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The Role of Private Sector Annuities Markets in an Individual Accounts Reform of a Public Pension Plan

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Abstract

The views expressed in this Working Paper are those of the author(s) and do not necessarily represent those of the IMF or IMF policy. Working Papers describe research in progress by the author(s) and are published to elicit comments and to further debate.

Pension reforms that establish individual accounts will diminish the relative importance of the traditional state pension while creating a significant role for individual accounts in providing income for retirement. This paper surveys the policy issues this new role entails. It offers general advice to countries considering such issues as the restrictions to be placed on the timing, extent, and form of withdrawals from individual accounts and the need for mandatory annuitization (conversion into annuities) of accumulated account balances. The paper also considers the role that private annuity markets should play and related regulatory, social safety net, tax, and administrative questions.

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At present we want to encourage prudence in the sense of distributing income through a man's life. When that time comes all sorts of fancy devices possibly with a counter-insurance element in it, e.g., annuities on joint lives... from the notes of Lord Keynes for the National Debt Enquiry, 1945.²

"Father, I have often thought that life is very short."—This was so distinctly one of his subjects that he interposed.

"It is short, no doubt, my dear. Still, the average duration of human life is proved to have increased of late years. The calculations of various life assurance and annuity offices, among other figures which cannot go wrong, have established the fact."

"I speak of my own life, father."

"O indeed? Still," said Mr. Gradgrind, "I need not point out to you, Louisa, that it is governed by the laws which govern lives in the aggregate." from Hard Times, by Charles Dickens.

I. INTRODUCTION AND SUMMARY OF CONCLUSIONS

A. Introduction: The Need for Private Sector Annuities

"Social security privatization" has come to describe a reform that involves the partial or complete replacement of the public defined-benefits system by a privately managed but publicly regulated defined-contributions system. Specifically, the introduction of a system of individual accounts (hereinafter referred to for convenience as an IA reform) supplants the payroll tax, the traditional source of finance for public pension systems. On the benefits side, an IA reform results in the funds that accumulate in the IA of a contributor becoming a source of income in retirement that replaces, wholly or in part, the pension, typically an indexed life annuity that the state provides.

This general pattern of reform has many variants. However, all of them—apart from a reform that effectively maintained the existing system by requiring that the funds that accumulate in an IA be used to purchase an annuity from the state—would lessen the role of the state pension.³ Although the merits of an IA reform have been endlessly debated, this aspect of an

² Royal Economic Society, Vol. XXVII of the *Collected Works of John Maynard Keynes*.

³ The paper uses the term "state" to refer in general to the central governing authorities of a country and not to a political subdivision, unless the context requires that it be used in the second sense, as in the states of the United States.

IA reform has not yet received all the attention that it deserves.⁴ The state pension plays a major role in providing income to the elderly in most advanced economies, and in not a few emerging market economies, although its role has declined in countries like the United Kingdom and Chile that have moved away from the standard model.

The partial or complete elimination of the indexed life annuity that a conventional public pension system provides raises some important questions. This paper aims to provide a general guide to countries that are coming to grips with them. A separate paper (Mackenzie (2002) deals with the same issues in the specific case of the United States, in the light of recent proposals to introduce individual accounts. Indexed life annuities can play a vital role in protecting the elderly from the risk of outliving their resources or underestimating the effects of inflation in real income, even though it is possible that the provision of an annuity by the state means that too large a share of a retiring person's wealth is annuitized (takes the form of an annuity).⁵ Typically, there is no close substitute for the state annuity, apart from occupational (employer-provided) pensions, and the coverage of this second tier is usually far from universal.

The full consequences of a diminished role for the state pension are incalculable. Private sector life annuities have typically not been regarded as a good investment, in part because of the adverse selection that affects annuities markets.⁶ There are good reasons for thinking that demand for private annuities will not spontaneously substitute for the state's pension. Many retired persons, if left to their own devices may well have difficulty formulating and sticking to a spending plan that will spread their resources over their remaining lifetime. The state pension ensures these individuals enjoy some amount of regular income. Although the across-the-board reduction or elimination of the state pension could benefit some individuals, it could cause hardship to many others. It will be important, in consequence, to examine carefully the implications of mandatory annuitization or other restrictions on the use of the funds accumulated in IAs.

A government contemplating the reform of a public pension plan, and in particular, the distribution phase must make two basic decisions: (i) should there be restrictions on the

⁴ For opposing views on the merits of an IA reform, see Munnell (1999) and Samwick (1999). For a more general perspective on pension reform, see Barr (2000), Cordes and Steuerle (1999), and Orszag and Stiglitz (2001).

⁵ If labor markets are sufficiently flexible, working later in life (e.g., past age 65) can also provide some longevity insurance. The effectiveness of this expedient will depend on the extent to which the skills and motivation of older persons depreciate with age and inactivity, and on how welcoming labor markets will be to them.

⁶ The annuities market has typically been viewed as suffering from adverse selection because annuitants have longer life expectancies than the rest of the population. This characteristic is reflected in annuity premiums, which makes them relatively unattractive to the general population. Adverse selection and other features of the market for annuities are discussed further in Section III and Appendix I.

distribution of the funds that accumulate in an IA, such as mandatory annuitization; and (ii) if annuitization is mandatory, should the provision of annuities be privatized. Although these choices are obviously fundamental, in that they define the basic model of reform the government will follow, an informed choice between them requires that a government investigate at some length all the ramifications they entail. The government must address a series of design issues whatever its final choice will be. Some of these are relevant whether or not the provision of annuities remains in the hands of the state; others arise only if annuitization becomes mandatory but the government cedes responsibility for the provision of annuities to the private sector.

The basic design issues that arise with mandatory annuitization with or without private sector provision are as follows:

How should the degree or extent of annuitization be determined? Four broad possibilities are:

- *Minimum premium value:* the premium paid for the annuity must equal or exceed some minimum value.
- *Minimum annuity payment:* the income the annuity generates must equal or exceed some minimum value (e.g., US\$700 or €500 per month).
- *Minimum replacement ratio:* the income the annuity generates must equal or exceed some specified ratio of a measure of the annuitant's earned income.
- *Mixed minimum annuity payment and replacement ratio:* the income the annuity generates must equal or exceed the greater of some minimum value or some specified ratio of a measure of the annuitant's earned income.

Should the value of the funds accumulated in the account or the income that the annuity generates be guaranteed? If so, should the full amount of the mandatory annuity as determined by one of the rules set out above be guaranteed or only part of it?

What form should the mandatory annuity assume? Annuities can be classified according to how long or under what conditions the annuitant receives income under the terms of the annuity contract; the timing of the payment of the premium; the form of the income the annuity provides; and the survivorship entitlement.

The following list, although it is not exhaustive, provides a general idea of the possible forms an annuity can take:

- duration: simple life, term (or period) certain or term certain and life;
- timing of payment: (i) immediately prior to annuitization, or some time before (a deferred annuity), and (ii) in one payment or a series of payments;

- form of income: fixed nominal, fixed real, variable with guaranteed minimum, variable but no guaranteed minimum; and
- survivorship entitlement (various possibilities, including joint and survivor).

What exceptions should be allowed? Should the terminally ill be allowed to opt out of mandatory annuitization?

How will the annuity fit into the existing social safety net? Should IA holders who have failed to save enough to finance the minimum annuity required of them have their account topped up, or should they be handled by the existing safety net? The state pension normally includes safety net features for family members that an annuity cannot provide—e.g., survivors' benefits that do not lower the value of the pension. How are these benefits to be treated? How should the redistributive features of the state pension be accommodated?

The issues below take on particular relevance in the case of private sector provision:

How much liberty should annuity providers have in pricing their products? Private sector annuities differentiate between the sexes. A female annuitant pays more for a given income than her male coeval because the average woman lives longer than the average man.⁷ A similar issue with regard to premium differentiation along racial lines may conceivably arise in the United States and possibly in other countries. Is such differentiation to be allowed?

