60. ***To limit the fiscal costs, any enhancements to assistance pensions would need to be flexible and respond to changing demographics.*** Over the next 50 years, the Chilean population will age quite sharply. As any enhancements to the pension system could become very expensive in the long run, new benefits could be linked to the increase in life expectancy. For example, many OECD economies are beginning to consider rules that would tie the retirement age to life expectancy.[24] Furthermore, the program would need to be aimed explicitly at reducing old-age poverty, and spending priorities would need to be adjusted if poverty rates in other age categories increased above the old-age poverty rates. This program should be designed and explained as an anti-poverty program, and workers encouraged to continue to contribute to their own accounts—to ensure that they have more than just a minimal retirement income.

F. Conclusions

61. ***The results from the previous sections suggest that Chile's pension reform has served some retirees well, but many others will face a shortfall that will grow ever more pressing over the next several decades.*** In the short-run, the average replacement rate is adequate, but it masks considerable variation between groups, so that 20–30 percent of the retired age population has very low replacement rates. While the replacement rates are projected to improve in the medium term, they will subsequently decline to levels at which they would not be high enough to ensure that retirees can maintain their standards of living.

62. ***From a fiscal perspective, future pension costs appear on a declining trend, but estimates may be deceiving because social pressures could force sharp changes to the old-age programs.*** The low coverage of the MPG indicates that it would not be, as initially intended, a broad based anti-poverty program for the elderly. Under current policies, many elderly would have retirement incomes that would last for only several years, because their account balances would be small, leading many to empty their accounts after only 5-10 years in retirement. Current policies would thus make many elderly look for work during retirement, even though many may not be able to do so. As a result, social pressures would likely build to provide broader anti-poverty programs for the elderly, but without sufficient time to pre-fund their costs.

63. ***Action should be taken now to pre-fund the system and design a proper anti-poverty program for the aged.*** The assistance pension was not designed to work with the current system. However, given the expected increases in life expectancy, Chile cannot likely afford a broad anti-poverty program at current retirement ages (65 for men, 60 for women). In

[24] One such possibility would limit the time spent in retirement to be no more than one-fifth (say) of the average life expectancy. For Chile, this rule would result in an increase in the retirement age to 71 for women and to 66 for men. For equity considerations, it may be better to harmonize the retirement age, which would suggest that retirees could draw on the public assistance program until around age 69 (for both men and women).

particular, any debate regarding the expansion of the anti-poverty program would need to consider the long-run costs and demographic trends, and action should be taken as soon as possible to provide for retirement programs over the long run.

64. ***Ultimately, prudent macroeconomic management is vital under a system of individual retirement accounts.*** Since workers must contribute during their entire working lives, they need to be able to find work, and the financial markets must be stable. If the economy is poorly managed, and unemployment or inflation jump sharply, workers would face permanently lower retirement incomes. Also, since there is limited intergenerational risk-sharing from macroeconomic shocks in a system of individual accounts, economic policies must remain sound. Finally, the labor market needs to function well in order to ensure that workers can move from one job to another, without losing too much time. With a system of private accounts, any time spent outside of the labor force means that workers are not contributing to their accounts, and hence, that they will ultimately have lower pensions.

MODELING OF THE RESULTS OF THE CHILEAN PENSION FUND SYSTEM

The most important element of the model used in the paper is that it is deterministic, so that account balances grow smoothly over time, depending on the: (i) contribution amount and fees, (ii) contribution density, (iii) time spent working, and (iv) rates of return. In this model, workers contribute a fixed percentage of their wages to a pension account, and fees are deducted from their contributions (in the case of income-based fees) or account balances (in the case of asset-based fees). However, this model assumes that workers will not contribute to the system every month of their working life, so the contribution density, or ratio of the number of months of contributions to the months during their working lives, is less than one. All workers retire at the statutory retirement age or stop contributing to the pension system. The account balances grow at a fixed, deterministic rate, based on the assumed returns to the pension fund system.

Heterogeneity is introduced in the model by allowing contribution densities, income, and macroeconomic and demographic variables to vary. These parameters can be changed, so as to produce a range of estimates and to test the sensitivity of the results, including by:

- **Contribution densities**, that vary across the working population, using an empirical estimate of the probability distribution derived from the 2002 *First Social Protection Survey* of households. The contribution densities were divided into one of 101 cohorts (ranging from zero to one, in 0.01 increments), and a kernel density estimator was used to predict the probability mass at each density. The distribution of contribution densities is assumed to be constant across time, but differs by gender.
- **Self-employment,** which is modeled as a period where the cohort is not contributing; however, using the survey. In addition, Table A.2 considers the impact of including a certain percentage of the time spent self-employed is covered by the pension system.
- **Income** that is conditional on the contribution density, as estimated from the 2002 Social Protection Survey. The income distribution was calibrated to match to the income distribution calculated by the SAFP.
- **Macroeconomic and demographic variables**, which are allowed to change over time. These are largely driven by a sharp decline in population and labor force growth during the forecast horizon. As a result, real GDP growth also falls—to keep labor productivity growth constant. In order to maintain economic consistency, wage growth, financial returns also fall.

As a result, the account balance of a worker accumulates in a predictable manner. Because of the assumption on contribution rates and income, these vary by the cohort of worker (and across time), with 101 cohorts of workers in each year. Following work by Arenas and Gana (2001), the real balance ($K_{i,t}$) of each worker within cohort (i) grows each year (t) by:

$$K_{i,t} = \left(1 + r_t - f^a\right)K_{i,t-1} + 12d_i\left(1 + \frac{r_t - f^a}{2}\right)\left(c - f^w\right)W_{i,t}, \qquad (1)$$

where r is the return on the pension fund, f^a is an asset-based fee, f^w is an income-based fee, d_i is contribution density for cohort i, c is the contribution rate, and $W_{i,t}$ is the real wage for

cohort *i* at period *t*. This paper follows their assumptions—that real wages (W_i) grow from age 18 (when a worker enters the labor force) until age 50. Then, wages plateau, remaining constant in real terms from 50 until retirement. See their paper for the complete derivation.

At retirement, the entire balance of the pension fund is converted to an annuity, if the retiree can afford a annuity income greater than the MPG. The annual annuity income depends on the gender of the worker, life expectancy, and the discount rate. The life expectancy data for estimating the annuity income for each cohort is taken from the SAFP (using table RV-2004). Nevertheless, the population data (used to calculate the size of a retiree cohort) is taken from the United Nations population estimates, which assumes that life expectancy is drifting upward slowly. Finally, the discount rate is assumed to drift downward, reflecting the decline in the real rate of return to pension funds. However, this annuity option is only available to those workers with account balances that are large enough.

For those workers whose cannot afford a MPG annuity, they draw down their account balances so that their pension income is equal to a MPG, until their account balance is exhausted. Strictly speaking, a retiree must draw down their income using the programmed withdrawal option, which generates a higher, initial income that declines over time. However, this formula is complex, so this simple approximation is used. For those cohorts who have contributed for 20 years or more, the state then funds a pension equal to a MPG for the rest of their lives. For everyone else, their pension income is zero.

These estimates are reproduced by contribution density-cohort, and when a cohort reaches the retirement age, this model assumes everyone retires. Using the empirical distribution estimated from the Social Protection Survey, it is possible to calculate the fraction of the population in each cohort, by gender. Ideally, the contribution density would vary by age (as well as by gender), but this aspect is not considered here.

As the retiree cohort ages, the mortality tables (RV-2004) are used to allow the cohort to "age", so that for every year, it is possible to compute the total spending on the minimum pension guarantee. This step is necessary, because as each cohort retires, the retirees receive an annuity, which is fixed in real terms.[25] However, the minimum pension guarantee grows (in real terms), so it is necessary to track the "gap" between the each retiree-cohort's annuity income and the minimum pension guarantee. Furthermore, the minimum pension guarantee is different for those under age 70 than those over age 70, so retirees are tracked by age.

Because data on individual account holders are unavailable, the estimates through 2020 are only approximate. From 2005–2020, the model uses highly aggregated data to estimate the balances of retirees. Furthermore, it treats all retirees as part of the private pension system; however, most retirees will still be part of the old system until the early 2010s. As a result, until 2020, the estimates for the minimum pension guarantee are "too low".

[25] Men can purchase an annuity with a survivor's pension, which lowers their replacement rate significantly. However, this option is not considered here; instead, the results are considered for just men and women, individually, without considering the impact of retirement on their spouses.

In addition, these assumptions are likely to be optimistic, since workers typically fail to save enough and usually underestimate how long they will live. As such, the deterministic nature of this model is likely to over-predict pension income and replacement rates. In particular, Chilean workers have a propensity for self-employment, to avoid mandatory social contributions. As a result of avoiding the short-term costs, the long-run fiscal costs are likely to be higher (and replacement rates, lower) than estimated here.

Furthermore, to keep the model compact, several elements of the current pension program are excluded from the model. First, all fees are assumed to be based on either income-based or asset-based; the fixed commission is assumed to be zero, and the costs associated with the disability and health insurance programs are ignored. Second, all workers are assumed to invest in only one fund, which provides a common return across all investors. Third, all workers convert their accounts to an annuity at the time of retirement—so that no workers take advantage of the programmed withdrawal or early retirement options.

The base case also includes the effect of the assistance pension, and assumes that the program would be available to every retiree whose account balance has been depleted. The assistance pension is meant to be the income support program for the very destitute, and as a result, the benefit levels are traditionally quite low (around one-half of the MPG, or about US$70 per month in 2005). However, these benefits are universal, once the retirees have exhausted all other retirement income. Since contributors with low densities (20–30 percent) can fund a pension for a number of years, the impact of this program would not be large, because a fraction of the retiree population would have died before becoming eligible.

Finally, this model ignores, for the sake of simplicity, several important strategic aspects of the pension program:

- **Options for Converting Pension Assets to Retirement Income:** By assuming all pension assets are annuitized, workers cannot take advantage of the two possible alternatives: (i) either cashing out the pension fund (as long there is enough remaining to fund a minimum pension), or (ii) take a series of programmed withdrawals to roughly approximate an annuity. If workers attempt to strategically "game the system,", these options could result in higher state support.
- **Employment Decisions to Avoid the Pension Contribution:** The mandatory social contributions (pension, disability, and health) is approximately 20 percent of wage income, so many workers attempt to avoid paying these contributions by seeking self-employment. This has resulted in a lower-than-anticipated contribution densities, and a significant number of people who contribution less 10 percent of their working life.
- **Disability Coverage.** Disability insurance and survivor benefits are included in the AFP system, as a form of a charge that is included in the AFP management fee. However, when the retirement benefits are very low, contributors find a way to qualify for disability coverage. For example, in Australia, disability payments have increased sharply in just twenty years. Here, in contrast, it is assumed that disability payments are assumed to be a constant 0.1 percent of GDP.

Table A.1. Assumptions Used to Estimate the Base Case 2005-2100

	Historical	Forecast				
	1995 2003	2004 2010	2011 2024	2025 2039	2040 2054	2055 2100
		average annual percent growth				
Economic and Demographic Assumptions						
Population growth	1.3	1.1	0.9	0.5	0.2	-0.1
Working age (15-64)	1.5	1.4	0.7	0.4	0.1	-0.2
Real GDP 1/	3.7	4.6	3.9	3.6	3.3	3.0
Nominal GDP 2/	7.3	7.0	6.1	5.8	5.5	5.2
Consumer prices 3/	4.3	3.0	3.0	3.0	3.0	3.0
Real wages 4/	0.6	3.9	3.0	2.7	2.4	2.1
Pension System Assumptions						
Real AFP returns 5/	10.1	5.7	5.0	4.6	4.3	4.0
Annuity discount rate 6/	6.2	5.7	5.0	4.6	4.3	4.0
Implies annuity factors of:						
Men	10.5	11.4	12.1	12.4	12.7	13.0
Women	13.1	14.6	15.8	16.4	17.0	17.7
Contributor Assumptions (constant across time)						
Worker contribution 7/	12.3					
AFP Fees	2.3					
		Men	Women			
Enter workforce at age		18	18			
Retirement age		65	60			
Life expectancy at retirement 8/		82.7	87.9			
Contribution density 9/		0.61	0.46			

Sources: Haver Analytics, 2002 Social Protection Survey, and Superintendency for Pension Funds (historical data) and staff estimat

1/ Real GDP growth is based on staff estimates for the WEO until 2010. After then, the growth rate declines in line with the decline growth rate of the working-age population (a proxy for labor force growth). Implicitly, this assumes constant labor productivity grow around 3¼ percent.

2/ Nominal GDP growth is set so that GDP inflation is roughly constant at 2-2¼ percent.

3/ This is set at the mid-point of the BCCh target band.

4/ Real wages grow so that nominal wages (which are equal to real wages + inflation) grows at the same rate as nominal GDP.

5/ Gross average annual returns of the system (historical data for for returns since 1982). During the forecast horizon, the real return is set as a 100bp mark-up on real GDP growth. Normally, this would violate internal consistency; however, these higher returns are justified because international diversification should allow for higher returns.

6/ This is taken as a simple, 50bp mark-down on pension fund returns.

7/ In percent of wages. Includes only pension fund management fees (excludes the disability and other social insurance contributions

8/ The life expectancy data are used to calculate the annuity factors (from table RV-2004). However, the UN Population Projections (the basis for the population forecasts) assume that the life expectancy continues to grow.

9/ Taken from the kernel density estimate of the contribution densities for households (from the *First Social Protection Survey*).

Table A.2. Long-run Outcomes of the Pension: Various Policy Alternatives

Base case results and deviations from baseline

	2020 2034	2035 2049	2050 2074	2075 2100	Long-run outcomes				
	Spending on the MPG 1/					Replacement rates 2/		Pct. receiving MPG 3/	
	Annual spending				PDV 1/	Men	Women	Men	Women
Base case	**0.2**	**0.4**	**0.9**	**1.0**	**337**	**57**	**28**	**0**	**54**
Policy simulations (in percentage point deviations from baseline):									
Increasing participation:									
a. Self employed covered @ 50 percent	0.1	0.1	0.3	0.3	108	10	4	0	2
@ 100 percent	0.1	0.2	0.3	0.4	128	15	8	0	4
b. Asset fees instead of wage fees	0.0	0.0	-0.1	-0.1	-27	2	1	0	-1
c. Retirement age for women set to 65	-0.1	-0.1	-0.2	-0.2	-64	0	10	0	8
Broadening benefits:									
d. Demogrants to all 15-year olds	0.0	0.0	-0.3	-0.8	-20	29	15	0	-6
e. Qualify for MPG after 180 months	0.3	0.5	0.7	0.7	263	4	7	0	20
after 120 months	0.6	1.1	1.5	1.6	571	11	17	0	40
Combined effects:									
f. Scenarios (a), (b), (c), (d), (e)	0.2	0.3	0.1	-0.6	96	31	36	0	27
g. Excluding demogrant (a, b, c, e)	0.2	0.3	0.5	0.6	190	15	23	0	32
h. Scenarios (a-100%), (b), (c), (e-120m)	0.3	0.6	0.9	1.0	335	23	37	0	54
Memorandum: Effect of including the assistance pension on replacment rates									
Covers all retired-age without pension	0.7	1.2	1.6	1.7	606	13	26	0	75

1/ Excluding disability spending. Present discounted value, using in percent of current GDP, using annuity discount rates.

2/ Replacement rates in percent of final salary.

3/ Percent of retired-age population receiving a MPG subsidy (or "top-up") to their pension.

4/ This scenario is very similar to the assumptions in Arenas de Mesa and Marcel (1999) and Benet and Schmidt-Hebbel (2001).

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II. CHILE: EXPERIENCE WITH PUBLIC-PRIVATE PARTNERSHIPS[1]

A. Introduction

1. ***By the early 1990s, a sizable infrastructure gap had emerged in Chile, and significant investment was needed to prevent infrastructure and transportation bottlenecks from becoming a major obstacle to growth.*** In common with other Latin American countries, fiscal adjustment under economic stabilization programs during the 1980s weighed heavily on public investment in infrastructure and on infrastructure maintenance. Rapid economic growth during the second half of the 1980s and into the 1990s quickly exposed infrastructure inadequacies. Traffic speeds markedly declined, road accident rates increased, and ports and airports became congested. The Ministry of Public Works (MOP) estimated investment needs in infrastructure for the second half of the 1990s at about US$11 billion, equivalent to over 20 percent of 1993 GDP.

2. ***A challenge for the government was to close the infrastructure gap while maintaining fiscal discipline that had placed public debt on a rapidly declining path.*** The solution lay in promoting private sector involvement in the provision of some public infrastructure through Public-Private Partnerships (PPPs), whereby private firms would build infrastructure assets and operate them for a number of years before transferring the assets to the government. Subsequent progress has been significant, especially in terms of rehabilitating and upgrading the highway network. However, the challenge remains enormous as economic growth has generated new demands for infrastructure. According to a recent study, the infrastructure gap for 2005–08 is estimated at US$15.8 billion, equivalent to close to 17 percent of 2004 GDP.[2]

3. ***At present, Chile's PPPs program covers 44 projects, with a total value of US$5.7 billion (6 percent of 2004 GDP) in investment.*** The program has centered around a series of projects to upgrade the Route 5 highway, which runs the length of Chile, with financing tolls (Box 1).[3] In all, it includes eight projects on Route 5 (US$2 billion); eleven other highway projects, including *Túnel del Melón* (US$1.3 billion); ten airport projects (US$0.2 billion); six urban road projects (US$1.8 billion); and nine other projects (including prisons, public buildings, and a reservoir, for US$0.4 billion).

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[1] Based on information collected by a mission comprising R. Hemming (FAD), M. Alier (WHD), T. Irwin (World Bank), and E. Sawada (Inter-American Development Bank) that visited Santiago during September 21-27, 2004. G. Adler updated the report, and broadened its coverage, in June 2005.

[2] Report prepared by the Chilean Chamber of Construction (2004); because of differences in methodology, it is not directly comparable with the estimate needs prepared in the early 1990s.

[3] For a fuller discussion of the highway PPPs program, see Gómez-Lobo and Hinojosa (2000), and Lorenzen and Barrientos (2001).

BOX 1. CHILE'S ROUTE 5

Due to Chile's peculiar geography, the highway network is organized around Route 5, a highway of some 3,000 kilometers that runs from the border with Peru to Puerto Montt (some 1,000 kilometers South of Santiago). It also includes several transversal highways that connect inland cities with the ports on the Pacific coast and with large cities in Argentina.

Given that it is the backbone of Chile's road transportation system, upgrading and maintaining Route 5 has been a key component of Chile's infrastructure plan. This plan included widening the busiest segment (the 1,600 kilometers between La Serena and Puerto Montt) of Route 5 to two lanes in each direction. Given the size of the project, and the risks involved with granting it in PPP, the government divided the project into eight segments, plus the construction of the *Túnel del Melón* (in 1994, the contract to build this tunnel marked the beginning of the PPP program).

One aim of the government has been that the Route 5 project should be financially viable, with similar tolls-per-kilometer across all segments of the route. Given that not all segments are equally profitable (the outer segments are less profitable than those near Santiago), the government cross-subsidizes the operators of unprofitable highway PPPs with payments made by the firms operating the profitable segments, in part through an Infrastructure Fund.

