

**FINANCING DISABILITY BENEFITS IN A SYSTEM OF INDIVIDUAL ACCOUNTS:  
LESSONS FROM INTERNATIONAL EXPERIENCE**

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## **Abstract and Policy Abstract**

In recent years, many countries with mandatory defined benefit pay-as-you-go (“PAYG”) systems have modified their systems to include individual accounts for financing retirement pensions. In most of these countries, a portion of the mandatory pension system’s contribution rate has been “carved-out”, and contributions earmarked by the carve-out are channeled into retirement accounts. Upon reaching retirement age, the contributions and accumulated interest in an individual’s account are used to finance all or part of that individual’s total retirement pension.

Although an individual account may be a useful vehicle for financing retirement income, it may not prove sufficient for financing disability benefits. In a pension system that depends solely or partly on individual investment accounts, individuals who become disabled at a young age might lack sufficient capital in their individual accounts to finance adequate disability pensions. Generally, therefore, the implementation of “carve-out” accounts for financing retirement benefits will necessitate changes to the financing mechanism for disability benefits.

A wide range of policy options exists for adapting disability benefits to operate in a pension system with carve-out retirement accounts. The purpose of this paper is to examine how countries with carve-out individual retirement accounts have approached disability reform, and to assess the applicability of these approaches in the United States.

## **1. Introduction**

In recent years, more than 20 countries that had previously financed their mandatory pension systems on a PAYG basis have modified their systems to include fully funded individual retirement accounts. In most of these countries, a portion of the mandatory pension system's contribution rate has been "carved-out", and the contributions earmarked by the carve-out are channeled into individual accounts. Upon reaching the retirement age, the contributions and accumulated interest in each account are used to finance all or part of an individual's total retirement pension.

Although an individual account may be a useful vehicle for financing retirement income, it may not prove sufficient for financing disability benefits. In a system based solely or partly on individual investment accounts, persons who become disabled at a young age might lack sufficient capital in their individual accounts to finance adequate disability pensions. The standard solution to this "shortfall" problem has been to allow the disability benefit to remain a defined benefit, and to adopt various measures to stitch together the defined benefit (DB) and defined contribution (DC) components of a system into a coherent whole.

A wide range of policy options exists for marrying DB disability benefits with DC old age benefits. A simple approach is to leave the pre-reform disability benefit formula in place, and to allow disabled individuals to retain the capital in their carved-out individual accounts. But this would be an extremely generous policy. Excessively generous disability benefits would generate strong incentives to claim disability benefits, thus creating moral hazard problems. Such a policy would threaten the actuarial balance of the PAYG system, because it would divert some contributions to individual accounts, reducing PAYG revenues, but would not correspondingly reduce PAYG disability benefits.

In the United States, some proposals to carve-out individual retirement accounts within the Old Age, Survivors, and Disability Insurance (“OASDI”) program have circumvented issues related to the funding of disability benefits, despite the fact that disability coverage is an important component of the system and disability incidence rates are not trivial.<sup>1</sup> If individual carve-out accounts are ever implemented, however, reform of disability benefits will become unavoidable. Given that a number of other countries have already faced this challenge, there may be some useful lessons to be learned from this international experience that could help facilitate policy development in the United States.

The purpose of this paper is to examine how countries with carved-out individual retirement accounts have approached disability reform, and to assess the applicability of these approaches in the United States. Most of the pension systems that were examined, however, introduced carve-out accounts in the very recent past, and, as a consequence, little data are available for evaluating the effects of the reforms. For this reason, our research consists primarily of a review of the basic structure of the reformed pension systems, rather than an analysis of empirical evidence regarding pension system performance.

This paper is organized as follows: section two summarizes the basic issues and problems that arise in a disability program when individual account carve-outs are implemented; section three identifies the three most widely-used approaches (or “models”) that countries with carve-out accounts have adopted for their re-structured disability programs; sections four, five and six describe, in turn, each of these three models; section seven describes disability reforms that have combined elements from two or more of the three primary disability models; section eight assesses

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<sup>1</sup> In 2003, 770 thousand new DI benefits were awarded, equivalent to 0.53 percent of the insured population. The stock of DI beneficiaries consisted of 5.8 million persons, equal to 4.0 percent of the total insured population. The stock of DI beneficiaries age 50 to 64 consisted of 2.1 million men and 1.7 million women, equal to 9.7 percent and 8.9 percent of the respective insured populations.

whether or not any of the three primary disability models, or mixtures of these models, might be applicable in the United States, and section nine concludes.

## **2. Basic Issues**

In the cases discussed in this paper, the starting point for reformers is generally a PAYG-financed defined benefit system that covers most or all of a country's workforce, and covers three different risks: old age, disability, and death (survivors' benefits). Typically, benefits for these three risks are financed with a single contribution rate assessed on workers' wages, and benefits are administered by a single government agency.

In the cases examined in this paper, policymakers decided to alter their country's pension system by converting the old age component of that system from a defined benefit structure to a defined contribution structure, or to a mixed two-pillar system consisting of a downsized defined benefit (financed on a PAYG basis) and a defined contribution pillar (financed on a capitalized basis). This financing change for old age benefits has repercussions for disability benefits (as well as for survivors' benefits), because disability and old age are very different types of risks.

Old age is a predictable event that occurs at the end of a person's working career. Disability, in contrast, can occur at any age. Therefore, while an individual savings account might be a suitable mechanism for financing old age benefits, it is not sufficient for financing disability benefits. If a pension system consisted solely of DC accounts, workers who were disabled at young ages would not have sufficient assets in their accounts to finance adequate disability benefits. The standard solution to this problem has been to allow the disability benefit to remain a defined benefit, and to adopt various measures to stitch together the DB and DC components of the system into a coherent whole. This is a difficult task involving the following important policy choices and challenges:

1. In a system with carve-out accounts, what is an appropriate duration for disability benefits – payable until death, or payable until the retirement age (at which point disabled workers would convert to old age benefits)?
2. In a system with carve-out accounts, should disability replacement rates be fully determined by a DB formula, or should replacement rates fluctuate in some way to reflect changes in interest rates and mortality rates (just as old age replacement rates in the DC pillar would fluctuate)?
3. If individual retirement accounts perform poorly (thus driving down old age replacement rates), the incentive to claim disability benefits might increase if the benefit levels are defined via a formula that is completely insulated from changes in financial markets. How can moral hazard be minimized, such that the reformed system does not inadvertently increase the incentive to apply for disability benefits?
4. How should disability benefits be financed? Should a disabled worker's account be used as a source of partial financing for disability benefits? Or should the account be preserved until a disabled worker reaches retirement age? Should a portion of disability benefits be financed by mandatory private insurance, or should benefits continue to be financed by payroll taxes on a PAYG basis?
5. In a system of carve-out accounts, what policy options are available to address recoveries from disability?

6. In a system of carve-out accounts, how do different financing strategies for disability benefits affect the actuarial balance and cash flows of a PAYG system?

In the remainder of this paper, we examine how different countries have dealt with these issues.

