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Estelle James
Urban Institute

Augusto Iglesias
Urban Institute

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Michigan Retirement Research Center
University of Michigan
P.O. Box 1248
Ann Arbor, MI 48104
http://www.mrrc.isr.umich.edu/
(734) 615-0422

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Abstract

Chile offers an innovative approach to disability insurance within a multi-pillar social security system. The individual's retirement savings account is used as part of his disability insurance, but if he becomes disabled the account is topped up enough to finance a defined benefit annuity that pays 70% of the reference wage. This is accomplished primarily through the private insurance market, but with government providing regulations and back-up guarantees. The private pension funds and insurance companies that participate in the assessment process have a pecuniary interest in keeping costs low, unlike most public systems that are run by agencies without a personal incentive to contain costs. The individual accounts, used for old age retirement savings, help to finance the disability and survivors' insurance as a joint product. This further keeps costs down and makes the system less sensitive to demographic shocks than a public pay-as-you-go system would be. However, pre-funding a defined benefit makes system costs much more sensitive to interest rate shifts. The defined benefit reduces risk to the worker but non-differentiated pricing creates cross-subsidies and, in a competitive market, incentives for creaming. Some of the cost reductions to the private insurance may imply a larger future public obligation, due to the minimum pension guarantee. This study examines the potential successes and pitfalls of this mixed public-private funded system of disability insurance and evaluates whether it provides a useful model for the US and other countries.

Authors' Acknowledgements

Many countries have adopted old age systems that include individual accounts—funded, privately managed defined contribution plans. The President's Commission to Strengthen Social Security recommended such a system for the US. It is difficult to figure out how to incorporate disability benefits into a social security system with a defined contribution component, since disabled people may not work long enough to accumulate large balances. The system might generate reasonable replacement rates for workers who retire after contributing throughout their lifetimes, but very low replacement rates for those who become disabled when young. Yet, if disabled people continue to receive their benefits from the traditional pay-as-you-go (PAYG) system, this will take an increasing percentage of total social security taxes in the future and might encourage workers with small accumulations to apply for disability benefits, which will raise taxpayer costs still further. Beyond these problems of integration, disability is a more subjective condition than old age, and disability programs are therefore prone to errors of over-inclusion or over-exclusion--granting disability status too generously or too stingily or to the wrong recipients. Because of the complexity of the issues, the President's Commission to Strengthen Social Security did not even attempt to tackle disability in its recommendations

Since 1987, Chile has offered an interesting public-private solution to this problem. This part of the Chilean system is much less well-known than the pension part, but it is equally innovative. Each employee in Chile is required to contribute 10% of his wage to an individual account, which accumulates and eventually finances his retirement pension. The money is invested by several pension funds (AFPs), among which workers can choose. If the individual becomes disabled before retirement his account is used to cover part of the disability insurance—which helps to keep its marginal costs low. But he is guaranteed a defined benefit, whether his account is large or small. This is accomplished through the private insurance market, but with government providing detailed regulations and back-up guarantees. The private market involvement prevents type 1 errors of over-inclusion, while the public involvement prevents type 2 errors of over-exclusion and private market failure.

Specifically: Each worker is guaranteed a lifetime benefit that is 70% of his average wage if he is totally disabled, 50% if he is partially disabled. He purchases this benefit with money in his individual account, but if this is insufficient the balance is topped up. Each AFP is required to purchase a term group insurance policy that will cover the cost of this

top-up for its affiliates. The cost of this insurance is passed along to contributing workers, as part of the administrative fee charged by AFPs. The fee is a uniform percentage of wage, regardless of age, occupation or account size. Survivors' insurance for workers is covered in the same way, by the same insurance policy. Currently the premium paid for group disability plus survivors' (D&S) insurance is about 1% of wages, with the disability portion accounting for two-thirds of the total. This compares with 1.7% of wage in the US for disability alone (covering the disabled only until age 65) and 3-5% in most other OECD countries (US Social Security Advisory Board 2001; Andrews 1999). Table 1 and figure 1 give the historical evolution of this insurance fee in Chile and compares it with the annual payouts that insured beneficiaries have received. (Later, we interpret the latter as an indicator of costs if financed on a PAYG basis).

On the public side of the ledger, the government regulates and guarantees. The minimum pension guarantee sets a floor--about 25% of the average wage in the economy--that may exceed the defined benefit for low earners, those with irregular contribution histories and the partially disabled. If the individual's own account is not large enough to cover the minimum pension, the government pays it, providing the individual meets the eligibility conditions for the guarantee. Government also guarantees 75% of the annuity over the minimum, in case the insurance company defaults. Furthermore, the government closely regulates the assessment procedure and the financing of the private insurance.

The object of this study is to examine how this mixed public-private system has worked and whether it provides a useful model for other countries to consider. We investigate the incentives and procedures it creates for controlling costs, the fee that will be needed in the long run to cover the group insurance policy (compared with the tax rate that would be needed in a pure PAYG system), the sensitivity of this rate to demographic and financial market risks, the existence of cross-subsidies and selection, and the contingent liability for the public treasury. In answering these questions we use publicly available aggregate data as well as a special data set that was put together for this project by the Association of AFPs, based on records of the Medical Commissions that certify workers as disabled. The absence of individual-level data makes econometric analysis infeasible.

Our major findings:

- The law and regulations governing disability insurance are extremely detailed and complex; this is not a simple system to implement.

- In the Chilean system AFPs and insurance companies have a strong financial incentive to contain successful claims, and are assigned a role in the assessment procedure that helps them to do so. Possibly as a result, the incidence of successful claims is much lower in Chile than in the US and other OECD countries, even when controlling for age structure and even after taking account of the dramatic rise in age-specific claims over the past decade in Chile

- The funded individual account that is set up for old age retirement covers part of the disability benefit, at no additional marginal cost. Once the account has been built up, this keeps marginal disability costs down, relative to costs in a pure PAYG system where there is no such joint supply. While the cost-saving varies with rates of interest and wage growth, our simulations indicate that, in the long run, about half the total cost of the defined benefit will be covered by the disabled workers' own accounts.

- Pre-funding also makes the system less sensitive to demographic shocks. Population aging increases the probability of disability and the cost of disability insurance, whether in a PAYG or pre-funded system. But in Chile these costs are partially offset by additional money in the accounts of the older workers.

- However, pre-funding a defined benefit makes the system very sensitive to interest rate shocks, and the recent decline in interest rates has produced large increases in group insurance and annuity premia. (In contrast, for old age pensions the benefit size varies with the interest rate).

- The use of a single insurance fee as % of wage for all members of an AFP leads to cross-subsidies among workers with different risk characteristics. In a competitive market, this may also lead AFPs to try to cream better risks. We found limited evidence of such attempts.

- This system could impose a substantial future burden on the public treasury, especially if the claims ratio and the proportion of partial and non-insured disabled continue to rise and the density of contributions remains low.

Part I describes the Chilean system in greater detail, focusing on the incentives for private AFPs to contain costs, the constraints imposed by regulations and potential future costs to the public treasury. Part II simulates the insurance fee that will cover the group disability policy under different scenarios, compares this with the tax rate that would be necessary under PAYG, and examines cross-subsidization and incentives for selection. This paper does not analyze whether the lower predicted rates of successful claims and costs are optimal, or whether Chile has substituted under-inclusion for the over-inclusion that may exist in other countries.[1]

1. How the Chilean Disability System Works—incentives to control costs

While pre-funding is the most obvious characteristic of the Chilean disability scheme, a second, more subtle, characteristic is the new incentive system. AFPs and insurance companies that provide disability insurance have a strong pecuniary incentive to keep costs down. This contrasts with public systems, where such pecuniary incentives are weaker and principal-agent problems potentially greater. The Chilean system therefore contains stronger safeguards against errors of over-inclusion. The challenge is to balance this with safeguards against over-exclusion. In this section we spell out the potential moral hazard problems and how Chile has dealt with them.

Group disability insurance and the incentives for cost control

Pension funds (AFPs) are required to provide disability and survivors insurance for their members. While these two types of pensions are financed in the same manner, this paper concentrates on disability pensions. These pensions are financed, to a large extent, by the individual's retirement savings. However, the individual is promised a defined benefit, which is 70% of his reference wage for total disability, 50% for partial disability, and 30-60% of the primary pension for various categories of survivors of disabled beneficiaries.

To turn the defined contribution into a defined benefit, the AFP must put an additional payment into the account if the worker's own accumulation is less than the necessary capital needed to finance an annuity of the specified type and amount. This additional payment is made at the point when the temporary disability is certified as permanent—3 years after the claim has been filed and temporary disability status has been

granted. During that 3-year period the AFP pays the defined benefit directly to the individual as a "provisional pension". Both pensions are expressed in UF's (Unidad de Fomento), the inflation-indexed unit of account that is commonly used for long-term transactions in Chile, so they are effectively inflation-indexed.

With the money in his account, including any additional payment, the disabled worker purchases an annuity or programmed withdrawal pension at the specified level. The annuity lasts the entire lifetime, thereby providing longevity insurance. The programmed withdrawal does not provide longevity insurance but does give the worker bequest rights over any money left in the account if he should die. If the individual's money is exhausted, the government pays the guaranteed minimum pension (MPG), providing the individual meets the eligibility conditions. In any event, most or all of the lifetime pension of the disabled individual is pre-funded at that point—partly out of his own retirement saving and partly out of the additional payment from the AFP.

The cost of this disability insurance is passed on by the AFP to all contributing workers as part of its administrative fee. This fee is charged as a uniform percentage of taxable wage; distinctions by age, gender, occupation or other individual characteristics are not allowed. The combined fee is about 2.5% of wages, with the D&S insurance share slightly less than 1% and the disability component about 2/3 of total D&S.[2]

Most important--for any given total fee that the AFP feels that it can charge, lower D&S costs mean that more is left over for the AFP's owners. Suppose the AFP starts out with a total fee of 2.5% of the worker's wage, and actual costs of 2%, half of which is the insurance cost, thereby earning a .5% profit. If it cuts the insurance cost to .75% and continues charging the same fee (because demand is viewed as inelastic), its profits increase by $((2\%-1.75\%)/.5\%)=50\%$. The AFP can accomplish this by monitoring the assessment procedure to reduce disability probabilities--which saves money for the system as a whole--or by selection--trying to attract members with lower probabilities while sending the high risks to other AFPs.

Assessment of claims—the role of private oversight

In most public systems the evaluation of the disability is made by a public body or medical experts and benefits are paid by the social security system. No party has a direct financial incentive to limit successful claims. In some countries program gatekeepers may

avoid conflicts by being generous, at the taxpayer's expense, disability benefits may be used by the government as a substitute for unemployment insurance or early retirement, and financial incentives such as bribes may lead public officers to accept questionable claims. All these practices increase costs, without a countervailing force.

In Chile, the evaluation is also made by medical experts and overseen by a public regulatory body, the Superintendencia of AFPs (SAFP), but the private pension funds (AFPs) participate in the process and have strong financial incentives to keep costs low. Their presence ensures that any doubts about the claim will be raised, just as the adversarial process in a trial ensures that both sides are presented. Therefore we would expect a lower ratio of successful claims, relative to insured population, in a Chilean-type system than in a public PAYG system—and this seems to be the case. We have no evidence on whether this process will also produce a more accurate targeting of successful claims.

Claims are evaluated and accepted or rejected by 21 Regional Medical Boards operating in 12 administrative regions plus Greater Santiago. Each Medical Board is made up of three doctors hired and paid by the SAFP but financed by the AFPs. The member may present his/her own medical tests and invite his/her personal doctor to take part in the discussions (but not the vote). The AFPs and insurance companies may also nominate a "medical observer," with the right to speak but not vote. Since 1998 this has become systematized: the AFP Association has organized a group of medical observers, who regularly attend Board meetings and monitor its work.

A positive first assessment by the Regional Medical Board entitles the individual to a provisional (temporary) disability benefit. About 60% of all claims are approved at this stage. Three years later (or sooner, if the individual reaches the normal retirement age), the member is re-assessed. This second assessment is considered permanent and, if positive, entitles the person to the additional payment that will cover his lifetime defined benefit. Currently about 75% of temporary disabled individuals are accepted as permanent three years later (Association of AFPs 2004).[3] This permanency of disability status is quite common in other countries, either on a formal or de facto basis—movement out of disability status is rare (OECD 2003).[4] If the permanent claim is rejected, the AFP must place in the worker's account the contributions he would have made during the 3 years of temporary disability, so his eventual old age pension is not reduced.

A Central Medical Board hears appeals from both sides and tries to keep uniformity across regions. The Central Medical Board is also made up of three physicians appointed and paid by the SAFP but funded by the AFPs. Some AFPs hire their own doctors to try to build strong appeals. In 2004 26% of all temporary approved claims and 18% of all permanent approved claims were appealed by AFPs, rates that have been growing over time, and one-third of these appeals were successful (Association of AFPs 2004). This reduces the rate of approved claims by 6-9% or 3-5 percentage points. A traditional public system has no place for such appeals, so costs would be 6-9% higher, ceteris paribus. The Central Board's decision is final as far as the AFP's are concerned; but members may appeal in the legal courts. The courts have reversed a small number of Board decisions.

A Technical Disability Commission sets and updates the rules for assessing the degree of disability. Representatives of the AFPs and the insurance companies, as well as three public representatives sit on this commission, with a vote. For each handicap presented by the member, the rules allot a certain percentage of disability, which are summed to produce the total degree of disability, uniformly regardless of the individual's occupation. However, the Medical Boards may increase this percentage discretionarily according to specified "complementary factors" in the case of older members with a low level of income, or when the member loses the ability to perform his or her normal job. If the degree of disability exceeds 67% the member is considered permanently and totally disabled, whether or not he has continued to work, and he is granted a 70% defined benefit. If the degree of disability is between 50-67% he is partially disabled and is entitled to a 50% defined benefit; this may leave him close to the minimum pension guarantee.[5] If degree of disability is less than 50%, he is not considered disabled. In 2004 60% of all claims were granted disability status, and ¾ of these were for total disability.