Will the framework of financial regulation and supervision be adequate in the brave new world of an enlarged annuities market? In the United States and the United Kingdom, the incidence of life insurance companies not honoring their commitments to annuitants has been very low, but insurance companies do get into difficulty. Some companies default, and some find themselves unable to honor their commitments to annuitants (and other creditors). Whether annuitization is mandatory or not, an IA reform will increase the demand for annuities, and with it the importance of sound regulation and supervision.

Should the state provide a guarantee of some kind to protect annuitants from the failure of their annuity provider, if it requires the purchase of annuities? This question cannot be answered satisfactorily without considering the potential for moral hazard that a guarantee will create, and is closely related to the previous question.

Are there differences in the tax treatment of the state pension and private annuities, and if so how should they be resolved?

What new procedures or institutions are required to ensure that the market for annuities plays its proper role in the provision of income for the retired, and what sequencing issues

⁷ The pronouns “he” and “she” are used interchangeably, except in contexts where the referring noun is normally one sex but not the other.

arise? The shape these procedures will assume will depend on the administrative and legal role that the state will play and on the extent of the choice IA holders have when they withdraw funds from their accounts. Revamping the current regulatory framework could take time. Even if the government is no longer providing the annuity, it has a vested interest in ensuring that annuitants contract with sound financial institutions and receive good value for their money. If annuity purchase is mandated, the government may have to devise exceptions to the general policy, and institutions or procedures to minimize abuse or gaming.

These words give the general flavor of the implementation issues that would need to be addressed.

B. Conclusions

Since the paper is intended to be a general guide to any country engaged in or contemplating an IA reform, rather than a blueprint for a particular country, its conclusions are necessarily general and somewhat tentative and conditional. The generality is necessary both because the paper cannot survey all the relevant institutions in each of the countries that might implement an IA reform, and because so much depends on the exact design of the reform. It makes a great deal of difference, for example, whether the IA reform is an “add-on” reform, which might leave the state pension basically intact.⁸ In addition, the answer to one question must depend on the answers to all the others. A decision to require the purchase of only a minimum annuity (rather than one intended to achieve some target replacement ratio) has different implications for financial regulation and supervision than a decision to require the annuitization of all the funds accumulated in an IA, for example.

To start with the basic question, *some* degree of mandatory annuitization is highly desirable for most countries implementing an IA reform, particularly a radical version that completely eliminated the state pension. The same arguments that justify compulsory participation in a social security system—the need to discourage improvident behavior and free-riding—can justify some degree of mandatory annuitization. Compulsory annuitization would also reduce adverse selection.

An informed decision as to the optimal degree of annuitization is ideally based on comprehensive surveys of the share of wealth at retirement (apart from the funds in the IA) that is already annuitized. In most countries, such information is not available. In the United States, however, the poorest fifth of OASI recipients are estimated to have virtually no occupational pension or other annuitized income. It is likely that the state pension dominates other forms of annuitized wealth in the same income class in other countries as well. Without mandatory annuitization, a radical IA reform would mean that the elderly poor would be bereft of the valuable longevity and inflation insurance that the state pension provides unless

⁸ An add-on reform would create an IA system without diverting part of the revenues from payroll taxation to fund the accounts.

they turned to the private annuities market. That many would do so is unlikely for a number of reasons.

As to the form a mandatory annuity might take, an indexed life annuity with survivor benefits would best replicate the most desirable features of the typical state pension. A minimum annuity payment defined in terms of a replacement ratio (over a certain income range) with a minimum value would replicate a key design feature of many state pension systems. The greater the share of IA funds that are annuitized, however, the greater the risk of over-annuitization and also of moral hazard if the value of the guaranteed annuity is set equal to the minimum mandatory annuity. In practice, the political environment in some countries might require that an informal guarantee be extended to cover that part of the mandatory annuity that was not covered by the official guarantee.

Exceptions to mandatory annuitization should be kept to a minimum, being extended at most to IA holders suffering from terminal illness. Annuity pricing poses problems. Differentiation is fair by one standard but not by another. Enforcing uniform pricing is administratively messy. Group annuitization, if organized by the government would reduce annuity premiums and simplify administration. These advantages come at the cost of reduced flexibility.

The major issue for financial regulation and supervision that arises with mandatory annuitization is the threat of moral hazard. In fact, there are two points in the accumulation-distribution cycle where moral hazard can arise. The first arises during the accumulation phase if a guarantee applies to the minimum value of the funds in an IA upon retirement, since this can create an incentive for an IA holder to invest his holdings recklessly, knowing he will be bailed out. This risk can be contained by limiting the value of the guarantee on each IA. The second arises when a guarantee on annuity payments creates an incentive for an annuity provider to offer excessively generous terms. Addressing the second problem effectively requires both a limit on the guarantee (as is typically the case with deposit insurance) and effective overall regulation.

The successful introduction of mandatory private sector annuities would require a substantial amount of preparation. This is particularly true of countries where annuities markets are limited and financial regulation needs strengthening. Even in countries where financial markets are sophisticated and financial regulation is strong, it is easy to underestimate the preparatory requirements for a successful reform. From the publicity campaign that informs IA holders of the changes to their retirement regime, to the implications of increased choice regarding the form that retirement income will take, to the regulations that will govern exceptions to the annuitization rules, to the necessary changes to the framework of financial regulation, the introduction of mandatory annuitization would require careful planning.

Finally, and depending on the eligibility of contributors to the state pension system for participation in the new IA system and on the treatment of their accrued pension rights under the old system, the first annuities under the new system may not be contracted until some time after the reform is enacted. While this delay in the start of annuitization may seem to

make the distribution phase of the reform less urgent; it is not a good reason for avoiding detailed and early planning.

The corpus of the paper begins in Section II with a description of the basic features of the market for life annuities that draws on the more technical discussion of the economics of annuities in Appendix I. Section II also discusses some relevant aspects of the regulation of life insurance companies. Sections III, IV, and V then turn to the basic issues this introduction has highlighted. Section III discusses the problems that can arise with private sector provision of annuities, including the risks of over and under-annuitization, and the consequences of unpredictable financial markets. Section IV deals with regulatory issues, and Section V with tax and administrative issues.

II. BASIC FEATURES OF ANNUITIES MARKETS IN THE UNITED STATES AND ELSEWHERE⁹

A. The Market for Annuities

Despite the very long history of annuities—their lineage extends back to ancient Rome—the market for private sector annuities in our own times is small in most countries, if it exists at all.¹⁰ The exceptions to this general pattern include Australia, Canada, Chile, Singapore, Switzerland, United States, and the United Kingdom, although in none of these countries is the annuities market really large in comparison with the market for other financial instruments. Markets for annuities are also developing in Argentina and other countries where IA reforms have been implemented.

The annuities market in the *United States* offers many different kinds of annuities, although its overall size is modest in comparison with that of other financial assets. The *variable annuity*, which combines features of a savings plan with an equity mutual fund, is by far the most important part of the market. Although a minimum payment is normally guaranteed once the holder opts for annuitization, payments vary with the return on the investments that fund the annuity. Sales of variable annuities in 1999 are estimated to have amounted to US\$122 billion. Sales of fixed annuities amounted to US\$37 billion, or roughly US\$19,000 per person reaching the age of 65 in 1999. The *single payment immediate fixed life annuity*—which in return for a lump sum payment provides a stream of payments fixed in dollar terms that commence upon purchase and are paid for as long as the purchaser (annuitant) lives—or

⁹ This section draws on Appendix I: The Basic Economics of Annuities, which discusses adverse selection and other aspects of the economics of annuities in more depth.