### **3. The Three Most Prevalent Disability Models for Systems with Carve-Out Accounts**

No two countries with carve-out accounts have adopted precisely the same model for the financing of disability benefits. Disability programs reviewed for this paper differ with respect to their eligibility criteria, the duration of their disability benefits, the level of their disability benefits, and the financing roles played by the individual account, the PAYG system, and private insurers. To facilitate discussion, however, we focus on three principal models that, taken together, are fairly representative of the diversity in approach to the financing and structure of disability benefits. These models are:

1. The **Chilean Model**, under which the capital in a newly disabled individual's account is augmented by additional capital provided by a private insurer, such that the combined account balance is sufficient to finance a lifetime defined benefit stream prescribed by law.
2. The **Swedish Model**, under which government-financed disability benefits are paid up to a particular cut-off age (e.g. the retirement age, or an age close to the retirement age), and, in addition, the government finances contributions to each disabled individual's account. Upon reaching the cut-off age, the disability benefit ceases, and the assets of the individual account are used to finance a stream of retirement income. A disabled individual's



replacement rate may increase or decrease upon reaching the retirement age, because disability benefits are defined by a formula, while old age benefits are a function of interest rates and mortality rates.

3. The **Hungarian Model**, under which the assets of a newly disabled person's individual account are transferred to the PAYG system, and, in return, the PAYG system finances a lifetime defined benefit stream.<sup>2</sup>

Some countries with carve-out accounts have disability programs that contain elements of more than one of these model types. Thus, exceptions to the three-model classification system exist. However, this classification scheme is a useful simplification, highlighting the primary structural differences in the disability financing mechanisms in countries with carve-out accounts. This paper will examine each of these three models in detail.

#### 4. The Chilean Model

##### The retirement component of the Chilean pension system

In 1981, Chile launched a new pension system composed of individual, capitalized retirement accounts, managed by specialized, private investment firms known as Administrators of Pension Funds ("AFPs"). This new retirement savings system was coupled with mandatory disability and survivor's insurance provided by private insurers. Between 1994 and 2003, nine

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<sup>2</sup> Members of Hungary's new, two-pillar pension scheme have two different options for disability benefits. Most disabled individuals will maximize their pension wealth by selecting the option just described above: the assets of an individual's account are transferred to the PAYG scheme, and, in return, the PAYG scheme finances a lifetime disability benefit stream. However, a second option exists, although this option is unlikely to be attractive until the capitalized scheme has been in operation for perhaps another 10 to 20 years. Under this second option, a disabled individual retains the assets in his or her account, and, in addition, receives a reduced PAYG disability benefit calculated pursuant to a less generous formula. Further details regarding Hungary's disability benefits are provided later in this paper.

additional countries in Latin America implemented reforms that, to a large extent, follow the Chilean model.<sup>3</sup> Given that other Latin American pension reforms have much in common with the Chilean reform, and given that the Chilean private account system is the first of such systems to have been adopted in Latin America, it is worthwhile to examine the Chilean case in detail.

When the new Chilean retirement system was launched in 1981, the country's existing workforce was offered the option of either joining the new capitalized DC system or remaining in the existing pay-as-you-go DB system. Approximately 75 percent of the covered workers elected to join the new system. For all subsequent years, however, new entrants to the labor market have been required to join the new system. Since 1981, the old DB system and the new DC system have run side-by-side, with membership in the new system constantly increasing, and membership in the old system gradually declining. As of 2004, approximately 96 percent of covered workers contribute to the new system, while only 4 percent continue to contribute to the old system.

AFPs manage the assets held in the individual accounts and charge a fee (expressed as a percentage of each worker's wage) for their services. Each AFP is free to set this fee, and, as a consequence, fees vary across AFPs. Each worker, in turn, is free to transfer his or her account from one AFP to another. Members of the new system are required to contribute 10 percent of their salary (up to a ceiling) to their individual retirement account.<sup>4</sup> The fee charged by the AFP is not deducted from this 10 percent, but rather is an additional percentage of the worker's wage (so the total amount paid by a member exceeds 10 percent of wages).

Each worker who switched to the new system in 1981 received a "recognition bond," the face value of which is roughly equal to the pension rights the worker had acquired under the pre-

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<sup>3</sup> Argentina, Bolivia, Columbia, Costa Rica, Dominican Republic, El Salvador, Mexico, Peru and Uruguay.

<sup>4</sup> The average contribution rate to the old system was approximately 22 percent in 1981. Thus, persons switching to the new system experienced an immediate increase in their net wage, because the contribution rate and fees charged by the new system are significantly less than 22 percent.

reform pension system. Recognition bonds earn a real, compound interest rate of 4 percent per year, and are redeemable either when a member reaches the normal retirement age or suffers a permanent disability. At the time of redemption, the government is required to deposit the bond's principal and interest into the member's individual account.

Upon reaching retirement age, a worker's mandatory savings (the individual's account balance plus the amount of the recognition bond) may be used to finance retirement income. Payout options are defined by law, and include programmed withdrawal, inflation-indexed lifetime annuities, or a combination of the two. For a married man, the payout options are designed to provide his spouse and children (and, under certain circumstances, his parents) with survivor's benefits. In addition, an individual with at least 20 years of contributions is eligible for a minimum pension financed by the government.<sup>5</sup>

#### The disability component of the Chilean pension system

To finance disability and survivors' benefits for their members, AFPs are required to purchase disability and survivors' insurance coverage from private insurers. The eligibility criteria and benefit levels provided by these insurance policies are fixed by law. AFPs pass along the cost of this insurance to their members by including it in their fees. Fees are not permitted to vary by age, sex or any other dimension; rather, fees are a flat percentage of workers' wages.<sup>6</sup> Contracts between AFPs and insurers generally fix insurance premiums for a period of 12 months.

Disability benefits are paid in two stages: a provisional stage and a permanent stage. An applicant who has been found to be disabled (by the medical commission) is granted a provisional

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<sup>5</sup> The minimum pension is paid only if a person's assets are insufficient to finance a lifetime, inflation-indexed annuity (which, for married men, must include a survivor's benefit) that falls below the level of the minimum. In such a case, the minimum pension is financed first with the member's assets. After these assets are exhausted, the Government assumes the responsibility for financing the individual's minimum benefit.

<sup>6</sup> In recent years, disability and survivors' premiums have averaged slightly less than 1% of covered wages.

disability benefit to be paid monthly for three years. The AFP's insurer is responsible for financing this inflation-indexed benefit, which is equal to 70 percent of the individual's wage base if the individual is deemed fully disabled, and 50 percent of the individual's wage base if found to be partially disabled. During the three-year provisional period, the assets in the individual's account must be invested conservatively (risky portfolios are prohibited).

After the three-year provisional period has elapsed, the individual must again appear before the medical commission. If the commission determines that the individual is still disabled, the benefit is then extended for the remainder of the individual's life. To finance this lifetime, inflation-indexed benefit, the insurer is required to make a lump-sum deposit (referred to as "additional capital") into the disabled person's individual account. The size of this lump sum is determined as follows:

$$\text{Additional Capital} = \text{Necessary Capital} - (\text{Individual's Account Balance} + \text{Recognition Bond})$$

"Necessary capital" is defined in detail by law, and is equal to the present value of a defined benefit stream that includes benefits for the disabled person as well as survivor benefits for family members who may outlive the disabled person. Necessary capital varies from case to case, because it depends on an individual's wage history and family structure (whether or not the disabled person is married, and number of children under the age of 24). The mortality tables used in this present value calculation are defined in the law. Different tables are used for disabled and non-disabled family members. The interest rate used in the present value calculation is defined by law, and is equal to the three month-moving average of interest rates for life annuity products sold in Chile. If the sum of an individual's account balance and recognition bond exceeds the necessary capital, the insurer does not have to make an additional capital payment.