If a person is deemed disabled but does not meet the eligibility conditions for insurance described below, he is entitled to withdraw the money in his account as a life annuity or programmed withdrawal, but he does not get the additional payment that would give him a 70% replacement rate. Among all individuals declared disabled by the Medical Boards, over the period 2000-2004, 30-40% were not eligible for the defined benefit. Thus only 40% of all claims were considered both disabled and insured.[6] Our analysis focuses on those who qualify for the insurance and therefore affect its cost.

Most of the costs of the Board itself and of medical tests that may be requested by the Regional or Central Boards are borne by the AFP involved. On the one hand, this cost-shifting to AFPs may lead to excessive appeals by members and higher disability rates than would be optimal. But on the other hand, AFPs have much greater experience with the system, which may enable them to limit successful claims. Their representative sits on the Regional Medical Boards (although without a vote) and the Technical Disability Panel, giving them regular on-going inputs into these decisions. The Association of AFPs keeps track of claims, acceptances and appeals and how these ratios have been changing through time and vary across regions and AFPs. The results of this procedure:

1. Consistent with our hypothesis about the importance of private pecuniary incentives, ratios of new disability beneficiaries to insured population are far lower in Chile than in the US or other OECD countries, holding age constant. We approximate the insured population in Chile as consisting of an average of contributors and members, since all contributors plus some non-contributing affiliates are insured. For age group 45-54, 2.9 per thousand insured members were accepted to disabled status in Chile in 1999, compared with 7.8 in the US and 8.6 in OECD as a whole (Table 2). Over all ages, 1 per thousand was accepted to new insured disability status in Chile in 2004, compared with 4 to 6 per thousand insured members in the US over the past decade (US Social Security Advisory Board 1998). Of course, we do not know whether the lower disability ratios in Chile are optimal or below optimal (that is, we do not know how many "true" disability claims were disallowed).

2. Yet, claims ratios have has been rising, from .2% of contributors in 1995 to .4% in 2004, and from .1% of active members to .2% in 2004 (data provided by Association of AFPs). We decomposed this change in claims/contributor ratios into parts due to changes in age composition (AgeComp) versus changes in age-specific claims propensities (ClmProp), using the accounting identity:

Δclaims=ΔAgeComp*1995ClmProp+ ΔClmProp*1995AgeComp + ΔAgeComp*ΔClmProp

Our decomposition shows that both factors contribute to the increase in claims/contributor ratios, but changing age-specific claims propensities play the larger role (Table 4). Why this is happening remains an important question for future investigation.[7]

3. Rather than counteracting this growth in disability claims, acceptance rates have remained roughly constant over this period. As a result, the probability of becoming disabled has risen substantially over time--even when age is controlled (Figures 2 and 3). This may be due to workers learning how to use the system rules to their advantage, hence filing more and better applications, or to a reconsideration of the criteria for granting disability benefits (since numbers of beneficiaries remain low, relative to insured population, by international standards). If this trend should continue, the incidence of disability in Chile will eventually come closer to that in OECD countries.

4. The assessment procedure in Chile has been only partially successful in achieving uniform treatment across regions. Large inter-regional differences continue to exist. For example, disability rates are much higher in regions 6 and 8 than in the rest of the country, while their population age distributions are virtually identical (National Institute of Statistics). These inter-regional disparities stem in large part from differences in age-specific claims ratios. Acceptance rates are lower than average in these regions, but not enough to bring their ratios of accepted claims back to the national average (Figure 4).

5. AFPs are strategically placed to determine the disabled individual's wage history and whether or not he is eligible for insurance. Insurance costs have been dampened by an increase in the proportion of approved claims declared ineligible for insurance and by careful application of the rules for determining the reference wage (see below).

Eligibility rules, reference wage and adverse selection

In Chile, eligibility for disability status, which gives the individual early access to the money in his account, depends purely on medical grounds. But eligibility for insurance benefits and the 70% defined benefit depends on his recent work history. He must 1) be working and contributing at the time of the claim, or 2) have contributed during the last 12 months and also paid at least 6 contributions in the year immediately preceding the last registered contribution. 3) Self-employed workers must have paid at least one contribution in the calendar month before the date of the claim. These eligibility conditions are lighter than those in other countries with contributory schemes, where 3 years (Latin America) or 5 years (OECD) of contributions are commonly required for entitlement (OECD 2003, Grushka and Demarco 2003, Andrews 1999), a fact that could lead to adverse selection of workers with a high propensity for disability into the insured labor market.

Strong possibilities for such adverse selection exist in countries where the informal and self-employed sectors are large. In Chile, the density of contributions —that is, the portion of his working life that an average worker contributes—is about 60% (Berstein, Larrain and Pino 2005; Arenas, Behrman and Bravo 2004). The remainder of the time the worker is out of the labor force, self-employed or in the informal sector. A healthy worker can avoid contributing by working in the informal sector, but move to the formal sector if he anticipates filing a disability claim. This becomes more likely as subjective diagnoses for disability, such as back pain and mental illness, whose intensity and timing are difficult to establish, replace more objective diagnoses such as cardiac problems. Self-employed individuals and independent contractors are not required to contribute to the system but may voluntarily do so if they suspect they are becoming disabled. Workers who can't meet the pre-conditions for early withdrawal of their funds (50% replacement rate, gradually rising to 70% after 2004) may move back into covered employment and apply for disability benefits. If the rate of return on accounts is less than 5%, most workers will fall into this category of having an old age replacement rate less than 70% as they approach their 60's (Table 3); they will fare better if they become eligible and apply for disability.[8] Poor record-keeping in many Latin American countries in the past have exacerbated these adverse selection opportunities.

Adverse selection in the Chilean scheme may be partially mitigated by the strong incentives AFPs have to make sure the eligibility conditions are strictly observed. They also actively discourage sales agents from bringing them new clients who are likely to apply for disability benefits in the near future (see Part II). Partially as a result, in 2004 40% of all successful claims were deemed ineligible for insurance, an increase from the 30% reported 4 years earlier. As discussed below, many of those deemed ineligible for insurance will nevertheless be eligible for the government's minimum pension guarantee.

Incentives for and costs of adverse selection are further reduced by calculations of the reference wage, which may give disabled workers a very low pension. The reference wage used to determine the defined benefit is the simple average of earnings and other income during the prior ten years, expressed in UF (therefore indexed for inflation) and with a ceiling (60UF). For workers who have not been in the social security system for ten years, only their membership period is included, with a minimum of 24 months, so young

members have a lower averaging period. But older members (more likely women) who have been unemployed, in the informal sector or out of the labor force for part of the last ten years have 0's averaged in and therefore have a lower "reference wage" and "reference benefit," even if they are eligible. If disabled, an average worker with an average density of contributions of 60% would get a reference benefit that is only 60%*70%=42% (not 70%) of the wage he got when working.[9] This makes it less likely that workers with a low density of contributions will find it advantageous to get back into the system to become eligible for insurance. Widows of these average disabled beneficiaries get 60% of his reference benefit, in other words 60%*60%*70%=25% of the wage he got when working. Both, however, are protected by the government's minimum pension guarantee, so long as they meet the eligibility conditions--which may eventually impose a large burden on the public treasury.

How the contract with insurance companies affects AFP incentives to control costs

In order to ensure that they will be able to finance their disability obligations, since 1987 AFPs have been required to take out a group policy with a life insurance company that guarantees the additional payment and provisional pension.[10] This contract varies among AFPs but basically it embodies risk-sharing such that the AFP covers all costs up to a ceiling while the insurance policy covers the tail of the distribution.

The 1987 law and subsequent regulations constrain many aspects of this contracting process, to avoid collusion or insurance failure and increase competition. A public competitive bidding process must be used to choose the insurance company. The AFP must send to the AFP Supervisor a comparative analysis of the cost of each bid and any other factors that led to its final choice. The interest rate that must be used in the calculation of the additional payment is the average internal rate of return on life annuities granted in the 3 months prior to that in which permanent disability was granted. The mortality tables that must be used are out-dated and probably overstate mortality rates.[11]   Nevertheless, the insurance company must stand ready to provide a simple immediate life annuity at the 70% defined benefit level, in exchange for the money in the account, including the additional payment. The individual worker can buy the annuity from this company or some other company, if he prefers. If mortality rates are overstated, this could lead to an understatement of the necessary capital and to a loss by the company on tied disability

annuity sales.[12] (It could also lead to a larger obligation for the public treasury for the minimum pension guarantee—see below).

Although the insurance fee that is charged back to workers is required to be a uniform percentage of wages for everyone, AFPs usually give insurance companies information about the gender, age, and regional distributions of their members, family groupings, account balances and historical claims rate. AFPs are likely to get more attractive bids if these factors indicate a lower disability rate. This may lead to attempts to cream the good risks. We return to this point in Part II.

The typical contract shares the risk between the AFP and insurance company, with the insurance company making actual payments but the AFP paying most of the cost, except for extreme outcomes. It includes a provisional rate, which determines the proportion of the wage bill that is transferred to the insurance company each month. This money is used by the insurance company to make the additional payment and pay the temporary pension. If actual claims exceed this provisional rate, the AFP transfers more money to the insurance company, up to a maximum rate that sets a ceiling to the AFP's obligations. The insurance company pays for anything above the maximum. The ceiling for disability plus survivors' insurance was less than .9% of wages for most contracts until the late 1990's, but as claims ratios rose and interest rates fell the maximum rate increased, and it is now ranges between 1-1.25% of wages. (Note that the actual D&S fee charged to workers has consistently been less than the ceiling). A participation rate, generally between 90 and 100%, specifies the proportion of savings that are kept by the AFP if actual claims are lower than the maximum; the insurance company keeps the rest. The ceiling and participation rate determine the degree of risk-sharing between the two organizations. Additionally, the AFP usually pays the insurance company a monthly flat fee for management expenses and the insurance company refunds to the AFP part of the investment returns earned on the provisional premiums, before they are spent.

AFPs save money by partial self-insuring. The pools of workers in each AFP (ranging from 150,000 to 1.5 million) are large enough to enable them to bear the risk stemming from differences in individual characteristics. The AFP is well placed to keep this risk low—it monitors the assessment procedure, it handles the initial application by workers and can steer them toward other programs (such as accident insurance) when

feasible, and it can direct its marketing efforts toward low risk workers. If the main savings come from monitoring the assessment procedure, this locus of risk-bearing also minimizes costs for the system as a whole, but if it comes from steering or selection, the gain for one AFP implies a loss elsewhere in the system.

But AFPs are not well structured to fully insure, which would entail capital and reserve requirements set by the insurance regulator. Insurance companies are better able to bear the risk of extreme outcomes, which usually stem from systemic variables. For example, the successful claims rate for the system as a whole rose sharply between 1997 and 1999 and many insurance companies made losses. (When contracts were renegotiated, the maximum rate went up substantially in every case).

As another example, between January 2002 and October 2005 the interest rate used for determining the additional payment fell from 5.56% to 3.1%, a 2.5 percentage point drop. Holding the account balance constant, this raised the necessary capital by over 40% and the additional payment by much more, due to a leverage factor described below. Yet, insurance contracts in place during 2002 still governed all claims originating in 2002, including the permanent disability assessments requiring additional payments in 2005. Insurance companies can and do hedge part of this interest rate risk by investing the reserves backing these obligations in long term bonds that will rise in value if interest rates fall. Nevertheless, companies are now making much larger additional payments than they expected, pushing them above the ceilings prevailing in 2002, and we can expect maximum rates to rise further when contracts are renegotiated.[13]

Since these systemic risks are largely non-diversifiable, when losses are made in one year, they must be covered by equity capital from reserves, profits made in other years or from other insurance products. This works, in part, because disability is only a small portion of the insurance companies' portfolios (retirement annuities constitute the largest portion). The bottom line in this risk-sharing arrangement—while extreme outcomes are insured, AFPs still have a big incentive to control costs that stem from individual claims.

Responsibility of the state—the minimum pension guarantee (MPG)

When the disability pension turns out to be lower than the minimum pension guarantee (MPG), the state makes up the shortfall, providing that the disabled member has: 1) at least 10 years' contributions in the social security system, or 2) at least two years'

contributions in the last 5 years prior to the disability claim, or 3) 6 months contributions if he has joined the labor force within the last 2 years, or 4) been contributing at the date of disability, if this was caused by an accident. This contrasts with 20 years of contributions required for eligibility for the MPG for non-disabled workers. Low earners with 10-19 years of contributions (which many have) will not qualify for the MPG normally, but will qualify if they are certified as disabled—and therefore have an incentive to do so. Eligibility conditions for the MPG are also easier than eligibility for disability insurance, since workers who contributed in the past but not the present will qualify for the former but not the latter. The minimum pension is about 25% of the average wage, and this rises to 27% at age 70 and 29% at age 75.[14]

Once they meet the eligibility criterion, several sub-groups of disabled are especially likely to have an own-pension that qualifies for the MPG top-up: 1) those with low density of contributions who have a small reference wage and pension because many 0 years have been averaged in; 2) insured disabled individuals who choose programmed withdrawals and live longer than the out-dated mortality tables would predict; 3) partially disabled workers who get only a 50% defined benefit; 4) members who are granted disability status but are not eligible for disability insurance because they are not current contributors (this group constitutes 30-40% of all the disabled); and 5) surviving widows of disabled workers who were originally entitled to the MPG at the 60% level but this has been implemented at the 100% level. Note that each of these categories is due to policy choices that reduce the cost of the private insurance but may increase the cost of the public contingent liability[15]

The private pecuniary incentives that may limit the success rate of claims of insured workers may not operate to limit successful claims of non-insured workers. AFP representatives know whether a worker has been contributing at the time of his claim and is therefore likely to be insured. They have no reason to spend resources on questioning or appealing non-insured claims. The Medical Boards may have less desire to deny a claim of a non-insured worker who, it appears, will simply be getting early access to his own savings. This may be contributing to the rise over time in the proportion of non-insured disabled. However, if the worker is certified as disabled he gets much easier access to the taxpayer-financed minimum pension guarantee than the non-disabled. Moreover, by taking

his money out early he fails to accumulate as large an account and own-pension as he would by keeping it in longer; his account has fewer years in which to accumulate interest and more years for which an annuity must be financed.