B. The Legal Framework

4. ***The PPP framework in Chile is solidly based in the Law.*** The 1991 Concessions Law constitutes the main legal framework for private sector participation in the construction and operation of public infrastructure in Chile.[4] The law establishes the legal features of PPP contracts, creates a system of competitive bidding based on flexible arrangements for awarding them, defines the rights and obligations of the parties, and specifies conflict resolution procedures. PPP projects are not required to follow the administrative process of other public investments under the National Investment System (*Sistema Nacional de Inversiones*).[5]

5. ***The law contains a number of elements that have contributed to the success of the PPP program:***

- A special purpose company, the PPP firm, has to be set up and must be dedicated solely to the operation of a PPP. Separate firms must be set up for each PPP, even if the owners are the same. Although these firms are closed companies, they are subject to the same reporting requirements as those of traded companies.
- To finance a project, PPP firms can securitize future revenue flows.
- With authorization from the Ministry of Public Works (MOP), a PPP contract is transferable to any entity that meets the eligibility criteria set out in the original

[4] MOP DFL No. 164 of 1991 and Presidential Decree No. 956 of 1997 update all previous legislation governing the construction, rehabilitation, maintenance, and operation of public infrastructure.

[5] The legal basis of public investment in the National Investment System is defined in the Financial Administration Law (DL No. 1,263 of 1975) and the Planning Law (Law No. 18,989 of 1990).

tender. Under this provision, a highway firm that ran into liquidity problems was able to sell its PPP to a new company.

- By mutual agreement, a PPP contract can be terminated with the consent of the government, the PPP firm, and secured lenders. In case of a serious breach of contract, the government can terminate the contract. In such a case, the law calls for a new bidding process, and secured lenders are paid first, with the proceeds from the new bid.
- Under a step-in-rights provision, a creditor of a bankrupt PPP can continue to operate the PPP. It can also request that the government tender the remaining period of the PPP and use the proceeds to settle the original firm's liabilities. In practice, step-in-rights are exercised gradually when a PPP firm gets into difficulties. The step-in-rights provision worked in the only two failures by PPP firms to date; in each cases, the main creditor took over the PPP and operated it for some time, with a view to selling it to another operator.

6. ***Well-specified conflict resolution procedures have been key to the development of the PPP program.*** In the first instance, conflicts should be brought to a three-member conciliatory commission, which has 30 days to issue a ruling—the MOP and the PPP firm each appoint a member, with a third member appointed by mutual agreement. If the conciliation process fails, the commission can rule, or take the case to the ordinary justice system. Either way, decisions are final, and not subject to appeal. The experience with these procedures has been satisfactory to both the government and the private sector, in particular because they have avoided protracted litigation. Since the MOP and PPP firms have a joint interest in promoting PPPs, it has sometimes been claimed that these procedures are biased in favor of PPP firms. However, these firms also have incentives in seeking a rapid resolution, because of the urgency to complete the infrastructure work and start collecting revenue. The MOP also has incentives to seek rapid renegotiation when conflicts derive from inadequate specifications in the tendering process.[6]

7. ***The PPPs program has been accompanied by a modernization of expropriation procedures that has helped overcome legal difficulties.*** For historical reasons, private property expropriations have been very difficult to implement in Chile, and legal challenges have sometimes stopped expropriations indefinitely. Expropriations are not part of the PPP Law, but are executed under a specific law of general application, and the MOP has modernized the management and procedures related to them. The government can now expropriate a property in PPP by paying for its commercial value to the owner. In case of disagreement, the owner can legally challenge this valuation (to ask for a higher price), but the expropriation cannot be stopped.

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[6] Currently, the evaluation and tendering process is undertaken by the PPPs unit (*Unidad de Coordinación de Desarrollo y Gestión de Proyectos*), while the Contracts Administration Unit (*Unidad de Coordinación de Desarrollo y Gestión de Contratos de Concesión en Etapa de Construcción*) is in charge of the administration and control of PPP contracts. Both units are part of the MOP.

C. Project Evaluation

8. ***In coordination with the Finance Ministry (MOF), the Ministry of Public Works (MOP) plays a key role in the development of PPP projects.*** In practice, most PPP projects have originated in the Ministry of Public Works (MOP), although they can also be proposed by other ministries, municipalities, or by the private sector.[7] The MOP evaluates projects, either directly or indirectly by relying on private consultants, in the context of a broad infrastructure plan. Initial consideration of a project which, in some cases, may respond to political pressures, normally results from a pre-feasibility study. The evaluation of projects involves also an environmental impact assessment. The Finance Ministry approves projects on the basis of macroeconomic and fiscal sustainability. This evaluation takes into account contingent liabilities related to expenditure commitment and government guarantees for current and future years.

9. ***In recent years, the social evaluation of projects has been gradually shifted to the Ministry of Planning and Cooperation (MIDEPLAN)***. This process, aimed at ensuring a broader evaluation of projects, builds upon a long tradition of social evaluation for government-financed programs. As a result, MIDEPLAN now supervises not only customary public investment projects but also PPP projects. After evaluation by MIDEPLAN, the MOP selects the appropriate candidates for PPPs among the projects that have been assessed to have a social rate of return of 10 percent or more.

10. ***Projects in the PPP program are selected primarily on the basis of their private rate of return.*** In practice, most projects that would require a low subsidy component are chosen to be part of the PPP program. As a second criteria, projects are undertaken on the basis of efficiency gains from transferring them to the private sector. To ensure that PPPs offer better value for money than traditional public investment, the MOP is in the process of developing public sector comparators. In some cases (prisons), previous public investment projects have been used as comparators, while in other cases (*Centro de Justicia de Santiago*, *Embalse Convento Viejo*) a new methodology is being applied to take into account the risks associated with shifting a project from the public sector to the private sector.[8]

11. ***The Infrastructure Fund, initially created to cross-subsidize PPP operations, also serves as a useful device to limit spending pressures.*** Given that the fund is now fully consolidated within the budget, it may not seem necessary any longer. However, recent budget reforms have changed the purpose of the fund and made it a useful tool to provide discipline to the PPP program. In particular, the Ministry of Public Works is now required to pre-fund the present value of government guarantees to public-private partnership (PPP) investments in the Infrastructure Fund. Furthermore, since the fund is meant to cover future contingent liabilities, ministries cannot use it for any other purposes. Additionally, the

[7] So far, the private sector has been the originator of six PPP projects.

[8] See "Report on Public Finances 2004" and "How to construct a Public Sector Comparator" Technical Note Nº5, Treasury Task Force, UK Treasury.

Budget Office has introduced a ceiling on the total present value of all guarantees to $1 billion, to help limit the exposure of the government.

12. ***To help prioritize projects, the government plans to introduce caps on the value of total contingent liabilities deriving from PPP contracts.*** Total financial risk coverage contracts (*contratos de cobertura de riesgos*) would be limited to US$2 billion for the three-year period following any fiscal year. In practice, this would restrict the number and value of projects that can be undertaken as PPP and force ministries to prioritize projects.

13. ***Looking forward, the government plans to strengthen the process for the granting of PPP contracts.*** All indications are that the major projects undertaken to date are of high quality, with significant additions to infrastructure made at little cost to the government. However, an increasing premium is likely to be placed on effective project appraisal going forward, as more high-risk projects are considered. These projects are also increasingly expected to be in areas where efficiency gains from PPPs are less clear (such as hospitals, schools, or public buildings). In addition, the resistance to charging fees is likely to mount in some sectors including, for instance, the use of urban roads. To address these issues and help improve possible efficiency gains, the government could step up the participation of potential PPP firms at the evaluation stage. Such a higher involvement could help ensure that better specifications are in place at the time of the tendering process. The government also plans to create a Superintendency in charge of the administration and supervision of PPPs, in order to separate these activities from the evaluation and tendering process.

D. Tendering Process

14. ***Providing clear project specifications is key to the success of the tendering process.*** Experience at the Chilean Ministry of Public Works has shown that providing clear specifications, with detailed design and complete engineering specifications, lowers the probability of conflicts and contract renegotiations. This helps increase competition by fostering the participation of smaller firms, which would otherwise not bid because of the large sunk costs associated with project design and engineering studies. This approach also helps better assess the cost of provision of goods by the public sector and establish public sector comparators. Nevertheless, excessive detail in the specification may also stifle private sector innovation and limit efficiency gains.

15. ***PPP contracts are awarded in competitive auctions open to all firms, domestic or foreign.*** Following a pre-qualification process, bids are called, and the project is awarded to the bidder with the best economic bid among all technically qualified proposals. Before bids are called, potential bidders are screened to determine their financial and technical soundness. Once bidders have been pre-qualified, participants must post call bonds (*boletas de garantía*) that the government can call if the bidder is unable to finance the project, or if he does not meet the terms of the contract. Call bonds are usually equivalent to about 4 percent of the total estimated cost of the project. Economic bids are evaluated primarily by

reference to the user fees and the proposed payments to (or subsidy from) the government, but other factors are also taken into account.[9]

16. ***A tendering committee is in charge of evaluating the economic bids.*** This committee of 5–7 members is composed of representatives from the Ministries of Finance and Public Works, as well as from other relevant Technical Units. It assigns a grade to each aspects of the bids and computes an overall grade for each bid, according to pre-specified weights. Based on this evaluation, the committee recommends to the MOP, and the latter to the MOF, the adjudication of the PPP to the winning firm. All contracts must be approved by the Finance Ministry, ratified by the General Comptroller, and signed by the President of the Republic.

E. Risk Allocation and Government Guarantees

17. ***Government guarantees are offered to PPP firms, mainly to protect them from demand risks and foreign exchange risks.*** PPP firms can choose whether to take or not the guarantees following the tendering process. Those PPP firms that take the guarantees are required to pay for them in a series of installments, which are a function of their expected value, computed using a methodology developed jointly with the World Bank. PPP firms insure against construction risks in the private market and are required to post performance bonds that are callable if construction targets are not achieved or if performance standards are not met. They are also required to obtain insurance for civil responsibility liabilities and *force majeure*, although in some contracts the government partly insures against *force majeure* above a certain threshold. Additionally, PPP firms must provide, two years before the expiration of the contract, a bond equivalent to 2–4 percent of the total cost of the project (adjusted by inflation) to guarantee that assets will be properly maintained and handed over to the government in good working condition.

18. ***The minimum revenue guarantee (MRG) plays a fundamental role in ensuring the availability of private financing for PPPs.*** Under the terms of the guarantee, at the end of each year the government compensates highway or airport PPP firms in case traffic or traffic revenue has been below a certain threshold. This threshold is usually set at around 70 percent of (conservatively) projected revenue. In return for the MRG, the PPP firm enters into a revenue-sharing agreement in which it shares a percentage of its revenue with the government once a threshold has been exceeded. Triggers for the revenue-sharing agreement have been linked to traffic volume, traffic revenue, and net income, calibrated at a level consistent with a profitability rate of 15 percent. Triggers for the MRG and the revenue-sharing agreement are included in the tender documents.

19. ***In 2002, the government introduced a revenue-distribution mechanism allowing PPP firms to insure themselves against demand risk.*** This is achieved by changing the PPP

[9] These other factors include the duration of the PPP (which cannot exceed 50 years by law); guarantees requested from the government; total income expected from the PPP; degree of risk assumed during the construction phase; the quality of the technical proposal; and the revenue shared with the government (or lower user fees) once profits reach a pre-determined level.

contract from fixed to variable terms, with the duration of the PPP being a function of future demand levels. Participation in this mechanism was offered to highway projects with at least one year of operation, many of which originated from the 1997–98 period, when traffic projections were based on optimistic GDP growth projections. Firms that opted to participate in the mechanism could, using their 2002 revenue as a base, choose a rate of growth for future revenues of 4–5 percent a year, which would be guaranteed by the government. In exchange for participation in this mechanism, PPP firms had to carry out upfront, additional work, equivalent to 6–10 percent of the NPV of the guaranteed revenue flows. If the targeted revenue flows did not materialize, the government had the option of extending the PPP by 60–100 months and, if the revenue target still has not been met by then, it could opt to pay the difference to the firm or let the PPP run until the revenue target has been met.

20. ***A Least-Present-Value-of-Revenue (LPVR) franchising mechanism has also been tried as an alternative to the revenue-distribution mechanism***. Under this scheme, the length of the PPP is variable and it terminates when the present value of revenue that was bid for and accepted is reached. This mechanism was used in the Santiago-Valparaiso highway PPP. It has been argued that the LPVR mechanism aims at ensuring fair compensation if the government decides to terminate the contract early. At the same time, the possibility of early termination by the government reduces the incentive for low-balling in the bidding process. In the Santiago-Valparaiso highway, the government is allowed to terminate the contract after 12 years by compensating the PPP firm for the difference between the observed present value of revenue and that included in the contract.

21. ***The foreign exchange guarantee is the main form of insurance offered by the government against financial risk.*** This guarantee was introduced in 1998 in response to a lack of long-term foreign exchange hedging instruments and the negative impact of the Asian crisis on external financing availability for infrastructure projects. During a window of 1-2 years from the date of a contract, PPP firms have the right to opt for coverage under the foreign exchange guarantee. Under this guarantee, the government compensates the PPP firm if the *Unidad de Fomento* (U.F.) depreciates against the U.S. dollar by more than 10 percent relative to a rate locked-in at the time of debt placement, and the PPP firm pays the government if the U.F. appreciates by more than 10 percent.[10] Four PPP firms have opted for the guarantee under these terms. It has been argued that, because the foreign exchange guarantee was offered at a time when the peso was undervalued in real terms, the government was likely to make a profit under this guarantee.

F. Financing

22. ***A favorable context has been created to ensure the availability of private financing for PPPs.*** Institutional safeguards and, in particular, step-in-rights and government guarantees, have been key to encouraging the private sector to participate in the financing of

[10] The U.F. is a unit of account that adjusts daily for past inflation. Firms opting for the foreign exchange guarantee are required to pay a fee of 0.2 percent of the project cost, and supplement fee of 1 percent of the guaranteed amount if the guarantee is called.

PPPs. The contracts specify the minimum capital requirements for a project, usually about 20 percent of the value of the project. In practice, actual capital contributions, which are determined by the availability of financing from other sources, have been closer to 30 percent. Equity financing has been obtained mainly from international firms participating in projects, although some equity has also been raised from domestic investment funds. Non-equity financing has been in the form of subordinated debt, bonds, and bank loans.

23. ***Bonds have required enhancements, mainly in the form of guarantees from financial insurance guarantors.*** These guarantees have been essential to ensure the successful placement of PPP project bonds, especially in international markets. By fully guaranteeing the servicing of the bonds, PPP firms benefit from the AAA-rating of the guarantor and can therefore place bonds at lower interest rates. The PPP firm pays a commitment fee, plus a premium if the guarantee is called. The cost of this insurance is relatively high and has increased over time.[11] Experience with non-guaranteed bonds has been limited.

24. ***Bank financing has been facilitated by an increase in lending limits for infrastructure projects.*** Since the mid-1990s, banks have been allowed to lend up to 15 percent of their capital and reserves to finance greenfield infrastructure projects. The public bank *Banco Estado* has been an active participant in the financing of PPPs at commercial terms. Domestic financing has also been facilitated by allowing private pension funds and insurance companies to invest in bonds issued by PPP firms, despite their lack of track record.

G. Contract Renegotiation

25. ***Contract renegotiations have allowed both the government and PPP firms to react to unforeseen changes in circumstances.*** These often reflect requests for additional work by the government and PPP firms running into financial difficulties. Unilateral requests for additional work by the government are limited to 5 percent of the project cost during the construction phase, and to 15 percent during the operating phase. The government is required to compensate PPP firms for additional work. This compensation can take the form of cash payments, an extension to the PPP contract, higher tolls, and/or cuts in other construction work. In practice, most renegotiations have been due to unforeseen problems; in some occasions, the process was difficult because the fiscal implications could not be easily accommodated in the budget.

26. ***Contract renegotiations stemming from financial difficulties of PPP firms have aimed at solving liquidity rather than solvency problems.*** By law, contract renegotiations cannot alter the financial balance of the original contract. In practice, however, it has proven difficult to determine whether this is the case or not. Given that new guarantees are often extended to PPP firms in exchange for additional work which is not tendered competitively, it is difficult to evaluate the financial consequences of renegotiations. In particular, this is made difficult by the absence of market prices for guarantees and a more general lack of

[11] The IDB has participated as a financial insurance guarantor in some projects.

information on the terms of renegotiated contracts (although original contracts are publicly available, this is not always the case with renegotiated contracts).[12] [13]

27. ***Efforts have been made to minimize the need for contract renegotiations by improving project specifications and the tender process.*** The tender process has focused on improving bidding schemes and preventing the submission of financially unviable offers.[14] The financial viability of offers has been achieved by setting floors to user fees that are high enough to ensure that PPP firms receive an adequate revenue stream. These floors have been coupled with right-to-do-business (*derecho de llave*) payments to the government by the bidder, that are specified as part of the tender. Requesting this payment from the bidder rather than the PPP firm lowers the probability of contract renegotiations, since the government is less likely to renegotiate contracts due to financial problems with the shareholders of the PPP firm than with the PPP firms themselves.

H. Fiscal Accounting and Reporting

28. ***Transactions related to PPPs are recorded in the budget on a cash basis.*** The various payments and receipts are reported in the following box:

BOX 2. PAYMENTS BETWEEN THE GOVERNMENT AND PPP FIRMS

Right-to-do business and Infrastructure payments. These payments are accumulated in the Infrastructure Fund, the resources of which are used to pay guarantees and subsidize the operation of highway PPPs that are not financially viable. The operations of the Infrastructure Fund are consolidated with the budget.

Subsidies. Fixed annual payments made by the government to operators of financially nonviable PPPs.

Compensations: (i) for ***administrative and control expenses:*** Fixed annual payments to the government by PPP firms to cover costs associated with the administration and control of PPP contracts; and (ii) for ***expropriation costs:*** Fixed payments to the government by PPP firms to carry out property expropriation.

Guarantee payments. Payments by the government to PPP firms when guarantees are triggered, and payments to the government by PPP firms under the revenue-sharing mechanism and on the upside of the foreign exchange guarantee.

Other payments. These include payments between the civil aviation authority and the operators of airports; by the Ministry of Justice to operators of jails; and by the Ministry of Public Works to a reservoir operator.

[12] Although the Concessions Law establishes that PPP contracts must be publicly available, administrative barriers make it difficult in practice.

[13] The government has also been careful not to expose itself to legal challenges from those that lost in the original bidding process and could argue that their bid would have been superior under the terms and conditions of a renegotiated contract. To date, no legal challenges of this nature have been filed.

[14] Possible explanations for submitting financially unviable offers include: (i) signaling low costs with a view to driving out competition in future projects; (ii) the bidder being interested in getting the construction contracts but not in operating the project; (iii) low-balling, when the bidder bets on getting a better deal in ex-post renegotiations; and (iv) errors in bids due to uncertainty.

29. ***In the interest of fiscal transparency, the government has also started reporting the contingent liabilities arising from guarantees provided to PPP firms.*** To that effect, the government commissioned a study from the World Bank to assess its exposure to risk under the PPPs program, measure and value the main sources of risk, and offer options for managing risks. The probability distribution of future payments is estimated by combining the contract clauses with models of the trigger variables (minimum revenue and exchange rate guarantees, primarily). The study uses Monte Carlo simulation to generate the estimates and Black-Scholes-Merton equations to value foreign exchange guarantees.[15]

30. ***Official estimates show that the NPV of the guarantees extended by the Chilean government is modest, at ¼ percent of GDP.*** These estimates, first reported in 2003 in the Report on Public Finances, were updated in the 2004 report. The expected net present value of minimum revenue guarantee payments (i.e., net of receipts by the government under the revenue-sharing agreement) over the period 2004–2030 is estimated at about ¼ percent of 2004 GDP (with an upper-bound of 5½ percent of GDP). Future commitments to subsidy payments are estimated at the equivalent of about 2¼ percent of 2004 GDP in net present value terms. In the fiscal accounts, the expected value of all contingent liabilities, as well as full-fledged liabilities deriving from the PPP program, are included as part of spending in the budget, both for the forthcoming fiscal year and in medium-term projections. The government also plans to introduce shortly in congress a draft law requiring the budget office to report all contingent liabilities deriving from the PPP program on an annual basis.