After the insurer has deposited the additional capital into a beneficiary's account, the beneficiary is free to access this capital using either a programmed withdrawal or by purchasing an inflation-indexed lifetime annuity, or a combination of these two approaches. If the beneficiary elects to purchase an annuity, he or she is free to purchase the annuity from any private insurer. If the beneficiary elects to purchase an annuity from the same insurer that made the additional capital payment, then that insurer is obligated to provide a benefit level that is at least as large as the level used in the necessary capital calculation.

Different financial obligations arise if, after receiving a provisional benefit for three years, the medical commission determines that an individual is no longer disabled. In such a case, the insurer is obliged to deposit a lump sum into the individual's account that is intended to roughly approximate the contributions that the individual would have made during the three-year provisional period had he or she been employed rather than disabled. The lump sum is equal to the level of the provisional disability benefit, multiplied by the number of months the provisional benefit was paid, multiplied by 11.1 percent. Given that a full disability benefit is equal to 70 percent of a person's wage base, this formula is equivalent to an effective contribution rate of 7.8 percent (7.8 percent = 70 percent multiplied by 11.1 percent) assessed on the person's wage base. An individual's wage base may be considerably lower than the individual's most recent wage, because the wage base is a moving average of an individual's monthly wage computed over the 120 months prior to disability. Therefore, in most cases the lump-sum-deposit will be significantly lower in amount than the accumulated value of the contributions the beneficiary would have made had he or she remained in the labor force.

As mentioned previously, a medical commission is responsible for determining the level of a person's disability. Each geographic region has its own medical commission composed of three doctors. To qualify for disability, at least two of the three doctors must conclude that the individual

meets the criteria for disability benefits. A disability determination of 66 percent or greater is required to qualify for full disability benefits. A disability determination of between 50 percent and 65 percent is required to qualify for partial disability benefits.

In addition, each medical commission has a fourth member who represents the private insurer or the AFP. While this fourth member is not involved in making disability determinations, he or she has a right to be present at each disability evaluation. Should the fourth member disagree with the commission's decision, the fourth member may encourage the AFP to file an appeal with the Central Medical Commission. In such a case, the AFP is responsible for financing costs due to the disability re-evaluation (e.g. transportation and traveling expenses to enable the claimant to visit the Central Medical Commission).

In addition to disability benefits, the insurance also covers survivor benefits associated with the deaths of active members and the deaths of provisional disability beneficiaries. In such cases, the insurer must pay a lump-sum equal to the capital necessary to finance a defined benefit stream (inflation indexed) for the survivors of the deceased.

## **5. The Swedish Model**

### The retirement component of the Swedish pension system

In 1999, Sweden implemented a comprehensive reform of its national-level pension system. The reform reduced the role of PAYG financing, changed the method used to calculate PAYG retirement benefits, and carved-out a contribution rate to finance a new system of capitalized individual accounts. Unlike the Chilean reform, however, the objective of the Swedish reform was not to dismantle the entire PAYG system and create a new pension system based solely on capitalized individual accounts. Rather, the Swedish reform was more modest in scope: it retained a dominant role for the PAYG system, and fashioned a supporting role for capitalized accounts.

In the reformed system, the contribution rate to the PAYG pillar is fixed at 16 percent and the contribution rate to capitalized accounts at 2.5 percent. Individuals may invest their capitalized accounts in any of 600 registered mutual funds, and, if they wish, may transfer their assets from one fund to another. The funds are independently managed by Swedish and foreign banks, insurance companies, and stock brokerage firms.

Like the funded component of the new system, the PAYG-component is also based on individual accounts. However, these accounts are notional rather than real. That is, each notional account serves merely as a bookkeeping device, recording an individual's PAYG contributions and notional interest. Upon retirement, the notional account is converted into a PAYG pension using an annuity factor defined by legislation.

Annuity is mandatory for the capitalized component of the system. Programmed withdrawals and lump-sum distributions are prohibited. A governmental agency serves as the annuity provider.

#### The disability component of the Swedish pension system

As in Chile, disability benefits in Sweden are determined by a defined benefit formula. However, the mechanism for financing these disability benefits differs significantly from the mechanism adopted in Chile, and, in addition, the duration of these benefits differs from the duration of such benefits in Chile.

In Sweden, the government finances disability benefits on a PAYG basis. Disability benefits do not extend until death; rather, disability benefits are paid until age 65, at which point a disability beneficiary must convert to old age benefits. Because disability benefits are determined by a defined benefit formula, while old age benefits are determined by individual accounts,

discontinuities in benefit levels are likely to occur when an individual switches from disability benefits to old age benefits.

In the Swedish system, individual accounts do not play a role in the financing of disability benefits. Rather, accounts are preserved until retirement. During a period of disability, the Central Budget finances contributions to a disability beneficiary's account based on hypothetical earnings imputed from the individual's earnings history.

Given that, in Sweden, retirement benefits are financed primarily on a PAYG basis, it is not surprising to find that disability benefits are financed on a PAYG basis. Likewise, in Chile, where retirement benefits are financed almost entirely by privately managed individual accounts, consistency in policy preferences would dictate that disability benefits also be financed via private sector institutions. That, in fact, is the case. In each country, then, the retirement component and disability component of the pension system share a common economic philosophy.

## **6. The Hungarian Model**

### The retirement component of the Hungarian pension system

In 1999, Hungary implemented a comprehensive pension reform of its national-level pension system. The reform carved-out a contribution rate for financing a new system of capitalized individual accounts and simultaneously reduced the role of PAYG financing. Although the PAYG system was downsized, it nevertheless remains the dominant pillar of the pension system, with individual accounts playing a supporting role.

Individuals who already were in the labor force when the new system was launched were given a choice to either remain in the PAYG “mono-pillar” system or to join the new “two-pillar” system. Members of the mono-pillar system pay a PAYG contribution rate of 26.5 percent of their wage and receive retirement benefits based on an earnings-related formula that provides an accrual



rate<sup>7</sup> of 1.65 percent for each year of service. Members of the two-pillar system, in contrast, pay a contribution rate of 18.5 percent of their wage to the PAYG pillar and 8 percent of their wage to the individual account pillar. Upon reaching retirement, members of the two-pillar system receive a PAYG-financed benefit based on an accrual rate of 1.2 percent (which is about 25 percent less than the mono-pillar accrual rate of 1.65 percent), plus an annuity or programmed withdrawal financed by the assets in their individual account.

Private investment firms manage the individual accounts. Members of the two-pillar system may transfer their retirement assets from one investment firm to another, if they wish.

#### The disability component of the Hungarian pension system

As in Chile and Sweden, disability benefits in Hungary are determined by a defined benefit formula. Disability benefits are payable until death (as in Chile). Disability benefits are financed primarily by the PAYG system (as in Sweden).

In Hungary, disability benefits for a member of the mono-pillar system are financed entirely by the PAYG system, and are calculated using the mono-pillar's disability benefit formula, which is similar to the mono-pillar's retirement benefit formula. A member of the two-pillar system may choose either of two different options for disability benefits. Under the first option, disability benefits are provided by the PAYG system and are determined by the mono-pillar disability benefit formula. An individual choosing this option is required to transfer the assets in their individual account to the PAYG system. Under the second option, an individual is permitted to keep the assets

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<sup>7</sup> An "accrual rate" is a parameter in a typical DB formula. A simple DB formula is as follows: pension = years of service \* 2% \* wage base. In this example, the accrual rate is 2 percent. A person who works 40 years would receive a pension equal to 80 percent (80% = 2% accrual rate \* 40 years of service) of their wage base. The wage base is a function of the person's wage history, e.g. the average of the person's last 5 years of wages prior to retirement.

in his or her individual account, and PAYG benefits are determined using the first-pillar<sup>8</sup> disability benefit formula, which is less generous than the mono-pillar disability benefit formula. The first pillar formula provides approximately 75 percent of the PAYG disability benefits provided by the mono-pillar formula.