Previous studies have shown that old age retirees with large accumulations tend to annuitize in order to get longevity insurance, while those with small accumulations tend to choose programmed withdrawals and rely on the MPG to provide longevity insurance (James, Martinez and Iglesias 2006). This is true of disabled pensioners as well. The average size programmed withdrawal is about half the size of the average annuity and only 25% more than the MPG (Table 5). As of 2003, 60% of all disabled workers had taken programmed withdrawal. More than half of these were drawing down their accounts at the minimum pension level. When they use up their own funds the state will take over, providing they meet the eligibility conditions. Another quarter had already exhausted their accounts and were receiving their pensions from the state. Indeed, the majority of all MPG recipients currently are disabled and survivor beneficiaries (data supplied by the SAFP).

The minimum pension guarantee has been rising at 2% annually, in real terms, since the new system started. When it rises, the increase applies to the stock of existing retirees, as well as the new flow (see James, Martinez and Iglesias 2006). This increase in MPG can add up to a particularly large amount for disability pensioners and their survivors, who may be young and live many years after retiring. When the rising MPG rises above existing annuity values, the government tops up the annuity. Based on these data, it seems likely that most disabled programmed withdrawal pensioners and their surviving spouses, and even some annuitants, will eventually receive the public subsidy.

This paper does not address the issue of how to prevent the growth of expenditures on the minimum pension guarantee and whether or not this would be desirable. It does appear that careful long run simulations of fiscal costs should be carried out, including scenarios where the incidence of disability, including partial and non-insured disability, and disability with a low reference wage, increase.

II. Costs and cross-subsidies in the Chilean system

In this section, we compare costs and cost-drivers in a pre-funded Chilean-type scheme, under alternative scenarios, with those in a public PAYG system, which the Chilean scheme replaced. An analysis of cross-subsidies and incentives for selection by AFPs also flows from this analysis.

A simple model for determining the group insurance premium

For simplicity, we focus on the cost of insuring total permanent disability, the largest component of disability costs. Broadly speaking, real insurance costs for an individual in Chile depend on the probability of becoming permanently disabled, the capital that is necessary to finance an annuity equal to the 70% defined benefit and the accumulation in the individual's account. Real insurance costs for the system depend also on the age structure of the covered population, which weights and sums the individual costs.

We calculate the fee, T, as a % of the wage bill, that must be charged to cover the group insurance that finances the lifetime pension for the inflow of newly disabled workers for the system as a whole. By law, this fee is levied as a uniform percentage of wage for all contributing workers in a given AFP. It depends on the real insurance cost associated with individuals in gender-age class i ($Insure_i$), summed over all classes, weighted by the proportion of each class in the contributing labor force (w_i) to get the total insurance cost (TotInsure), and divided by the AFP's total wage bill (equation 1).

$$T = TotInsure/Wage\ bill = \sum w_i Insure_i/Wage\ bill \quad (1)$$

The insurance cost of individual i depends on the additional payment (Add_i) and other costs that would be needed if he became newly disabled times the probability of covered disability for i's gender-age class ($Prob_i$) (equation 2).

$$Insure_i = Add_i * Prob_i \quad\quad\quad (2)$$

Add_i, in turn, depends on the necessary capital ($NecC_i$) needed to cover the defined benefit (70% of his average wage for the last ten years). Specifically, $NecC_i$ equals the defined benefit times the annuity factor (a_i), for the newly disabled worker minus the worker's own capital ($OwnC_i$)--that is, the balance in his account--that helps to cover these costs. The annuity factor tells us by how much the specified annual payout must be multiplied to get

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the expected present value of the lifetime pension stream. It depends on the interest rate decreed by regulations (r), the relevant mortality tables (M), and i's age and gender that determine his or her place within these mortality tables.[16] For simplicity, r is assumed to be the same for all workers and insurance companies, and constant over time and duration. Since survivors of disabled beneficiaries also receive benefits, the annuity factor is based on a joint pension for married men (equations 3 and 4).

$$Add_i = NecC_i - OwnC_i \qquad\qquad (3)$$

$$NecC_i = DB_i * a_i(r, M, age_i, gender_i) \qquad\qquad (4)$$

The balance in the account depends on the individual's contributions at age t ($Contrib_{it}$), compounded by the interest rate earned (r) until age of disability (N), summed over all t in which contributory work occurs. Contributions are based on wages, so contribution rate (k), initial wage rate (W_i^t) and rate of wage growth over contributing years (g) determine the total accumulation (equation 5).[17]

$$OwnC_i = \sum Contrib_{it}(1+r)^{N-t} = \sum kW_i^t(1+g)^{t-t}(1+r)^{N-t} \qquad\qquad (5)$$

In contrast, the required contribution rate in a PAYG system = annual payouts for total stock of disabled beneficiaries/covered wage bill.

The relative cost of a Chilean-type scheme therefore depends on 1) the size of the new inflow of disabled compared with the stock of existing disabled and 2) the average additional payment required to purchase a lifetime annuity for the newly disabled compared with the average annual payout to the existing disabled. In the early years of a new system, when the stock of existing beneficiaries is not much larger than the inflow of new beneficiaries and account accumulations are small, the contribution rate needed to finance PAYG payouts will be lower than that in a Chilean-type scheme. Pre-funding for lifetime pensions generally requires more money initially than PAYG for annual pensions. In long run steady state, however, PAYG contribution costs should be higher, since the stock of disabled becomes large relative to the new inflow, and the cost of the lifetime annuity is covered partially by the account accumulation and investment earnings. We will investigate this relationship between simulated PAYG and Chilean costs in a new and a mature system.

We will also investigate which variables determine relative costs. We expect that PAYG costs will be more strongly related to population aging, which increases the stock relative to the flow and also increases the probability of disability, while a Chilean-type

scheme has the offsetting advantage of greater account accumulation with age. But interest rates should be irrelevant to PAYG contribution requirements, while strongly influencing the premium needed to pre-fund the lifetime pension in Chile.

Simulations—how costs rise with age and population aging

Table 6 and Figure 5 simulate equations 3-5--the own capital, necessary capital and additional payment needed for a worker, per dollar of his wage, if he should become disabled, focusing on how these vary as the worker ages. We assume in this base simulation that the contribution rate is 10% of wages, as in Chile. The net rate of return on accumulations and discount rate for annuity are assumed to be 4.5%. The worker enters the labor force at age 20 and works steadily thereafter until retirement or disability. His wage rises 2% per year over his lifetime, from age-earnings or economy-wide growth. Expected age of death for men = 80, for women = 83, and wives are 4 years younger than husbands. Otherwise, we do not distinguish between men and women at this point.

Given these assumptions, the worker's own capital rises steadily as he ages, due to the growing accumulation in his account from contributions and investment earnings. At the same time, necessary capital per dollar of wage falls more modestly as the pension has to be paid for fewer years.[18] As a result, the worker's own capital covers an increasing proportion of the necessary capital. The additional payment required, should a worker become disabled, starts at 99% of necessary capital but falls to 3% just before age 65.

Table 7, columns 1-4, simulates equations 1 and 2 under the same set of assumptions, taking into account data on approved disability rates and insurance eligibility rates. Even though the additional payment (contingent upon disability) falls sharply with age, the probability of disability rises even faster. Thus, the real insurance cost associated with individual i rises dramatically as i ages. The real insurance cost (additional payment per unit of wage*probability of disability) is 100 times greater for a 60-year old than for a 20-year old! This also means that aggregate insurance costs will rise as the population ages.

Given the current age structure of contributors in Chile and the assumptions used for our simulations, the insurance premium will be .67% of the aggregate wage bill.[19] This allows us to calculate the actual dollar amount of the insurance fee that workers in different age-wage categories pay. Under the assumed 2% rate of wage growth, worker close to retirement age will pay more than double the amount paid by a starting worker.   But this

differential amount paid is much less than the differential in real insurance costs. As a result, younger workers are "profitable" to the system while older workers are loss-makers (Table 7, col. 4-6 and Figure 6). The cross-over point occurs in the early 40's.

Sensitivity analysis—Chile vs. PAYG

Next, we test the sensitivity of the disability insurance fee (as a % of wages) to alternative assumptions and compare with pay-as-you-go costs, defined as total payouts to the stock of disabled pensioners/total wage bill (Table 8). We also observe how much of the total cost of the disability pension is covered by money accumulated in the worker's account. In this analysis we abstract from the incentive effects described in Part I. That is, we assume that the probability of disability is the same in the two systems, in order to isolate the impact of pre-funding per se. Unless otherwise noted, we carry out this simulation mainly for a steady state in which all key parameters, including disability rates and age structure of contributors, are identical for the two systems and remain constant over time, except for the variables that we are explicitly changing. In Chile contract terms between the AFPs and insurance companies often span 2-5 years, so the adjustment to these changing variables occurs slowly, as new contracts are written. In these simulations we assume immediate re-contracting.

Base case—start-up vs. steady state. We start with the base case, in which r= 4.5% and age-wage growth = 2%. Then, in year 1 of the scheme, with only 1 year's worth of account accumulation and stock of disabled pensioners, but assuming the same probability distribution for the inflow of new beneficiaries that exists today, the fee in a Chilean-type scheme would be relatively high—1.35%--while that in a PAYG system would be very low--.08%. A Chilean system costs 17 times as much as a PAYG system in year 1 (row 1). But costs steadily fall in the Chilean scheme as account balances grow, and rise in the PAYG scheme as the stock of disabled pensioners increases, so the PAYG fee almost overtakes the Chilean fee by the end of the fourteenth year (row 2). In steady state, the insurance fee in a Chilean-type system falls to .67%, since money in the accounts—accumulated but no longer needed for old age retirement--covers half the total cost (row 3). In contrast, in the PAYG system, with no accounts or investment earnings but a large stock of pensioners, the required contribution rate to cover the identical disability payouts would be 2.73%, 4 times as large as in Chile.

Interest rate variations. The required insurance fee in the Chilean scheme almost doubles if the interest rate falls to 2% at the payout stage (row 4) and more than doubles if interest rates are also 2% during the accumulation stage (row 5). In this case, the accounts are small and cover only about one quarter of total insurance costs. But if the rate of return rises to 6% (row 6), the insurance fee is cut in half relative to the steady state base case, since the accounts have grown much larger and, further, insurance companies can count on higher investment earnings to help cover their annuity costs. This was roughly the situation in Chile during the 1990's. Over the past 3 years we have observed a 2.5% decline in interest rates, which, our simulations show, are likely to more than double the insurance fee when the full adjustment in contract terms has taken place. In contrast, the required contribution rate in a PAYG system is totally insensitive to the interest rate.

The high responsiveness of the Chilean scheme to changes in interest rates is due in part to a leverage factor built into the system—if the necessary capital rises without a corresponding increase in account balance, the additional payment bears the full brunt of the increase needed. For example, suppose the interest rate suddenly falls from 4.5% to 2%, and in the very short run this only affects the annuity discount rate. Then, the necessary capital per unit of wage for a 50-year old worker rises by $4.6 (from $11.1 to $15.7), an increase of 41%. The additional payment also rises by $4.6 (from $6.5 to $11.2)—but this is an increase of 72%, which produces a corresponding increase in insurance fee (Table 6, compare next-to-last row with base case for age 50).

In the medium term the balance in the worker's account will increase, due to rising bond prices as the interest rate falls, and this offset part of the higher additional payment. But in long run steady state, when workers are buying in at the new higher bond prices, the additional payment must rise even more, since the worker's own-accumulation falls due to the lower rate of return (Table 6, last row).[20]

Wage growth. A higher rate of age-wage growth (row 7) means larger accounts but even more so, a higher reference wage. The defined benefit to the newly disabled depends only on the last ten years of wages while the money in the accounts depends on earlier wages as well. The gap between necessary capital and own capital increases if wage growth is high, and the additional payment and insurance fee must rise to cover this gap. The

required contribution rate in a PAYG system also increases, but less than in the Chilean scheme. Thus the ratio of Chile/PAYG fees rises slightly.

Retirement contribution rate. Suppose the retirement contribution rate rises, to 15% instead of 10% (row 8)? The accounts are now much larger, so fewer workers need additional payments. As a result, the insurance fee falls dramatically, to .4%—while in a PAYG system an increase in the old age contribution rate has no impact on the cost of disability insurance. This underscores the fact that in Chile the retirement account does double duty in covering disability insurance, at no marginal cost, hence results in a large saving relative to a PAYG system.

Disability benefit rate. Suppose the disability defined benefit rate is cut to 50% of reference wage instead of 70% (row 9)? This implies a 29% cut in payouts, which would cut PAYG disability taxes by 29%. But the insurance fee in Chile falls by much more than 29% because of the leverage factor: necessary capital falls while the worker's own account is held constant. Many workers now find that their own-accounts are large enough to cover the entire benefit—hence little or no additional payments are needed. The insurance fee falls to .28%--less than half the steady state base fee. Thus, Chile's system is much more amenable to manipulation by policy variables such changes in benefit rate or retirement contribution rate than is a PAYG system. The ratio of insurance fees in Chile's system versus a PAYG system was 25% in the base case but it falls to 14-15% when old age contribution rates rise or disability benefit rates fall. (Of course, the converse is also true).

Disability probability rates. A doubling of disability probability rates has a powerful impact on insurance fees, doubling them in both systems (row 10). But, as discussed in Part I, the Chilean system may have stronger incentives and more effective procedures for controlling these rates.

Population aging. If the age distribution of the population shifts toward older age groups, insurance costs rise in both systems, because disability probabilities are greater for older workers (row 11). Thus, we can be fairly certain that the D&S insurance premium will rise substantially in the years ahead, as the population ages. But the increase will be smaller in Chile than it would be in a PAYG system, because of the offsetting effect of larger accumulations in the accounts of older workers.

Density rates. Both systems are left unchanged by an decrease in density of contributions that is evenly spread through the person's lifetime, since the wage bill, reference wage and account accumulation are cut in the same proportion. Therefore we do not show the impact of this change. But if density becomes low early in life and high later on, in the age range that is more subject to becoming disabled, this will raise the average reference wage and pension but reduce the average account balance (since it has accumulated interest for fewer years), and will lead to a relatively large additional payment and insurance cost relative to the neutral case. PAYG costs will also rise, but by a smaller amount since there is no account balance effect.