I. Assessment

31. ***Chile's experience with PPPs has been successful.*** This success has been underpinned by a solid institutional framework; well-developed procedures for evaluating and tendering projects; fair sharing of risks between the public and private sectors; reforms to ensure the availability of private financing for projects; and a high level of fiscal transparency.

32. ***Notwithstanding this success, there are a few areas where the PPPs program could be strengthened going forward.*** These relate to:

- ***Conflict resolution procedures.*** To address a possible bias in favor of PPP firms, the composition of conciliatory commissions could be reconsidered, with a view to replacing the MOP representative with a government appointee from the Finance Ministry who does not have a vested interest in the PPP program. Progress has been made in that direction in the sanitation sector, where a commission of independent experts provides advice on pricing.
- ***Evaluation of new PPP projects.*** There is a need to ensure that the detailed project appraisal techniques applied to traditional public investment are extended to proposed

[15] The government and the World Bank are contemplating a second phase of the study which, among other things, would extend the analysis to other sources of risks.

PPPs, specially when such proposals extend to projects that are more marginal in terms of expected social returns. This requires a concerted effort to ensure adequate skilled manpower at MIDEPLAN. At the same time, the MOP should expedite work on the development of public sector comparators for proposed PPPs.

- ***Design and engineering specifications.*** While there are advantages to tendering fully specified projects, there is a risk that this approach stifles private sector innovation and therefore limits efficiency gains. As the range of PPP proposals expands and, in particular, as the size of a typical PPP declines, there are advantages to letting PPP firms have a larger say in project design and engineering. This is beginning to happen in the case of prison PPPs.
- ***Publication of PPP contracts.*** Full information on original and renegotiated contracts should be publicly available. In view of the heterogeneity and complexity of PPP contracts, the MOP could develop a uniform template that summarizes their key provisions for publication on the MOP website and as part of the budget documentation. In fact, a template (*Ficha Ejemplo*) is being developed for internal use by the MOF that could fulfill this purpose.

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III. Competition in the Chilean Banking Sector: A Cross-Country Comparison[1]

A. Introduction

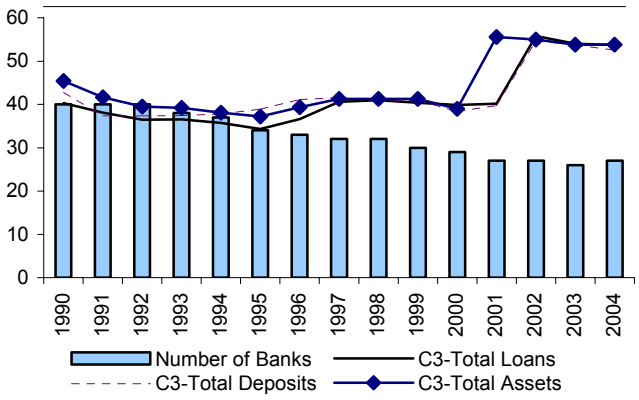
1. ***The concentrated structure of the Chilean banking market has raised concerns about insufficient competition in this sector.*** The Chilean banking market is relatively concentrated and a majority of the banks is owned by a handful of financial conglomerates with significant linkages between the banking, securities, mutual and pension fund management, and insurance businesses. However, the ownership linkages are mitigated by firewalls and cross-selling restrictions across the customer base, reducing the possibility of realizing economies of scale at the financial conglomerate level.

2. ***This paper analyzes the banking market in Chile and compares competition and profitability with thirty other countries.*** Section B provides a brief background of the Chilean banking market. Section C provides estimates to test the conduct of competitive behavior among Chilean banks versus other countries. Section D provides comparisons of profitability of Chilean banks with those in other countries. Section E concludes.

B. Structure of the Chilean Banking Market[2]

3. ***Over the past twenty years, the Chilean banking sector has grown increasingly concentrated.*** The decrease in the number of banking institutions is the result of the 1982 banking crisis and a series of mergers that took place during the last decade. The number of banks dropped from 40 in 1992 to 26 at end-2003 (Figure 1). At end-2004, the three largest banks accounted for about 54 percent of total assets and deposits and 52 percent of loans. Twenty of the banks are privately held, and six are affiliates of foreign banks. The state owned *Banco Estado* is the third largest bank in the system. It manages the account of the General Treasury of the Republic and also conducts regular banking operations. The six foreign banks established in Chile (ABN Amro, BBVA, Deutsche Bank, Santander Chile, Scotiabank SudAmericano, and HSBC) are either majority-owned

Figure 1. Number of Banks and Concentration Indices



Source: SBIF

[1] Prepared by Meral Karasulu.

[2] Chile-specific numbers are based on bank-by-bank data by SBIF. For international comparisons Bankscope data is used to ensure cross-country consistency. As a result, some numbers reported by Bankscope are not consistent with Chile-specific numbers.

(directly or indirectly) or controlled by foreign bank interests.[3] They account for about 34 percent of total assets and include the largest bank in the system (Table 1). In addition, the local branches of foreign banks account for close to 6 percent of total bank assets.

Table 1. Chile: Market Shares and Ownership in the Banking Sector 1/

	Controlling Group	Market Share (in % of)		
Institutions		**Total Assets**	**Total Loans**	**Total Deposits**
Banks established in Chile				
Banco Santander-Chile	Santander*	21.8	22.7	20.6
Banco de Chile	Luksic	16.0	17.6	16.4
Banco del Estado de Chile	Gov. of Chile	15.9	13.3	15.5
Banco de Crédito e Inversiones	Yarur	11.9	12.0	11.8
Banco Bilbao Vizcaya Argentaria, Chile	BBVA*	7.1	7.7	8.3
Corpbanca	Saieh	5.7	6.5	5.9
Scotiabank Sud Americano	Scotia*	3.1	3.1	3.2
Banco Bice	Matte	3.0	2.7	3.4
Banco del Desarrollo	Norte Sur	3.0	3.7	2.8
Banco Security	Sigdo Koppers	2.9	3.1	3.3
HSBC Bank Chile	HSBC *	0.7	0.3	0.3
ABN AMRO Bank (Chile)	ABN*	0.7	0.6	0.3
Deutsche Bank Chile	Bankers Trust and Deutsche Bank *	0.7	0.0	0.7
Banco Falabella	Falabella	0.6	0.7	0.7
Banco Internacional	Furman	0.3	0.3	0.4
Banco Ripley	Calderón	0.2	0.3	0.3
París		0.2	0.3	0.3
HNS Banco	Ergas	0.2	0.2	0.2
Banco Penta		0.1	0.0	0.0
Banco Monex	Ergas Benmayor	0.1	0.0	0.0
Foreign Bank Branches				
Citibank N.A.		2.9	2.2	2.9
BankBoston N.A.		2.3	2.3	2.4
JP Morgan Chase Bank		0.4	0.0	0.2
The Bank of Tokyo-Mitsubishi Ltd.		0.1	0.1	0.1
Banco do Brasil S.A.		0.1	0.1	0.0
Banco de la Nación Argentina		0.0	0.0	0.0

Source: SBIF

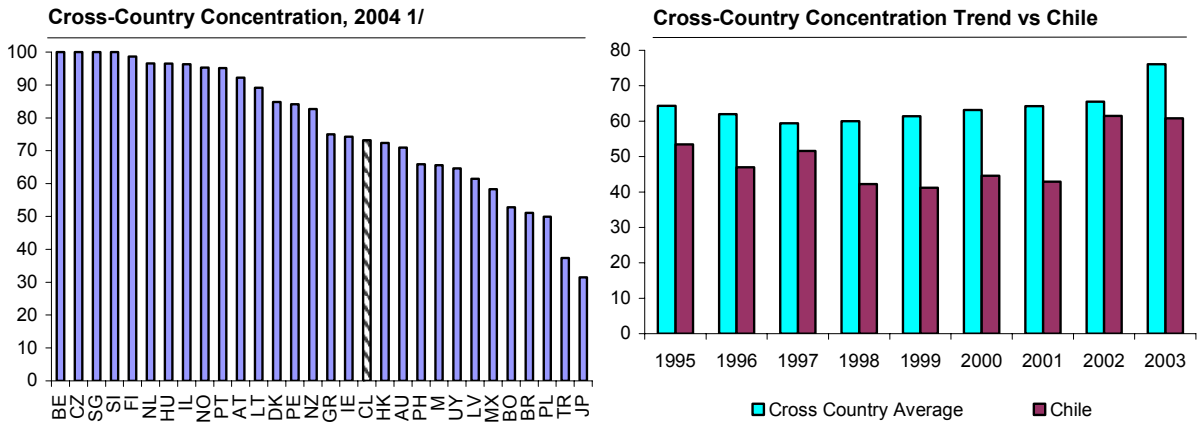
* Foreign owned or controlled

1/ As of December 2004.

4. ***The trend of increasing concentration in the Chilean banking sector is similar to the global trend experienced by the countries in the sample.*** When compared to the average concentration across countries, Chile does not stand out by its level of concentration or by its concentration trend since 1995 (Figure 2). With a few exceptions, in virtually all countries of the sample, concentration in the banking sector has increased since the mid-1990s. This partly reflects the liberalization of financial services, which has improved economies of scale, and has thus increased incentives for mergers and international integration.

[3] Dresdner Bank Sudamerika scaled back its presence to a representative office in September 2004.

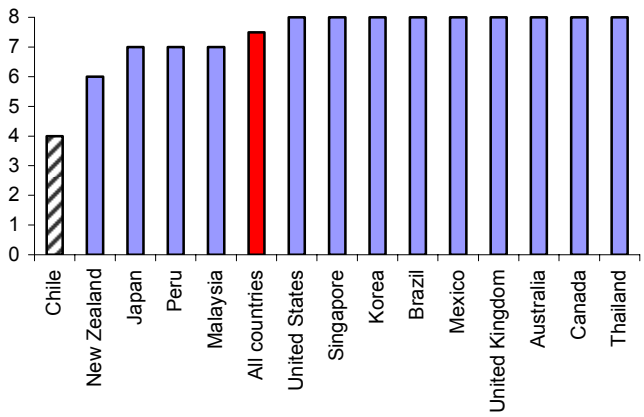
Figure 2. Cross-Country Concentration



Source: Bankscope
1/ Data for Japan as of 2003.

5. ***Although Chile has low administrative barriers to entry in the banking sector, other factors may act as a deterrent.*** Regulatory barriers to bank entry in Chile are one of the lowest by international standards (Figure 3).[4] However, the Chilean banking system maintains capitalization levels well above the minimum regulatory requirements and also above those in most other countries. These high levels, which contribute to banks' financial stability, may also act as effective entry costs, particularly given the relatively small size of the domestic banking market (Figure 4). On average, a one percent market share (in terms of non-risk weighted assets) in the Chilean banking system costs about 8 percent more in equity capital than, on average, in the countries in the sample. When adjusted for banking risks, the premium for Chile is about 10 percent higher than on average in the other countries.[5]

Figure 3. Entry Restrictions



Source: Barth, Caprio and Levine(2003). A higher number (1-8) indicates a more restrictive regime. Indicator calculated based on legal submissions required for banking license: "All countries" encompases 151 countries.

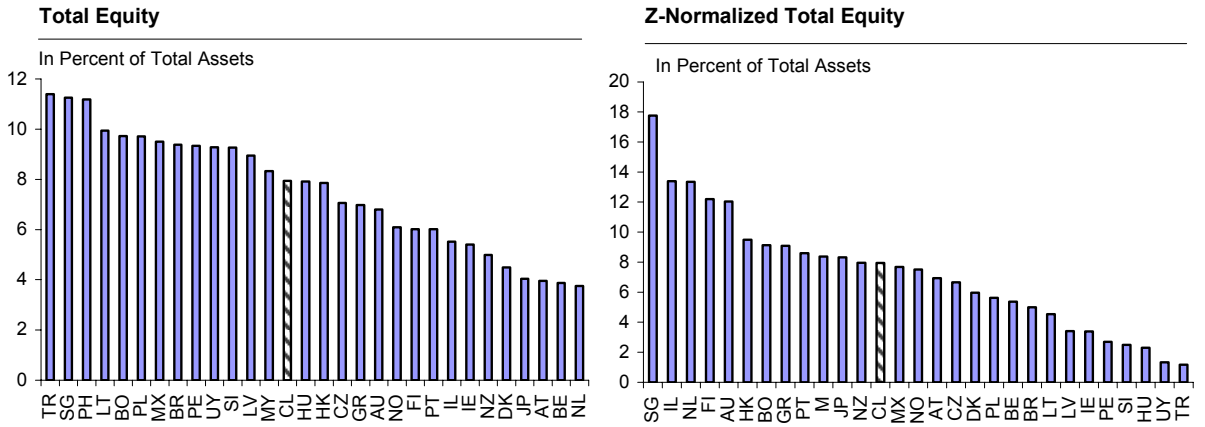
[4]Barth, Caprio, and Levine (2000) construct an index of entry restrictions based on the legal submission requirements to obtain a new banking license. These requirements range from requirement of submitting sources of funds to be disbursed in the capitalization of the new bank to market differentiation intended for the new bank. The index can take a value of 1 to 8 (with 8 being the most restrictive).

[5]The simple equity capital-to-asset ratio does not incorporate bank risk. However, the more appropriate indicator, the capital-to-risk-weighted asset ratio (CAR) is not consistently reported in Bankscope database. In Chile, CAR stood at 15 percent at end-February 2005, while the simple equity-to-total asset ratio was 8 percent. To account for differences in bank default risk across countries, the equity capital-to-asset-ratio has been

(continued)

Higher levels of bank capitalization in Chile may also partly reflect the investment restrictions on private pension funds (AFPs). As the largest institutional depositors in the banking system, the AFPs are prohibited from investing in banks whose credit ratings are below BBB. This induces banks to maintain risk-weighted capital asset ratios above the required minimum level, to ensure high credit ratings.

Figure 4. Total Equity in Percent of Total Assets



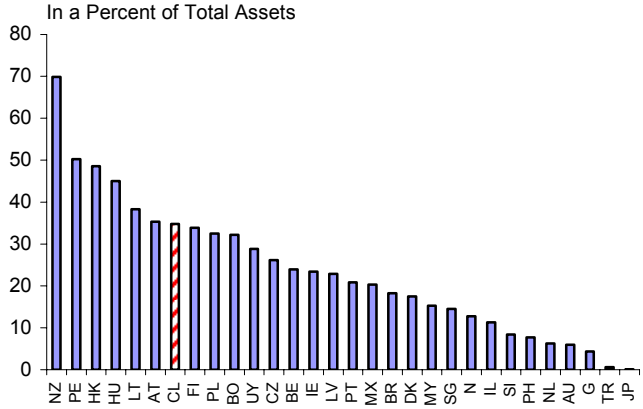
Source: Bankscope

6. ***The reduction in minimum paid-in capital requirements in recent years may have reduced the cost of entry, at the margin.*** In late 2001, the Superintendency of Banks and Financial Institutions (SBIF) lowered minimum paid-in capital requirements, in order to promote the development of niche banks and improve competition. Since then there have been five new entrants, including two consumer-oriented commercial banks and a former finance company which was transformed into a full-fledged bank. The other two entrants are small banks specialized in SME financing and foreign exchange operations. Although all new entrants are niche players, they signal intensifying competition in retail banking.

normalized using the Z-score. The Z-score measures systemic risk potential for a bank. It is defined as the ratio of (ROAA+EQTA) to the standard deviation of ROAA, where ROAA is the return on average assets and EQTA is the equity capital-to-asset ratio. A larger value of Z-score indicates lower risk profile, either by improved efficiency (high ROAA), greater diversification (low variation of ROAA), or lower leveraging (increasing EQTA). The Z-score normalized capital-to-asset ratios provide comparable levels of capital-to-asset ratios if the bank default risk in individual countries were to equal to that of Chile's.

7. ***The presence of foreign banks has helped improve efficiency in the banking sector.*** The Chilean banking sector has been opened to foreign entry since the banking crisis of the early 1980s. Today, Chile has one of the highest ratios of foreign bank ownership in the region and among other emerging economies (Figure 5). The presence of foreign banks has often been cited as an innovative force[6] through product innovation, cost efficiency and better risk management practices, and Chile does not appear to be an exemption in that area. Bank branch networks have been rationalized and the employee-to-asset ratios and cost-to-income ratios have declined significantly (the cost-to-income ratio fell from over 63 percent in 2000 to 52½ percent in 2004 (Table 2).

Figure 5. Foreign Ownership



Source: Bankscope

Table 2. Chile: Structural Banking Indicators

	1995	2000	2001	2002	2003	2004
Number of Banks	34	29	28	26	26	27
Number of Bank Branches per 1000 capita	11.5	11.8	11.7	10.9	11.2	11.2
Total bank assets per bank employee						
Constant 1990 mn CHP	299.1	754.5	966.7	1071.1	1118.7	1246.7
Cost to Income Ratio 1/		63.3	60.6	56.8	56.3	52.5

Source: SBIF

1/ From Bankscope.

8. ***Banks face negligible competition from other non-bank financial institutions.*** In most advanced economies, the liberalization of financial services has led to increased competition from non-bank financial intermediaries, which has tended to compress margins in the banking sector. Chile, despite its large banking system, has only handful of small non-bank financial institutions that are independent of banks (Table 3). This is a reflection of conglomeration in the overall economy and in the financial sector. Ownership

Table 3. Chile: Bank Ownership of Non-Bank Financial Institutions

Brokerage	62.6
Agentes de valores	98.2
Mutual Funds	85.8
Investment Funds	9.0
Leasing	99.9
Securitization	50.5

Source: SBIF

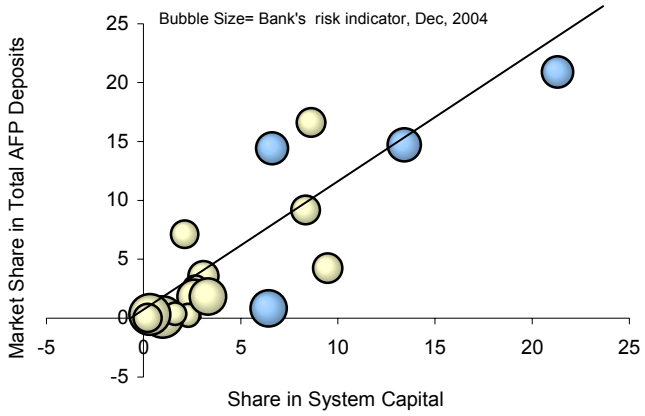
1/ As a percentage of total assets in each subsector.

[6] S. Martinez Peria and Mody (2002) find that a higher system-wide participation of foreign banks lowers administrative costs for the sector. Claessens, Demirgüç-Kunt, and Huizinga (2001) also report a negative correlation between foreign bank entry and overhead costs.

concentration in a few large conglomerates limits the supply of capital from independent sources. The fastest growing segments of the non-bank credit sector—e.g. leasing and factoring—are owned by, and increasingly integrated into, banking groups. There are only three independent factoring companies outside of the banking system, with small market shares. The financial system also includes 79 credit cooperatives, but their small size and narrow range of activities do not create any competitive pressures on the banking system.[7] The mutual fund sector is also dominated by banks, with over 60 percent of funds under management controlled by three large banks. Since 2004, insurance companies have been allowed to extend certain types of loans to their customers, which could potentially increase competitive pressures in some business lines. There is a also a cyclical element to competition from non-banks in some business lines. Following the slowdown in 1997–98 alternative financing to SMEs declined sharply but, with strong economic growth since 2004, more non-banks are moving into this segment of the market.