Essentially, members of the two-pillar system are permitted to re-enter the mono-pillar system in the event of disability. The price of re-entry is forfeiture of the assets in one's individual account. In exchange, the PAYG system provides a mono-pillar disability benefit, which is larger than the corresponding first-pillar disability benefit. Most individuals will maximize their pension wealth by selecting the mono-pillar disability benefit and forfeiting the assets in their individual account. However, as the capitalized system matures, some older workers who have contributed throughout their entire careers to the two-pillar system may maximize their pension wealth by retaining their individual account and receiving the first-pillar PAYG disability benefit rather than the mono-pillar benefit.

## **7. Mixed Models**

Some countries with carve-out accounts have disability programs that mix together elements from two or more of the three disability models we have described.

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<sup>8</sup> The term "first-pillar" refers to the PAYG component of the new two-pillar pension scheme; "second pillar" refers to the individual account component of the new system, and "mono-pillar" refers to the PAYG scheme for those persons who have chosen not to participate in the new two-pillar scheme.

<b>Table 1. Disability Financing Mechanisms in Pension System with Carved-Out Individual Accounts</b>						
	The Three Primary Models			Mixed Models		
	Chile	Sweden	Hungary	Bolivia	Mexico	Uruguay
Duration of disability benefits	Lifetime	To 65	Lifetime	To 65	Lifetime	Lifetime
Individual account used to finance disability?	Yes	No	Yes	No	Yes	Yes
PAYG system helps finance disability?	No	Yes	Yes	No	Yes	Yes
Private insurance helps finance disability?	Yes	No	No	Yes	No (*)	Yes
Private insurers deliver annuities to disabled?	Yes	No	No	No	Yes	Yes
(*) Private insurers provide annuities to the disabled, but the capital used to purchase those annuities is obtained from the government and from the savings in an individual's account, rather than from a private insurer.						

For example, the disability program in Bolivia combines characteristics of both the Chilean model and the Swedish model. Private insurers are responsible for financing disability benefits, as in the Chilean pension system. And, as in the Swedish pension system, disability benefits are payable only until a particular cut-off age (65), rather than until death, and individual accounts may not be accessed until that age (after which disabled individuals convert from disability to old age benefits).

In the Mexican disability system, like the Chilean system, an individual's disability benefits are financed using the assets in their individual account plus a lump-sum payment made by an insurer. In Mexico, however, the government serves as the insurer rather than private sector insurance firms. While private insurers are not responsible for lump-sum payments in the Mexican disability program, they do function as annuity providers for individuals wishing to transform their individual accounts into guaranteed benefit streams.<sup>9</sup>

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<sup>9</sup> There is anecdotal evidence that the Institute Mexicano del Seguro Social ("IMSS"), a Government agency that plays a central role in the administration of the country's national pension scheme, has in some ways thwarted the development of the private annuity market for disability benefits. Through various mechanisms, the IMSS has encouraged the disabled to receive disability benefits directly from the IMSS, rather than purchasing annuities from private insurers. This strategy is less costly in the short-run for the IMSS, because the agency can finance benefits on a PAYG basis rather than financing the present value of each newly disabled person's entire benefit stream. Thus, while in theory the Mexican disability program has much in common with the Chilean program, in practice the Mexican system may operate in a manner similar to the Hungarian disability program, under which an individual's account is transferred to the PAYG system and, in exchange, the individual's disability benefits are financed by the PAYG system.

In Uruguay, individual accounts were introduced, but the PAYG pillar continues to play a significant role in financing old age benefits, disability benefits and survivor benefits. Persons with wages below a threshold continue to be served exclusively by the PAYG system, unless they opt to send half of their contributions to the capitalized system. Persons with higher wages are obligated to make contributions to both pillars. Disabled persons participating in the two-pillar system receive two separate disability benefits: a PAYG-financed benefit and a benefit financed by private insurance and by assets in the individual account.

## **8. Applicability of International Experience to OASDI**

### Fiscal Considerations

In recent years, various proposals have been made to modify OASDI by carving-out individual retirement accounts. These proposals are motivated, in part, by the hope that individual accounts will lead to higher savings rates and thus will help prevent replacement rates of future generations of retirees from falling (relative to the replacement rates of current retirees). However, to finance the carve-out accounts, a portion of OASDI's total contributions must be re-directed into these accounts, thus reducing the flow of contributions available to finance current beneficiaries. This will lead to a period of transitional deficits that will last for at least a generation, until the individual account system has reached maturity. The larger the contribution rate for the carve-out accounts, the larger will be the transitional deficits. The transitional deficits are the price that must be paid in order to build-up capital in the individual accounts.<sup>10</sup>

Policymakers evaluating carve-out proposals must examine projected transitional deficits and decide whether or not the nation can manage to finance these deficits. The financing structure

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<sup>10</sup> Transitional costs could be financed using debt, in which case future generations would face the task of repaying this debt. Alternatively, transitional deficits could be financed through decreased consumption, in which case the economy might benefit through an increase in the stock of savings.

for old age benefits clearly is the dominant factor determining the size of the transitional deficits. But the financing structure for disability benefits is also important. Of the three disability models we have examined, the Chilean model generates the largest transitional deficits, the Hungarian model generates the smallest (*ceteris paribus*), and the Swedish model generates deficits that fall between the two.

The Chilean model of disability finance increases the overall transitional deficit because disability benefits in the new system are financed entirely on a pre-funded basis, while in the pre-reform system disability benefits were financed on a PAYG basis. The shift from PAYG-financing to pre-funding causes transitional deficits to emerge. In the new system, the premiums paid to private insurers represent the present value of *future* disability benefits<sup>11</sup> rather than the cost of current disability benefits. Had the Chileans continued to finance disability benefits on a PAYG basis (i.e. disability premiums or contributions would finance *current* benefits rather than future benefits), the overall transitional deficits due to the pension reform would have been smaller. However, the economic gains due to the reform might also have been smaller, because the premiums paid to Chile's private insurers have been accumulated in reserve funds and invested throughout the economy, thus promoting financial sector development and economic growth.

The Swedish model of disability finance generates much smaller transitional deficits than the Chilean model (*ceteris paribus*). The Swedish reform, unlike the Chilean reform, did not alter the financing mechanism for disability benefits. Disability benefits continue to be PAYG financed; thus, no transitional deficits were created by changes to the disability system. However, the Swedish government is responsible for financing contributions to a disabled person's individual account, and these contributions are tantamount to a transition cost.

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<sup>11</sup> More accurately, the premiums represent the present value of future disability benefits minus the present value of the accumulated capital held in the individual accounts of newly disabled persons.

While the Chilean and Swedish disability models contribute to an increase in total transitional costs, the Hungarian disability model actually decreases total transitional costs. Because the individual account is transferred to the PAYG system (in most cases) when a person becomes disabled, the PAYG system experiences an initial positive cash flow for each new disability case. Thus, the Hungarian disability model reduces the transitional costs associated with the implementation of carve-out accounts. The Hungarian model represents the path of least resistance, placing no upward pressure on transitional deficits, but also providing none of the economic benefits that may arise as a result of increases in pension savings.