Our main conclusions from these simulations:

1. Once the steady state is reached, annual insurance fees in a Chilean-type scheme are much lower than that which would be required if the same benefits were covered on a PAYG basis. This is mainly because, in Chile, funds in the retirement accounts plus expected interest earned on the pension premiums during the payout stage cover much of the disability costs for the new inflow and pensions purchased in the past cover the benefits of the large stock, while in a PAYG system the current payroll tax would have to cover the latter cost. These factors, plus the incentives discussed in Part I, help explain why disability and survivors insurance fees in Chile and other Latin American countries that follow its approach have been less than 1% of wages, while in most OECD countries that use a PAYG approach without private participation in the assessment process, the implicit fee exceeds 3% wages (Grushka and Demarco 2003, Andrews 1999).

2. However, during the early years of the new scheme, when the accounts and the stock of disabled pensioners are relatively small, the insurance fee needed for PAYG is lower than that needed for a Chilean-type scheme, due to the up-front costs of pre-funding.

3. The underlying role played by account accumulations and pension premiums makes a Chilean-type scheme very sensitive to the interest rate, while PAYG plans are much more sensitive to the age structure of the work force. Pre-funding partially protects the Chilean disability system from the impact of population aging.

4. Finally, Chile's system is much more responsive than a PAYG system would be to changing old age contribution rates and disability benefit rates, thereby lending itself to easier policy manipulation.

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5. Our simulations are roughly consistent with changes in actual D&S insurance fees and annual payouts for D&S benefits--the latter a proxy for costs that would apply if the same benefit were paid on a PAYG basis (Table 1, Figures 1 and 7).[21] Fees in Chile were higher than PAYG costs would have been near the start of the new disability system, in 1990. But they fell rapidly during the early 1990's, due to growth in account balances in a funded system. At the same time, annual payouts for D&S benefits rose steadily as the stock of disabled beneficiaries grew relative to the new flow—illustrating the inevitable cost path as a PAYG system matures. Thus the insurance fee in Chile is now only 74% that of its PAYG equivalent. However, Chile's absolute fee has increased and its relative position has temporarily ceased to improve due to recent rapidly falling interest rates that adversely affect funded systems but do not affect PAYG systems.

6. We reran our simulations using, alternatively, the 1995 and 2004 age structures, disability probabilities and interest rates, in an attempt to determine how much of the increasing fee over time was due to aging of the contributory labor force, higher age-specific probability of disability and an estimated 1% decline in the annuity interest rate (Table 9). We found that the total simulated insurance fee rose .39% over this period. Of this amount, 15% was due to aging of the contributory labor force and another 23% to declining interest rates.[22] But the largest cause was the rising age-specific rate of successful insured claims, discussed in Part I, which accounts for 38% of the total increase.

All these results confirm that the Chilean system is relatively low cost but highly sensitive to interest rate changes, it is not immune to population aging, and, despite the incentives and procedures discussed in Part I, has not prevented the growth of successful disability claims (Figure 8).

Cross-subsidies

Private disability insurance would normally put people into highly differentiated risk categories, which are charged different prices. When this is limited by asymmetric information or by regulations, cross-subsidies arise. The Chilean requirement of a uniform insurance fee (as % of wages) in the face of differential disability probabilities is an example of a regulation that creates cross-subsidies. This raises equity questions about whether the redistribution is going in the right direction. It also raises two types of efficiency questions: 1) AFPs may seek out profitable workers and try to avoid serving

loss-makers, as discussed in the next section; and 2) If group change is feasible, workers may try to place themselves into the group that receives subsidies rather than giving them, which may raise the incidence of disability among contributors and the over-all cost of the system. One of the most likely ways to avoid paying a cross-subsidy is to evade contributions by working in the informal labor market.

The most obvious cross-subsidy is by age. We have already seen (Table 7 and Figure 6) that young workers, who have low disability probability rates, pay more than their true insurance cost, while the opposite is true for older workers. Even though younger workers have smaller accounts, their lower successful claims rate more than offsets this effect and reduces their expected insurance cost, but it doesn't reduce their fee. The dividing line between profit and loss-making workers for the disability system is between ages 40-45. From an equity viewpoint this cross-subsidy may be neutral, as we can think of a given worker redistributing to himself over his lifetime. But from an efficiency viewpoint it may distort behavior. Young workers may avoid the formal system (have a low density of contributions) because the insurance fee they will have to pay contains a large tax, while older workers try to re-enter to gain the subsidy—both of which will increase the required insurance rate and may imply an inefficient allocation of labor.

A second obvious source of cross-subsidy is gender. On average, disability rates of men are 3 to 4 times as high as those of women (Table 10 and Figure 9). Additionally, men have survivors while women usually don't (widows are automatically considered survivors while husbands are not considered survivors unless they are disabled and financially dependent on their wives). The net result is that female workers pay for D&S insurance that they likely never will use, while male workers get more than they pay for. This may discourage women from working in the formal labor market.

Third, single people cross-subsidize married people. This subsidized treatment of survivors' insurance during the working stage is quite different from the treatment during the retirement stage, when husbands pay for a joint pension by accepting a lower benefit themselves. Again, single people (who tend to be young) will have an incentive to evade the formal system.

Cross-subsidies go to workers with steep age-earning profiles, since they have small accumulations relative to their reference wage. This means that subsidies go to high

earners, who got that way by having steep age-earnings profiles. Low earners may then be induced to work informally, for at least part of their careers. Operating in the opposite direction, high earners may cross-subsidize low earners because they are less likely to become disabled. But if disabled, high earners may get better medical care and live longer, thereby costing the system more. These counteracting effects may be the reasons why a previous analysis based on limited data from 1987-89 does not find evidence of cross – subsidies across income groups (Valdes Prieto and Navarro Beltran 1992).

Finally, large persistent differences appear across regions, despite the procedures described above to unify criteria (Table 10). In Region 6 disability rates are about 40% higher than the Metropolitana region of Greater Santiago, and in Region 8 they are 75% higher than Metropolitana. All three regions have similar age distributions and interest rates, so this is not the cause of the disparity. Industry practitioners believe that these disparities are due to lax application of the criteria by the Regional Boards in the face of a heavier incidence of claims in these regions (Figure 4). The net result is a cross-subsidy to Regions 6 and 8 by the rest of the country.

Selection by AFPs

How do AFPs react to these cross-subsidies? According to our discussions with industry representatives, they use two methods to keep disability costs down: monitoring the assessment procedure—which is efficient—and selection—trying to attract and retain workers with low insurance probabilities (young single workers, women, safe occupations), while trying to avoid the others. Selection reduces costs for the given AFP, but does not reduce costs for the system as a whole—it simply shifts costs from one AFP to another. It may not be efficient, as it may make it difficult for some workers to get into the AFP of their choice for their old age retirement accounts. It may result in different fees for affiliates of different AFP's or for higher profit rates of AFPs with a low risk clientele.

AFPs cannot exclude workers who wish to affiliate, but they can put forth differential efforts to attract different kinds of workers. For example, they can and do pay their sales agents different commissions, depending on gender, age and income of the workers they bring into membership. The most aggressive AFPs claim they engage in the following practices: They don't pay any commissions on new affiliates from high-risk regions or demographic categories or on those who file for disability benefits within two

months of joining; they do pay an above-average commission for new low risk affiliates; they take account of the claims rate in a region when deciding whether to open a branch; consider closing branches in high-risk cities; warn prospective new affiliates that strict criteria will be applied in case of disability claims; have above-average appeals rates (besides the direct effect, this reputation may induce affiliates who are contemplating filing a claim to switch to another AFP); train their staff members at branch offices to send workers who inquire about disability insurance to other programs such as sickness or accident insurance, if possible; compete for skilful risk managers who will help them do all of the above.

If these strategies are effective, it would mean that high-risk workers pay a higher cost, but part of this cost takes the form of lower service and fewer choices for their retirement accounts. If some AFPs follow these strategies more effectively than others, high-risk workers may end up pooled with other high-risk workers, in AFPs with high fees or low service. AFPs collect data on disability rates by group, which will eventually enable them to refine these techniques. Since older AFPs already have a stock of members who are likely to stay with them, through inertia, the new AFPs are best positioned to use these selection methods effectively. The older AFPs also have a larger legacy of non-contributing affiliates, some of whom will apply for disability status.

In 2004 the ratio of covered accepted claims per thousand contributors varied among AFPs from 1.2 to 1.9, a 50% difference that could translate into a 50% difference in real insurance costs. The AFP that is particularly noted for these efforts has been at the bottom in terms of accepted covered claims per contributor, while the oldest and largest AFP, unable to select, has been near the top end. The former also has the highest rate of successful appeals while the latter has one of the lowest rates (Association of AFPs 2004 and Tables 11A and B). Thus cost-cutting by selection seems to go together with cost-cutting by vigorous monitoring of the approval process.

The selection problem could be completely eliminated if a single insurance company, chosen in a competitive bidding process, was given the responsibility for providing the additional payment for everyone. Workers would then all be placed in one large risk pool, rather than being divided into 6 separate risk pools, as they are today. Provision of disability insurance would then be separated from the management of

retirement saving. However, a monopoly provider might believe it could pass higher costs back to the worker in the next round of bidding, so it would have less incentive to monitor claims carefully. The reduction in positive selection by AFPs would then be accompanied by a reduction in oversight and appeals and an increase in adverse selection into insurance by workers with high disability probabilities. Interestingly, the new unemployment insurance system instituted by Chile, which also uses a combination of individual accounts and insurance, puts all workers into a single pool and auctions off the rights to handle the insurance to a single provider. The bidder that won—a consortium of AFPs.

Conclusion and Lessons for Other Countries

The Chilean system for disability insurance has two innovative features: it is pre-funded and it utilizes private pecuniary incentives to contain successful claims and costs. Pre-funding in Chile takes place in two stages: first, building the retirement accounts through the worker's career and second, using an additional payment when the person becomes disabled to enable the purchase of a life annuity or programmed withdrawal pension. This strategy costs more than PAYG initially, as pre-funding always does, but it cuts costs dramatically as the system matures. It also reduces the sensitivity of costs to population aging.

Private AFPs are given an opportunity to contain costs by having regular representation on the Regional Medical Boards that assess claims, by having the right to appeal, by sitting on the Technical Commission that sets the criteria for determining degree of disability and by keeping records that enable strict enforcement of eligibility criteria and reference wage. Their participation in the assessment procedure may be partly responsible for the fact that the inflow of new disability beneficiaries is much lower in Chile than in the US or other OECD countries, even when age structure and coverage are controlled. Both the private incentives and the pre-funding result in insurance fees that are much lower in Chile than in other countries that do not have these features—less than 1% in Chile, compared with 3-5% in most OECD countries.

Unlike its old age system, Chile provides disability insurance as a defined benefit, with uniform pricing as a % of wages for all contributors. Underpinning these arrangements

is a minimum pension guarantee, which sets a floor on disability income for workers who meet the MPG eligibility condition. Together, these features are designed to protect workers against loss of earnings due to disability, at relatively low cost. However, they also have other effects, not very evident at first, which may create problems in the future:

1) In a funded system that guarantees a defined benefit, the term group insurance premium will be very sensitive to interest rates. The total cost of the system will vary from year to year depending on interest rates in the economy, and employers and workers have to adjust to the varying contribution rate. According to our simulations, a 1% decrease in interest rates used for annuitization will increase the premium by over 20%. This contrasts with the handling of the old age pension in Chile, in which the benefit adjusts to interest rate changes while the premium is determined by the accumulation in the account.

2) Cross-subsidies that stem from uniform community pricing in the face of differential risk may pose problems in a competitive environment and in economies where the informal sector is large. AFPs may try to select good risks and avoid bad risks, making it difficult for bad risks to affiliate with the AFP of their choice. Workers with low disability and survivor probabilities and negative cross-subsidies (when young and single) may try to stay out of the formal contributory system. They may re-enter the formal system when they have higher probabilities and positive cross-subsidies (when older and married), thereby increasing total cost while diminishing insurance coverage. We already have (limited) evidence of selection by AFPs.

3) A potentially high cost of the minimum pension guarantee looms, for disabled beneficiaries whose defined benefit is relatively low--because of low earnings or contribution densities, partial rather than full disability status or ineligibility for the group disability insurance. Our data indicate that the majority of disabled individuals fall into these categories and will eventually receive some subsidy.

4) The transition cost problem faced by a system of funded retirement accounts, if financed by a diversion of existing payroll taxes, is exacerbated when disability benefits are also fully funded, since these benefits are disproportionately represented in the early stages of the new system.

We discuss each of these in turn:

The high interest rate sensitivity of insurance costs is difficult to avoid, especially in a context where a defined benefit is promised and insurance companies are changed frequently. Mandating long- term contracts between AFP and insurance company might permit partial smoothing through time, as a single maximum rate holds for the duration of the contract, while the insurance company bears the risk that actual costs will be higher. But the longer the contract duration, the higher the risk premium that insurance firms are likely to demand; and fees might jump by a large amount when the contract finally changes. It is also possible that AFPs will absorb some of the cost increases and smooth insurance fees over time, if they believe that affiliates will react to price volatility or that political criticism will be stimulated by increases in fees—the latter is likely to be the case currently. However, if AFPs hold insurance fees constant when interest rates fall, they may also hold fees constant when interest rates rise again; volatility may be reduced but the average cost is likely to reflect the average interest rate, over time.

Chile handles the selection problem by prohibiting exclusion of workers by AFPs. Anyone who wants to affiliate with an AFP must be accepted. However, selection may exist on a more subtle basis, by making it more difficult for some groups (regions, ages, socio-economic classes) to affiliate with the AFP of their choice. Then, different groups may end up paying different prices—more money or less service. This does not appear to be a huge problem in Chile, but we do see some evidence of limited selection. The selection problem could be completely eliminated if the provision of disability insurance were separated from the management of old age saving. Workers could then all be placed in one large disability risk pool, rather than being divided into 6 different risk pools. The provision of disability insurance would be handled by a single company, chosen in a competitive bidding procedure. This would eliminate selection problems but it might also eliminate some of the incentives to control costs which exist currently.