¹⁰ Poterba (2001) gives a brief account of the history of annuities. See also Appendix I.

in the case of an annuity with a joint survivor, as long as either he or his spouse lives—is not popular, with only US\$2 billion in sales in 1998.¹¹

In the *United Kingdom*, the life annuity is more important in relative terms than it is in the United States. Individuals with a defined-contribution scheme who have opted out of the state earnings-related pension scheme (SERPS) must annuitize 100 percent of the funds that would otherwise have gone to finance a state pension. The annuity is to be purchased between the ages of 60 and 75. Funds attributable to additional contributions should be 75 percent annuitized. This annuity is to be purchased between the ages of 50 and 75. The market for annuities is now comparatively small, but can be expected to grow as more and more individuals with defined-contributions plans reach retirement age (Banks and Emerson (1999)).

Life annuities have become fairly common in *Chile* with the growth in the number of Chileans retiring under the system of individual accounts that was introduced in 1981. This development reflects the restrictions the law imposes on the form that withdrawals from individual accounts may take, the restrictions being intended to ensure that account holders have sufficient funds to acquire an annuity that will allow them a reasonable standard of living in retirement. The accumulated funds in individual accounts typically finance either an indexed life annuity or a series of programmed withdrawals (essentially an indexed term-certain annuity), although the funds in the account that exceed the equivalent of what is necessary to finance a pension that equals or exceeds both a specified replacement rate and value may be withdrawn in a lump sum. As of December 2001, the share of distributions taking the form of life annuities accounted for about 53 percent of the total chosen by retiring plan participants.¹²

Singapore has also witnessed a rapid growth in recent years in the market for life annuities. Doyle, Mitchell, and Piggott (2001) note that about one-sixth of the workforce retiring in 1999 purchased an annuity. This growth results from recent changes to the regulations governing withdrawals from the Central Provident Fund, a publicly-run defined-contributions scheme—that encourage an account holder to devote a specified minimum of the funds accumulated in his or her account to the purchase of a life annuity when the funds become accessible for withdrawal at age 62. *Australia's* pension system has a privately managed individual accounts component, known as the Superannuation Guarantee, that applies to most workers. A contribution of 9 percent of salary finances either a defined-contribution pension or fully funded defined-benefit pension. At age 55, the “preservation age,” the account holder may elect to receive either a lump sum withdrawal or an income stream. The standard age

¹¹ The estimates of annuities sales in 1999 come from a website called <http://www.insure.com>, which refers to LIMRA international. The figure for life annuity sales in 1998 comes from Brown and Warshawsky (2001) who estimate it on the basis of data from the American Council of Life Insurers.

¹² This information comes from the website of the Chilean Superintendency of Pension Fund Administrators, <http://www.safp.cl>, which provides a wealth of material on the Chilean pension system (in Spanish).

(i.e., old age) pension is subject a minimum retirement age of 65 for men (61½ for women) and to a means test that applies to both income and wealth. These conditions create an incentive for some account holders to elect the lump sum withdrawal option and spend the money quickly in order to increase the size of their age pension. Concern over this incentive effect has led to a change in the law that will eventually increase the preservation age from 55 to 60.¹³ Information on the annuities markets of countries that have implemented an IA reform in the 1990s is scanty.

Annuities markets in *France, Germany, Italy, and Japan* are apparently small, mainly because of the relative generosity of the state pension system and the important complementary role played by occupational pensions. In Italy's case its inflationary past may also play a role.

Indexed life annuities depend on the existence of indexed government securities. Markets for these instruments have been functioning for some time in the *United Kingdom, Chile, and Israel*. They are popular in Chile and Israel, two countries with moderately low inflation rates today but with an inflationary past. (Nominal annuities are not available in either country.) A market for indexed annuities exists in the United Kingdom as well, but is only just starting up in the United States, although the Treasury has been issuing indexed debt (TIPS) since 1997. Markets for indexed annuities, albeit very small ones, are also found in Colombia and Peru, where the IA reforms implemented in the 1990s include provisions requiring IA holders to buy either an indexed life annuity (which may be deferred) or engage in a series of programmed withdrawals when they retire.

This brief review of the international experience lends support for the view that annuities markets are relatively larger, or are growing at a faster pace, in those countries that have public pension systems with an important defined-contributions component and that encourage or require the annuitization of the funds accumulated in an IA upon retirement. A corollary of this point is that the annuities market remains to be developed in those countries with generous public systems that have not adopted any variant of the Chilean model.

The life annuity sold by life insurance companies and other financial institutions in the countries just named and a few others is similar to the retirement benefit provided by the state. There are important differences between them, however. Most state pensions are indexed, usually to consumer prices, unlike the typical private sector annuity, although indexation in practice has been less than full in some countries. Legislatures can vote to change the value of the state pension, although the political influence of retirees and the restraining effect of legal and constitutional provisions would make wholesale or abrupt changes unlikely in many countries including the United States. In contrast, life insurance

¹³ The retirement age for women is being gradually increased to 65 (Doyle, Mitchell, and Piggott (2001) and OECD (1999, 2001)).

companies are bound by their contract, although fraud or managerial incompetence (or possibly very bad luck with investments) can disrupt payments to annuitants.

B. Influences on the Demand for Life Annuities

Economists have proposed five basic explanations for the small size of markets for private sector annuities, and life annuities in particular. Specifically, demand for life annuities may be inhibited by: (i) the substitutes provided by the state pension and occupational pensions; (ii) the desire to leave a bequest; (iii) the need to defray unexpectedly large expenditures; (iv) the perceived costliness of annuities entailed by adverse selection; and (v) the shortsightedness of potential annuitants or their lack of understanding of an annuity's properties. A sixth explanation, which may have more applicability in emerging market than advanced economies is a lack of trust in financial institutions.

These are plausible explanations. The provision of retirement income by employers or by the state, which typically takes the form of a life annuity could be expected to reduce the demand for annuities from an insurance company. In countries like France, Germany, and Japan, the combined annuity provided by state and employer currently replaces most of the retired person's earned income. The dominant role played by these two pillars of retirement saving leaves little room for individual annuities, although scope undoubtedly exists for growth in the annuities market. The share of the wealth of the average retired person that is annuitized may be smaller in the United States than it is in these European countries. However, a recent study found that annuitized income, including estimated private pension and social security accrued benefits, accounted for 52 percent of average net wealth of a sample of Americans aged 51–62. For the bottom 5 percent by wealth the ratio was estimated to be 195 percent, of which 179 percentage points was accounted for by social security (Gustman et al (1997)).

The wish to leave a legacy will may also deter annuitization. When an individual buys a simple life annuity, her premature death deprives her heirs of all or most of the wealth represented by the premium. It also leaves her less prepared (although not necessarily insufficiently prepared) to deal with unexpected but necessary outlays. Adverse selection does raise the cost of annuities for the typical person. The purchase of a simple life annuity, regardless of its implicit rate of return, may seem like a bad bargain, since it involves an irredeemable upfront payment of a large sum of money in return for a stream of income of uncertain duration. Finally, there is no question that annuities are a sophisticated financial instrument. Unlike a bond or money market investment, the annuitant gives up the principal. She does not have her cake and eat it too. Even if annuities are a good buy, the form of the transaction is not that of the typical investment.

Nonetheless, these explanations, with the possible exception of the first are not entirely satisfactory. In principal, the typical person should benefit from owning a private annuity unless his or her wealth is already substantially annuitized.¹⁴ A discussion of the merits of life

¹⁴ If human capital is included in the measure of personal wealth, most individuals do have a substantial share of their wealth annuitized during their pre-retirement lives.

annuities follows, since it is relevant for the issue, explored in Section III, of whether annuities should be mandatory if an IA system is adopted. Appendix I, from which this part of Section II is drawn, presents a more complete discussion of the economics of annuities.