9. ***The funding structure of banks is concentrated in pension fund deposits.*** At end-2004, AFP deposits accounted for 21 percent of total deposits in the financial system and 170 percent of the capital of the financial system. However, in some banks, pension fund deposits account for more than 30 percent of total deposits. Investment regulations limit the AFPs' exposure to any bank to 100 percent or less of the bank's capital. Limited by these constraints, AFP deposits across the system appear to be broadly distributed in proportion to bank capital. In instances where AFP deposits in any bank are uncharacteristically high in relation to bank size, risk considerations may have been important in the decision (Figure 6). The larger banks in the system tend to have lower AFP deposits in their portfolio and also have riskier assets (as assessed by the SBIF).[8] For smaller banks, size appears to be the constraining factor—partly reflecting the low risk of small foreign banks in the system.

Figure 6. Bank Size, AFP Deposits, and Bank Risk



Source: Bankscope

10. ***Ownership linkages with AFPs may provide a competitive advantage to banks.*** In Chile, all the large pension funds belong to foreign banks. Using bank-by-bank panel data on interest rates and AFP deposits, Ahumada and Cetorelli (2003) find that banks affiliated with pension funds have higher deposit rates and a larger deposit base (controlling for bank size

[7] Their market share in terms of total loans is 0.8 percent, with the majority of loans concentrated in microfinance lending (loans of up to 200 UF).

[8] SBIF regularly publishes a risk index for each bank based on the classification of bank assets.

and other bank characteristics). They conclude that banks affiliated with a pension fund may be offering higher interest rates to this fund and that, in return, they can count on a more stable deposit base. This, in turn, may contribute to lowering funding costs. The affiliated banks also tend to have higher interest margins, which may suggest that they are able to pursue riskier lending strategies.

C. Testing for Competition : A Cross Country Comparison

11. ***Conventional wisdom on the relationship between market structure and competition suggests that more concentrated markets tend to be more collusive and, hence, more profitable, but the data do not bear this link.*** A clear relationship cannot be discerned in cross-country data between return on assets, return on equity, net interest margins (NIMs) on the one hand, and the Herfindahl-Hirshman Index (HHI), a commonly used measure of concentration, on the other hand (Figure 7).[9] Alternative paradigms point out that concentration in the banking industry could not be univocally associated with a lack of competitive behavior. The literature provides two alternative explanations for the structure-conduct-performance paradigm:

- The ***contestability theory***[10] argues that the threat of entry alone can lead to competitive behavior regardless of the number of banks operating in the market. Hence, if entry barriers are sufficiently low, market power may not lead to excessive returns for fear of new competitors.
- Similarly, the ***efficiency hypothesis***[11] suggests that economies of scale may enhance the efficiency of large firms, and the observed concentration may result from a strategic decision of more efficient firms to increase their market share rather than from exploiting their efficiency at the original market share and price level.

Neither explanation would support an unequivocal conclusion that less competitive conduct will occur because of a high degree of observed concentration. Since these different hypotheses come to conflicting conclusions regarding the link between concentration and competition, it is necessary to test empirically for the actual competitive behavior in a given market structure.

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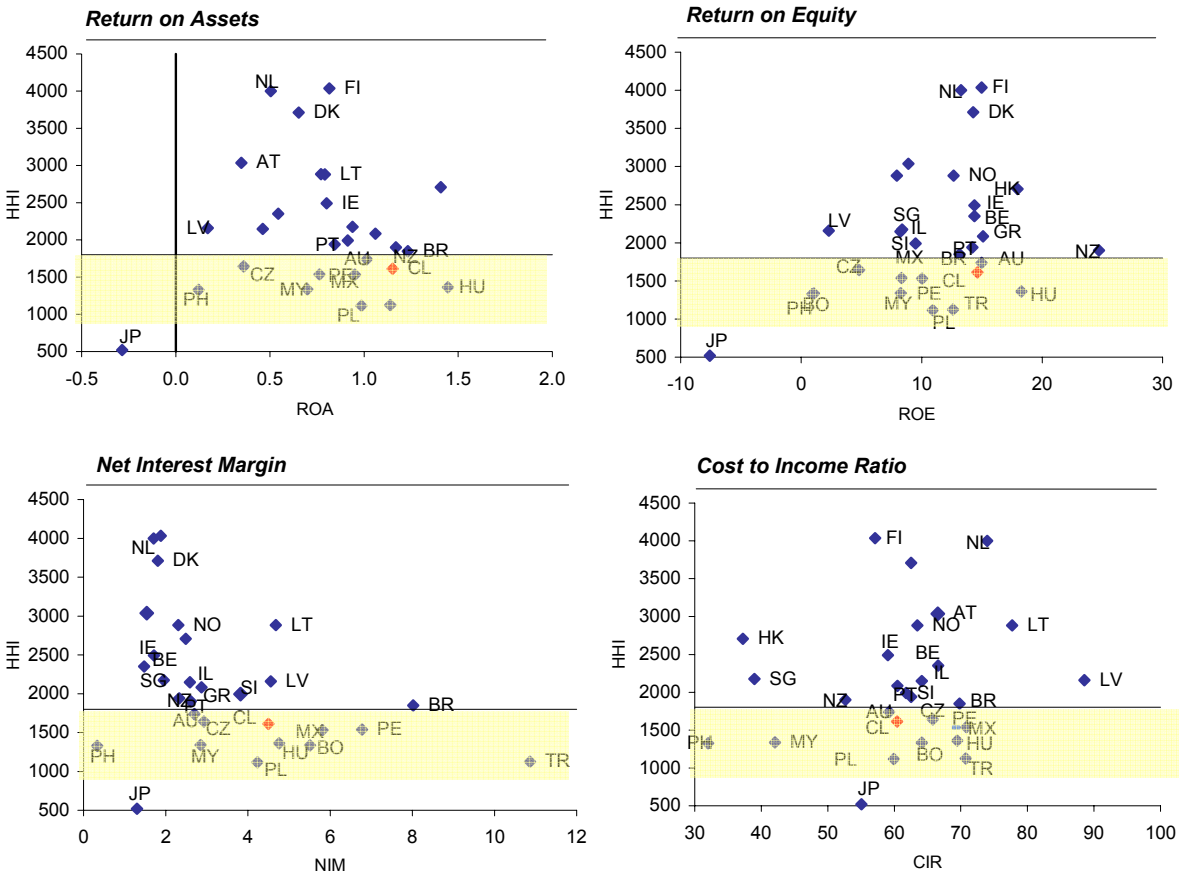
[9] The Herfindahl-Hirshman (HHI) index is a measure of market concentration given by $HHI = \Sigma s_i^2$ where s_i is the market share of the ith firm. The HHI takes into account the relative size and distribution of the firms in a market and approaches zero when a market consists of a large number of firms of relatively equal size. The HHI increases both as the number of firms in the market decreases and as the disparity in size between those firms increases. Markets in which the HHI is between 1,000 and 1,800 points are considered to be moderately concentrated, and those in which the HHI is in excess of 1,800 points are considered to be highly concentrated.

[10] See Baumol (1982).

[11] See Demsetz (1974).

Figure 7. Herfindahl-Hirschman Index and Profitability Measures



Source: Bankscope

12. ***The Panzar and Rosse (1987) approach provides a framework to empirically assess competitive conditions in the banking market through tests of input price elasticities.*** It is based on estimates of the factor price elasticities of the reduced form revenue equations (R) and can be used on balance sheet and income statement data:

$$R = F(w, X) \qquad (1)$$

Where w_j is factor price for input j, X are exogenous variables shifting the firms' revenue and cost functions. The elasticity of total revenue is estimated with respect to the firm's input prices (w_j). The sum of these elasticities constitutes the so-called H-statistic:

$$H = \sum_{j=1}^{m} \left(\frac{\partial R}{\partial w_j} \frac{w_j}{R} \right) \qquad (2)$$

33. ***Panzar and Rosse show that, in static market equilibrium, the H-statistic will be equal to one under perfect competition.*** They assume that the firm's cost functions are linearly homogenous in factor prices (i.e. their technical rate of substitution does not depend on the scale of costs or production) and that factor prices are exogenous to the individual firm. Their finding means that, in long-run equilibrium with entry and exit, firms operate at the minimum of the average costs, which then equals price. Hence an increase in input prices and, thus, in average costs would lead to a proportional rise in revenues at the firm level. Alternatively, an H-statistic of below one would indicate monopolistic competition, whereas negative values for H correspond to monopoly or perfectly collusive oligopoly.

13. ***Utilizing a bank-by-bank cross country dataset, the competition index H-statistic was estimated with annual data for 30 countries for 1995–2004, using fixed effects.*** This method allows to control for unobserved heterogeneity by capturing all bank-specific, non-time varying, determinants of revenues that are not explicitly addressed in the regression specification by the bank fixed effects term (see Appendix I for regression specifications). The sample statistics, including the number of banks in each country are presented in Table 4. For Chile, the estimations were repeated using SBIF data for a longer period (1990–2004), and are reported separately (Table 7). Since the Bankscope data and SBIF data are not directly comparable, for cross country comparisons the paper relies on Bankscope-based estimates.

14. ***Country-specific estimation results suggest that the Chilean banking system is monopolistically competitive*** (Table 5). For the Chilean banking market, the estimated H-statistic is 0.77 while, across countries, its average value is 0.81 (it ranges from a very low 0.18 to 1).[12] For almost all countries where there are sufficient data—the Table excludes seven countries for which the total observations were less than 30 data points—the hypothesis of monopolistic competition cannot be rejected. These results echo earlier findings reported in the literature for mature as well as emerging banking markets using the Panzar and Rosse (1987) approach. The main factor price driving the H-statistic is the cost of funds. The elasticity with respect to labor input is lower, but significantly different from zero throughout the sample. The price of fixed capital contributes only marginally to overall factor price elasticity and is insignificant for many countries.

15. ***The H-statistic estimates are subject to some downward bias for all countries due to the inability to capture the maturity structure of loan portfolios in the database.*** If longer maturities in fixed rate contracts prevent banks from direct price adjustment, even in perfectly competitive markets, delayed changes in pricing would imply lower estimated elasticities. However, in the absence of cross-country information on contract maturity, there is no ex-ante reason to expect this bias to affect only the estimates for Chile. Furthermore, the H-statistic estimates based on Chilean supervisory data only (Table 7) for the period 1990–

[12] Gelos and Roldos (2004) and Yeyati and Micco (2003) report H-statistics for Chile of 0.75 and 0.82, using data for 1994-2000, and 1996–2000, respectively, but neither can reject the monopolistic competition hypothesis, either.

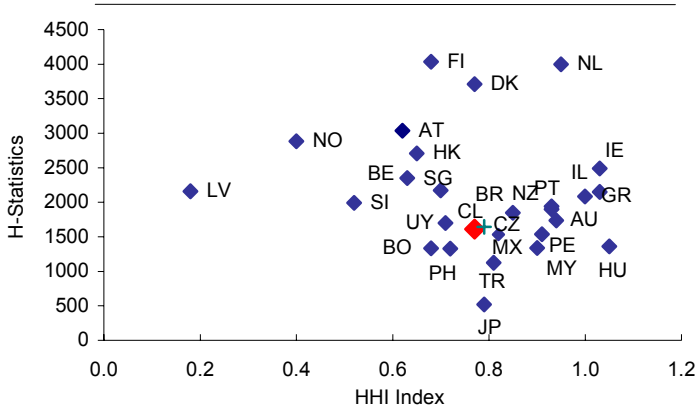
2004 also suggest a lower index (the maturity of the loans and deposits, and the share of interbank loans and deposits were controlled for). These results cannot be compared statistically to cross country estimates of the H-statistic obtained from another dataset and should be interpreted as self-standing.

16. ***A pooled regression shows that the estimated competition index for the Chilean banking market is lower than in other countries.*** In order to test whether the competition index of Chilean banks is statistically lower than in other countries, a separate pooled regression was estimated with multiplicative dummies for the input costs (the dummy variable would take the value one if the bank operated in Chile, and zero otherwise). A significance test on the coefficients on these dummy variables would allow us to test for differences in the input price elasticities of Chilean banks, and hence in the H-statistic of the Chilean banking market against a pooled sample of other banks. In this regression, other macroeconomic variables were also included to control for country-specific factors, including bank concentration (HHI-index), besides two interactive dummy variables to control for foreign ownership, bank size, and input prices.

17. ***The results from a set of alternative specifications suggest that the H-statistic for Chile is statistically lower than the one observed in the overall sample, reinforcing the conclusion that there is less competition*** (Table 6). Specifically, the factor price elasticity of funds is systematically lower, and that of the capital cost systematically higher. When controlled for the concentration in the country, the factor price elasticity of labor cost is also lower than the rest of the sample.

18. ***The dispersion of the competition index across countries does not seem to be strongly correlated with the observed concentration in those markets*** (Figure 8). There is no clear relationship between the estimated H-statistics and the concentration index in banking systems across countries. This is consistent with the ambiguity of the structure-conduct-performance hypothesis in the data as noted above. Yeyati and Micco (2003) report estimates for the Latin American region where increasing concentration does not significantly alter the estimated H-statistics over time. They also report a negative correlation between increasing foreign penetration and the estimated H statistics, a result confirmed by the negative sign of the interactive dummy of the share of foreign assets in the bank and the input prices reported in Table 6.

Figure 8. HHI Index and H-Statistics



D. Are Chilean Banks Excessively Profitable?

19. ***High and persistent profitability is usually associated with non-competitive behavior.*** This section complements the analysis above by providing comparisons of cross-country bank profitability to assess whether Chilean banks are making profits above and beyond what can be explained by factors that affect cross country differences in bank profitability.

20. ***Simple sample indicators suggest that the profitability of Chilean banks is somewhat higher than that in other banking systems.*** A simple comparison of profitability indicators across 30 countries covering 1995–2004 points to comfortable profit levels in Chile, both in terms of average assets and average equity, driven mainly by high NIMs. (Figure 9). The Chilean banking system also has moderately high cost-to-income ratios compared with other countries.

21. ***After controlling for macroeconomic and bank-specific factors, the net interest margins of Chilean banks appear statistically higher than in other banks in the sample.*** To test whether in Chile the NIM, the most important component of the ROAA, is above what can be explained by bank and country specific factors, a pooled regression was estimated, controlling for bank and country specific variables and a dummy variable that identifies Chilean banks. Since the focus of this comparison is to account for differences between banks, rather than the variation for banks over time, the between estimator was used.[13] The regression controls for bank equity-to-total assets, loans-to-assets, total deposits-to-total funding, overhead costs, liquid assets ratio, tax rate (defined as taxes over pre-tax profits), non-earning assets-to-total assets, and interest revenue to total operating income. It also controls for foreign ownership and concentration in the sector. To account for cross-country differences, the regressions included the average interest rates—defined as the average of a short and a long-term interest rates, per capita income, total assets of the deposit money banks to GDP, inflation, and real GDP growth.[14] In the absence of a better measure for credit risk[15]—a key determinant of the NIM—the regression includes sovereign spreads to control for cross-country differences in risk. However, this potential measurement bias is partly

[13] In the sample the variation of NIM across banks is more than double the average variation of NIM over time for a bank, also confirming the appropriateness of the between-groups estimator, rather than a fixed-effects regression. The between estimator is equivalent to using sample means of the variables for each bank and it eliminates the complication of time dynamics in the sample. Hence the county specific time-varying macroeconomic variables should be interpreted as reflecting the sample mean differences between countries rather than their respective variation over time. The regression specification should be considered as a reduced form to account for differences in the sample averages of bank and country specific factors, rather than a structural model of net interest margins.

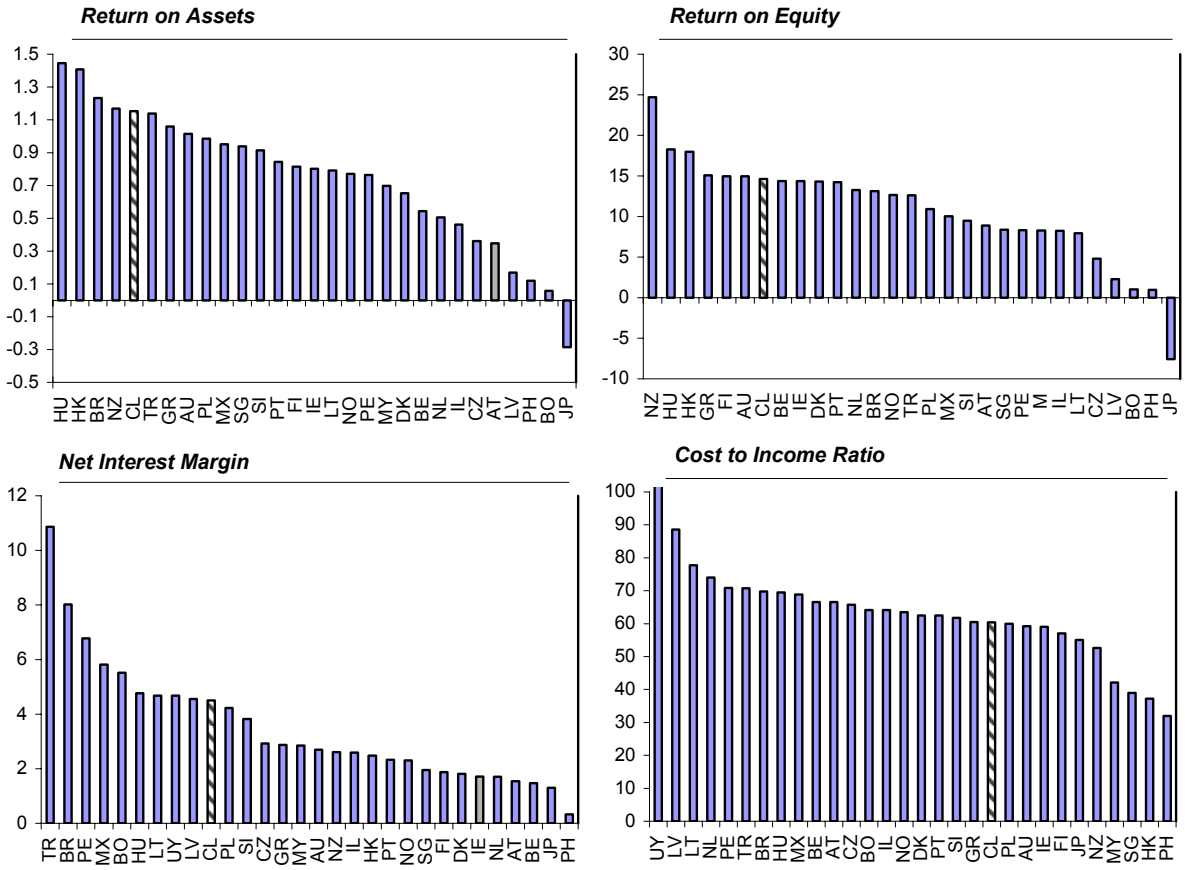
[14] A similar specification was used by Demirgüç-Kunt and Huizinga (1999) who estimate cross country regressions to explain the determinants of commercial bank interest margins.

[15] Bankscope database does not consistently report loan loss provisions, which would have been a better measure of bank credit risk.

mitigated by the inclusion of real GDP growth, which has been found to be correlated with credit risk over the business cycle.[16]

22. ***On average, the Chilean bank's NIM is 1½–2¼ points higher than for the average bank in the sample.*** For all specification of the regression (Table 8), the Chilean banks have a statistically higher NIM, after controlling for various bank-specific and macroeconomic characteristics. This result is also robust to excluding larger Chilean banks from the sample and collaborates earlier findings of lower competition in the Chilean banking market.

Figure 9. Profitability Indicators



Source: Bankscope

E. Conclusion

23. ***Cross-country comparisons show that the profitability of Chilean banks is above what can be explained by macroeconomic and banking sector characteristics in Chile.*** The estimation results suggest that, on average, the net interest margin of Chilean banks is

[16] See Pesola (2001), and Kalirai and Scheicher (2002).