The likely long-term fiscal burden through the MPG should be carefully calculated, with sensitivity analysis. Controlling the incidence of successful claims partially controls this cost to the public treasury. But beneficiaries with uninsured claims or low benefits due to low density of contributions are likely to become recipients of public subsidy, eventually. These types of beneficiaries are unfortunately common in an economy with a large amount of informality and the consequent difficulty in enforcing steady collections.

Finally, pre-funding disability insurance through a carve-out does imply transition costs. Countries that want pre-funding with low transition costs could use an add-on.

What are the lessons for the US or other countries that have or are considering starting an individual account system? Should they adopt the Chilean scheme for disability insurance, to gain the advantages of pre-funding and private incentives to contain costs? In this discussion it is important to bear in mind that in the US and many other countries the account size under consideration is smaller than that in Chile, and a larger public benefit is likely to be retained. Precise replication of the Chilean disability scheme is not feasible or desirable under these circumstances. However, certain elements could be adapted. For example, using the money in the accounts as a partial pre-funding of the disability benefit makes a lot of sense. Granting a defined benefit to disabled workers, at least until normal retirement age, is also almost inevitable. Several alternative approaches to disability insurance are outlined below, in conjunction with an old age system that combines a modest retirement account with a downsized PAYG benefit:

1. The first alternative would use a private insurance company to pre-fund a lifetime disability benefit. Workers would be placed in one large risk pool, as they are in the US today, but this risk would be financed through the private insurance market, as in Chile. In place of the decentralized provision of disability insurance in Chile, this responsibility would periodically be auctioned off in a competitive bidding process to a single private company, with the premium paid by the social security system. This fee could be carved out from the tax that currently finances disability insurance, or it could be an add-on to the payroll tax, to avoid transition costs. The company would pay a lifetime annuity directly, or it would make the additional payment which, together with the worker's own account balance, would finance a lifetime annuity for disabled individuals. The assessment process would continue to be run by the social security system, but with participation by the insurance company. The potential selection we observed in Chile would be eliminated, while costs would be kept low by pre-funding, private monitoring of the assessment process, and the competitive bidding process. However, the insurance company might charge a high risk premium because of its limited control over the evaluation procedure and the long uncertain time period for the lifetime annuity. Moreover, if the defined benefit for

disability were high relative to the reformed old age benefit, workers would be encouraged to seek disabled status, also raising costs.

2. A variation on this theme would have the company pay the disability benefit only until the normal retirement age (say, age 67), at which point the reformed old age benefit would take over. This switch at the normal retirement age is roughly consistent with current practice in the US. In this case, the individual's money would remain in his account, collecting interest, until age 67. Indeed, as part of its obligation, the insurance company would pay into the account each year a contribution based on an imputed wage. When the individual reached age 67 the disability benefit would cease and he would receive a reformed old age benefit from the traditional system plus a pension financed by his individual account. This variation would imply less pre-funding than the previous option, a lower risk premium for the insurance company and a smaller incentive for workers to apply for disability benefits as they approach retirement age. The disabled individual might experience an abrupt change in benefit size at age 67—but then, so do workers, when they retire and shift from wage to pension income.

3. The third option would use a government agency, rather than a private company, to provide disability benefits. The agency would take the money in the accounts and provide the defined benefit directly to disabled individuals. This system would be partially pre-funded, by the money in the account, but there would be no additional up-front payment, since the rest of the benefit would be financed on a PAYG basis. Because of the smaller amount of pre-funding, short run costs would be lower and long run costs higher than in a Chilean-type scheme. Cost controls due to private participation in the assessment procedure would be absent. Costs would be much less sensitive to interest rate variations, but more sensitive to population aging, than in a funded scheme. This method is being used in Hungary and, de facto, in Mexico.[23] A variation in Sweden replaces the disability benefit with the old age benefit plus a pension from the account, at the normal retirement age (see Wiese 2006 for further discussion of Hungary and Sweden).

This paper has focused on the impact of pre-funding, private incentives and other variables on disability insurance costs in the Chilean scheme. We have no evidence on the important questions of whether more accurate evaluations are made by this procedure, or whether Chile has chosen the right trade-off between benefits and costs.

Table 1: D&S insurance fee and D&S payouts as % of wage bill

Year	D&S insurance fee/ wage bill	D&S payouts/ wage bill	D&S insurance fee/D&S payouts
1990	1.35%	0.84%	161%
1991	.98%	0.84%	117%
1992	.83%	0.79%	105%
1993	.76%	0.74%	103%
1994	.70%	0.77%	91%
1995	.58%	0.79%	74%
1996	.56%	0.72%	78%
1997	.56%	0.76%	73%
1998	.56%	0.80%	70%
1999	.67%	0.91%	74%
2000	.78%	0.99%	79%
2001	.74%	1.04%	71%
2002	.77%	1.11%	69%
2003	.95%	1.11%	86%
2004	.95%	1.29%	74%

Source: data from Primamerica, based on data from SAFP and SVS.

Col. 1 gives insurance fee, as % of wages, by year, for Chilean group disability and survivors' (D&S) insurance policy that covers additional payment, provisional benefits and other expenses. This is an approximation, based on financial statements of AFPs regarding their payments to insurance companies. An approximation is needed because AFPs are not required to give precise audited statements of the breakdown of their charges between insurance fees and administrative expenses.

Col. 2 gives total D&S pensions paid to individuals who, in the past, filed successful claims under D&S insurance. See note 21 for derivation of these numbers.

Col. 3 gives ratio between the two.

Table 2: Inflow to disability benefit status, Chile compared with US and OECD
Per 1000, 1999—new inflow

Age group	20-34	35-44	45-54	55-59	60-64
Chile	.2	.9	2.9	7.2	12.3
US	2.7	4.5	7.8	13.9	12.8
OECD	2.3	4.2	8.6	14.9	14.1

Source: OECD data from OECD (2003), p. 81

Chilean data calculated by authors from claims and assessment data supplied by Association of AFPs, contributor and member data supplied by SAFP. Only disabled who are insured are included here—in 1999 this was about 70% of those who were granted disabled status in Chile. Inflow to temporary disability status is given; inflow to permanent disability status would be about 2/3 as large, depending on age. Ratios are given as % of [(members + contributors)/2] since insured population includes some affiliates who are not currently contributing.

OECD numbers are % of insured population, which is close to working age population in these countries.

Table 3: Real rates of return needed for 70% old age replacement rate of last ten years' average wage, for worker age 60 with different number of contributing years

Years worked	r needed if contributions made at end of career	r needed if contributions made at start of career
10	23.2%	6.1%
20	11.1%	5.3%
30	7.1%	5.1%
40	5.2%	5.2%

Source: author's calculations

Assumptions: 10% contribution rate, 2% rate of real wage growth, expected age of death 80. For workers who contributed at start of their careers, last ten years' wage was many years ago and therefore relatively low given real wage growth in economy. These workers are eligible for disability insurance only if they re-enter the formal labor force as contributors.

Table 4: Claims ratios over time—change due to aging composition effects vs. age-specific claims propensity effects

Observed	1995 age composition and age-specific claims propensities	2004 age composition and age-specific claims propensities	Change, 2004-1995
Claims/contributors	.23%	.42%	.19%
Decomposition--change in claims/contributors from 1995 to 2004	**2004 age composition,** with 1995 age-specific claims propensities constant	**2004 age-specific claims propensities,** with 1995 age composition constant	**interaction term**
Claims/contributors	.3%	.32%	
Increase from observed claims/contributors, 1995	.07%	.09%	
% of total observed change	37%	49%	14%

Source: data on claims supplied to us by Association of AFPs and calculations by authors

Panel 1 presents observed ratios of aggregate claims/contributors for 1995 and 2004, and change in claims ratios between these two years.

Panel 2 decomposes observed change in aggregate claims/contributors into two parts: one part due to change in age composition of contributors, holding 1995 age-specific claims propensities constant (as weights), and the other part due to change in age-specific propensities to file claims, holding 1995 age composition constant (as weights).

Table 5: Numbers and size of disability policies in new system (stock of annuities and programmed withdrawals (PW))

	Total disability pensioners	% annuitants	Average size monthly annuity (UF)	Average size monthly PW (UF)
1988	3,294	26.4%	7.8	4.5
1989	5,181	32.7%	9.8	5.2
1990	6,785	39.6%	10.5	4.4
1991	6,942	42.8%	10.5	4.9
1992	7,196	41.7%	10.5	5.3
1993	7,301	41.7%	10.0	5.1
1994	8,295	40.7%	9.9	5.9
1995	10,409	34.3%	10.3	6.5
1996	11,931	36.4%	10.2	5.7
1997	13,413	36.8%	10.1	5.7
1998	15,875	35.9%	10.5	5.6
1999	19,069	37.9%	10.6	5.7
2000	20,281	40.6%	10.5	6.2
2001	23,388	39.6%	10.7	6.1
2002	26,809	40.7%	10.8	5.9
2003	29,826	40.4%	10.8	5.8

Source: data from Primamerica, based on data from SAFP and SVS.

Notes: About 85-90% of disability pensions are for total disability. Average size given is for pensioners on total disability. These numbers do not include disabled beneficiaries covered directly by their AFPs pre-1987 under an arrangement called "cubiertas por seguro." The system described in the text was adopted in 1987.

UF is Unidad de Fomento—the price indexed unit of account in Chile. Its exchange rate with the dollar has varied over time. In 2002 1UF=about $25 so average monthly annuity was about $270 and average monthly programmed withdrawal pension was about $150.

The MPG has been 4.46UF, rising to 4.86UF at age 70 and 5.1UF at 75.

Table 6: Simulation of necessary capital, own capital and additional payments, to worker, if disabled, selected ages, per $ of own-wage

	Necessary capital/ own wage	Own capital/ own wage	Additional payment/ own wage	Own capital/necessary capital
20	14.6	0.1	14.5	0.01
25	13.7	0.6	13.1	0.05
30	12.9	1.2	11.7	0.10
35	12.6	1.9	10.7	0.15
40	12.2	2.7	9.5	0.22
45	11.7	3.6	8.1	0.31
50	11.1	4.6	6.5	0.41
55	10.3	5.7	4.6	0.55
60	9.3	6.9	2.4	0.75
64	8.3	8.1	0.3	0.97
wtd av.	12.4	2.4	10.0	0.21
50, ann. r=2%	15.7	4.6	11.2	.29
50, all r=2%	15.7	3.1	12.6	.20

Source: simulation by author

Assumptions: workers remains in contributing employment through age 64 or until disabled, annual wage growth = 2%, rate of return on account and discount rate used for calculation of necessary capital for annuity = 4.5%, age of death = 80 for husband, 83 for wife, she is 4 years younger than he, and he must purchase a joint pension.

Numbers give $ of necessary capital, own capital and additional payment per $ of wage, contingent on individual becoming disabled.

Weighted average sums over all ages, with weights = actual age distribution of contributors in Chile.

Last two rows show how necessary capital, own capital and additional payment change for a 50-year old disabled individual when the interest rate drops to 2% at the annuity stage only and at the annuity + accumulation stage.

Table 7: Annual insurance cost, premium and cross-subsidy for permanent disability, selected ages

Age	Age distribution of contributors	Incidence of disability	Real insurance cost ($)	Insurance fee ($)	Cross-subsidy ($)	Cross-subsidy/ own wage (%)
20	.029	.0001	0.7	6.7	6.0	0.60%
25	.029	.0001	0.7	7.4	6.7	0.61%
30	.032	.0005	3.9	8.1	4.3	0.35%
35	.032	.0007	6.4	9.0	2.6	0.19%
40	.030	.0012	10.4	9.9	-0.4	-0.03%
43	.030	.0012	10.1	10.5	0.5	0.03%
45	.022	.0021	17.0	11.0	-6.1	-0.37%
50	.015	.0041	29.1	12.1	-17.0	-0.94%
55	.008	.0093	51.4	13.3	-38.1	-1.90%
60	.003	.0221	69.0	14.7	-54.3	-2.45%
64	.03	.0221	8.8	16.0	7.2	30%
Wtd av. insurance cost/wtd av. wage			**.67%**			

Source: simulations by author.

Assumptions: worker has an initial wage of $1000 yearly, annual wage growth = 2%, remains in labor force until age 64 or disabled, rate of return on account and discount rate used for calculation of necessary capital for annuity = 4.5%, age of death=80 for male worker and 83 or his wife, who is 3 years younger; he purchases a joint annuity.

Col. 1: actual age distribution of contributors in Chile, which is assumed to remain constant over time. This is used to weight average insurance cost and average wage.

Col. 2: incidence of newly accepted permanent disability claims/contributors from data supplied by Association of AFP's, Chile

Col. 3: insurance cost per worker = probability*additional payment as % of wage (from Table 6)*60% (In 2004 60% of accepted claims were eligible for insurance).

Weighted average insurance cost/weighted average wage (of $1420 annually) gives insurance fee as % of wage that must be charged to break even (.67% in this case). Weights are proportion of each age group in total set of contributors.

Col. 4: individual's insurance fee = worker's own-wage*break-even insurance fee as % of wage for the system (using .67% fee calculatedabove).