The life annuity offers potentially valuable longevity insurance—protection against the risk of outliving one's resources, whether because of unexpectedly long life, fecklessness, or bad investments. Starting from the assumption of perfect financial markets—costless financial intermediation—and making a few other simplifying assumptions, it is possible to show that in the absence of a bequest motive an individual will not only acquire annuities but will devote all his wealth to that end. The reason for this is that the return an annuitant gets on his investment, provided he lives (his conditional return) will always exceed the rate of interest.¹⁵

Adverse selection, costly financial intermediation and a desire to leave a legacy are facts of life, and would presumably reduce the amount of wealth an individual would devote to an annuity. On the other hand, they need not reduce the demand for annuities to zero. Adverse selection affects the market for life annuities because the life expectancies of annuitants exceed those of the general population, which increases the premiums life insurance companies charge for annuities, making them less attractive to the general population. Nonetheless, annuities retain their property as longevity insurance, even if the terms are not as good. The same is true when the costs of financial intermediation are recognized. As for bequests, the purchase of an annuity reduces the *maximum* bequest an individual could leave, but depending on its terms has relatively little effect on the *expected value* of the bequest.¹⁶ It is not irrational or foolish for a person to buy an annuity while at the same time she plans to leave a bequest, particularly if she has good reason to believe she will live a long life.

C. The Cost and Insurance Value of Annuities

Recent research, summarized in Appendix I, has tried to gauge the effect of adverse selection and other influences on the attractiveness of annuities in the United States, the United Kingdom, and a few other countries. This work aims to calculate what a given age-group gets back in present discounted value terms for every dollar, pound, or peso it spends on life annuities. Typically the ratio of this present discounted value to the premium—the money's

¹⁵ The other assumptions are essentially that there is no uncertainty regarding interest rates, and that life expectancies (the probability of dying in any given period) are known and the same for all members of the population. The insurance company pools the premiums of all its annuitants, investing them at the market rate of interest. Because the probability of all of them surviving from one period to another is less than one, the insurance company can offer an annual income with a conditional rate of return that exceeds the market rate of interest.

¹⁶ The annuitant can hedge against the consequences of premature death by buying a certain and life annuity, which makes payments for a stipulated period (e.g., 10 years) or until the annuitant's death, whichever period is greater.

worth ratio (MWR)—is less than one.¹⁷ If it were not, the insurance company would be losing money (unless it could invest the premiums at a rate that exceeds the discount rate). Recent studies of the annuity markets in the United States, Canada, the United Kingdom, Chile, Australia, Singapore, and Switzerland confirm that MWRs for annuitants consistently exceed that of the general population. For example, Mitchell et al (1999) estimated that the MWR (using the government bond rate for the discount rate) for a 65-year old female from the general population in the United States is .829; the MWR for a 65-year old female annuitant is .893 (see Table 1).

These studies shed great light on the importance of adverse selection. If the difference between the MWR for the general population and that for the annuitant population reflects the impact of adverse selection, then they show that a substantial share of the load on an annuity for the population at large results from adverse selection. Other influences may be at work, however, as Walliser (2000) and Palacios and Rofman (2001) have pointed out. In the United States, and probably other countries, the higher an individual's income, the longer he or she tends to live. If the demand for annuities is normally related to income, annuitants will tend to be longer-lived. Walliser (2000) argues that this does not explain all of the observed difference between the life expectancies of annuitants and those of the general population.

In any case, and as Brown (2001) and Mitchell, Poterba, and Warshawsky (1999) point out, the MWR is not a good guide to the value of annuities as insurance. The basic reason for this is that the MWR calculation, which discounts future payments by the probability of survival and by the financial discount rate does not take account of an annuitant's aversion to penury in old age. Thus, an American male aged 65, who has about a 50 percent chance of living to age 80, is assumed to discount income (consumption) in his 80s by more than 50 percent, and will attach very little weight to consumption in his 90s. Anyone who is truly averse to the prospects of growing old in poverty or living on the sufferance of relatives will place a higher weight on the annuity's provision of income regardless of age. Some one with a total aversion to the risk of outliving his resources would act as if he was assured of living to some very ripe old age (say 90 or 95). A life annuity is extremely valuable for such a person. See the subsection "Annuities versus Self-Insurance" in Appendix I for further discussion.

Whether everybody, or even most people, would in practice discount the future at as low a rate as this is debatable. As a normative account, or a guide to sensible behavior in

¹⁷ The MWR is defined as the ratio of the present discounted value of the future stream of payments weighted by the probability that the annuitant survives to receive the payment to the premium. The numerator is given by

the expression $C = \sum_{i=1}^n A \cdot \pi_i / (1+r)^i$ where A is the fixed payment, n is the maximum number of years an

individual survives after purchase of the annuity, r is the (assumed constant) rate of interest and π_i is the probability the individual survives to the i th year after retirement.

Table 1. Money's Worth Ratio (MWR) Values for a Group of Countries: Nominal Annuities

<i>Using government bond rate or yield curve</i>												
	Australia		Canada		Singapore		Switzerland		United Kingdom		United States	
	Population		Population		Population		Population		Population		Population	
	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant
Male, aged 55	....	....	0.949	1.000	....	0.990	1.043	1.195	....	0.985	0.838	0.904
Male, aged 65	0.914	0.986	0.925	1.014	....	1.256	0.965	1.169	0.897	0.966	0.816	0.916
Male, aged 75	....	....	0.889	1.036	....	....	0.854	1.111	0.850	0.940	0.797	0.922
Female, aged 55	....	....	0.950	0.999	....	0.985	1.084	1.169	....	....	0.845	0.891
Female, aged 65	0.914	0.970	0.937	1.015	....	....	1.029	1.152	0.910	0.957	0.829	0.893
Female, aged 75	....	....	0.933	1.035	....	....	0.947	1.095	0.871	0.942	0.833	0.902
<i>Using the corporate bond rate or yield curve</i>												
	Australia		Canada		Singapore		Switzerland		United Kingdom		United States	
	Population		Population		Population		Population		Population		Population	
	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant	General	Annuitant
Male, aged 55	....	....	0.877	0.919	....	....	0.976	1.103	....	....	0.745	0.796
Male, aged 65	0.846	0.906	0.869	0.947	....	1.073	0.922	1.104	0.854	0.916	0.742	0.825
Male, aged 75	....	....	0.851	0.984	....	....	0.833	1.072	0.823	0.907	0.744	0.852
Female, aged 55	....	....	0.872	0.911	....	....	1.000	1.074	....	....	0.743	0.778
Female, aged 65	0.839	0.885	0.874	0.941	....	....	0.974	1.083	0.860	0.901	0.745	0.797
Female, aged 75	....	....	0.885	0.977	....	....	0.917	1.054	0.838	0.903	0.768	0.827

Source: For countries other than the United States: James, Estelle and Dimitri Vitas, "Do Consumers Get Their Money's Worth?" paper prepared for World Bank Conference, "New Ideas on Old-Age Security," Washington, September 1999; for the United States, Mitchell, Olivia, and others, 1999, "New Evidence on the Money's Worth of Individual Annuities", *American Economic Review*, Vol. 89 (December), pp. 1299–1318.

Note: All annuities are immediate single payment life annuities. U.S. data are for 1995.

retirement, however, it appears to accord well with most people's intentions and to reflect standard financial advice.¹⁸

D. Annuity Providers

Life insurance companies are typically the sole providers of life annuities in both the OECD and middle-income countries, since the regulatory framework applying to financial institutions normally restricts the sale of annuities to life insurers. Argentina, where separate retirement insurance companies specialize in the sale of life annuities to individual account holders who are withdrawing the funds from their IA, is an exception to this rule.

Even if the regulatory framework were more liberal, life insurance companies would enjoy some comparative advantage in the provision of annuities owing to the economies of scope obtainable by providing both life annuities and life insurance. The provision of both of these products requires the knowledgeable estimation of life expectancies and survival probabilities, and hence the services of actuaries. In addition, life annuities and life insurance are natural hedges for one another.¹⁹

A further and important rationale for joint provision is that the premiums for each type of insurance are invested in similar ways, with an emphasis on fixed interest instruments. This emphasis stems from the nature of the commitment that the insurance company enters into when it sells a fixed life annuity—the payments on an annuity are exactly like those on bonds—as long as the annuitant survives—in that nonpayment constitutes default. The need to honor the annuity contract places a limit on the share of the portfolio of assets funding the annuities that could be invested in equities or high-yield bonds. There may be some scope for investing a part of the portfolio in these higher-risk instruments, however, if doing so increases the mean return appreciably without increasing risk appreciably.