#### Fiscal Considerations: Simulations of Transitional Deficits

An estimate of transitional deficits as a function of various disability-finance designs for OASDI is beyond the scope of this paper. But such estimates are obviously a critical input for policymakers faced with a menu of different financing options for disability benefits. To provide a basic understanding of how each of the three disability models would affect transitional deficits, we developed a stylized model to simulate the operation of a very simple fictional pension system. A description of the model, as well as a list of the model's economic and demographic assumptions, appears in the appendix.

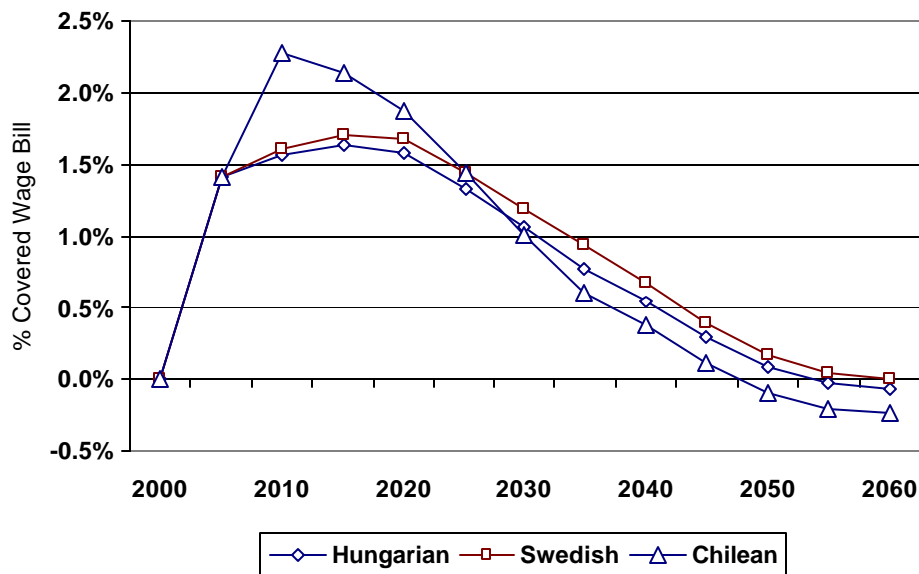
Our simulations begin with a fiscally balanced PAYG system financed via an 11% contribution rate. Individual accounts are introduced in the year 2005, funded by carving out a contribution rate of 4% (thus, members of the two-pillar system pay 4% to the individual account pillar and 7% to the PAYG pillar). We assume that participation in the individual account pillar is voluntary, and that half of all workers choose to participate. Simulations reveal that the PAYG system must endure a long period of transitional deficits caused by the introduction of carve-out accounts. After 2019, however, transitional deficits begin to fall because members of the two-pillar

system begin to retire. As these workers enter retirement, and as members of the single-pillar system die, the average PAYG replacement rate falls, and fiscal stress on the PAYG system is reduced.

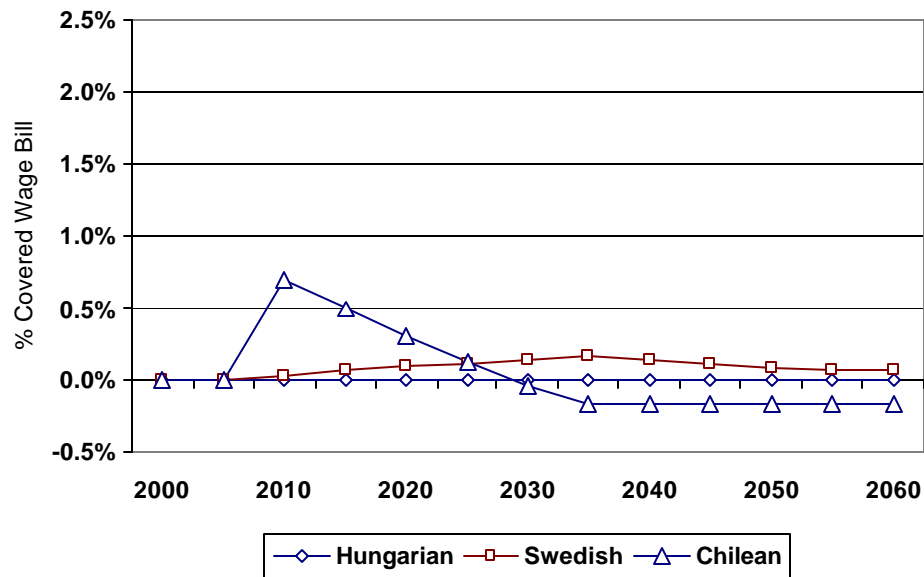
The choice of the disability financing mechanism has an impact on transitional deficits. To quantify this impact, we performed three different simulations -- one simulation for each of the three primary disability models. Results are presented in the two graphs that follow. The first graph shows the total transitional deficit, which includes two components: 1) the deficit that is due solely to changes in old age financing, and 2) the deficit that is due solely to changes in disability financing. The second graph shows only that portion of the total deficit that is due to changes in disability financing. The simulation results reveal that transitional deficits are due primarily to changes to the old age component of the pension system – but changes to the disability component also have a significant impact on deficits.

**Figure 1. Total Transitional Deficits**

(These deficits include both the deficit due to changes to old-age benefit financing and the deficit due to disability financing changes.)



**Figure 2. Transitional Deficits Due Solely to Changes to the Financing Mechanism for Disability Benefits**



The simulations reveal a trade-off between short-run and long run costs. The Chilean model has a large upward impact on the PAYG deficit during the first 20 years of the reform; but in the long run, the Chilean model is the least expensive of the three.<sup>12</sup> Relative to the Chilean disability model, the Swedish and Hungarian disability models, by contrast, have only a small impact on transitional costs. While these results are based on a model of a stylized pension system rather than a model of OASDI, they provide a useful benchmark for assessing the relative fiscal costs of different approaches to disability finance.

### Moral Hazard

When old age benefits and disability benefits are financed by a single defined benefit system, it is possible to carefully control the relationship between old age benefit levels and disability benefit levels. This relationship is simply a policy decision. But when old age benefits

<sup>12</sup> This result emerges because we have assumed that private insurers earn a net interest rate on their reserves that exceeds wage-bill growth. If the interest rate were equal to wage-bill growth, then the Chilean disability model would generate the same long-run disability costs as the Hungarian disability model.



are partially or fully financed by individual accounts (while disability benefits continue to be defined benefits), the relationship is no longer a policy decision. Old age replacement rates will fluctuate in response to interest rate changes and mortality rate changes. Should old age replacement rates fall below the level of disability replacement rates, the disability claims rate might increase, as workers seek ways to maximize their benefits. Thus, the implementation of carve-out accounts can amplify moral hazard problems by increasing incentives to claim disability benefits.