1½-2¼ points higher than in the average bank in the sample, after controlling for macroeconomic and banking-sector specific factors that may affect profitability.

24. ***The higher profitability of Chilean banks is consistent with the lower estimated competition index for Chile.*** The analysis suggests that Chile's banking system—as most banking systems—can be characterized as monopolistically competitive but, as compared to the cross-country sample, the estimated competition index for Chile is statistically lower. Less competition appears to be driven by high effective entry costs—in the form of higher capitalization ratios—despite low regulatory barriers to entry, relatively minor competition from other non-bank financial intermediaries, and investment restrictions on the investments of private pension funds (the largest institutional depositors). These findings also highlight the need for more in-depth future research on the impact on financial sector profitability of investment regulations of the private pension funds.

Table 4. Chile: Sample Statistics

Country Name	Country Code	Total Assets	Fixed Assets	Overhead	Personnel costs	Revenue	Net interest Revenue	Other Operating Income	Total Equity	Number of Banks
Austria	**AT**	4746.587	44.424	70.664	40.479	260.677	67.726	38.964	184.369	73
		(18657.390)	(140.468)	(294.758)	(166.874)	(944.077)	(270.903)	(161.404)	(650.704)	
Australia	**AU**	20457.120	214.123	528.301	293.213	1429.026	502.217	381.525	1403.275	43
		(41376.330)	(447.984)	(1008.459)	(530.963)	(2776.326)	(1000.744)	(776.039)	(2873.462)	
Belgium	**BE**	20259.030	215.495	318.066	166.428	1151.467	268.229	192.141	676.629	54
		(58801.760)	(645.889)	(913.624)	(484.719)	(3157.378)	(747.013)	(582.986)	(1912.602)	
Bolivia	**BO**	312.282	9.560	12.350	5.604	40.260	15.376	3.983	27.419	16
		(280.548)	(7.735)	(9.775)	(4.497)	(38.403)	(14.439)	(3.799)	(23.014)	
Brazil	**BR**	3272.404	90.314	230.929	128.166	924.579	210.705	103.950	292.261	188
		(9652.430)	(293.443)	(742.851)	(474.886)	(2734.633)	(618.685)	(445.516)	(753.200)	
Chile	**CL**	2499.569	58.277	73.056	40.903	280.659	98.564	27.328	197.928	32
		(3502.346)	(82.803)	(100.739)	(57.687)	(394.427)	(141.446)	(49.185)	(256.991)	
Czech Republic	**CZ**	2581.711	81.911	80.363	28.741	272.244	70.678	47.628	178.794	36
		(4300.878)	(163.313)	(152.881)	(53.410)	(456.278)	(137.444)	(95.657)	(301.641)	
Denmark	**DK**	4774.278	41.912	73.460	42.422	240.938	81.822	27.094	235.902	61
		(20642.830)	(127.304)	(241.164)	(139.730)	(823.406)	(266.760)	(97.298)	(809.888)	
Finland	**FI**	30593.020	422.877	496.018	234.482	1511.528	496.404	367.281	1587.737	11
		(46462.230)	(785.506)	(731.495)	(389.887)	(1898.457)	(761.078)	(548.317)	(2241.628)	
Greece	**GR**	9052.923	223.750	246.629	145.922	789.653	217.086	182.836	594.336	24
		(12748.080)	(302.824)	(302.932)	(190.331)	(1202.842)	(276.500)	(261.242)	(705.818)	
Hong Kong	**HK**	10660.760	310.891	125.819	75.638	697.296	251.071	93.457	902.827	50
		(33523.820)	(1004.789)	(405.322)	(237.107)	(2171.576)	(751.115)	(328.316)	(2239.330)	
Hungary	**HU**	1160.302	40.500	53.206	24.331	170.153	48.749	29.989	92.693	34
		(1774.175)	(71.457)	(100.663)	(38.879)	(275.132)	(85.925)	(57.481)	(120.900)	
Ireland	**IE**	9213.266	88.547	175.939	90.040	601.764	161.551	134.583	541.174	45
		(18976.350)	(257.098)	(494.002)	(256.653)	(1218.939)	(426.184)	(406.223)	(967.125)	
Israel	**IL**	9942.464	130.400	241.288	153.525	688.410	226.976	137.840	550.616	19
		(15479.310)	(204.730)	(378.344)	(238.071)	(1129.877)	(362.715)	(224.190)	(855.474)	
Japan	**JP**	51407.460	656.760	655.673	165.226	2439.574	712.727	323.642	2073.242	171
		(126279.300)	(1498.829)	(1393.175)	(367.745)	(6262.512)	(1524.584)	(944.661)	(5019.586)	
Lithuania	**LT**	286.812	20.043	14.986	7.348	20.357	10.565	7.855	28.507	14
		(414.105)	(22.631)	(18.192)	(8.466)	(24.626)	(14.521)	(10.039)	(43.960)	
Latvia	**LV**	164.354	7.038	8.394	3.346	12.061	6.188	5.344	15.652	30
		(246.155)	(9.015)	(10.654)	(4.453)	(15.130)	(8.630)	(8.823)	(22.895)	
Mexico	**MX**	3610.957	143.761	178.047	66.387	694.526	179.448	81.000	335.326	51
		(7979.316)	(362.083)	(397.327)	(153.371)	(1491.462)	(447.702)	(215.981)	(803.654)	
Malaysia	**MY**	4512.454	46.436	71.824	36.262	334.705	132.959	45.749	358.855	45
		(7047.335)	(74.419)	(105.112)	(54.324)	(540.594)	(204.082)	(75.628)	(558.375)	
Netherlands	**NL**	26989.510	355.493	549.543	338.687	1453.191	442.939	324.735	1069.812	57
		(96234.190)	(1310.276)	(2132.205)	(1253.505)	(5276.347)	(1671.718)	(1280.352)	(3492.189)	
Norway	**NO**	7124.252	88.202	163.084	71.258	506.571	167.087	83.874	457.979	18
		(11467.040)	(144.605)	(239.470)	(113.629)	(738.118)	(246.658)	(130.269)	(720.545)	
New Zealand	**NZ**	8847.123	108.789	182.333	94.113	705.977	212.528	114.292	408.849	14
		(6736.217)	(107.405)	(153.610)	(68.270)	(605.921)	(173.653)	(99.133)	(385.246)	
Peru	**PE**	830.291	36.149	47.162	19.777	97.990	46.209	16.728	75.385	26
		(1284.749)	(51.132)	(63.946)	(26.467)	(146.039)	(64.766)	(30.971)	(109.301)	
Philippines	**PH**	1800.329	80.979	64.198	25.048	200.013	65.599	36.903	233.654	42
		(2197.887)	(121.330)	(74.200)	(31.025)	(230.656)	(81.598)	(48.101)	(271.468)	
Portugal	**PT**	8043.414	149.944	176.606	95.610	752.362	173.192	102.665	448.315	37
		(13362.900)	(269.881)	(321.399)	(165.592)	(1191.859)	(298.445)	(202.605)	(776.969)	
Singapore	**SG**	11231.700	179.450	120.736	64.917	658.286	238.708	68.981	1302.905	26
		(17142.930)	(281.662)	(170.082)	(92.572)	(849.721)	(332.782)	(101.272)	(1991.726)	
Slovenia	**SI**	759.245	29.036	28.191	15.786	70.721	29.634	15.573	74.993	27
		(1279.590)	(49.455)	(44.543)	(24.100)	(110.052)	(46.320)	(23.790)	(101.546)	
Turkey	**TR**	2881.709	149.094	166.291	52.922	695.765	238.035	20.326	282.691	56
		(4814.326)	(372.166)	(318.368)	(89.483)	(1352.858)	(495.310)	(310.438)	(594.624)	
Uruguay	**UY**	621.423	12.177	48.089	11.702	237.423	26.089	32.921	86.126	47
		(1039.823)	(32.766)	(156.267)	(20.893)	(484.383)	(66.183)	(132.861)	(267.160)	
Total number of banks:										1347

*Data in () correspond to the standard error

Table 5. Chile: Fixed Effects Estimation of Revenue Equation (Eq. 3)

	AT	**AU**	**BE**	**BO**	**BR**	**CL**	**CZ**	**DK**	**GR**	**HK**	**HU**	**IE**	**IL**	**JP**	**LV**	**MX**	**MY**	**NL**	**PH**	**PT**	**SI**	**TR**	**UY**
Dependent Variable	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*
Labor	0.146**	0.113***	0.278***	0.219***	0.135***	0.205***	0.165***	0.356***	0.212**	0.092***	0.213	0.216***	0.377	0.431***	-0.264	0.097	0.208***	0.246***	0.144*	0.116**	0.024	0.198***	-0.048
	[0.068]	[0.031]	[0.062]	[0.046]	[0.042]	[0.072]	[0.039]	[0.037]	[0.082]	[0.029]	[0.125]	[0.060]	[0.261]	[0.043]	[0.193]	[0.074]	[0.036]	[0.086]	[0.078]	[0.051]	[0.069]	[0.048]	[0.095]
Interest	0.420***	0.736***	0.329***	0.400***	0.547***	0.417***	0.576***	0.303***	0.737***	0.557***	0.699***	0.734***	0.425***	0.277***	0.348**	0.731***	0.574***	0.677***	0.470***	0.332***	0.429***	0.552***	0.694***
	[0.048]	[0.051]	[0.068]	[0.043]	[0.031]	[0.063]	[0.038]	[0.020]	[0.049]	[0.025]	[0.075]	[0.053]	[0.033]	[0.010]	[0.151]	[0.062]	[0.027]	[0.052]	[0.058]	[0.041]	[0.057]	[0.034]	[0.040]
Capital	-0.028	0.069***	-0.02	-0.01	0.058**	0.124***	-0.008	0.038**	0.031	0.018	0.078	0.096*	0.18	0.041**	0.01	-0.003	0.094***	-0.02	0.080**	0.218***	-0.001	-0.007	0.097**
	[0.021]	[0.021]	[0.021]	[0.040]	[0.029]	[0.041]	[0.023]	[0.017]	[0.039]	[0.017]	[0.111]	[0.050]	[0.202]	[0.017]	[0.184]	[0.036]	[0.022]	[0.030]	[0.031]	[0.073]	[0.023]	[0.022]	[0.035]
Other costs	0.084***	0.018*	0.047**	0.067***	0.105***	0.027	0.053***	0.075***	0.021	-0.014***	0.059*	-0.015	0.044	0.038***	0.089	0	0.019**	0.048*	0.025	0.262***	0.069***	0.072***	-0.034
	[0.022]	[0.010]	[0.022]	[0.014]	[0.021]	[0.018]	[0.018]	[0.011]	[0.016]	[0.004]	[0.032]	[0.031]	[0.073]	[0.008]	[0.086]	[0.028]	[0.008]	[0.025]	[0.017]	[0.019]	[0.020]	[0.016]	[0.024]
Equity-to Asset Ratio	0.976	2.013***	-1.643	2.728***	0.298*	-0.14	0.875***	0.496	-0.725***	-0.319	3.645***	0.319	2.564	1.174***	6.607***	0.656	0.645**	-0.763	0.671*	0.744	1.668*	0.800***	3.286***
	[0.620]	[0.572]	[1.116]	[0.816]	[0.160]	[0.406]	[0.300]	[0.504]	[0.229]	[0.262]	[1.157]	[0.724]	[5.180]	[0.341]	[1.680]	[0.409]	[0.297]	[0.919]	[0.340]	[0.491]	[0.836]	[0.098]	[0.827]
Total Loans/Total Assets	0.215	-0.212	-0.503*	-0.254	-0.002	-0.311	-0.058	0.454***	0.299	0.325***	0.336	0.062	-0.367	-0.633***	-0.849	-0.322*	0.033	0.346	0.134	-0.590***	-0.211*	-0.393***	-0.358**
	[0.161]	[0.225]	[0.270]	[0.164]	[0.118]	[0.251]	[0.142]	[0.107]	[0.185]	[0.087]	[0.303]	[0.222]	[0.662]	[0.145]	[0.659]	[0.160]	[0.154]	[0.217]	[0.192]	[0.130]	[0.106]	[0.128]	[0.140]
Total Deposits/ Total Funding	-0.375*	-0.079	0.098	0.099	-0.305**	0.284**	0.776***	-0.581*	3.995*	0.009	-0.46	-0.706***	0.438	2.891***	0.708	0.714***	0.701***	-0.342	1.67	0.184	0.205	0.139**	0.259
	[0.189]	[0.086]	[1.388]	[0.505]	[0.119]	[0.131]	[0.219]	[0.324]	[2.115]	[0.044]	[0.341]	[0.226]	[2.229]	[0.216]	[2.468]	[0.188]	[0.248]	[0.361]	[6.593]	[0.173]	[0.135]	[0.069]	[0.273]
Constant	-0.082	0.426*	0.181	0.042	0.517***	-0.049	-0.418	0.622*	-3.521	-0.645***	0.89	1.269***	0.343	-2.208***	-2.574	-0.434	-0.352	1.104**	-2.06	0.431	-0.807**	0.683***	-0.946*
	[0.340]	[0.242]	[1.463]	[0.530]	[0.181]	[0.515]	[0.280]	[0.360]	[2.128]	[0.172]	[0.639]	[0.422]	[2.078]	[0.314]	[2.432]	[0.440]	[0.309]	[0.532]	[6.563]	[0.354]	[0.373]	[0.207]	[0.530]
Observations	150	85	149	43	441	92	79	216	64	139	44	42	59	457	50	63	159	108	128	127	44	132	45
Number of banks	47	23	39	14	129	26	25	53	18	33	13	13	17	112	17	28	40	29	36	29	12	44	17
Adjusted R-squared	0.42	0.85	0.19	0.85	0.53	0.40	0.84	0.75	0.92	0.86	0.75	0.90	0.77	0.79	0.28	0.88	0.86	0.73	0.41	0.71	0.80	0.72	0.92
Within Group R-squared:	0.62	0.90	0.44	0.92	0.68	0.61	0.90	0.82	0.95	0.90	0.86	0.95	0.86	0.85	0.62	0.95	0.90	0.82	0.61	0.79	0.89	0.82	0.96
H-statistic	0.62	0.94	0.63	0.68	0.85	0.77	0.79	0.77	1.00	0.65	1.05	1.03	1.03	0.79	0.18	0.82	0.90	0.95	0.72	0.93	0.52	0.81	0.71
Market Structure 1/	MPC	PC	MPC	MPC	MPC	MPC	MPC	MPC	PC	MPC	PC	PC	PC	MPC	MPC	MPC	MPC	PC	MPC	PC	MPC	MPC	MPC

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

1/ MPC = Monopolistic Competition, PC=Perfect Competition at 5 percent of significance

Table 6. Chile: Pooled Regression Results

Dependent Variable	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*
Labor	0.091**	0.081**	0.194***	0.262***	0.062*	0.269***	0.080**	0.091**	0.060*	0.091**	0.078**	0.087**	0.061**
	[0.038]	[0.038]	[0.017]	[0.018]	[0.031]	[0.018]	[0.038]	[0.038]	[0.031]	[0.038]	[0.038]	[0.038]	[0.031]
Interest	0.488***	0.512***	0.471***	0.464***	0.521***	0.442***	0.512***	0.488***	0.522***	0.489***	0.515***	0.486***	0.517***
	[0.028]	[0.026]	[0.012]	[0.013]	[0.022]	[0.011]	[0.026]	[0.028]	[0.022]	[0.027]	[0.025]	[0.028]	[0.021]
Capital	0.064	0.071*	0.030***	0.014	0.084***	0.013	0.073*	0.065	0.085***	0.064	0.077*	0.077*	0.077***
	[0.040]	[0.040]	[0.010]	[0.009]	[0.030]	[0.009]	[0.040]	[0.040]	[0.030]	[0.040]	[0.039]	[0.039]	[0.029]
Other costs	0.052***	0.056***	0.053***	0.034***	0.057***	0.031***	0.056***	0.052***	0.056***	0.052***	0.058***	0.048***	0.057***
	[0.013]	[0.013]	[0.006]	[0.005]	[0.010]	[0.005]	[0.013]	[0.013]	[0.010]	[0.013]	[0.013]	[0.013]	[0.010]
CL x interest	-0.245*	-0.280**	-0.165*	-0.153***	-0.283**	-0.115*	-0.281**	-0.245*	-0.287**	-0.244*	-0.292**	-0.236*	-0.286**
	[0.137]	[0.137]	[0.095]	[0.059]	[0.114]	[0.059]	[0.137]	[0.137]	[0.114]	[0.137]	[0.136]	[0.137]	[0.113]
CL x Labor	0.047	0.048	-0.044	-0.137*	0.049	-0.137*	0.048	0.048	0.048	0.047	0.051	0.046	0.048
	[0.169]	[0.170]	[0.120]	[0.075]	[0.136]	[0.075]	[0.170]	[0.169]	[0.136]	[0.169]	[0.170]	[0.170]	[0.135]
CL x Capital	0.230**	0.228**	0.096	0.138***	0.202**	0.142***	0.227**	0.229**	0.200**	0.230**	0.224**	0.232**	0.201**
	[0.112]	[0.113]	[0.077]	[0.048]	[0.087]	[0.048]	[0.113]	[0.112]	[0.087]	[0.112]	[0.112]	[0.112]	[0.086]
CL x Other Costs	-0.049	-0.038	-0.024	-0.004	-0.033	-0.014	-0.037	-0.049	-0.029	-0.048	-0.036	-0.048	-0.03
	[0.057]	[0.058]	[0.035]	[0.022]	[0.048]	[0.022]	[0.057]	[0.057]	[0.048]	[0.057]	[0.057]	[0.057]	[0.047]
Equity-to Asset Ratio	1.108***	1.124***	0.494***	0.527***	1.251***	0.520***	1.120***	1.107***	1.246***	1.103***	1.139***	1.057***	1.268***
	[0.255]	[0.256]	[0.075]	[0.067]	[0.194]	[0.068]	[0.255]	[0.254]	[0.194]	[0.253]	[0.254]	[0.254]	[0.191]
Total Loans/Total Assets	-0.109	-0.123	0.004	0.127**	-0.197***	0.109**	-0.124	-0.109	-0.195***	-0.11	-0.124	-0.106	-0.172**
	[0.096]	[0.096]	[0.051]	[0.055]	[0.073]	[0.055]	[0.096]	[0.096]	[0.073]	[0.095]	[0.096]	[0.096]	[0.071]
Total Deposits/ Total Funding	0.234*	0.241*	-0.101*	0.228***	0.038	0.238***	0.242*	0.234*	0.039	0.235*	0.240*	0.208*	0.04
	[0.126]	[0.126]	[0.055]	[0.056]	[0.093]	[0.056]	[0.126]	[0.125]	[0.093]	[0.125]	[0.126]	[0.125]	[0.092]
HHI_ctry	0	0	0	0	0	0							
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]							
Total DMB assets/GDP	0	0	0	-0.000***	0	-0.000***	0	0	0	0	0	0	
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	
Per Capita Income	0	0	-0.000**	0	0	-0.000***	0	0	0				
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]				
CPI Inflation	0.005**	0.005**	0.003***				0.005**	0.007**		0.006	-0.006		
	[0.002]	[0.002]	[0.001]				[0.002]	[0.004]		[0.004]	[0.004]		
GDP growth	-0.002**			0.002***				-0.002**		-0.002**		-0.002**	
	[0.001]			[0.000]				[0.001]		[0.001]		[0.001]	
Size	-0.066*	-0.072*			-0.099***								
	[0.040]	[0.040]			[0.029]								
Foreign							-0.073*	-0.066*	-0.100***	-0.066*	-0.078**	-0.088**	-0.092***
							[0.040]	[0.040]	[0.029]	[0.040]	[0.040]	[0.038]	[0.028]
Constant	-0.082	0.149	0.298***	0.137	0.510**	0.045	0.128	-0.089	0.426*	-0.062	0.075	0.114	0.297
	[0.332]	[0.318]	[0.113]	[0.118]	[0.252]	[0.116]	[0.310]	[0.323]	[0.240]	[0.307]	[0.304]	[0.298]	[0.230]
Observations	664	664	2465	1604	794	1604	664	664	794	664	664	664	822
Number of banks	241	241	873	594	248	594	241	241	248	241	241	241	249
Adjusted R-squared	0.47	0.46	0.42	0.58	0.53	0.58	0.46	0.47	0.53	0.47	0.46	0.46	0.52
Within Group R^2:	0.67	0.67	0.63	0.74	0.68	0.74	0.67	0.67	0.68	0.67	0.67	0.67	0.67