A life insurance company offering life annuities confronts a number of risks. First, it must deal with interest rate uncertainty (or equity risk if it invests in equities). The extent to which interest risk is a problem depends on the extent to which the company can match its expected payments stream with the interest and redemption schedule of its portfolio of bonds and other

¹⁸ Guides on how to prepare for retirement in the United States typically begin from the premise that wealth at retirement should be sufficient to support some desired or adequate personal expenditure level over the foreseeable future. As an example, a guide that the Actuarial Foundation made available on its website in May 2001 includes the sentence: "Many Americans use their retirement assets too rapidly and later find they can't afford a decent standard of living." It goes on to state: "Few retirees appreciate how costly it is to maintain their standard of living for another 20, 30 or more years after they stop working, especially with inflation, medical bills and other unexpected expenses... You may underestimate how long you'll live, not recognizing that life expectancy is only an average figure and that some individuals will live much longer than average. Or you may underestimate how much you can reasonably spend, and go without some things you can well afford."

¹⁹ However, Atkinson and Dallas in Atkinson and Dallas (2000), p. 682, referring to the U.S. market note that required capital formulas do not allow mortality and longevity risk to be offset against each other.

assets. This in turn will depend on how complete the bond market is, and on its length. Bond markets offering a full range of maturities from 30 days to 30 years are not common outside the industrialized countries.²⁰

Supposing for the sake of example that an annuitant's maximum life post-retirement is 30 years, and that Treasury securities are available over the whole maturity range up to 30 years, an insurance company could acquire a portfolio of bonds that would be perfectly matched. In other words, that part of the annuity payment that exceeded the interest earned on the portfolio during the same period could always be met by selling a maturing bond, thereby avoiding the consequences of a falling bond market. In practice, a 30-year bond is not quite enough, since many residents in both the advanced and emerging market countries will still be alive more than 30 years after they retire and buy a life annuity. In consequence, some interest rate uncertainty is unavoidable even in the countries with the most developed financial markets.

There will also be a trade-off between the average rate of return on bonds and interest uncertainty. The insurance company that holds only government securities will earn a lower rate of return on average than one that invests in corporate securities, which have a higher yield. However, corporate debt, apart from the obligations of utilities is not generally available with 30-year maturities. Since life insurance companies in most OECD countries do invest in corporate bonds (typically, but not always AA rated), they are exposed to more interest rate risk than they would be if they invested only in public debt. In addition, the higher yield of corporate debt comes at the cost of higher default risk. For the U.S. market in particular, the apparent risk of default for the highest-rated corporate grades is not significant, but undergoes a noticeable increase with "high-yield" (i.e., junk) bonds. Liquidity risk—the risk that in periods of generalized liquidity preference bond markets may effectively freeze up—is especially significant for high-yield bonds, but may also affect even more highly-rated paper at times. In any event, many of the countries with annuities markets that are developing in response to an IA reform lack a liquid and stable bond market, even for government paper.

Some simple simulations based on U.S. data suggest that the impact of interest rate uncertainty in isolation with a bond market with maturities of up to 30 years is comparatively minor, since the share of the present discounted value of the expected payments stream of payments to annuitants who retire at the age of 65 and survive more than 30 years of retirement will not be large. Interest uncertainty becomes more important with higher yield shorter maturity corporate bonds, and in countries where the maturity range for government debt is relatively short or incomplete. Interest uncertainty can also combine with the other risks an insurance company faces to inflict substantial losses.

²⁰ The maturity spectrum in the United States has shortened with the recent discontinuation of auctions of 30-year bonds.

The insurance company can choose not to match the maturity of its assets with its liabilities, and keep a substantial share of its bond portfolio at the long end when the yield curve slopes upwards on the expectation that the resulting gain in interest income may offset the capital loss when the longer-term debt is liquidated before its term. This strategy exposes the insurance company to capital loss, however, if the general level of interest rates increases by more than the company expected.²¹ Conversely, if maturities are not sufficiently long when annuity contracts are signed, an insurance company can suffer considerable losses by overestimating the level of future interest rates, a fate which recently befell one of the United Kingdom's oldest life insurance companies (United Kingdom Parliament (2001)).

The inclusion of equities or other risky assets in the portfolio of assets increases the risk of capital loss, since maturity matching is not possible with equities. On the other hand, investing in equities can be justified if holding them for a long period reduces the risk of low returns to acceptable levels. As an example, it may be prudent to assume that the annuity payments made to those relatively few members of a group of retirees who reach the age of 85 or older could be financed from a specified share, invested in equities of the premiums the group paid when it retired at age 65.²² As Section IV discusses, most national regulatory agencies place fairly strict limits on the portfolio share that life insurance companies may devote to equities and other assets with an uncertain return.

The insurance company also faces some uncertainty if the number of its annuitants is not sufficiently large, since the law of large numbers may not then apply. This should not affect the larger companies, although it might affect the market for annuities to the very old, since their numbers will have declined. It may also affect companies just entering the business, to the extent that it takes time for them to build up a large policyholder base. More importantly, however, is the fact that life expectancies and survival probabilities are not predictable with certainty. As a result, life insurance companies will make relatively conservative assumptions about survival probabilities, increasing the cost of annuities above what they otherwise would be. A conservative approach is undoubtedly prudent, since underestimating the probability of survival can prove to be an expensive mistake (see the subsection "Longevity Risk" in Appendix I).

Summing up the foregoing, life insurance companies and other providers of life annuities incur a binding obligation to make a stream of fixed payments whose number is not completely predictable. The risk to them of this commitment can be minimized by holding government debt with an appropriate balance of maturities. However, few countries have

²¹ If the term structure of interest rates slopes upward and proves to be an accurate predictor of future interest rates then the company will incur losses in any event on its sales of longer-term bonds, which it may or may not have predicted.

²² Bodie (1990) challenges the view that stocks are not risky in the long run. He argues that although the probability of a loss of any size declines with the length of time stocks are held, the probability of a large loss increases.

markets for public debt with both long (e.g., 30-year) maturities and no gaps across the maturity spectrum. Some diversification of their portfolios to include equities and higher-yield bonds may increase the overall rate of return without increasing risk substantially, and allow life insurance companies to offer more competitively priced annuities. This strategy entails accepting both an increase in interest rate risk (because of the shorter maturities of corporate debt) and in default risk.

It may be hard to gauge the point at which an increased share of higher risk instruments increases risk unacceptably. Given the fact that it takes some time to determine whether the sale of annuities to a given cohort of retirees has been profitable, the pressure of competition can induce life insurance companies to offer premiums that expose them to considerable loss if their interest rate assumptions prove to be wrong. This practice should, in principle, be inhibited if reserves are calculated conservatively, since low premiums oblige a company to add to its reserves.²³ Nonetheless, to the extent that there are pressures on insurance companies to offer excessively good terms, there could be serious consequences for the taxpayer if life annuities are protected by a public guarantee.

The structure of the life or retirement insurance industry—specifically, the degree of its concentration and the number of firms involved—varies substantially across countries. In Chile and the other South American countries that have adopted versions of the Chilean system, the number of companies tends to be small, and the degree of concentration high. Argentina is a case in point, with 20 retirement insurance companies as of June 30, 2000, of which the four largest account for about two-thirds of the market.²⁴ Concentration ratios are much lower, and the number of firms much higher, in the larger OECD countries. The particular structure of the industry in Chile and its neighbors has implications for regulation (see below).

E. The Regulatory Framework

Life insurance companies in the countries where annuities markets have developed or are developing—basically, most of the OECD, and those countries in Latin America and Eastern Europe that have implemented an IA reform—are subject to a variety of regulatory regimes. Three areas are of particular interest for this study: regulations governing investment policy, the status of annuity holders in the event of bankruptcy or default, and the regulation of actuarial assumptions.