In the Chilean pension system, the discontinuity between disability replacement rates and old age replacement rates is potentially quite large:

<b>Table 2. Comparison of Disability and Old Age Replacement Rates in the Chilean Pension System</b>		
Interest Rate Relative To Average Wage Growth	Disability Entry Pension as % of Average Wage	Old Age Entry Pension as % of Average Wage
<b>Person Type 1: Male with 20 years of contributions</b>		
0.0%	64%	11%
2.0%	64%	16%
4.0%	64%	24%
<b>Person Type 2: Male with 40 years of contributions</b>		
0.0%	64%	21%
2.0%	64%	40%
4.0%	64%	75%
<b>Person Type 3: Female with 20 years of contributions</b>		
0.0%	64%	9%
2.0%	64%	14%
4.0%	64%	22%
<b>Person Type 4: Female with 40 years of contributions</b>		
0.0%	64%	18%
2.0%	64%	36%
4.0%	64%	69%
Source: Author's calculations (see footnote number 13 for underlying assumptions)		

The preceding table<sup>13</sup> compares the level of disability replacement rates with the level of expected old age replacement rates generated by the Chilean pension system, for various examples of individuals who are merely one month away from the legal retirement age.<sup>14</sup> The results reveal that only an individual with a long career, and who has earned an attractive return on his or her individual account during that career, can expect to receive an old age replacement rate that will exceed the replacement rate the individual would obtain if he or she were to qualify for a full disability pension. A male with 40 years of contributions, for example, who earned an average return equal to wage growth plus 2 percent during those years, would receive an old age replacement rate equal to about 40 percent of his career-average wage. In contrast, if the same individual were to qualify for disability benefits, he would receive a replacement rate of approximately 64 percent (including survivor's benefits). The potentially large gap between disability and old age benefits creates a strong incentive to apply for disability benefits.<sup>15</sup>

Because the Hungarian pension reform was more modest in scope than the Chilean reform, potential discontinuities between old age replacement rates and disability replacement rates are less pronounced in the Hungarian pension system. The Chilean reform completely dismantled the DB pillar for old age benefits and erected a DC pillar in its place. In contrast, the Hungarian reform

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<sup>13</sup> The calculations presented in this table are based on several key assumptions. First, we assume that each person earns the average wage throughout his or her career. Second, we assume that real wage growth is 2 percent per year. Third, we assume that male retirees purchase joint-life annuities, while female retirees purchase single-life annuities (By law, a married, male retiree who purchases an annuity with the savings in his mandatory individual account is required to buy a joint-life annuity. In contrast, a female retiree does not face this restriction.). Fourth, to calculate disability benefits, we assume that the date of disability onset is merely one month before the retirement age. Fifth, annuity factors for determining old age pensions were computed using mortality table "RV-2004." This table is specified in law, and is used by insurance firms to compute technical reserves for life annuities for non-disabled beneficiaries.

<sup>14</sup> The normal retirement age in Chile is 65 for men and 60 for women.

<sup>15</sup> The exceptionally high returns that the Chilean individual account system has experienced since 1981 have helped to mitigate this moral hazard problem. However, the future performance of Chile's financial markets may fall short of the high rates-of-return that have been experienced in the past. Therefore, gaps between old age and disability replacement rates are likely to grow in the future.

downsized, but did not eliminate, the DB pillar for old age benefits. In general, the larger the role of the DB pillar (and, consequently, the smaller the role of carve-out accounts), the smaller will be potential gaps between old age and disability replacement rates.

Of the three primary model types, the Swedish disability model is perhaps the best insulated from the effects of moral hazard. Rather than providing lifetime disability benefits (as in Chile and Hungary), benefits in Sweden are payable only until the retirement age (or a cut-off age near the retirement age). At the cut-off age, disability benefits cease and old age benefits begin. Old age benefits may be higher or lower than disability benefits, depending on historical and current interest rates (and other factors as well, such as mortality rates). Because disability benefits in the Swedish system cease at a cut-off age, it is not possible for an individual to permanently elevate his or her benefit level by qualifying for disability benefits. Of course, there is still an incentive to apply for disability benefits – but that incentive is unrelated to the implementation of carve-out accounts.

Among those countries with both carve-out accounts and lifetime DB disability benefits, we found no examples in which disability replacement rates were in some way linked to financial market performance or to changes in mortality rates. Such a linkage could help mitigate moral hazard. For example, if mortality rates for the general population were declining by say 1 percent a year, thereby having a downward effect on retirement incomes generated by the individual account system<sup>16</sup>, the disability benefit formula could be modified to capture this effect. In other words, the disability benefit formula could be altered so that it emulates, at least to some extent, the behavior of a defined contribution system.

Regardless of the structure of disability benefits, the negative effects of moral hazard can, to some extent, be combated through a disciplined system of disability evaluation and review. A

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<sup>16</sup> In a DC system, increases in expected lifetimes lead to decreases in monthly benefit levels (*ceteris paribus*), because assets must be annuitized across a greater time period.

disability program with strong oversight of disability benefit awards will be better equipped to deal with an increase in the incentive to claim disability benefits than a program that lacks administrative discipline. Many of the countries that have adopted the Chilean disability model hope to reduce disability incidence rates because private insurers have strong financial incentives to fight any disability decision that appears to be medically unsupported.<sup>17</sup> However, in a country with a well-managed PAYG disability program with strong oversight of the award process, a shift to a Chilean-style disability model might have little or no impact on disability incidence rates.

### Distributional Considerations

The disability and old age benefit formulae for OASDI contain an explicit mechanism to redistribute income from individuals with higher lifetime incomes to individuals with lower lifetime incomes. The formulae's bend points cause replacement rates to fall as lifetime income increases. In addition, income is implicitly transferred from males to females, because females have greater post-retirement life spans than males.

In contrast to defined benefit systems such as OASDI, defined contribution systems are not particularly effective mechanisms for achieving income redistribution. In fact, defined contribution systems are often implemented for the express purpose of eliminating redistribution that is considered undesirable by a country's policymakers. In Sweden, for example, the reform of 1999 was motivated not only by a desire to increase workers' retirement savings, but also by a desire to eliminate redistribution from workers with flat earnings profiles to those with steep earnings profiles (Palmer, "The New Swedish Pension System", 1999). To this end, not only did the reform introduce carve-out accounts, but it also transformed the PAYG pillar from a traditional DB system into a notional defined contribution ("NDC") system. An NDC system is financed on a PAYG

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<sup>17</sup> Unfortunately, we were unable to find any studies or research papers that compared pre-reform and post-reform disability incidence rates for countries adopting Chilean-style disability programs.

basis, but mimics the operation of a DC system by establishing notional individual accounts to tightly link PAYG benefits to PAYG contributions.<sup>18</sup>

Unfortunately, neither the Chilean, the Hungarian nor the Swedish reforms offer useful lessons for integrating carve-out accounts into a pension system that has, as an explicit objective, the redistribution of income to individuals with low lifetime wages. The primary objective of the three pension systems is not to redistribute income, but rather to replace wage income in a similar manner across all types of workers.

Implementation of carve-out accounts in the United States is a more complex endeavor than in countries with pension systems that are focused solely on income replacement rather than income redistribution. To understand how the implementation of carve-out accounts in OASDI could affect incentives to claim disability benefits, it is useful to consider the effects of retaining the existing redistributive DB formula for disability benefits, but replacing the old age component of the system with a large DC pillar.<sup>19</sup> Thus, disability benefits would be entirely DB, while old age benefits would be entirely DC. In addition, we assume that disability benefits are awarded for life and are not adjusted upon reaching retirement age. Finally, we assume that upon qualifying for disability benefits, the assets in an individual's account are transferred to the PAYG system (as in Hungary).