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Size: Share of bank's assets in total system assets interacted with input prices
Foreign: Share of foreign ownership in a bank interacted with input prices

Table 7. Chile: Regression Results : SBIF Data, Fixed Effects

	1	2	3	4	5	6
Dependent Variable	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*	*TR/TA*
Labor	-0.076	0.036	-0.056	0.080*	-0.055	0.081*
	[0.083]	[0.073]	[0.055]	[0.046]	[0.056]	[0.046]
Interest	0.561***	0.481***	0.460***	0.385***	0.462***	0.384***
	[0.085]	[0.075]	[0.040]	[0.034]	[0.039]	[0.034]
Capital	0.008	0.059	0.087**	0.055	0.073*	0.042
	[0.089]	[0.084]	[0.044]	[0.039]	[0.043]	[0.039]
Other costs	0.104***	0.108***	0.144***	0.147***	0.151***	0.154***
	[0.028]	[0.027]	[0.017]	[0.016]	[0.017]	[0.016]
Equity-to Asset Ratio	0.900*	0.436	0.7	0.263	0.715	0.291
	[0.488]	[0.462]	[0.478]	[0.455]	[0.478]	[0.455]
Total Loans/Total Assets	1.296***	1.124***	1.303***	1.097***	1.314***	1.104***
	[0.268]	[0.236]	[0.263]	[0.230]	[0.265]	[0.231]
Foreign x Interest	-0.136	-0.133*				
	[0.092]	[0.080]				
Foreign x Labor	0.026	0.055				
	[0.072]	[0.065]				
Foreign x Capital	0.058	-0.046				
	[0.103]	[0.096]				
Foreign x Other costs	0.063**	0.068**				
	[0.030]	[0.029]				
AFP x Interest			-0.037	-0.055		
			[0.171]	[0.168]		
AFP x Labor			0.538*	0.575*		
			[0.324]	[0.322]		
AFP x Capital			-0.600**	-0.524**		
			[0.264]	[0.255]		
AFP x Other costs			0.198**	0.209***		
			[0.081]	[0.080]		
Interbank Deposits/Total Deposits	0.223		0.235		0.213	
	[0.302]		[0.296]		[0.298]	
Interbank Loans/Total Loans	-0.642***		-0.643***		-0.608***	
	[0.196]		[0.197]		[0.196]	
Short term loans/ Total Loans	-0.074		-0.035		-0.066	
	[0.176]		[0.173]		[0.174]	
Short termdeposits/ Total Deposits	0.306		0.351*		0.363*	
	[0.187]		[0.189]		[0.186]	
Total Deposits/ Total Funding	0.188	-0.149	0.242	-0.149	0.206	-0.158
	[0.253]	[0.140]	[0.243]	[0.134]	[0.244]	[0.135]
Constant	-1.255***	-0.346	-1.016**	0.012	-1.255***	-0.29
	[0.388]	[0.269]	[0.422]	[0.313]	[0.384]	[0.263]
Observations	391	446	391	446	391	446
Number of banks	40	40	40	40	40	40
Adjusted R-squared	0.48	0.42	0.48	0.42	0.47	0.42
H-statistic	0.58	0.68	0.63	0.67	0.63	0.66
F-Value for: H = 0.	56.39	81.74	91.2	126.33	92.16	126.95
Prob > F for H=0	0	0	0	0	0	0
F-value for : H = 1.	25.58	17.465	30.351	31.64	31.844	33.04
Prob > F for H=1	0	0	0	0	0	0

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

Table 8. Chile: Regression Results: Between Estimator, With Weighted Least Squares

	1	**2**	**3**	**4**	**5**	**6**
Dependent Variable	*nim*	*nim*	*nim*	*nim*	*nim*	*nim*
Equity-to Asset Ratio	10.647***	10.037***	10.482***	10.614***	10.475***	9.639***
	[1.299]	[1.281]	[1.274]	[1.167]	[1.144]	[1.168]
Total Loans/Total Assets	2.375***	2.405***	1.922***	2.431***	2.413***	1.590***
	[0.554]	[0.556]	[0.554]	[0.509]	[0.508]	[0.505]
Overhead/ Total Assets	0.440***	0.446***	0.387***	0.419***	0.423***	0.449***
	[0.037]	[0.038]	[0.038]	[0.034]	[0.034]	[0.035]
Liquid Funds/ Total Assets	-0.009***	-0.008**	-0.008**	-0.009***	-0.009***	-0.008**
	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]	[0.003]
Taxrate	0.048	0.063	0.054	0.065	0.069	0.11
	[0.108]	[0.108]	[0.113]	[0.105]	[0.105]	[0.112]
Non-earning Assets/ Total Assets	-0.036**	-0.040**	-0.034**	-0.035**	-0.037**	-0.046***
	[0.016]	[0.016]	[0.016]	[0.015]	[0.014]	[0.015]
Interest Revenue/ Other Operating Inc	0.014	0.005	-0.063*	-0.013	-0.012	-0.015
	[0.036]	[0.036]	[0.036]	[0.033]	[0.033]	[0.034]
HHI_ctry	0	0	0	0	0	-0.000*
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Total DMB assets/GDP	0	0	0	0	0	-0.000***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Per Capita Income	0	0	0	0	0	0
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Foreign	-0.214	-0.285	-0.617**	-0.306	-0.315	-0.600**
	[0.259]	[0.258]	[0.258]	[0.236]	[0.235]	[0.241]
Sovereign_spreads	0.003***	0.002**	0.001	0.001	0.001	0.003***
	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]	[0.001]
Interest Rate	-0.089***	-0.041*	0.085***			
	[0.030]	[0.023]	[0.017]			
Inflation	0.200***	0.205***		0.171***	0.178***	
	[0.026]	[0.026]		[0.020]	[0.017]	
GDP Growth	-0.080**			-0.013		
	[0.031]			[0.022]		
Total Deposits/ Total Funding	0.963	1.065*	0.647	0.883	0.923	0.678
	[0.631]	[0.632]	[0.626]	[0.597]	[0.593]	[0.600]
CL_DUM	1.492**	2.257***	2.014***	2.058***	2.172***	1.610**
	[0.724]	[0.661]	[0.685]	[0.663]	[0.635]	[0.671]
Constant	-1.354	-1.731*	-0.542	-1.471*	-1.501*	0.632
	[0.893]	[0.883]	[0.866]	[0.816]	[0.814]	[0.799]
Observations	3273	3273	3609	3618	3618	4009
Number of banks	790	790	797	858	858	867
Adjusted R-squared	0.47	0.46	0.43	0.47	0.47	0.42
Between Group R^2:	0.48	0.47	0.44	0.48	0.48	0.42

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

REGRESSION SPECIFICATIONS

Data were constructed using bank balance sheets and income statements obtained from Bankscope. Bankscope database purges the data of exited or merged banks, so that only the remaining banks are kept retroactively in the database. This exclusion, however, is not inconsistent with the Panzar and Rosse (1987) methodology, which assumes that the banking sector has reached its steady state after exits and mergers. The SBIF data for Chile, on the other hand, include both the banks that have exited since the beginning of the sample period and the new entrants since 2002. Comparison of the results for Chile using these alternative sources of data shed some light about the impact of these exclusions, but these findings cannot be extended to the cross-country sample.

The estimated revenue equations for each country take the following form:

$$\ln\left(\frac{TR}{TA}\right)_{i,t_i} = c_i + \beta_1 \ln\left(\frac{W}{TA}\right)_{i,t_i} + \beta_2 \ln\left(\frac{K}{TFA}\right)_{i,t_i} + \beta_3 \ln\left(\frac{OC}{TA}\right)_{i,t_i} + \eta X_{i,t_i} \quad (3)$$

$$\text{for each } i = 1, 2, \ldots N_j$$

$$\text{and for each } t_i = 1, 2, \ldots T_i$$

where N_j is the number of banks in country j, and T_i is the total observations for bank i in the sample. W is personnel costs, K is capital costs defined as total overhead minus personnel costs, OC is other operating costs, TA is total asset, and TFA is total fixed assets.[57] The unit labor costs would have been better approximated using the number of employees, rather than total assets, but the Bankscope database does not provide consistent observations for the number of bank employees. X are other control variables intended to capture the business mix differences across banks. In the estimations, these included total customer loans as a share of total assets (CLTA), total deposits as a share of total funding (TDTF) and total equity to total assets ratio (EQTA).

[57] Similar specifications have been used before, among many others, by De Brant and Davis (2000), Hempell (2002), A. Belaisch (2003) and G. Gelos and J. Roldos (2004).

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IV. PERSPECTIVES ON CHILE'S PRIVATE EXTERNAL DEBT[1]

A. Introduction

1. ***Although Chile's sovereign debt is rated investment grade by all major rating agencies, perceptions of financial vulnerability linked to high levels of private external debt have been cited as a constraint for further upgrades.***[2] At 55 percent of GDP on average in 2002–04, Chile's external debt ratio exceeds the ratios of most countries with similar debt ratings, with most of Chile's debt originating from the private sector.[3] However, the ratio of total external debt has declined sharply in recent years, from about 60 percent of GDP at end-2002 to 46½ percent at end-2004.

2. ***Over the medium term, Chile's external debt is projected to decline slightly under the scenario corresponding to the authorities' intended policies, suggesting a sustainable debt path.*** A non-increasing external debt path is considered to be a sufficient condition for a country to remain solvent and, assuming that Chile continues implementing prudent macroeconomic policies as envisaged in the baseline-scenario presented in the Staff Report, its external debt is expected to be sustainable over the medium term.[4] Moreover, there are no short-term risks to external liquidity—defined as the risk of failing to service debt if the net amount of maturing debt can not be refinanced—since the Central Bank's gross external reserves comfortably exceed short-term external debt by residual maturity. Stress tests, however, highlight the sensitivity of the external debt-to-GDP ratio, in particular of the private sector, to large exchange rate shocks.

3. ***This paper analyzes the size and structure of Chile's external debt from an international perspective and investigates whether perceptions of financial vulnerability are justified.*** Section II sets the stage by comparing Chile's external liability and asset positions with those of other economies. Section III tests whether Chile's level of economic development, openness, size, institutional quality, and other economic attributes warrant the level and structure of its external liabilities. Section IV examines the maturity, ownership,

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[1] Prepared by Oya Celasun (RES). The author has benefited from useful discussions with T. Cordella, K. Cowan, C. Echeverría, A. Faria, E. Jadresic, O. Jeanne, L. F. Jimenez, S. Lehmann, G. M. Milesi-Ferretti, and A. Rebucci. Special thanks to K. Cowan, E. Hansen, and L. O. Herrera (for sharing their data on Chilean nonfinancial corporations); P. Lane and G. M. Milesi-Ferretti (international investment positions); U. Panizza (currency denomination of internationally-issued debt securities), and M. Leos (Moody's debt ratings).

[2] Fitch upgraded Chile's sovereign long-term foreign currency rating to A in March 2005, following a similar upgrade by S&P in January 2004. Moody's has kept its rating (Baa1) unchanged since 1995. It changed its outlook from "stable" to "positive" in February 2005, but cited high levels of external private debt as a source of vulnerability.

[3] Unless noted otherwise, the term private external debt in this paper refers to the external debt of all sectors other than the general government and the monetary authorities. This definition is dictated by data availability and the need to use a consistent definition across the sample of countries covered in the analysis.

[4] Solvency requires that the net present value of non-interest current account balances be at least as large as the net present value of the country's external debt. See, Blanchard and Fischer, Chapter 2 (1989).

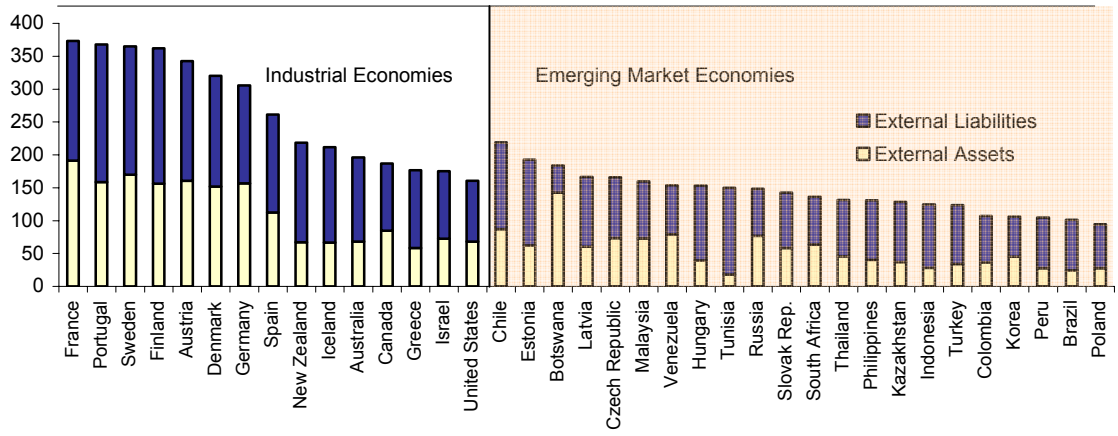
sectoral, and currency composition of the private external debt with a view to highlighting potential vulnerabilities, and Section V concludes.

4. ***The analysis suggests that the fairly high level of private external debt does not pose significant short-term risks to financial stability.*** The level of external indebtedness largely reflects the high degree of financial integration between Chile and the rest of the world. Factors that mitigate risks associated with the high level of external debt are a favorable maturity and ownership structure, a high level of foreign reserves, a small stock of external public sector debt, and the increasing availability of financial instruments to hedge against exchange rate risk. The development of markets for currency derivatives and domestic currency denominated debt will be key to further reduce the vulnerabilities associated with Chile's external liability structure in the medium term.

B. Chile's External Asset and Liability Structure from an International Perspective

5. ***The Chilean economy enjoys a high degree of international financial integration.*** Chile stands out among other emerging market economies as a country with a comparatively high level of external assets as a share of GDP (Figure 1). These external assets consist mainly of a large stock of central bank reserves, direct investments abroad by Chilean resident corporates, and portfolio investments by private pension funds. The bulk of Chile's external liabilities consists of debt and a stock of direct investment that is among the highest in the world as a percent of GDP. By contrast, the share of portfolio equity liabilities is relatively small (Figure 2).

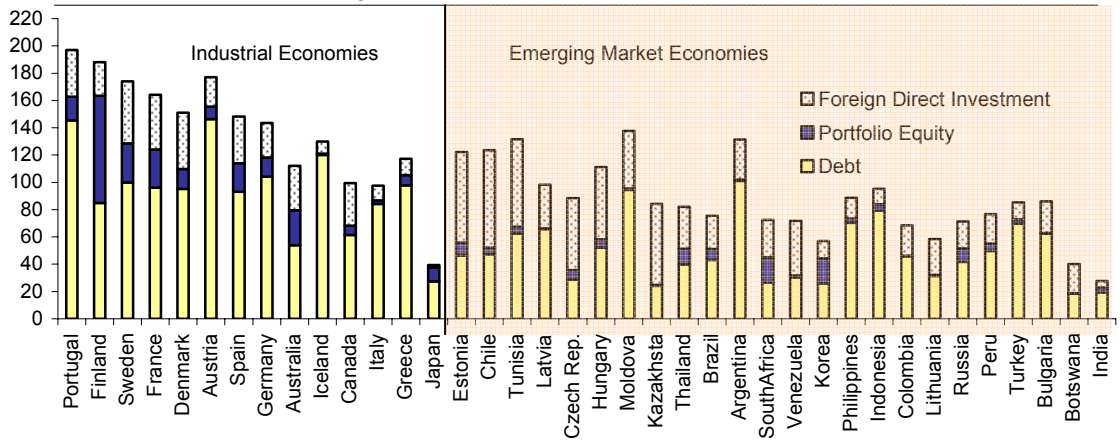
Figure 1. External Assets and Liabilities
percent of GDP, 2001-2003 average



Source: Author's calculations based on International Investment Positions, IFS, IMF.

6. ***Chile's total external debt-to-GDP ratio exceeds that of most countries with similar debt ratings, but is only about half the level in industrialized countries.*** Compared with other emerging market economies whose foreign-currency debt are similarly rated Baa by Moody's, Chile has larger than average debt and debt-service ratios (Table 1). This has been constraining improvements in Chile's debt ratings. By contrast, Chile's external debt-to-GDP ratio is close to half the average external debt-to-GDP ratio in industrialized economies.

Figure 2. Private External Liabilities
percent of GDP, 2001-2003 average



Source: Author's calculations based on International Investment Positions, IFS, IMF.

7. ***Mirroring strong fiscal policies in the past two decades, public debt accounts for a limited share of Chile's overall external debt position.*** At end-2004, the external debt of the nonfinancial public sector stood at slightly below 10 percent of GDP. This level compares favorably with public-sector external debt levels in most emerging market economies.

8. ***The Chilean private sector, on the other hand, has accumulated a large stock of external debt*** (Figure 3). Chile is similar to most emerging market economies in that a large share of private external debt is held by the non-financial corporate sector rather than by resident banks. At the same time, private Chilean residents hold higher level of external assets, in percent of GDP, than most other emerging economies. This stands in contrast to industrialized economies, where the banking sector generally holds the bulk of external debt (Figure 4). External private debt positions in most industrialized economies largely reflect the intermediation of foreign funds into external debt assets by banks and multinational corporations, translating into smaller net debt exposures. By contrast, in Chile, as in most emerging market economies, the external assets of the private sector are relatively small and, thus, net indebtedness is relatively large in relation to gross external debt (Figure 5). This explains why the external debt level tends to attract greater scrutiny than it would in a typical industrialized economy.