The investment policies of life insurance companies are normally subject to either a “prudent person” (or “prudent portfolio”) regulatory framework, or a framework of quantitative restrictions. Under the prudent person (PP) approach, the company’s investment policy is

²³ A life insurance company will not know whether its contracts with a given cohort of retirees are profitable or not until most have died.

²⁴ This information comes from the website of the regulatory agency (<http://www.safjp.gov.ar>).

supposed to be guided by the test of what a prudent person would do in the circumstances. The PP approach could be interpreted as implying that a company's investments should maximize the expected rate of return while keeping risk acceptably low, but in practice the assessment of portfolio quality may be based on the quality of individual investments. The quantitative restrictions approach typically sets ceilings, usually expressed in percent of total portfolio assets, on the share of the portfolio that may be invested in particular asset classes. The two approaches are not mutually exclusive, since the PP approach can and is often complemented by quantitative restrictions on portfolio composition. In particular, most countries prohibit or limit investments in the company's own stock or the stock of affiliates.

The principal-agent approach to regulatory issues may shed light on the problem of regulation of life insurance companies, and the regulation of their portfolio allocation decisions in particular. The principals in this case comprise the policyholders and shareholders, and the agent is management.²⁵ Principal agent problems arise with financial institutions because the principals, (i.e., the shareholder-owners or depositor or policyholder-creditors) are unable to exercise direct and effective oversight of the managers (the agents) of the institution. Such a failure of control can arise when managers have technical expertise or privileged information they can exploit to their own ends.

A standard criticism of the use of quantitative restrictions on asset holdings is that it may induce suboptimal or risky investments by even a prudent investor. This follows from elementary portfolio theory, which implies that quantitative restrictions will in general push a portfolio off its efficient allocation frontier (Shah (1998)).²⁶ However, when applied to the investment decisions of managers, the validity of this criticism depends on the assumption that managers interests' coincide with those of the principals. The principal agent approach suggests that this may not be the case. It does however imply that, provided effective market-based incentives for sound investment decisions exist, quantitative restrictions should not be necessary and may be harmful. These incentives are maximized when company management is well-trained; information on company performance is clear, reliable, and promptly disseminated; shareholders will punish bad management; and policyholders are financially savvy: in other words, when corporate governance is effective.

The putative superiority of the PP approach, at least in an environment of strong and effective financial regulation and supervision, has not made it the regulatory formula of choice in the case of insurance company regulation. With some exceptions, including The

²⁵ This is a simplification, since the interests of policyholders and shareholders do not necessarily converge.

²⁶ Elementary portfolio theory casts the investment decision as one of ensuring that a given asset allocation maximizes the portfolio's expected return for the specified level of risk, so that achieving a higher expected rate of return will require accepting a greater degree of risk. Adding a constraint on portfolio allocation will either reduce the expected return for a given risk level, or at best leave it unchanged. The potentially negative impact of quantitative restrictions depends on exactly how constraining the restrictions are. Restricting equities to no more than 10 percent of total portfolio has quite different consequences from a restricting them to no more than 40 percent, for example.

Netherlands and the United Kingdom, OECD members prefer to rely on quantitative restrictions rather than the PP approach in the regulation of life insurance companies (Davis (2001)). The same applies to life insurance companies in Argentina, Chile, and Peru. Some of the limits that apply to positions in equity and other risky assets might conceivably cramp a company's asset allocation strategy. For example, Canadian life insurance companies are subject to a limit of 5–25 percent in real estate and equity investments combined; Japan limits equity holdings of life insurance companies to 30 percent and real estate holdings to 20 percent of total portfolio. In the United States, the states are responsible for insurance regulation, and they can and do place quantitative restrictions on the shares of asset classes in the portfolio. Nonetheless, and given the nature of life insurance companies' obligations, these restrictions may not impose severe limits on their operation. Reliance on quantitative regulations may enhance the quality of regulation in countries where the regulatory agency is not yet ready to follow the PP approach (see below).

Three aspects of the legal status of annuitants in the event of bankruptcy are of particular importance: the first is whether the assets that fund annuities are treated differently from the other assets of the insurance company; the second is the nature of annuitants' claims on a company in the event of bankruptcy; and the third is the degree of protection, if any, offered annuitants by the insurance industry or the state. Typically, the assets that fund annuities are not treated collectively like a pension fund's assets; i.e., they do not constitute a separate entity that is distinct from the company's other assets, and they may be attached by the company's creditors.²⁷ As for the annuitants' claim on the company, in the United States the annuitant is simply another creditor, and in fact his claim is subordinated to that of the bond holder. Holders of annuities from one moderately large U.S. life insurance company received only 70 cents on the U.S. dollar for a period of 13 months after state regulators seized control of the company (United States General Accounting Office (1999)). Life annuities are not protected by insurance arrangements as occupational pensions are by the Pension Benefit Guarantee Corporation, although annuitants whose policies are not being honored may be able make a claim against an industry-operated fund that is regulated by the particular state (e.g., Delaware, New York) in which the insurance company operates. In other countries, the state has been known to intervene on an ad hoc basis to compensate policyholders of troubled life insurance companies, but there is no explicit guarantee, nor has an implicit guarantee typically been in effect.

In some countries, the approach of quantitative restrictions has gone beyond portfolio allocation and has also been applied to the demographic assumptions that life insurance companies use in calculating their premiums. In Argentina, Chile, Colombia, and Peru, insurance companies are required to use the life table stipulated by the regulatory authority. The mortality rates of the regulatory table are significantly lower than the rates in the national tables. In calculating the present value of their reserves, the companies are required

²⁷ Variable annuities are an exception to this in the United States Perun (undated). They are treated in the same way as mutual fund holdings. This difference reflects the fact that variable annuities are invested in the stock market, and only a minimum rate of return is guaranteed by the insurance company.

to use interest rates determined by the government (Palacios and Rofman (2001)). The retirement insurance companies in Argentina must also rely on a stipulated interest rate in pricing their annuities (see Table 2).²⁸ This means that price competition in the Argentine market is expressed solely through variations across companies in the commission they charge on their annuities.

Table 2. Required Rates of Interest for Annuity Reserve and Quotation Calculations in Argentina, Chile, Colombia, and Peru

Country	Quotation rate	Reserve rate
Argentina	4 percent nominal	4 percent nominal
Chile	Unconstrained, usually higher than those used for reserves	Before 1998: 3 percent real. Since 1998: rate of underlying assets
Colombia	Unconstrained	4 percent real
Peru	Unconstrained	3 percent real

Source: Palacios and Rofmen (2001).

Regulation of the discount rate used to calculate reserves and premiums may have some unexpected consequences. In the case of Argentina, for example, it appears that an increase in market interest rates will not be reflected in the premiums annuitants pay, whether the increase is temporary or permanent. In the case of the other three countries, the limit on the interest rate used to value reserves means that, if an increase in market interest rates is reflected in lower premiums, it will be necessary to establish additional reserves to ensure that provisioning for annuities is adequate. The relatively low rate of interest used to determine reserves combines with the mortality assumptions to produce a conservative estimate of reserves (i.e., more than is likely to be necessary).

²⁸ The lower the interest rate stipulated for the valuation of reserves, the more life insurance companies would have to have on hand when an annuity contract was written. The lower the interest rate used to value premiums, the higher the price of a given income stream.

III. POTENTIAL PROBLEMS WITH RELIANCE ON PRIVATE SECTOR ANNUITIES

The previous section reviewed some of the basic features of the market for private annuities, and argued that some annuitization of wealth at retirement enhances welfare, especially the welfare of the improvident. The longevity insurance annuities provide should be valuable, despite the fact that the discounted present value of the payments the average annuitant receives per dollar of premium can be well below one. This section addresses the potential consequences of relying on private sector annuities to fill the void created by the reduction or elimination of the state pension. It concludes that there are some substantial drawbacks to such a strategy, particularly if the purchase of at least a minimum annuity is not mandatory.