In such a system, individuals with low incomes would have a stronger incentive to apply for disability benefits than individuals with high incomes, because they would benefit from the DB

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<sup>18</sup> Like the Swedish reform, the Chilean reform of 1981 was driven, in part, by a desire to eliminate redistribution that was considered unfair by many policymakers. The pre-reform Chilean pension system was highly fragmented, consisting of several different PAYG schemes covering different segments of the workforce, each scheme with different contribution rates, benefit formulae, and retirement eligibility criteria. Because all of the schemes depended, to a large extent, on government transfers, redistribution was implicitly occurring among these different schemes. In addition, redistribution occurred within each scheme because benefit formulae generally were based on only the last few years of a worker's earnings. This benefit design redistributes income from workers with flatter earnings profiles to those with steeper earnings profiles, and may be susceptible to manipulation and gaming. Thus, the creation of a mandatory, national-level defined contribution system offered policymakers a means to sweep the pension system clean, removing undesirable redistributions that occurred under the pre-reform scheme.

<sup>19</sup> While this is not a feasible policy option due to fiscal constraints, it facilitates an understanding of important distributional issues.

pillar's redistribution but receive no special treatment from the DC pillar. For similar reasons, females would have a stronger incentive to apply for disability benefits than would males, because the DB benefit formula is blind to the fact that females have longer expected lifetimes than do males. In contrast, the DC pillar would be sensitive to male/female mortality differentials because annuity providers would factor in a female's longer expected lifetime in calculating her benefit level<sup>20</sup>.

Policymakers must be conscious of how incentives to apply for disability benefits might change if OASDI's old age benefits are restructured such that they are less redistributive relative to current law. If corresponding changes in the level of redistribution are not made to the formula for determining disability benefits, then incentives to apply for disability benefits will increase amongst that segment of the workforce that benefits the most from DB redistribution.

Many carve-out proposals for OASDI have attempted to preserve the level of income redistribution inherent in the current-law system. To compensate for the reduction in income redistribution caused by the introduction of individual accounts, these reform proposals increase the level of income redistribution in the downsized PAYG system. The net effect, it is hoped, is a two-pillar system that produces roughly the same income redistribution as the existing PAYG system. The use of benefit offsets<sup>21</sup>, for example, can have this effect.

None of the pension systems we have examined make use of benefit offsets. Rather, most two-pillar systems (i.e. systems with both a PAYG component and a carve-out component) simply

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<sup>20</sup> In some DC pension schemes, however, annuity providers are required to use unisex mortality tables. The use of unisex mortality tables redistributes retirement income from males to females.

<sup>21</sup> A benefit offset can be used to reduce PAYG retirement benefits to reflect contributions to a carve-out account. The offset is determined in a two-step process. First, an individual's contributions to a carve-out account are recorded in a notional account, and the account is credited with a notional interest rate. Second, upon reaching the retirement age, the account is converted to a benefit offset by dividing by an annuity factor. The benefit offset is then subtracted from the unreduced PAYG benefit (the PAYG benefit that the individual would have received had they not participated in the individual account system). The result is a reduced PAYG benefit, adjusted downward to reflect an individual's participation in the individual account system.

have a less-generous benefit formula for members of the two-pillar system. Thus, there is no international experience that can help us understand potential interactions between the design of benefit offsets and the incentive to claim disability benefits.

Regardless of the method used for calculating reduced PAYG benefits (either benefit offsets or an entirely new PAYG formula), the Swedish disability model is best insulated against increases in incentives to claim disability benefits, because disability benefits cease at a particular cut-off age rather than extending until death.

### Dealing with Recoveries

If individual accounts are carved out of OASDI, a mechanism must be devised to deal with recoveries from disability. A small fraction of disabled persons recover before reaching the retirement age. In these cases, disability benefits are terminated. Eventually, after reaching the retirement age, the individual may apply for retirement benefits.

If carve-out accounts are introduced to OASDI, dealing with recoveries becomes more complex. For example, the Chilean disability model is designed to function in conjunction with lifetime, rather than temporary, disability benefits. Under the Chilean model, an insurer makes a lump-sum payment to the newly disabled's account, and the account, in many cases, is then annuitized. If such a system were introduced in the United States, a person recovering from disability would have an account balance of zero. To account for recoveries, legislation would have to be introduced to restore the account balance (perhaps with imputed contributions and interest) and partially compensate the private insurer. Alternatively, the DI program could be modified to include, as in Chile, two stages of disability benefits: provisional and permanent. Only after a beneficiary is classified as permanent would the individual account be annuitized.

If, however, the Hungarian model were applied to OASDI rather than the Chilean model, the same problem would be encountered – an individual recovering from disability would have an account balance of zero, because the balance would already have been transferred to the PAYG system and paid-out to current beneficiaries. One solution to this problem would be to hold the account in escrow until the individual reaches the retirement age, with transfer to the PAYG system to occur only after that time. If, however, the individual were to recover before reaching retirement age, the individual would then regain custody of his or her account. To ensure a satisfactory account balance for those who do recover, the PAYG system would have to finance imputed contributions and interest for the period of disability. These payments could be made at the time of recovery.

In contrast to the Chilean and Hungarian models, the Swedish model is completely compatible with a system in which recovery from disability results in benefit cessation. No changes to the Swedish model would be required.

#### Feasibility of Covering DI Benefits Via Private Insurance

The Chilean disability model requires the participation of private insurers. In Chile, private disability premiums are a function of the following factors: (1) disability incidence rates, (2) the asset levels held in the individual accounts of the insurer's members, (3) future interest rates, (4) future rates of inflation (because the benefits are inflation-indexed by law), (5) mortality rates of the disabled, and (6) family structure of the disabled (because the insurance must also provide survivor's benefits). Clearly, disability insurance in Chile is a complex financial product – one that is difficult to price.

Initially, when the individual account system was first launched, premiums for private disability and survivor's insurance were more than 2 percent of the covered wage bill, but have



since fallen to about 0.85 percent of the covered wage bill. It is possible that the high initial premiums were due, at least in part, to a lack of information.<sup>22</sup> The insurers were venturing into new territory and covering unfamiliar risks. High premiums were necessary until an understanding of the magnitude of the various risks was developed.

In the United States, if private disability insurance were to cover a portion of DI benefits, it is possible that a similar premium pattern could occur. Premiums would decline gradually as insurers became more knowledgeable about the risks involved. To help insurers with their pricing, the Social Security Administration could share information it has available regarding historical disability incidence rates and mortality rates.<sup>23</sup>

To deal with changes in risks, private insurers would require the freedom to adjust premium levels periodically. While the existing OASDI system has a relatively constant contribution rate that remains level for long periods, a system involving private insurers would have greater volatility of contribution rates (for the DI portion of the system). Different insurers might offer different contribution rates for this insurance, and employers and employees would have to adjust their contribution payment systems to deal with this added layer of complexity.

An additional complication is the fact that OASDI benefits are inflation indexed. Because most long-term government debt and corporate bonds in the United States are issued with a fixed nominal interest rate rather than a fixed real interest rate, insurers in the United States could be expected to experience some difficulty in finding suitable assets to match against inflation-indexed liabilities. In Chile, as in the United States, disability benefits are inflation indexed. In Chile,

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<sup>22</sup> There are additional factors that may have contributed to the drop in insurance premiums. First, investment returns earned by the individual account system were quite high during the 1980s and 1990s. The build-up of account balances during this period probably helped to reduce disability and survivors' insurance premiums. Second, competition in the industry has increased over time, also helping to drive down insurance premiums.