Col. 5: cross-subsidy in $ = insurance fee minus real insurance cost for individual

Col. 6: cross-subsidy as % of worker's own-wage = cross-subsidy in $/worker's own wage

Table 8: Insurance fee as % of wage under various scenarios, compared with PAYG

	Ins fee --Chile	Ins fee if no accounts	% from accounts	Disability fee if PAYG	Chile/PAYG (col. 1/col. 4)
Base case: r=4.5%, g=2%					
1. end of yr 1	1.35%	1.36%	1%	0.08%	1688%
2. yr 14	1.15%	1.36%	15%	1.12%	103%
3. steady state	0.67%	1.36%	51%	2.73%	25%
Sensitivity analysis					
4. r=2% in payout stage	1.20%	1.91%	37%	2.73%	44%
5. r=2%--accum+payout	1.47%	1.91%	23%	2.73%	54%
6. r=6%	0.32%	1.14%	72%	2.73%	12%
7. r=4.5,g=3%	0.81%	1.47%	45%	2.92%	28%
8. contribution rate => 15%	0.40%	1.36%	71%	2.73%	15%
9. benefit rate => 50%	0.28%	.97%	71%	1.95%	14%
10.disability prob'lity doubles	1.34%	2.72%	51%	5.46%	25%
11.% old increases	0.96%	2.63%	63%	4.93%	19%

Source: simulation by author

This is simulated group insurance fee as % of wages for permanent disability in Chilean-style system, compared with insurance fee as % of wages for same benefit payouts in hypothetical PAYG system. Simulations use Chilean incidence rates (new accepted permanent disability claims/total contributors) and demographic structure of contributors, which are assumed to remain constant. Contribution rate = 10% and defined benefit for disability = 70% of reference wage, with 60% of primary benefit to surviving widow of disabled worker. In 2004 only 60% of disabled workers were eligible for insurance so this reduces the probability of insured accepted claims (the remaining 40% can draw benefits from their own accounts but are not covered by insurance and do not collect the additional payment or defined benefit). Expected age of death = 80 for men, 84 for women, and wives are 3 years younger than husbands; calculations are for joint annuity purchased by husband.

In base case rate of return on accounts and annuities = 4.5%, wage growth = 2% annually.

Row 1: results for end of year 1 of new system; past service counts toward eligibility but account accumulations and stock of disabled pensioners are small as system is new.

Row 2: results for year 14 of new system.

Row 3 and subsequent rows assume steady state.

In subsequent rows, base assumptions apply except for specified variable that is changed.

Row 4: r falls to 2% during annuity stage.

Row 5: r falls to 2% during accumulation and payout stage.

Row 6: r increases to 6%.

Row 7: rate of wage growth increases to 3%.

Row 8: contribution rate is increased to 15%.

Row 9: defined benefit rate is cut to 50%.

Row 10: ratio of accepted disability claims/total contributors doubles.

Row 11: population aging: proportion of total contributors at each age under 43 is cut by 1% per year and raised by 1% per year for each age over 43, due to reduced fertility.

Col. 1: break-even insurance fee for additional payment to finance defined benefit, as % of wage.

Col. 2: insurance fee in absence of accounts (additional payment = necessary capital)

Col. 3: proportion of defined benefit financed by account ((col. 2-col. 1)/col. 2)

Col. 4: cost as % of wage if same defined benefit were financed on PAYG basis for stock of disabled; stock = sum of past inflow until age 80 for men + 7 years at 60% for surviving wife.

Col. 5: ratio of insurance fee in Chilean scheme to PAYG insurance cost.

Table 9: Causes of increased simulated disability insurance cost, 1995-2004

Total effect	1995 age structure and disability probabilities, r=5%	2004 age structure and disability prob., ann. r=4%		Total change, 2004-1995
Simulated insurance fee	.29%	.68%		.39%
Decomposition-- change in simulated insurance fee	**2004 age structure & 1995 disability probabilities, r=5%**	**2004 disability prob. & 1995 age structure, r=5%**	1995 age structure & disability prob., **ann. r=4%**	**Sum of separate effects**
Simulated insurance fee	.35%	.44%	.38%	
Increase from simulated 1995 fee	.06%	.15%	.09%	.3%
% of total simulated change	15%	38%	23%	76%

Source: simulations by authors, based on assumptions given in Table 8 except as noted below. Data on age structure of contributors and probability of permanent disability for 1995 and 2004 supplied by Association of AFPs. 60% of approved claims in 2004 and 70% in 1995 were eligible for insurance; total disability probabilities were reduced by these proportions. Assumed real interest rate for accumulation stage in both years is 5%. Assumed annuity interest rate is 5% for 1995, 4% during 2004, which roughly corresponds to average annuity rates prevailing in these years.

Table 10: Variation in permanent disability rates, insured + non-insured (as % of contributors) by year, gender and region

	Chile	Region 6	Region 8	Metropolitana	Women	Men
1995	0.08%	0.10%	0.13%	0.07%	0.02%	0.08%
1996	0.08%	0.07%	0.12%	0.06%	0.02%	0.08%
1997	0.08%	0.09%	0.12%	0.07%	0.02%	0.09%
1998	0.10%	0.09%	0.17%	0.08%	0.03%	0.10%
1999	0.11%	0.11%	0.21%	0.09%	0.03%	0.12%
2000	0.12%	0.12%	0.21%	0.10%	0.04%	0.13%
2001	0.15%	0.19%	0.26%	0.12%	0.04%	0.16%
2002	0.18%	0.22%	0.29%	0.15%	0.05%	0.18%
2003	0.17%	0.24%	0.30%	0.14%	0.05%	0.17%
2004	0.17%	0.21%	0.26%	0.15%	0.05%	0.14%

Source: data provided to authors by Association of AFP's

Table 11A: Variation by AFPs—claims, approvals and insured, 2004

AFP	Claims/ affiliates (per 000)	Claims/ contributors (per 000)	Approval rate (%)	Insured among approved (%)	Approved insured/ contributors (per 000)
Cuprum	1.71	2.61	65	73	1.24
Habitat	2.05	4.0	61	60	1.45
Provida	2.29	4.94	56	59	1.64
SantaMaria	1.52	3.65	62	62	1.41
Planvital	1.92	5.48	62	55	1.88
Summabans.	1.78	3.27	65	62	1.33
Total	2.02	4.21	59	60	1.51

Table 11B: Variation by AFPs—successful appeals, 2004*

	First (temporary) assessment			Second (permanent) assessment		
AFP	Appeals rate(%)	Success rate(%)	Overturned rate (%)	Appeals rate(%)	Success rate(%)	Overturned rate (%)
Cuprum	28.9	38.6	11.2	22.5	30.3	6.8
Habitat	25.8	34.5	8.8	15.5	27.9	4.3
Provida	25.8	35.9	9.3	16.9	24.4	4.1
Santa Maria	26.0	39.1	10.2	18.0	19.1	3.4
Planvital	26.0	38.8	10.1	19.7	28.0	5.5
Summabans.	30.1	29.9	9.0	21.7	26.2	5.7
Total	26.4	35.8	9.5	17.9	25.5	4.6

Source: calculations by authors based on data from Association of AFPs 2004.

Appeals rate is number of appeals by AFPs as % of approved covered claims.

Success rate is successful appeals by AFPs as % of all appeals

Overturned rate is successful appeals by AFPs as % of approved covered claims.

Figure 1: D&S insurance fee and payouts as % of total wage bill*
(based on Table 1)

D&S insurance fee and D&S payouts as % of wage bill
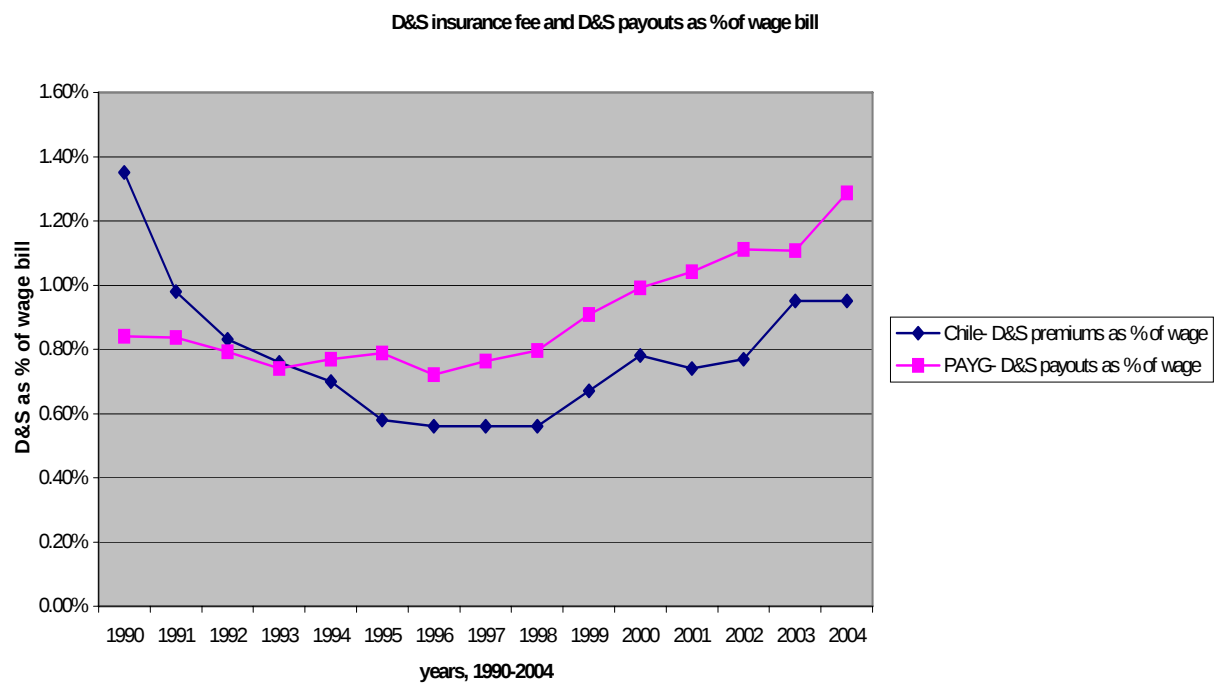
Figure 2: Rising disability claims and accepted claims over time

**Claims, temporary and permanent disability as % of contributors, over time**
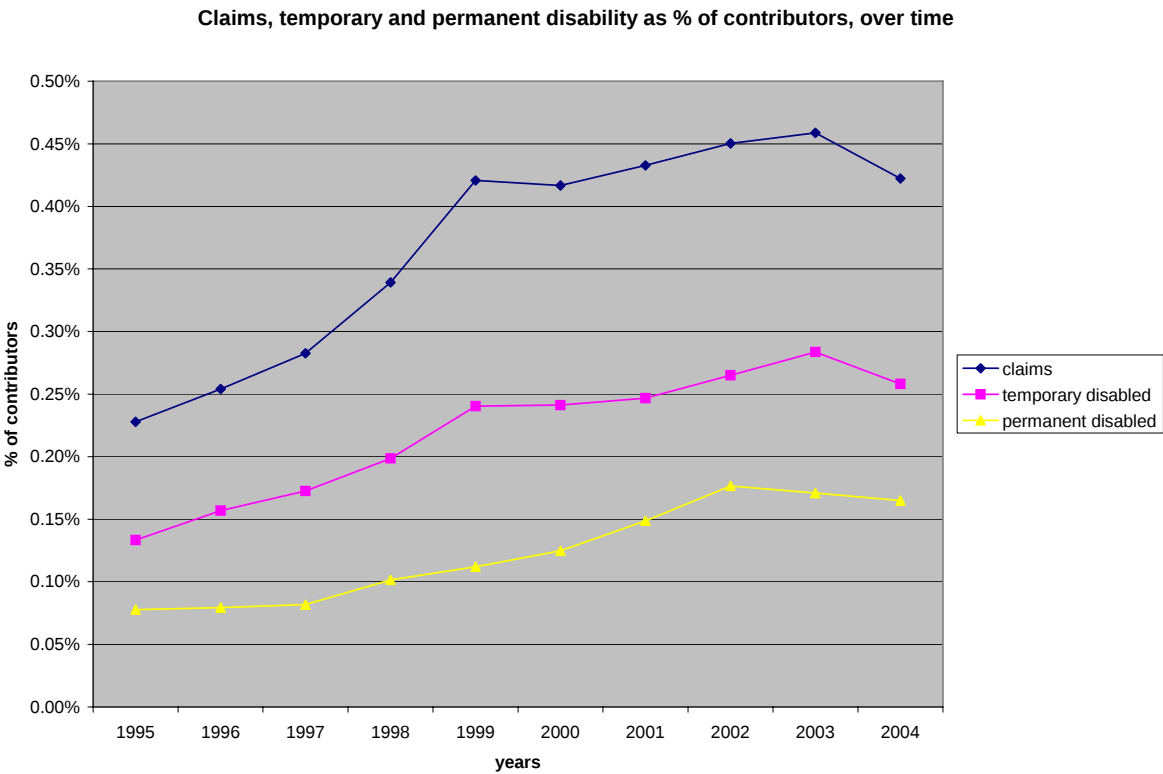
Figure 3: Disability acceptance rates over time

accepted disability rates, over time
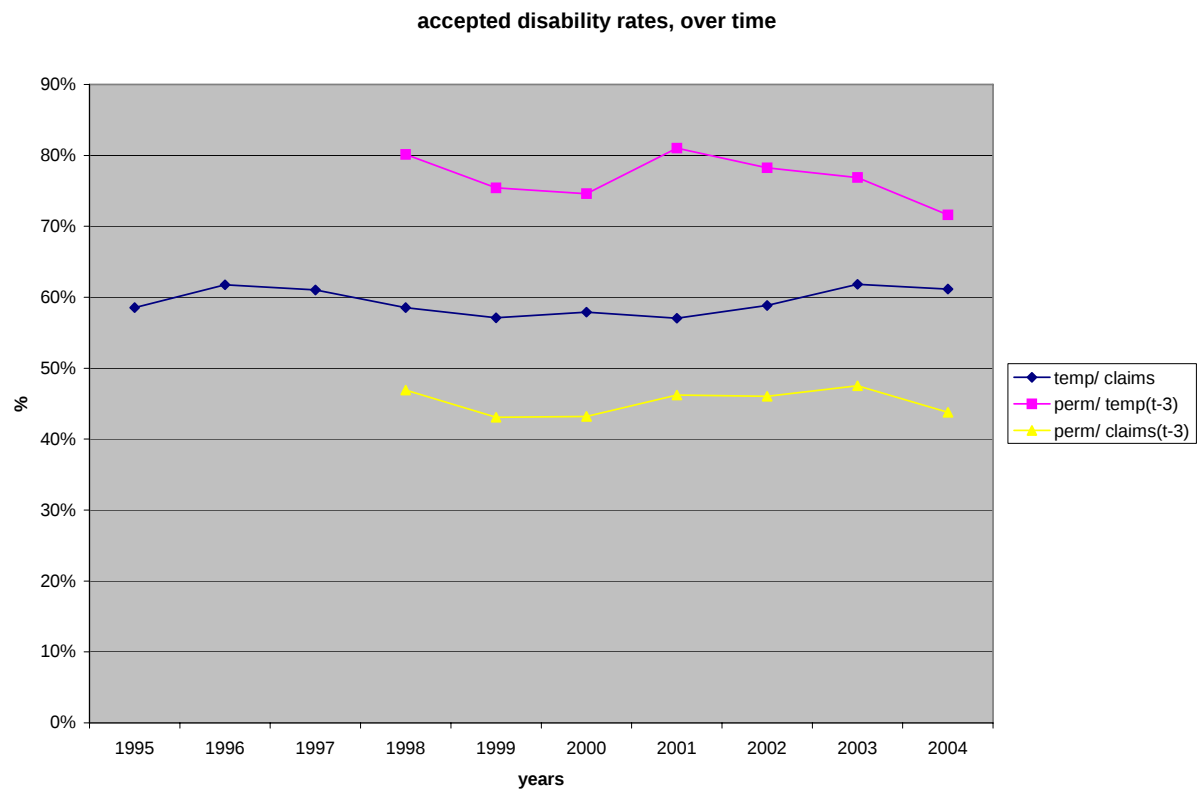
Figure 4: Claims/contributors and accepted claims/contributors, ratios of Regions 6 and 8/all-Chile