A. Price Differentiation

One potentially problematic feature of the annuities market is the practice of price differentiation on the basis of sex, income and other personal characteristics. Life insurance companies in the United States and other countries charge women a higher premium for a given income stream than they charge men, because women live longer. In the United States, a life annuity would cost a 65-year old women about 8 percent more than it would cost a man (a marked differential is also found in the UK annuity market). The potential exists for similar differentiation on the basis of race in the United States, since life expectancies of African Americans are lower than those of the general population.²⁹ State pension systems, however pay women the same pension they pay men with the same earnings history.³⁰ Similarly, private pension plans in most countries may not differentiate on the basis of the sex of the plan member—only salary history and length of participation in the plan determine the value of the pension. In consequence, the average lifetime benefit a female receives from both the state and an occupational pension will be greater than that of a male with the equivalent earnings history.

The possibility of premium differentiation by sex raises the issue of the competing claims of social solidarity and individual equity. The traditional approach of solidarity can be justified on the grounds that the burden on women of their need to accumulate more savings by the time of retirement that is imposed by their greater longevity should be shared by society at large. The individualist view, in contrast might argue that the fact that women typically enjoy longer life means that equal pensions increases their lifetime income and consumption, creating an unjustified disparity between the way they and men are treated. If the purpose of a public pension system is to achieve some minimum income level during the retirement years, however, then what is relevant is annual income, not the expected value of the post-retirement income stream. The point needs to be addressed, since reliance on private sector

²⁹ The author's understanding is that insurance companies in the United States do not differentiate premiums on racial lines. It is not clear that such a practice could withstand a legal challenge.

³⁰ In fact, many social security systems around the world used to set a statutory retirement age for women that was less than the retirement age for men. This form of discrimination is less common today.

annuities has some potentially undesirable consequences. For example, a women will have to save more during the same working life or work longer and retire later than a man to achieve a given income level in retirement. Conceivably, a reduced state pension, which would be the same for both sexes, could prove a basic level of support, complemented by an annuity financed by the funds in the IA, whose premiums would differ between the sexes.

Forbidding the use of the sex of the applicant as an index in annuity pricing would mean that male and female annuitants of the same age would be charged the same premium.³¹ This restriction would pose a problem for life insurance companies as well as one for public policy. Life insurance companies that are successful in obtaining as their clients a share of men higher than the share of males in the retiring population at large will have higher profits than those companies with a disproportionate number of women. If the premium life insurance companies charge per dollar of lifetime income stream is high enough to allow them to earn a normal profit on annuities for women, it will be more than enough to earn normal profits on the business of male annuitants, since the competitive premium for male annuitants would be less than that for women. The break-even unisex premium will be somewhere in between.

Hence, life insurance companies would have an interest in discouraging female applicants, if they can do so legally, and in encouraging male applicants instead. Life insurance companies could be required to accept applications of annuities from women, but any insurance company with a share of women higher than the average would, other things being equal, earn below average profits.³² It is hard to tell how great a problem this would be in practice. It might lead companies to adopt a passive attitude to female annuitants, while competing hotly through nonprice means—if that were legal—for male annuitants.³³

Apart from sex (gender) and race, the development of genetic tests raises the issue, as Walliser (1998) points out, as to the limits to be placed on life insurance companies' use of

³¹ Under the new Polish system, insurance companies will be expected to use a unisex life table (Chlon et al (1999)).

³² On the basis of quotations from the annuityshopper.com web site in January 2002, the premium for a monthly income of US\$1,500 for a 65-year-old American male would be in the neighborhood of US\$200,000, and would be about 8 percent higher for a 65-year-old female. For a population split equally between men and women, the break-even unisex premium would be about US\$208,000. Consequently, insurance companies would be earning above-normal profits of US\$8,000 per annuitant when they sold an annuity to a male and losing the same amount when they sold an annuity to a female.

³³ Observance of a law forbidding differentiation by sex in premium-setting could conceivably be facilitated by some sort of industry pooling arrangement. The arrangement might work as follows. Life insurance companies with more men than women would contribute to the pool an amount that would be a function of the premium differential, any difference in average annuity size, and the difference in the numbers of male and female annuitants. Life insurance companies with more female than male annuitants would draw from the pool, with the amount of their drawing being determined in the same way.

personal information in pricing its products. The issue is particularly important for life insurance, but could also become important for life annuities.

A related issue is differentiation in pricing by size of annuity. Small annuities could be more expensive per unit of income, since some administrative costs are a function of the number of policies rather than their total value. Little evidence on pricing practices is available for any country, however. If price differentiation were a problem, a law forbidding it might also lead insurance companies to discourage the applications of small annuitants.

B. Interest Uncertainty and the Annuitant

Another issue that needs to be addressed is the unpredictability of the income that a given annuity premium can buy. Annuity premiums vary with the general interest level. Even if an individual account holder can predict quite accurately the balance in her account at retirement age, she will not be able to predict the ratio of income to premium accurately until very close to the date at which she locks into her annuity. This is a problem with life annuities. Its practical significance depends on the variability of the interest yield curve. Fluctuations in short-term interest rates should not have a marked impact on the price of life annuities, unless they are associated with fluctuations all along the maturity spectrum. The impact of the problem can be mitigated by making the rules governing withdrawals from IAs more flexible. One approach would be to allow the deferral of the date at which an annuity is to be purchased, with programmed withdrawals from the IA during the period between the date when the funds in the IA were first available to purchase an annuity and the date at which purchase actually takes place. This would at least allow the IA holder to benefit from an increase in interest rates in the years immediately following the date when she would normally annuitize. The strategy would not guarantee her any given premium rate, however. Another strategy would be to allow the purchase of one or more deferred annuities some years before retirement. Blake (1999) notes that deferred annuities in the United Kingdom have proved to be very expensive.³⁴ Neither strategy, singly or in combination, would ensure that different cohorts of retirees would all obtain the same income per dollar, pound, or peso per unit of premium, however. The regulated interest rates that characterize the Argentine system, while they may limit competition between annuity providers, would at least ensure this uniformity.

C. Inflation and Indexed Annuities

A fixed income life annuity would be a pretty close substitute for the typical state pension if it were indexed. The evidence implies that indexed annuities, where they are available, come at an extra cost, however. Studies of the MWR for indexed annuities in Chile, Israel, and the United Kingdom find that indexation can reduce the MWR substantially (see Tables 3 and 4).

³⁴ Alier and Vittas (2001) report on simulation experiments in which phased purchases of variable annuities beginning some years before retirement and continuing after retirement are used to mitigate the impact of fluctuating income in retirement. They find that volatility is reduced, although by no means eliminated.

Table 3. MWR Values for a Group of Countries: Indexed Annuities

<i>Using the government bond rate or yield curve</i>							
	Chile Population		Israel Population			United Kingdom Population	
	General	Annuitant	General	Annuitant	Mandatory	General	Annuitant
Male, aged 55	0.860	0.909	0.803	0.889	....	....	....
Male, aged 65	0.868	0.939	0.799	0.921	1.160	0.801	0.878
Male, aged 75	0.865	0.947	0.797	0.956	....	0.776	0.871
Female, aged 55	0.848	0.905	0.783	0.881	....	....	....
Female, aged 65	0.866	0.947	0.760	0.911	1.240	0.798	0.850
Female, aged 75	0.865	0.977	0.725	0.948	....	0.791	0.871
<i>Using the corporate bond or yield curve</i>							
	Chile Population		Israel Population			United Kingdom Population	
	General	Annuitant	General	Annuitant	Mandatory	General	Annuitant
Male, aged 55	0.779	0.818	0.727	0.797	....	....	....
Male, aged 65	0.802	0.863	0.742	0.847	0.990	0.756	0.823
Male, aged 75	0.816	0.890	0.757	0.901	....	0.731	0.818
Female, aged 55	0.760	0.805	0.706	0.783	....	....	....
Female, aged 65	0.788	0.859	0.703	0.830	1.042	0.745	0.791
Female, aged 75	0.809	0.907	0.687	0.886	....	0.757	0.828

Source: James, Estelle and Dimitri Vitas, "Do Consumers Get Their Money's Worth?" paper prepared for Bank Conference, "New Ideas on Old-age Security", September 1999

Note: All annuities are immediate single payment life annuities.