<sup>23</sup> The Social Security Administration has several detailed studies of mortality rates of the DI population (e.g. Zayatz, Actuarial Study #118, 2005).

however, inflation-indexed bonds are much more common, and insurers invest in these bonds in order to match the duration of their benefit liabilities with the duration of their assets<sup>24</sup>.

## 9. Conclusions

Our analysis of international pension reform experience revealed three basic approaches for restructuring disability benefits to accommodate the implementation of carve-out accounts: the Chilean model, the Swedish model and the Hungarian model. These models differ with respect to the duration of disability benefits and the financing roles played by the individual account, the PAYG system, and private insurers. The models vary in their effects on the incentive to claim disability benefits, their ability to deal with recoveries from disability, and their effects on the system's actuarial balance.

When old age benefits and disability benefits are financed by a single defined benefit system, it is possible to carefully control the relationship between old age benefit levels and disability benefit levels. This relationship is simply a policy decision. But when old age benefits are partially or fully financed by individual accounts (while disability benefits continue to be defined benefits), the relationship is no longer a policy decision. Old age replacement rates will fluctuate in response to interest rate changes and mortality rate changes. Should old age replacement rates fall below the level of disability replacement rates, the disability claims rate might increase, as workers seek ways to maximize their benefits.

None of the disability models we examined offers a completely effective solution to this moral hazard problem. However, the Swedish model – under which disability benefits cease at the retirement age (or a cut-off age near the retirement age) – is clearly better insulated against this

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<sup>24</sup> In practice, Chilean insurers are unable to achieve a perfect match between the duration of their assets and liabilities, but the capital markets are evolving rapidly. With each passing year a greater range of financial instruments are available to Chilean insurers, thus enabling a better match of assets to liabilities.

moral hazard than either the Chilean or Hungarian models (under which DB disability benefits are paid until death). To reduce moral hazard even further, the disability benefit formula would have to be modified such that it captures at least a portion of the mortality rate risk or the interest rate risk (or both risks) that is inherent in a DC system. For example, the formula could include a mechanism to gradually reduce disability replacement rates in response to reductions in mortality rates.

The implementation of carve-out accounts raises important questions in regard to recoveries from disability. Under the Hungarian disability model, a disabled individual's account is transferred to the PAYG scheme, and under the Chilean model, a disabled individual's account may be annuitized. Such arrangements are most suitable for pension schemes in which disability benefit awards are permanent (even in the event of recovery from disability). The Swedish disability model, in contrast, is completely compatible with a system such as OASDI in which recovery from disability results in cessation of disability benefits.

Each of the three main disability models we identified has a different impact on a PAYG system's actuarial balance. The Chilean model has a large upward impact on the PAYG deficit during the first 20 years of the reform; but in the long run, the Chilean model is the least expensive of the three, assuming that interest rates are sufficiently high. Relative to the Chilean disability model, the Swedish and Hungarian disability models, by contrast, have only a small impact on transitional costs.

Implementation of carve-out accounts in the United States is a more complex endeavor than in the three primary cases considered in our study. The Chilean, Hungarian and Swedish pension systems are intended to replace income rather than redistribute income. Individual accounts are consistent with that objective. In contrast, OASDI's benefit formula generates replacement rates that decline as lifetime income increases. If carve-out accounts were implemented in such a way that the progressivity of old age benefits were reduced, and, in addition, the current-law DB promise

were maintained for disability benefits, then incentives to apply for disability benefits could be expected to increase amongst that segment of the workforce that benefits the most from DB redistribution. To avoid increasing the incentive to claim disability benefits, any changes to the progressivity of old age benefits (as a result of the implementation of carve-out accounts) should be matched with corresponding changes to the progressivity of disability benefits.

## List of Countries Included in Our Analysis

<b>Table A. Countries with Carve-Out Accounts, and Year of Carve -Out Implementation</b>			
Latin America		Europe	
Argentina	1994	Bulgaria	2002
Bolivia	1997	Croatia	2002
Chile	1981	Estonia	2002
Columbia	1994	Hungary	1998
Cost Rica	2000	Latvia	2001
Dom. Rep.	2003	Macedonia	2005
El Salvador	1998	Poland	1999
Mexico	1997	Slovakia	2005
Peru	1993	Sweden	2000
Uruguay	1995		

<b>Table B. Countries with Carve-Out Accounts, Classified by Disability Financing Model</b>	
Chilean Model	Argentina, Chile, Peru
Swedish Model	Latvia, Slovakia, Sweden
Hungarian Model	Bulgaria, Croatia, Hungary, Macedonia, Poland
Mixed Model	Bolivian, Mexico, Uruguay
<p>Note: this table is incomplete because we are still waiting for policy descriptions, or clarifications, from some countries. The table will be updated and expanded after we have obtained complete and clear policy descriptions from all countries.</p>	

## A Description of the Stylized Simulation Model

To provide a rough idea of transition costs associated with the implementation of different disability financing models, we developed a stylized model to simulate the operation of a simple fictional pension system that finances old age benefits and disability benefits (but not survivors' benefits). In this fictional pension system, workers enter the labor force at age 20, remain employed for 40 years, retire at age 60, and continue living until age 75. All workers earn the average wage throughout their careers. We assume that 10 percent of the workforce becomes disabled at age 50; for the sake of simplicity, this is the only age at which workers become disabled. Also, for the sake of simplicity, disabled persons are assumed to have the same lifespan as those in the non-disabled population.

Old age benefits are calculated using a notional defined contribution ("NDC") formula. This type of benefit formula automatically adjusts replacement rates for future retirees to fiscally sustainable levels. For example, if we simulate the introduction of carve-out accounts, the NDC formula will gradually reduce the PAYG replacement rates of future retirees to reflect the reduction in the PAYG contribution rate.

An NDC system mimics the operation of a DC system. Each worker has a notional account. PAYG contributions are recorded in this account and credited with notional interest. Upon retirement, the account is used to determine a PAYG pension. If the notional interest rate is set at a rate equal to growth of the covered wage bill, and if the annuity factor used to convert the account to a pension is calculated using this same notional interest rate, then PAYG expenditures will equal PAYG contributions under steady-state demographic and economic conditions. We assume that the pension system operates amidst steady-state economic and demographic conditions. We assume the following steady-state conditions: annual population growth of 1 percent, annual real wage growth of 1 percent, and an inflation rate of 2 percent. Benefits are inflation indexed.

Our simulations begin with a fiscally balanced PAYG system. The system is financed with an 11 percent contribution rate. Old age expenditures are equal to 9.2 percent of the covered wage bill and disability expenditures are equal to 1.8 percent of the covered wage bill. Voluntary carve-out accounts are introduced in the year 2005 for individuals who are below the age of 45 (i.e. individuals born after 1960). We assume that 50% of those eligible to participate do so. The carve-out contribution rate is 4 percent. Thus, members of the new two-pillar system pay 4 percent of wages into an individual account and 7 percent of wages into the PAYG system. Older members of the workforce (those born before 1960) continue to pay an 11 percent PAYG contribution rate.

For each simulation, disability benefits are financed using either the Chilean, Swedish or Hungarian financing models. Under each of these models, we assume that the entry pension for disabled persons is equal to the entry pension for retirees from the PAYG-only system. By "entry pension", we mean the first pension paid after an individual becomes a beneficiary. In addition, we assume that disability incidence rates do not vary as a function of the disability-financing model. Disability incidence rates remain constant across all simulations.

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