claims/contributors and temporary acceptances/contributors, ratios of regions 6 and 8 to all-Chile
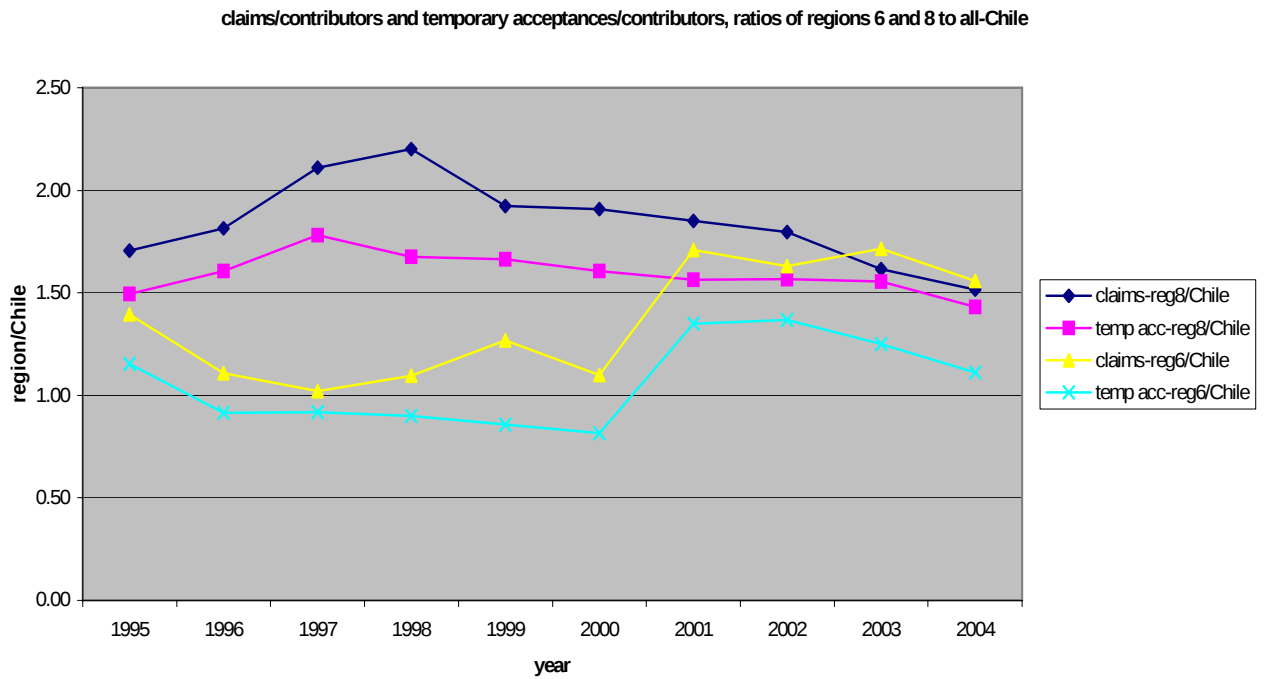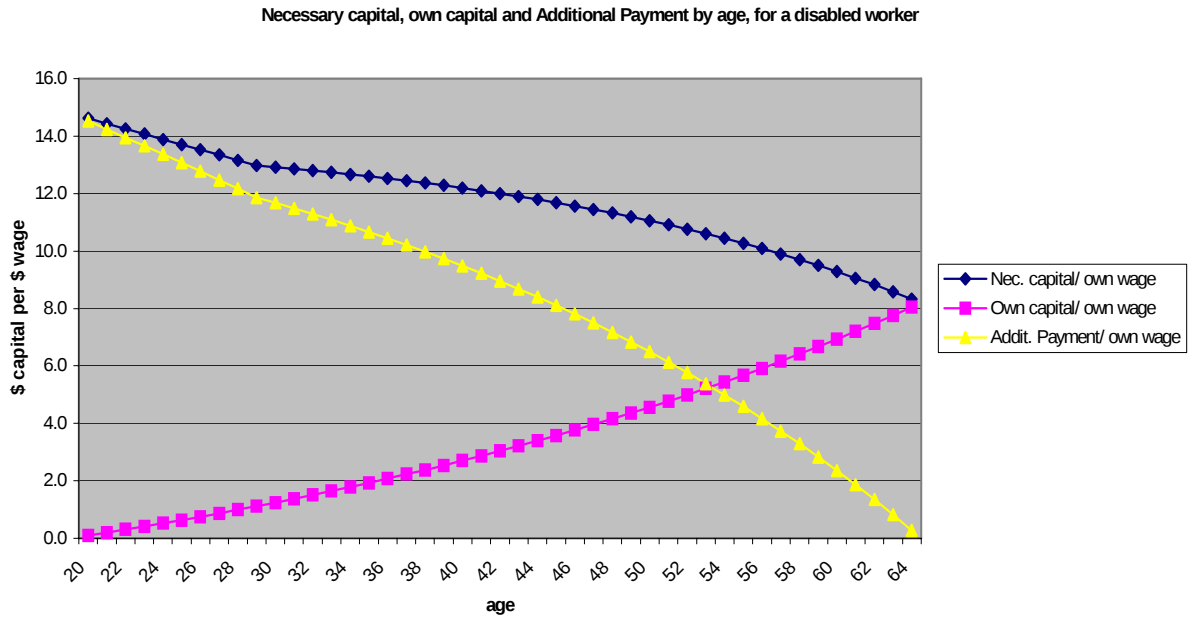
Figure 5: Simulated necessary capital, own capital and additional payment per $ of wage for disabled worker, by age

Necessary capital, own capital and Additional Payment by age, for a disabled worker

For assumptions see tables and text

Figure 6: Insurance fee, cost and cross-subsidy, by age

Insurance fee, cost and cross-subsidy, by age
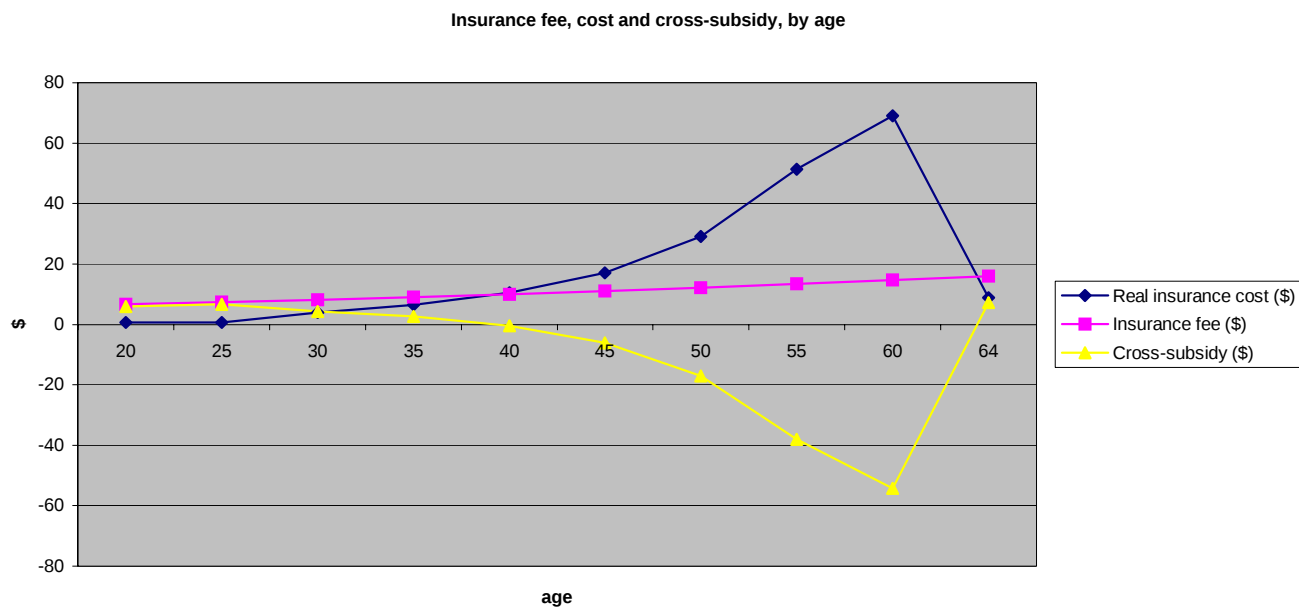
**Figure 7: Annual D&S costs: ratio of Chilean/PAYG approach** (based on Table 1)

group insurance fee/ total D&S payouts
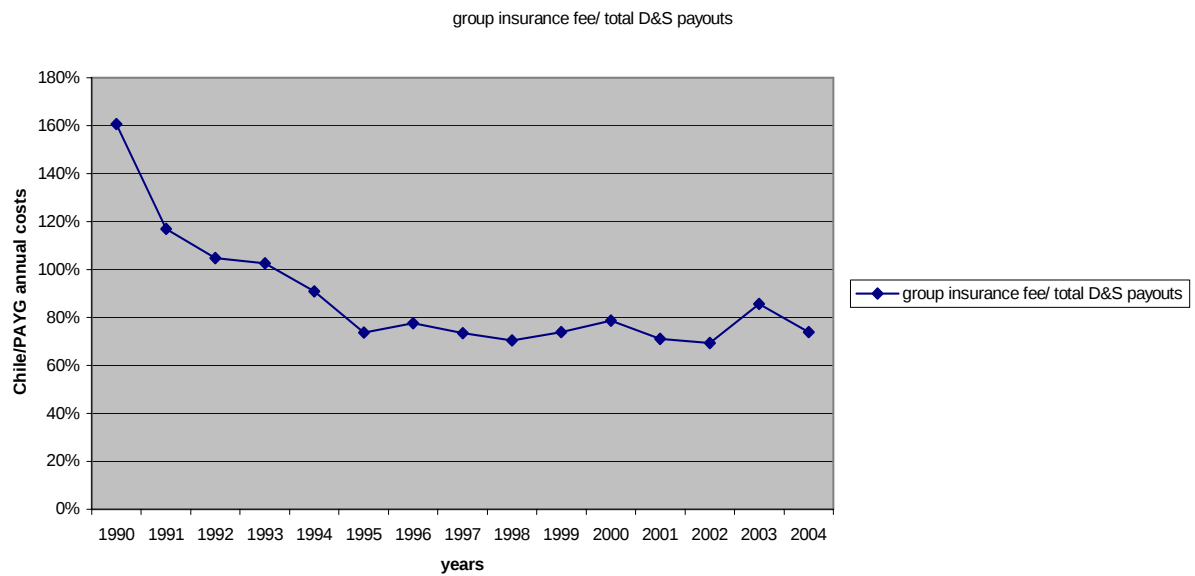
Figure 8: Growth in age-specific permanent disability rates