Figure 3. Chile: Total and Private External Debt

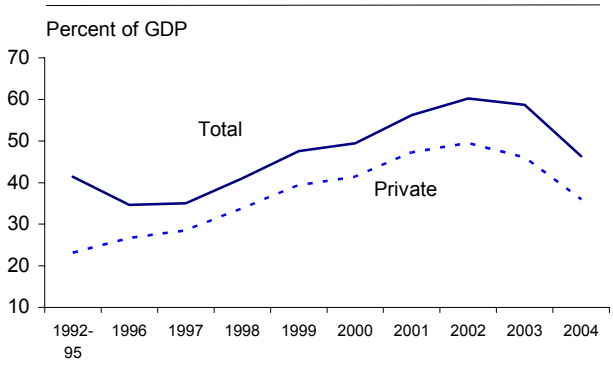


Table 1. External Debt Indicators
Comparison with Countries with Similar Debt Ratings 1/

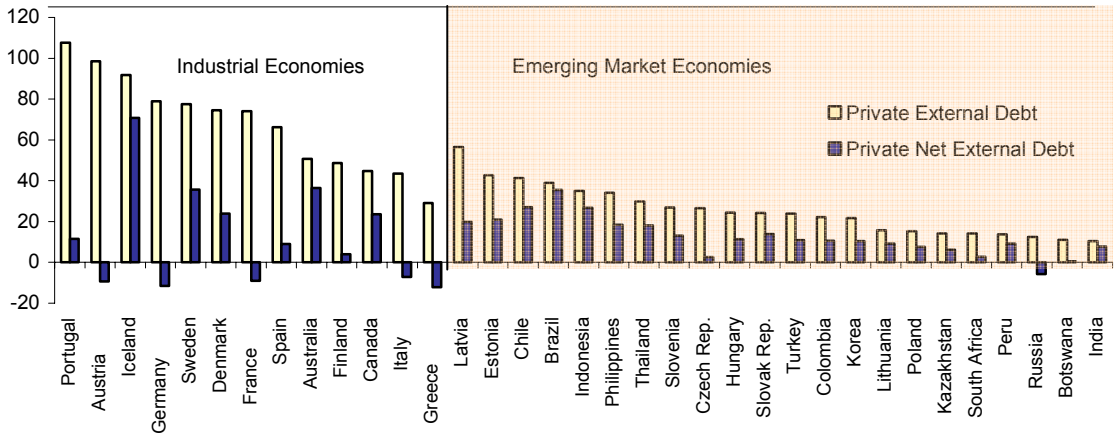
	2001	2002	2003	2004
External Debt/GDP				
Chile	56.2	60.2	58.7	46.4
Other Baa-rated Countries				
Mean	41.0	41.6	40.7	38.4
Median	42.8	46.9	36.2	30.9
External Debt/Current Account Receipts				
Chile	157.0	166.2	151.3	107.9
Other Baa-rated Countries				
Mean	89.5	93.2	88.6	78.0
Median	84.3	85.1	85.3	74.3
External Debt/International Reserves				
Chile	267.6	263.9	271.7	272.6
Other Baa-rated Countries				
Mean	336.4	315.3	287.6	246.6
Median	264.4	261.9	285.3	283.1
Debt Service Ratio 2/				
Chile	25.3	32.6	26.4	24.0
Other Baa-rated Countries				
Mean	17.8	18.6	17.1	13.4
Median	13.7	14.3	12.9	10.2

Source: Moody's Investor Service; and Fund Staff estimates.

1/ Baa-rated countries include Bahrain, Barbados, Chile, Croatia, El Salvador, India, Kazakhstan, Mauritius, Mexico, Oman, Russia, Saudi Arabia, South Africa, Thailand, Tunisia.

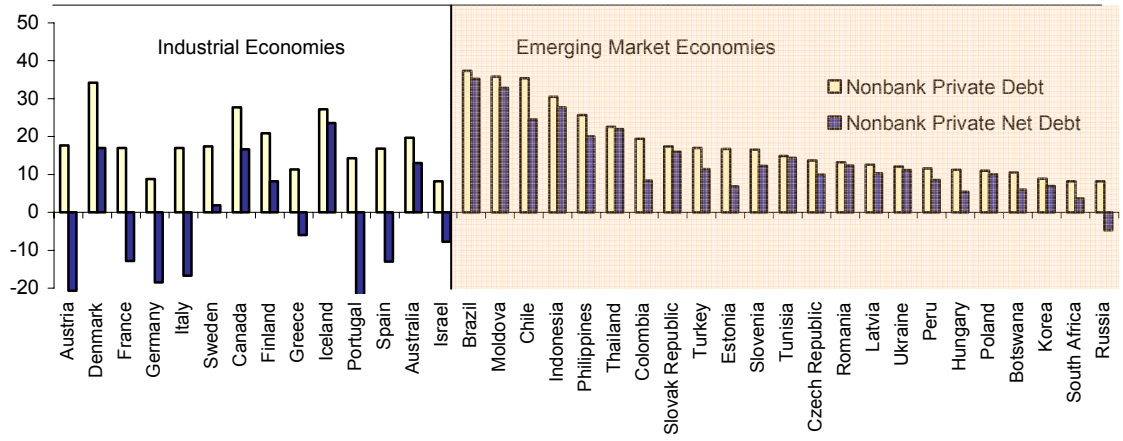
2/ The debt service ratio is defined as the ratio of principal and interest payments to current account receipts.

Figure 4. Private External Debt
percent of GDP, 2001-2003 average



Source: Author's calculations based on International Investment Positions, IFS, IMF.

Figure 5. External Debt of the Nonbank Private Sector
2001-2003, percent of GDP



Source: Author's calculations based on International Investment Positions, IFS, IMF.

C. An Empirical Investigation of the Determinants of International Investment Positions

9. ***This section presents a set of cross-country empirical regularities that characterizes international investment positions, with a focus on the private sector.*** The analysis conditions the external asset and liability positions of a group of countries on their economic and institutional characteristics. The estimation results are used to compute benchmark levels of external liabilities for Chile, as predicted by cross-country regularities, which are then compared with actual levels. This enables an assessment of whether Chile's external liabilities can be deemed to be excessive when macroeconomic and institutional factors that determine external positions are taken into account.

10. ***The analysis builds on the findings of the recent literature on the determinants of international investment positions.*** Unlike international capital flows, which reflect the adjustment of external assets and liabilities to their desired levels in response to changes in the economic environment, the stocks and composition of external assets and liabilities reflect the economic history of a country, including expectations about economic prospects. Thus, identifying the determinants of net external asset and liability positions is more challenging than identifying those of net capital flows. Nonetheless, recent efforts to collect data on International Investment Positions (IIP) in a consistent manner across countries, and increased availability of detailed IIP data from the IMF's *International Financial Statistics*, have allowed a number of empirical studies to shed light on the determinants of external capital structures across countries.[5] The analysis in this section builds on the findings of this literature by expanding the set of potential explanatory variables and examining overall and private sector positions separately.

[5] Lane and Milesi-Ferretti (2000, 2001) investigate the determinants of IIP and its subcomponents. Focusing on developing countries, Lane (2004) and Faria and Mauro (2004) study the determinants of external debt and equity liabilities.

11. ***The analysis uses comprehensive data on IIPs to study external gross and net asset positions.*** The set of examined IIP components includes the overall and private sector net external asset positions (as a background for the study of the various components of external liabilities), total and private sector gross external debt, and portfolio equity and direct investment liabilities, all measured as ratios to GDP. It also includes debt, portfolio equity, and direct investment liabilities expressed as a share of total private sector liabilities. All the dependent variables are drawn from the International Investment Positions database of *International Financial Statistics* and are averaged for the period 2001–2003 (the most recent 3-year period covered in the database). Appendix 1 provides further details on the dataset used for the analysis.[6]

12. ***The determinants of private and total external liabilities are investigated on the basis of variables previously identified by the literature, as well as additional variables considered to be relevant for the Chilean case.*** The set of explanatory variables are averages for 1996–2000. They include variables that were determined to be relevant for international investment positions by the prior literature, such as the level of economic development, size, trade openness, and institutional quality. In order to capture the presumably greater need for international risk-sharing in economies characterized by high volatility of real variables, the volatility of the terms of trade and its interaction with trade openness are also included.[7] Appendix 1 lists the rationale behind investigating each of these variables as potential determinants of external capital structures. For each dependent variable, a large number of regressions were estimated using different combinations of the regressors. The model that provided the best adjusted R-squared was used to calculate a fitted value for Chile. Table 2 presents the regression results and the fitted values for Chile within one-standard error confidence intervals.

13. ***The results suggest that Chile's total debt-to-GDP ratio is very close to what would be expected on the basis of the estimated empirical model, but its private external debt is significantly larger than expected.*** As shown in columns 3 and 4 of Table 2, the total debt-to-GDP ratio is close to the predicted level. Given that private debt is higher, this implies that the public sector's external debt is lower than what would be predicted by the model. In addition, the levels of portfolio equity and direct investment financing as ratios to GDP are well within the one-standard-error intervals around the fitted values (columns 5 and 6), as are the shares of these equity financing categories in the total external liabilities of the private sector (columns 9 and 10). This suggests that the Chilean private sector is an outlier in its external debt stock, but not necessarily in its composition, thus ruling out the notion of excessive debt reliance by the Chilean private sector at the expense of other forms of financing.

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[6] The country coverage of the sample is dictated chiefly by data availability. Both industrialized and developing countries were included in the analysis, but financial centers, where gross positions are not meaningful, were excluded.

[7] It would be expected that economies characterized by high real volatility exhibit a preference for equity rather than debt liabilities, as equity liabilities allow for more risk sharing relative to debt liabilities.

Table 2. International Investment Positions: Ordinary Least Squares Regressions

	Dependent Variables as Shares of GDP						Dependent Variables as Shares of Total or Private Sector Liabilities			
	Net Foreign Assets	Private Net Foreign Assets	Debt Liabilities	Private Debt Liabilities	Portfolio Equity Investment Liabilities	Total Equity Liabilities	Total Debt	Private Debt	Portfolio Equity	FDI
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
GDP per capita	0.002***	0.001**	0.003***	0.002***	0.000*	0.002***		0.001***	0	-0.001**
	[0.001]	[0.000]	[0.000]	[0.001]	[0.000]	[0.000]		[0.000]	[0.000]	[0.000]
GDP	4.481		-10.889***	-3.271	-5.048***	-12.432***			-2.454	-2.842
	[5.046]		[3.460]	[1.985]	[1.700]	[4.448]			[1.568]	[2.463]
Trade Openness	0.427**	-0.439***		0.674		0.361***		-0.009		0.201**
	[0.191]	[0.092]		[0.446]		[0.128]		[0.045]		[0.098]
Imports/GDP			1.501***		-0.225		0.928**		-0.473*	
			[0.557]		[0.149]		[0.392]		[0.252]	
Exports/GDP			-1.098*		0.093		-1.099***		0.112	
			[0.548]		[0.104]		[0.360]		[0.194]	
Share of Fuel Exports	0.832**									
	[0.377]									
Share of Ore and Metal Exports		-0.963***				0.808**	-0.370**			0.153
		[0.311]				[0.319]	[0.181]			[0.163]
Natural Resource Exports								-1.106***		
								[0.276]		
TOT Volatility				1.991	-0.088	0.358**	-0.225**		-0.228*	0.578***
				[1.468]	[0.068]	[0.175]	[0.093]		[0.119]	[0.155]
Regulatory Quality		-9.386**		10.723						
		[4.253]		[8.550]						
M2/GDP		-0.213			0.167***				0.327**	
		[0.130]			[0.054]				[[0.089]	
Openness*TOT Volatility				-0.04						
				[0.030]						
Constant	-91.668***	13.173	29.749***	-25.896	3.078	-5.386	73.448***	44.362***	12.35	30.05**
	[17.229]	[9.484]	[9.277]	[23.816]	[4.491]	[10.043]	[4.014]	[5.051]	[7.84]	[8.795]
Observations	78	41	63	36	26	34	41	53	25	33
Adjusted R-squared	0.31	0.39	0.42	0.61	0.49	0.47	0.27	0.34	0.5	0.58
Chile :										
Prediction	[-65.2,-49.8]	[-84.0,-58.6]	[51.2,59.9]	[14.33,33.71]	[3.96,5.57]	[57.4,85.6]	[37.8,52.3]	[32.95,38.2]	[5.7,9.0]	[57.4, 69.9]
Actual	-42.1	-66.6	55.41	41.33	5	76.4	42.1	35.2	4.2	60.6

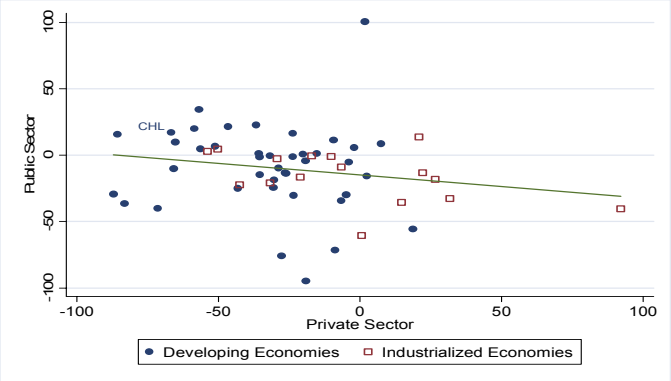
Notes: Robust standard errors in brackets. * significant at 10%; ** significant at 5%; *** significant at 1%. External Private Debt corresponds to the sum of Banks and Other Sctors' Bonds and Notes (in Portfolio Investment Liabilities) and Other Investments in the International Investment Position Statistics in the IMF's IFS. Other Investments include Bank Loans, Currency, Deposits, and Other Liabilities. The Appendix provides further detail on data sources and variable definitions

14. ***In net terms, the external positions of the Chilean economy and the private sector are also in line with the predictions based on the empirical estimates.*** Specifically, both the net foreign assets of the overall economy and of the private sector are within the confidence intervals predicted by the model. This finding lends support to the hypothesis that Chile is financially integrated with the world economy in a balanced manner—with high levels of both external assets and liabilities (Table 2, columns 1 and 2).

15. ***Empirical regularities suggest that the comparatively low level of public external debt may have provided room for the high level of private sector external debt.*** Cross-country data points to a negative empirical relationship between the net external asset positions of the private and public sectors (Figure 6), which also holds for external debt stocks. This inverse relationship suggests that the external borrowing of the private and public sectors are partly substitutable. Hence, with a relatively small public sector in Chile given the extensive privatization process in the past decades (e.g. key utilities are privately-

owned), one would expect larger borrowing needs of the private sector.[8] Further, the negative relationship may also reflect the fact that, in many countries, a large amount of external borrowing by the public sector tends to increase the country risk and crowd out borrowing by the private sector.[9] In the Chilean context, it might be argued that the small debt of the public sector has produced a positive externality for the private sector, in the form of lower interest rate spreads than those that would have prevailed under a high level of public debt.

Figure 6. Net External Assets: Private versus Public Sectors (percent of GDP)



Source: Author's calculations based on International Investment Positions, IFS, IMF.

16. ***Two central conclusions emerge from the analysis so far.*** First, the relatively large size of the Chilean private external debt stock can partly be ascribed to the fact that the external indebtedness of the public sector is unusually low for a country with Chile's characteristics. And, conditional on Chile's economic and institutional attributes, the total debt position of Chile is not excessive from a cross-country perspective.

D. The Structure and Composition of Chilean External Private Debt

17. ***This section reviews the structure of Chile's private sector external debt and the financial soundness of the corporate sector, in an attempt to highlight potential strengths and weaknesses***. In general, a given level of external indebtedness can imply different degrees of financial vulnerability depending on the maturity structure and currency composition of the debt, the overall financial health of the borrowers, and the extent to which they use natural or financial hedges against risks.

Maturity and Interest Rate Structure

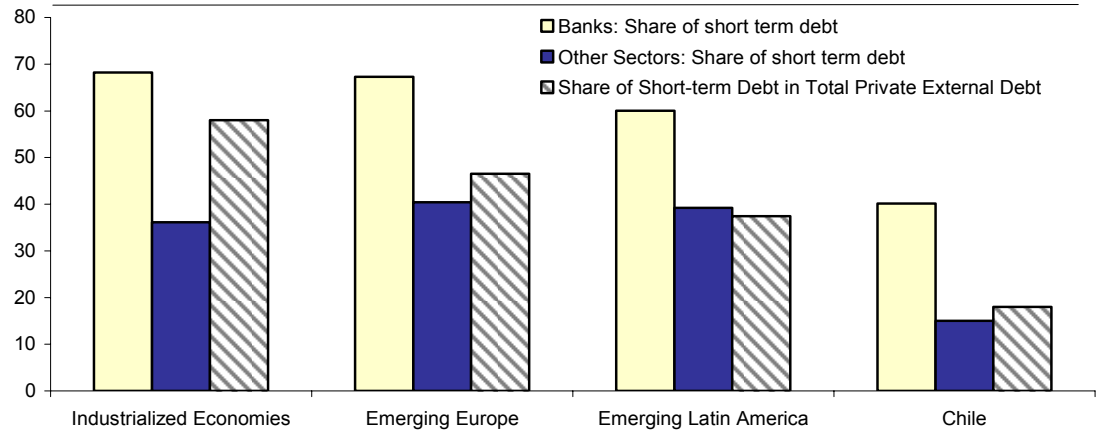
18. ***Most of Chile's private external debt liabilities have long-term maturities, but slightly less half of the debt is at floating interest rates.*** In Chile, the share of external debt with short-term maturities is significantly lower than in the average of emerging market economies (Figure 7) and the average maturity of the long-term debt stock is relatively high, at slightly above 4.5 years. About 60 percent of the short-term debt is held by the commerce and financial sectors, which naturally rely more heavily on short-term financing than other sectors of the economy. The small share of short-term debt and the relatively smooth path of

[8] It is also conceivable that one domestic institutional sector intermediates funds from abroad to the other domestic sector.

[9] Vergara (2004) notes that in Chile, the small size of the total public debt stock has allowed for favorable corporate tax rates and strong private investment rates partly financed by foreign borrowing.

projected debt service are positive indicators for rollover risks in Chile. Furthermore, the stock of gross official reserves comfortably exceeds the amount of short-term external debt by residual maturity. However, about 45 percent of the debt is at floating interest rates, implying that the cost of debt service would worsen in the event of an unfavorable external shock.[10] A study by the Central Bank of Chile estimates that the cost of debt service increases by US$200 million for every 100 b. p. increase in external borrowing rates.[11]

Figure 7. Share of Short-term Debt in Total Private External Debt (percent)



Source: Author's calculations based on International Investment Positions, IFS, IMF.

19. ***A mismatch between the currency denomination of debt and revenues can lead to financial distress if revenues are highly volatile in terms of the currency unit in which the debt is denominated.*** In recent emerging market crises, extreme cases of distress have often been associated with large foreign-currency denominated debt in the nontradable sector: large depreciations of the currency in real terms tend to magnify the cost of debt service in sectors where earnings are not naturally linked to the exchange rate. Such risks are not, however, confined to very large devaluations. A floating exchange rate and volatile terms of trade tend to make real earnings and the real exchange rate volatile, and thus expose borrowers to risks if debt, but not earnings, are denominated in foreign currencies.

20. ***In Chile, external debt is almost exclusively denominated in foreign currencies, mostly the U.S. dollar***. This structure suggests a potentially significant exposure of real debt service costs to exchange rate fluctuations. Cowan, Hansen, and Herrera (2004) provide evidence that real exchange rate depreciations led to significant declines in the investment rates of Chilean firms that had net exposures to exchange rate risk on their balance sheets. However, these authors also find that Chilean firms tended to match the currency denomination of their debt with those of their assets and income streams, in particular since

[10] Caballero (2002) notes that the cost of international borrowing is strongly negatively correlated with Chile's terms of trade and business cycle, implying that Chilean corporations' terms of access to international credit is highly procyclical.

[11] See *Informe de Estabilidad Financiera*, Banco Central de Chile, June 2005.

the shift to a floating exchange rate regime in 1999. Their results suggest that the effective foreign currency exposure is smaller than suggested by foreign-currency debt levels alone.

21. ***Close to 40 percent of the private sector external debt is naturally hedged against currency fluctuations.*** The composition of the external debt stock by economic sector in Chile indicates that 38 percent of the private sector external debt is held by firms in the agriculture, mining, and manufacturing sectors (Table 3).[12] In these sectors, earnings are either directly or indirectly denominated in foreign currencies, as prices move closely with the exchange rate. Another 25 percent of the private sector debt is held by financial institutions, where regulations have ensured careful management of exposures to currency movements. Data collected for the 2004 Chile Financial Sector Stability Assessment (FSSA) indicate that Chilean banks hedge 90–100 percent of the net foreign currency position on their balance sheets.