new permanent disability/contributors by age&year
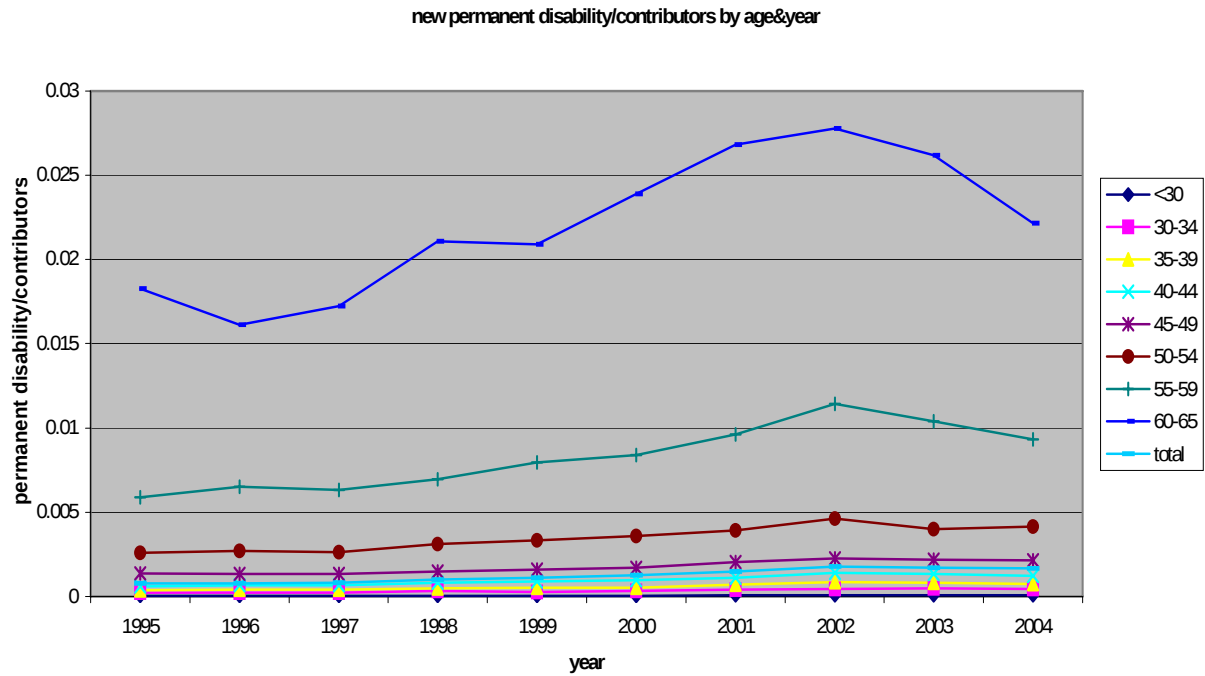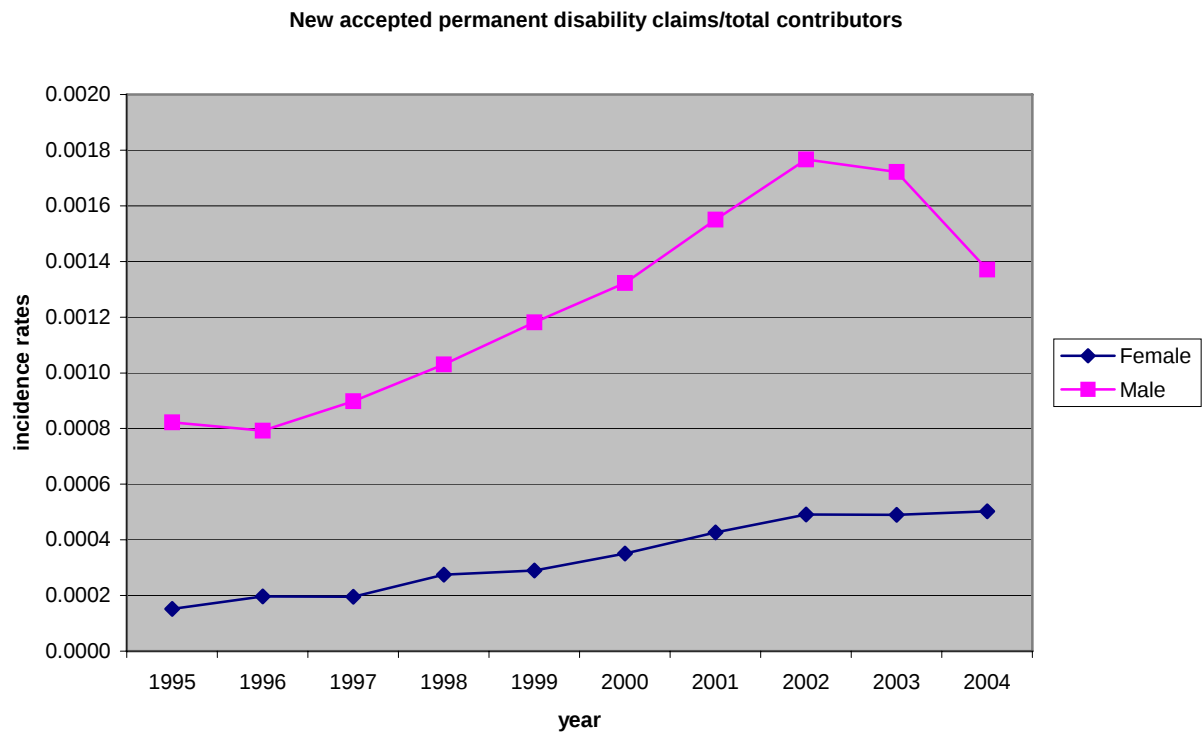
Figure 9: Differences in disability rates by gender

New accepted permanent disability claims/total contributors

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Endnotes

[1] For previous discussions of disability insurance in Chile and other countries with individual accounts see Grushka and Demarco 2003, Landman 2004 and Wiese 2005.

[2] The breakdown given between disability insurance and survivors' insurance is based on data analysis by the authors; AFPs do not report this breakdown. AFPs are required to report the breakdown of fees between D&S insurance and other administrative charges to the regulator. However, there is no audit or market test to ensure that this reporting is accurate. In any event, the worker faces a combined administrative fee.

[3] Most of the attrition is due to deaths that have occurred in the meantime, given the relatively high mortality rate during the first few years of exposure, among the disabled.

[4] A common problem in disability systems is how to rehabilitate and provide work incentives for disabled workers. This poses a contradiction, because disability benefits are presumably paid to individuals who cannot work, if they work they may become ineligible for benefits and thereby become worse off, yet the economy is better off if they are encouraged and enabled to work. Chile's system, like all others, reflects these contradictions. Members who receive provisional pensions, whether for total or partial disability, may continue working while receiving the pension. If employed they must pay social security contributions.   However, members who receive provisional disability pensions have little incentive to contribute, because if eventually granted permanent total disability status, as most are, the greater balance accumulated in the personal accounts will merely reduce the additional payment without improving the total pension. The Medical Board does not have to receive information about whether or not the worker has worked, but the AFP usually sends them this information in cases where work has continued. Thus, work is not necessarily held against the individual in the assessment procedure, but it may be, and at any rate the entire contribution rate will be a pure tax to him, in contrast to other workers who derive a direct benefit from these contributions. There are no deliberate rehabilitation facilities. All these factors will discourage work during the temporary period. Once the worker gets permanent disability status, he keeps it regardless of whether or not he works. This contrasts with many other countries where, eventually, individuals who work are taken off the disability rolls. In this sense, the Chilean disability system rewards work, as does the Chilean old age system (see Edwards and James 2005). However, workers who have withdrawn from the labor force during their provisional period may find it difficult to re-enter later on.

[5] In the case of a member declared partially disabled, the additional payment is the difference between the necessary capital and 70% of the balance in the personal savings account. The remaining 30% of the balance allows the member to finance an additional pension, bringing his ultimate replacement rate above 50%. Of course, this provision adds to total insurance costs. However, 80-90% of disabled workers are certified as totally disabled so this provision has not had a large impact. Members who are declared permanently partially disabled may later apply for a total disability declaration. This has no financial impact on the AFP or the insurance company because, if the application is successful, the person only gains access to the rest of the balance in his account.

[6] For comparision, the rate of acceptance in the US is 45%, with wide variations across states. (Social Security Advisory Board 2001). This is lower than the acceptance rate of claims in Chile, but slightly higher than the proportion of claims that were both insured and accepted.

[7] Worker learning about how to use the new system is one possibility. Some people attribute the increase to a rise in the rate of unemployment after 1999. Claims started to fall in 2002, as the unemployment rate fell.

[8] This incentive has been mitigated by the very high (10% real) rate of return earned during the first 25 years of the new system; but we can expect these high rates of return to fall and therefore the incentive to retire on disability to rise in the coming years.

[9] This is comparable with many OECD countries, although higher than the US and UK. See Andrews 1999 for numbers in other countries.

[10] A potential conflict of interest might arise if the AFP contracts with an insurance company in its own financial conglomerate. The AFP might then have an incentive to increase the insurance fee, because it becomes a non-transparent profit to its affiliated insurance company, with the high cost passed along to workers. This arrangement may be used when workers are not price-sensitive but transparent profits may be subject to political disapprobrium. Indeed, this might have happened in the early years of the new system, when AFPs contracted directly with insurance companies to pay the benefits, without giving workers any choice in the matter. In Argentina (which has a similar system) in 2002, 11 of the 12 pension funds belonged to the same ownership group as their insurance company—an arrangement that apparently led to high insurance fees (Grushka and Demarco 2003). In 1987 the system was changed in Chile, as described in the text, to avoid this conflict of interest and make the annuity market more competitive. Since that time, AFPs have changed insurance companies frequently, less than half of the contracts written have involved an ownership relationship between the AFP and the insurance company, and there is no apparent difference in the contract terms between those with and without such a relationship.

[11] Current tables have been in force since 1985, in contrast with mortality tables for normal old age and early retirement, which were up-dated in 2004. Mortality tables for the disabled are especially complex because they depend on cause of disability. True mortality rates of disabled due to psychiatric causes may be lower than those due to cardiac causes, and the latter themselves have been falling over time. They also depend on years of exposure—in general, disability mortality rates tend to be especially high during the first few years after the claim is made and closer to the population average thereafter. (See James, Martinez and Iglesias 2006 for a more general discussion of the overstated mortality and interest rates in the Chilean payout stage).

[12] However, only 40% of disabled workers choose to annuitize, many of these choose a guaranteed period annuity for which the market price may be charged, and some purchase an annuity on market terms from a different insurance company.

[13] We may contrast this arrangement with funded defined benefit employer-sponsored plans, which try to smooth fluctuations in required contribution rates by basing charges on assumptions about the long run rate of return. Experience has shown that these assumptions are often wrong, and may leave the pension system seriously under-funded. Chile avoids this problem in its D&S system by requiring the cost of the DB to change frequently, as interest rates change. The term contract between the AFP and insurance company sets a ceiling to the share of these costs that is borne by the AFP and its members and thereby partially smooths, over a limited period of time; but the cost is passed back to workers when the contract is renegotiated. Insurance companies may charge a risk premium because they are vulnerable to interest rate fluctuations during the fixed contracting period, which typically lasts 2-3 years.

Insurance companies and AFPs also take on some stock market risk, since the individual retains control over investing his account during the 3-year temporary disability period, and if the stock market should fall the additional payment that is the obligation of the AFP and insurance company will rise (of course, the opposite is also true). This risk has not been very great in the past, since the proportion that could be invested in stocks was limited by regulations. However, the allowable percentage rose when portfolio choice was greatly increased in 2002.

[14] If the individual has other sources of incomes, such as wages or pension from the old system, this may invalidate his eligibility for the MPG. However, it is not clear that this means-test is vigorously enforced. See James, Martinez and Iglesias 2006.

[15] Consider the case of a half-average-wage worker with a 60% density of contributions, who qualifies for insurance. His defined benefit will be 50%*60%*70%=21% of the average wage. In this case, during the temporary disabled stage the AFP pays his provisional pension and the member takes out an additional amount from his personal account, bringing the total to 25% of the average wage. After a positive permanent assessment, the resources withdrawn from the account are subtracted from the required additional payment. The member must take a programmed withdrawal, withdrawing the minimum pension from his account until it is exhausted, at which point the state pays the whole minimum pension. Thus the low reference wage, which saves money for the insurance scheme, ultimately increases the fiscal burden.

[16] Other characteristics, such as income, education, occupation and DNA may also enter into the correct mortality schedule. However, the only characteristics now specified by the SAFP in setting the allowable mortality tables are gender and age.

[17] In the past, recognition bonds that grant credit for service in the old system also constituted a large part of the individual's own accumulation. However, these recognition bonds are now diminishing in importance, as most newly disabled persons today had little service prior to 1981.

[18] The worker's total own capital rises faster and further, and the total necessary capital also rises despite the fewer years of annuitization, due to wage growth over the worker's lifetime. This partly moderates the decline in additional payment per unit of wage.

[19] Note that this simulation applies to permanent disability only. Costs of temporary disability and survivors' benefits would more than double the total cost of D&S insurance. However, actual interest and mortality rates have been much higher than our assumed rates, offsetting much of this cost increase in the past, but possibly not in the future.

[20] The increase in insurance fee between rows 3, 4 and 5 in Table 8 are roughly consistent with these percentages. The match is not perfect, since the additional capital changes by varying amounts for workers of different ages, and the numbers in Table 8 reflect the weighted average.

[21] We cannot compare disability costs alone, since reported insurance fees combine disability and survivors' costs. To compare the D&S insurance fee in Chile with that which would be charged if all D&S benefits were paid on a PAYG basis, we need data on total annual D&S benefits paid to individuals as a result of their coverage by the D&S insurance. However, the available data on D&S payouts in Chile include payments to survivors of old age and early retirement pensioners, financed by joint pensions purchased upon retirement. These benefits are not financed by D&S insurance so we exclude them from the comparison. We estimate that 36% of all D&S payouts were for disability and 64% were for survivors, of whom 54% were financed by D&S insurance. This means that 70% (=36%+54%*64%) of the reported D&S payouts stem originally from D&S insurance.
The reported numbers on D&S payouts also include some disability beneficiaries who were not eligible for the additional payment, although they were permitted to draw down their own accounts after being certified as disabled. These constitute about 30% of the stock of disabled individuals (40% of the new inflow in 2004) but only 20% of all payouts to the disabled. (We estimate the average benefit for the uninsured disabled is the same as the average PW benefit, which is about 2/3 of the average benefit including annuities). These payouts, too, should be excluded from D&S payouts, a reduction of 36%*20%=7%. Operating in the opposite direction, the temporary disabled are paid directly by their AFPs for 3 years and are not reported as recipients of D&S pensions. This group needs to be added back into the group that would have to be paid, in a PAYG system. This would add about 43% to disability costs or 36%*43%=15% to total D&S payouts. The net impact of these three adjustments brings us to 70%-7%+15%=78% of reported D&S payouts as the implicit amount that would have to be charged if the same benefits that are paid today on a funded basis were instead financed on a PAYG basis. We report these adjusted numbers in Table 1 col. 2.

[22] The aging of contributors is due in part to the fact that the new system started out with a relatively young age structure, as older workers stayed in the old system when the basic pension reform took place in 1981. Additionally, under the new system older workers have postponed pension age, which means that many stay in the contributory work force (Edwards and James, 2005).

[23] Mexico was supposed to use a system similar to that in Chile, except that the old social security agency was entrusted with the responsibility for collecting the D&S fee and coming up with the additional payment, when necessary. The fee was set at 2.5%, by law, rather than by the market. The agency was supposed to auction off each annuity contract to the lowest bidding insurance company. However, according to anecdotal evidence, the agency found that the cost of lifetime annuities exceeded 2.5%, while paying the benefits on a PAYG basis was much less than 2.5%--as we would expect during the early years of a new scheme. They therefore delayed the annuity process, and gave individuals the option of requesting direct payment from the agency. Data show that the number of annuity contracts authorized by IMSS rose dramatically at the start of the new system in 1997, but has decreased sharply over the past 4 years. The difference between 2.5% of wages and actual D&S payouts provides a cash surplus to the agency for its other purposes—but this surplus is only temporary, as in most new PAYG systems.