22. ***Borrowers in economic sectors where no natural hedges exist are increasingly using financial hedges against exchange rate risk.*** A database constructed by Cowan, Hansen, and Herrera (2004) based on corporate annual financial reports (FECUs)—which accounts for roughly one third of the external debt position of the nonfinancial corporate sector—shows that financial hedges are mostly used by corporations in the nontraded utilities, transport, storage, and communications sectors. The same database also shows that, at end-2002, 18 percent of the total U.S. dollar-denominated debt of the corporations included in the database was covered by net long positions in forward dollar contracts.[13] However, the bulk of exchange rate risk hedging was concentrated in a small number of large firms (Table 4). Apart from the naturally-hedged mining sector where most firms do not file annual reports with the Superintendency of Securities and Insurance (SVS), it is likely that financial hedging against currency risk is less pervasive among the typically smaller firms that are not included in the FECUs database. The extent to which the firms that are not covered in the FECUs database are exposed to currency risk on account of their external debt positions is an issue that merits further investigation.

[12] The transport, storage, and communications sector is usually also classified as tradable, although the extent of pass-through from the exchange rate to prices in this sector would be expected to be less than that in the agriculture, manufacturing, and mining sectors.

[13] Using annual financial reports (FECUs) filed by nonfinancial corporates with the SVS, the 2004 FSSA estimated that, excluding natural hedges, this proportion was higher, with about 42 percent of the total net foreign currency-denominated liability position hedged at end-2003.

Table 3. Chile: Gross External Debt, by Economic Sector, 2000-2004

(US$ Million)

	2000		2001		2002		2003		2004	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Agriculture, Livestock, Fishing, Forestry	815	2.2	787	2.0	716	1.8	715	1.7	700	1.6
Mining	10,790	29.0	11,012	28.6	11,042	27.3	11,434	26.5	10,091	23.1
Manufacturing	3,910	10.5	4,526	11.7	4,073	10.0	3,808	8.8	4,060	9.3
Electricity, Gas and Water	5,171	13.9	4,806	12.5	5,001	12.3	4,708	10.9	5,047	11.6
Construction	555	1.5	983	2.6	734	1.8	982	2.3	1,011	2.3
Commerce	2,762	7.4	2,547	6.6	2,658	6.6	2,632	6.1	2,891	6.6
Transport, Storage, Communications	3,479	9.4	3,766	9.8	4,012	9.9	3,778	8.8	4,429	10.1
Financial Institutions and Services	7,087	19.1	7,060	18.3	8,553	21.1	10,272	23.9	10,544	24.2
Personal, Community, Social Services	188	0.5	164	0.4	150	0.4	188	0.4	161	0.4
Total Private Sector Debt	34,757	100	35,651	100	36,939	100	38,517	100	38,934	100
Memorandum:										
General Government Debt	2,420		2,887		3,565		4,551		4,720	
Total External Debt	37,177		38,538		40,504		43,068		43,654	

Source: Central Bank of Chile

(1) Valor nominal.

(2) Excluye intereses devengados.

23. ***The presence of domestic agents with both long positions in foreign currency assets and domestic currency liabilities has fostered a fairly liquid onshore market for currency hedges.*** In the onshore market for forwards, which accounts for most of the hedging activity in Chile, pension funds and exporters provide the bulk of foreign-currency paying positions to corporate end-users. The cost of forwards is estimated to be lower than in other emerging market economies, and comparable to those in Australia and New Zealand (Chan-Lau, 2005). As in most other countries, maturities are skewed towards the short term, with seven-days to one-year maturity contracts accounting for 81 percent of the total in 2004.[14]

24. ***To more fully hedge against risks stemming from exchange rate fluctuations, external borrowers in Chile would have to increasingly enter into exchange rate risk-sharing agreements with nonresidents.*** It is estimated that in Australia and New Zealand—two natural resource based economies with high levels of private sector external indebtedness—the overall extent of hedging against exposures stemming from foreign-currency denominated external debt is higher than in Chile. Moreover, in Chile and in other emerging market economies, the amount of currency-risk sharing between residents and non-residents (through cross-border trading of derivatives) remains fairly low relative to the amounts observed in industrialized economies. Thus, to more fully hedge against exchange rate volatility, external debt holders in Chile will have to increasingly shift net exposures to currency risk to nonresidents.

[14] In Australia and New Zealand, the maturities of forward contracts appear to be shorter, with 55 and 74 percent of contracts maturing in less than seven days, respectively (Bank of International Settlements, 2004).

Table 4. Chile: US Dollar Denominated Debt Exposures in A Sample of Non-Financial Corporations, 2002

(in percent, unless noted otherwise)

		Exports/ Sales	Financial Hedges/ Debt	Financial Hedges/ Short Term Debt	Financial Hedges/ Net Debt	Total Debt (US$ Million)	Number of Firms
Agriculture, Livestock, Fishing, Forestry							
	Total	38.6	0	0	0	125	4
	Mean	26.1	0	0	0		
	Median	0.0	0	0	0		
	75th Percentile	61.9	0	0	0		
Mining							
	Total	35.2	2.7	13.5	-1.2	337	7
	Mean	32.3	0.8	6.1	-0.6		
	Median	21.3	0	0	0		
	75th Percentile	54.4	1.5	12.1	0.0		
Manufacturing							
	Total	24.3	16.6	29.1	73.2	1,410	40
	Mean	26.0	11.8	52.4	37.0		
	Median	10.5	0	0	0		
	75th Percentile	58.9	11.1	12.9	0.0		
Electricity, Gas, and Water							
	Total	0.0	4.0	27.0	5.0	4,730	17
	Mean	0.0	15.4	96.9	16.4		
	Median	0.0	0	0	0		
	75th Percentile	0.0	1.1	13.5	8.5		
Commerce							
	Total	0.5	7.2	12.5	12.7	133	7
	Mean	10.0	1.3	2.6	2.4		
	Median	0.0	0.0	0.0	0.0		
	75th Percentile	3.3	0.0	0.0	0.0		
Transport, Storage, Communications							
	Total	4.6	43.9	164.6	97.7	3,010	12
	Mean	0.0	15.1	193.7	17.5		
	Median	0.0	0.0	0.0	0.0		
	75th Percentile	4.3	5.4	5.5	5.4		
Non-Financial Corporations							
	Total	9.4	18.1	70.4	36.1	9,802	90
	Mean	15.7	10.8	66.0	24.2		
	Median	0	0	0	0		
	75th Percentile	14.3	0	0	0		

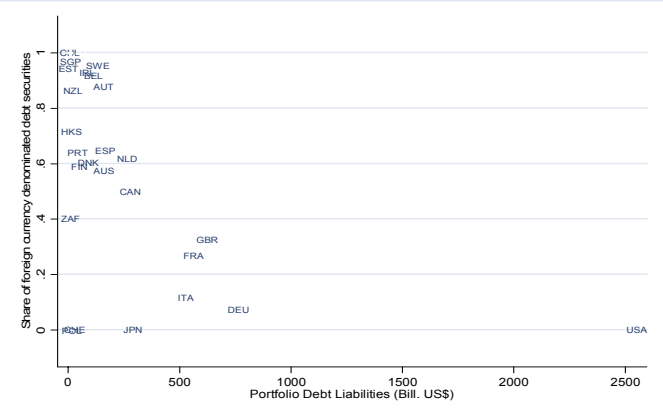
Source: Author's calculations based on a dataset provided by Cowan, Hansen, and Herrera (2004).

Note: The total stock of US dollar denominated debt covered in the sample corresponds to about one third of the external debt of the Nonbank private sector in 2002. Data on corporations in the Construction, Personal, Social and Community Services, and Other Unclassified Sectors are not shown, as they account for a very small share of US dollar denominated debt and hedging activity.

25. ***Increasing the share of debt in domestic currency would help reduce the financial vulnerability of Chilean firms operating in the non-tradable sector.*** The share of domestic currency-denominated external borrowing is almost nonexistent in most emerging market countries, and also remains low in many small industrialized open economies (Figure 8). Eichengreen, Hausmann, and Panizza (2004) report that the vast majority of international

debt securities are issued in five major currencies: the U.S. dollar, the euro, the Japanese yen, the Swiss franc, and the sterling pound.[15] A sound track record of inflation appears to be a necessary condition for the ability of countries to issue domestic currency-denominated external debt. However, the ability to issue debt in domestic currency also appears related to the relative size of the country in international debt markets. The larger the stock of outstanding debt securities issued internationally by a country, the deeper and more liquid are the markets for such securities. Nonetheless, several countries, including Australia, Canada, New Zealand, and South Africa—all natural-resource based economies like Chile, have managed to attract foreign investments in domestic currency debt, despite their relatively small size in international debt markets.

Figure 8. Share of Foreign Currency Denominated International Debt Securities (2001)



Source: Eichengreen, Hausmann, and Panizza (2004).

26. ***Some emerging market governments have recently met the challenge of successfully issuing domestic currency debt abroad.*** In recent months, some Latin American countries—including Colombia—successfully issued international bonds denominated in local currency. In addition, private entities have issued global bonds denominated in or indexed to the local currency in Mexico and Brazil. These developments are encouraging for other emerging market economies that would benefit from reducing their net exposures to exchange rate fluctuations.

Ownership

27. ***The high share of foreign ownership of external debt is a source of financial strength and stability in Chile.*** Slightly more than half of the private external debt belongs to foreign-owned companies, and about one fourth is owed to parent companies abroad.[16] The mining sector, which has attracted a large amount of foreign direct investment, accounts for a sizable share of external debt. Given Chile's favorable macroeconomic and institutional environment, a number of multinational firms—for instance in the electricity sector—have strategically invested in Chile as a hub for further investments in the region, financing their investments partly by external debt. Direct investments in other countries in the region have exposed foreign-owned corporations to occasionally volatile external earnings, but during

[15] The dataset compiled by Eichengreen, Hausmann, and Panizza (2004) covers only bonded debt issued cross-border. It thus excludes loans and locally issued bonds.

[16] Over the past ten years, the increase in the external private debt of Chile has largely resulted from the external borrowing of foreign-owned corporations. The external debt of domestically owned corporations has been fairly stable.

recent incidences of debt-distress among foreign owned corporations—some of which were driven by losses incurred in other countries in the region—foreign parent companies have been fully supportive of their Chilean subsidiaries.[17]

28. ***Incentives in the Chilean tax code contributed to the external borrowing of foreign-owned corporations in the 1990s, but these incentives were partly eliminated in 2001.*** Throughout the 1990s, Chile's corporate tax code presented incentives for foreign-owned corporations to borrow externally from parent companies, as interest payments on external debt with related companies were subject to a tax of 4 percent, whereas dividend remittances were taxed at 35 or 42 percent.[18] In 2001, in an effort to reduce the evasion of domestic taxes, the tax rate on interest payments to related companies was raised to 35 percent for companies whose debt with related companies exceeded their equity by more than 300 percent. Partly as a result, the rate of external debt accumulation by foreign-owned nonfinancial corporations has declined since 2001.

Corporate Sector Financial Soundness

29. ***Ultimately, the sustainability of Chilean external debt will depend on the financial soundness of the Chilean corporate sector.*** Despite their high level of external debt, the overall leverage of Chilean corporations is not large in comparison to those of their peers in Australia and Canada, or in comparison to those observed in emerging market economies in Asia or Latin America (Table 5). In the mining sector, which accounts for about one third of private external indebtedness and where debt has financed projects with flows of income

Table 5. Leverage Ratios in Publicly Listed Corporates by Sector, 2003 (in percent)

	Chile	Australia	Canada	South Africa	Emerging Asia	Emerging Europe	Emerging Americas
Non-Financials	69	62	87	44	73	38	96
Financials	235	261	164	146	267	169	191
Utilities	118	205	171	...	100	14	139
Non-Cyclical Services	71	76	107	26	79	65	140
Cyclical Services	83	66	96	42	72	64	76
Non-Cyclical Consumer Goods	39	60	101	45	66	22	68
Cyclical Consumer Goods	15	51	34	55	90	47	22
General Industrials	36	38	288	60	70	120	104
Basic Industries	34	47	90	61	81	26	78
Resources	42	50	45	42	94	28	73
All	107	145	113	73	102	65	109

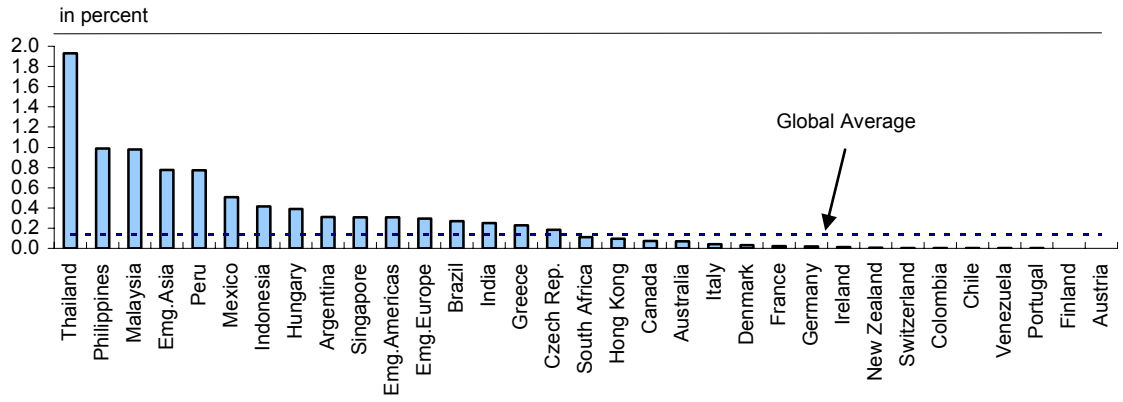
Source: Brooks and Ueda (2005).

[17] Chapter VI of Kalter, et. al. (2004) discusses the debt difficulties of Enersis and AES Gener in 2001–2002, two foreign owned corporations operating in the electricity sector. The financial difficulties faced by Enersis was due to losses incurred on foreign investments in the region, while the difficulties of AES Gener were the result of the financial problems faced by its parent company in the United States.

[18] Such gaps in the tax treatment of interest versus dividend payments to related foreign companies are smaller or nonexistent in most other mineral-exporting economies, which have similarly attracted a large presence of foreign-owned companies. See PricewaterhouseCoopers (2004).

based on proven reserves of copper or other metals, leverage appears to be lower than in most comparator countries and regions. Moreover, aggregate and sectoral Black-Scholes-Merton (BSM) default probability estimates calculated using corporate-level data for 2003-04 indicate that Chilean corporations were financially sound (Figure 9).

Figure 9. Market Cap Weighted BSM Default Probabilities, 2004



Source: Brooks and Ueda (2005).

E. Conclusions

30. ***Although Chile's private sector external debt is relatively high by emerging market standards, the more moderate level of total debt largely reflects Chile's economic attributes.*** The empirical analysis suggests that Chile's relatively high level of per capita income and trade openness, as well the relatively small size of its economy, warrant its level of external indebtedness. However, Chile is unusual in terms of the composition of external debt by institutional sector, with the private sector holding a larger amount of debt than expected from cross-country empirical analysis. The relatively small stock of public debt, which in part reflects the relatively small size of the public sector following the privatization program, appears to have provided additional room for private sector indebtedness abroad.

31. ***It would be desirable to have a larger share of Chile's external debt denominated in Chilean pesos or hedged.*** As recommended by the 2004 FSSA, the establishment of an organized exchange for derivatives trading, allowing for banks, pension funds, and insurance companies to underwrite option contracts would foster the development of the onshore currency derivative markets. If exposures to currency fluctuations are to be hedged to a larger extent, however, Chilean residents with external debt will have to increasingly enter into currency risk-sharing agreements with nonresidents. Raising the awareness of small and medium-sized firms regarding the benefits of hedging against exchange rate risk would also be desirable.

DATA SOURCES AND DETERMINANTS OF INTERNATIONAL INVESTMENT POSITIONS

1. Data Sources and Descriptions

Dependent Variables. The source for countries net foreign assets and debt liabilities is Lane, P. and G. M. Milesi-Ferretti (2005). The source for all other dependent variables is the International Investment Position reported by the IMF's *International Financial Statistics*. The dependent variables are expressed as ratios to GDP or to total private sector liabilities (the sum of FDI, portfolio equity, portfolio debt, and other investments categories), where the private sector is defined as "Banks" and "Other Sectors". The data are averages for 2001-2003. Financial centers (Switzerland, Hong Kong, U.K, Cyprus, Panama, Ireland, The Netherlands, Malta and Bahrain) are excluded from the sample).

Independent Variables. Data on the terms of trade was obtained from the *World Development Indicators* database of the World bank, and the *World Economic Outlook* database of the IMF. Data on broad money (M2) was obtained from the IMF's *International Financial Statistics*. For all the other variables see the data sources in Faria and Mauro (2004).

2. Determinants of International Investment Positions

A recent line of research has sought to identify the cross-country empirical regularities associated with external assets and liabilities (Lane and Milesi Ferretti, 2000, 2001, Lane 2004, Faria and Mauro, 2004). The empirical investigation of international investment positions (IIP) in this paper has been largely guided by the set of determinants explored in this literature. The determinants investigated in the present analysis of IIPs are listed below, with brief explanations of their relevance for the analysis.

Real GDP per capita. Countries with lower levels of economic development would be expected to obtain external finance in order to build their physical and human capital stocks and smooth consumption on the path of convergence to higher per capita income levels. In practice, however, the presence of repudiation risk and moral hazard limits the access of developing countries to external finance. This enables countries that can offer more collateral to access international capital markets more strongly—making it more likely that countries with higher per capita output to accumulate relatively higher amounts of external liabilities.

Country size measured by GDP. Larger countries tend to have more diversified productive structures, more potential to share risk domestically, and thus deeper domestic financial markets. This is likely to limit the need to accumulate external liabilities.

Trade openness and terms of trade volatility. Countries that are open to international trade are more likely to be committed to honor their external obligations, given the larger costs of trade sanctions in the event of a default on financial obligations. This might imply that more open economies have more favorable credit risks, and access external credit at better terms. Moreover, countries that are more dependent on net export revenues may prefer to hold smaller amounts of liabilities and greater amounts of assets, as a buffer stock against trade-related income volatility. The latter is likely to increase with the volatility of the terms of

trade, which is captured by an interaction term between openness and terms of trade volatility. The volatility of the terms of trade itself may result in an accumulation of external liabilities in countries with lower income levels. In a pure accounting sense, countries that have prolonged periods of trade surpluses (deficits) are more likely to have larger (smaller) net foreign asset positions. Given the possibility that imports and exports may have opposite effects on asset and liability positions, its useful to explore whether it matters to incorporate these variables separately as opposed to their sum.

Natural Resources. The ownership of natural resources—measured as the sum of fuel, ore and metal exports as a share of total exports or GDP—is likely to permit an increase in credit to a country as natural resources may serve as collateral (Lane, 2004). Also, the exploitation of natural resources require large scale capital investments, which might attract foreign investors, especially in emerging market economies. Since fuel resources are often owned and operated by public sectors to a greater extent than ore and metal mines, the analysis differentiates between these two types of natural resources in an empirical analysis of the external asset and liability positions of the private and the public sectors.

Institutional Quality. A number of studies have stressed the possibility that countries with weak institutions may attract more FDI as a share of total liabilities—since FDI might be more difficult to expropriate than other investments. Others have suggested that non-FDI investments—in particular banks' external debt—are more likely to be bailed out during crises, resulting in higher shares of FDI in countries with weak institutions (Wei, 2001). Lane (2004) reports a positive impact of institutional quality on per capita external indebtedness in developing countries in 1995-98, whereas Faria and Mauro (2004) find higher institutional quality to be associated with greater shares of FDI and equity liabilities in developing countries. Here we test the significance of an overall index of institutional quality as well as an index of regulatory quality on the IIP variables.

Depth of local financial markets. The deeper the local financial markets are, the less would be the need for the residents to obtain financing from abroad. The depth of financial markets, however, are likely to be correlated with the sophistication of financial markets, which could attract foreign investments.

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