Table 4. United Kingdom: MWR for Nominal and Inflation-Indexed Annuities

	Nominal annuity			Inflation-indexed annuity		
	Average Payout	Highest Three	Lowest three	Average payout	Highest three	Lowest three
Male, aged 60	0.921	0.953	0.873	0.867	0.916	0.808
Male, aged 65	0.908	0.936	0.868	0.854	0.898	0.797
Male, aged 70	0.889	0.917	0.853	0.836	0.881	0.783
Female, aged 60	0.928	0.966	0.861	0.876	0.924	0.832
Female, aged 65	0.907	0.942	0.857	0.857	0.892	0.812
Female, aged 70	0.886	0.920	0.841	0.836	0.869	0.790

Source: Brown, Jeffrey R, Michell, Olivia S., and Poterba, James M., 1999, "The Role of Real Annuities and Indexed Bonds in an Individual Accounts Retirement Program," NBER Working Paper 7005 (March).

Note: The estimates are based on a sample of 14 large insurance companies. The data were provided By Annuity Direc, Ltd. The reference date is 8/21/98. All annuities have a five-year guarantee period.

The difference between the MWRs for indexed and nominal annuities could reflect differences in the size of the markets and the completeness of maturities for the securities that fund these instruments.

Indexation is an important property of a pension, since even a comparatively low rate of inflation can substantially lower the real value of a pension or a life annuity over the course of retirement. When inflation is fairly predictable, which is more likely when its *average* rate is low, part of the annuity payments can be saved for later years. The rate of return to such saving will be less, however, than the implicit conditional rate of return of the annuity (assuming the annuitant survives). This home-grown approach to inflation insurance requires some financial expertise as well as self-discipline.

More importantly, the approach remains vulnerable to inflationary shocks. A highly variable rate of inflation can result in substantial unforeseen declines in real income. For example, if an individual plans for an annual rate of inflation of 2½ percent, and the actual rate averages 4 percent, over a 15-year period the real value of the annuity payment is reduced by 20 percent. An indexed annuity, whether provided by the state or the private sector, thus provides valuable protection.

There is in principle no reason why the private sector cannot provide an indexed annuity, provided the state supplies indexed bonds. In doing so, the state is assuming the risk of

inflation.³⁵ In addition, the need to match the maturity structure of liabilities with assets holds for indexed debt just as much as it does for fixed income (nominal) debt, so that indexed debt needs to be available over the whole range of maturities. In the case of the United States, nominal debt is available at maturities that range continuously from short term to almost 30 years. There are gaps in the maturity spectrum for indexed debt because it has not been issued for long, or at many maturities. The indexed debt issued by the UK Treasury spans the same maturity spectrum as nominal debt. Price (1997) reports that in practice the longest maturity of government indexed bonds in Chile is 20 years.

Advocates of privatized pension systems maintain that privatized systems are not subject to political risk—or to the same degree of political risk—as state systems. One of the arguments made in support of this view is that the real value of state pensions in many countries has been highly variable. This was especially true of Latin American pension systems in the 1980s. The bouts of hyperinflation that beset Argentina during that decade, for example, caused huge fluctuations in the real value of the average pension despite its being officially indexed.

Nonetheless, indexed debt is not entirely free of political risk. Governments that have difficulty indexing state pensions may well have difficulty honoring their commitment to indexed debt. Conceivably, a government in the throes of a serious fiscal crisis that has issued indexed bonds might not be able to honor them.³⁶ The issue of indexed debt, which appears to be necessary for the private sector to offer inflation insurance is not a sure guarantee, in other words that the insurance obligation will be honored in every circumstance. This point needs to be borne in mind in the case of countries where a tradition of sound money is not well established.

D. The Consequences of Shortsighted Behavior

A basic argument for social security, and one that applies to any system, is that some individuals—perhaps a significant share of the population—need to be protected from their own shortsightedness. Left to their own devices, people will not save enough for their old age.³⁷ A further argument is based on the state's presumed obligation to support the destitute

³⁵ The state normally has the means (policy instruments) to control inflation, whether or not it has the political will to do so, although short-term inflationary shocks are typically not quickly neutralized. The issue of indexed debt, although it may send a signal that an increase in the inflation rate is expected, also means that the government will not benefit from the impact of unexpected inflation on the real value of its nominal debt. It increases a government's incentive to avoid inflationary finance.

³⁶ Financial debt may be considered to entail a more binding obligation, however, than the obligation entailed by a commitment to maintain the real value of pensions.

³⁷ Studies of the issue have focused on the ratio of wealth to income, finding that wealth is typically too low to generate adequate income levels in retirement. Engen et al (1999) cast some doubt on this in a study of the

elderly. In these circumstances, a public pension program is a means of avoiding a free rider problem. Libertarians challenge this defense of social security on the grounds that it entails a paternalistic interference by the state in the economy and in citizens' lives.

Whatever the merits of the latter view, there is plenty of informal evidence that people have difficulty understanding how to plan for a secure retirement. Even the well-educated can be naïve about financial matters, and an IA reform will involve everyone, including functional illiterates with no real understanding of basic personal finances.³⁸ Even in the advanced economies, some social security recipients will have never bought a house, or taken out a mortgage. Some will be marginally competent, even if they have been able to hold down a job.

The diminished role of the state pension requires retirees to decide whether or not they wish to compensate for the resulting drop in the degree of annuitization of their wealth. Persons whose wealth was overannuitized to begin with will choose not to, and the decision will enhance their welfare. Others, with little or no annuitized wealth may also choose not to, and there is a danger that their decision will jeopardize their welfare. This risk is present even if the level of wealth upon retirement is adequate to maintain an individual's habitual standard of living. By luck or by design, a person may have enough wealth (including wealth in the form of annuities) to finance an adequate rate of expenditure in retirement even if he lives to a ripe old age, and still encroach on it too quickly.

The argument can be made that in countries with generally well educated populations and competitive and well developed financial markets that individuals will have no shortage of good financial advice, and that competitive pressures and appropriate legislation will minimize the risk of the unsophisticated being persuaded to make unsound decisions. That said, there is no shortage of bad advice and little or no regulation of financial advisors. In Chile, where the limited options at the distribution stage should aid sound decision-making, there have been instances of collusion between the salesman and the IA holder to increase the share of the accumulated funds in the IA that the holder could withdraw in a lump sum. The IA holder in one instance received a sum that was worth far less (measured at any reasonable

United States that takes account of the unpredictability of income in interpreting whether the ratio of wealth to income is sufficient to generate the desired level of income

³⁸ The American press is replete with stories of bad financial judgment. The Washington Post in its April 10, 2001 number provides a telling account of bad financial planning in a story about families that had invested the money they were saving for their teenaged children's college education in extremely risky stocks, despite the fact that they would need the money in only a few years' time. They suffered large losses. The July 22, 2001 Sunday New York Times reports on a case in which a computer salesperson entrusted his life savings to two brokers from a well-known investment bank. He lost everything. A recent U.S. survey by the Washington-based Employee Benefit Research Institute, reported in the Wall Street Journal of May 10, 2001 found that "...only 39 percent of those surveyed said they had taken a stab at the math [to calculate how much they would need to save for retirement], down from 51 percent last year." In addition, 55 percent of the survey respondents were unaware of the increase in retirement age that became law in 1983.

discount rate) than the income stream he gave up (Palacios and Rofman(2001)). In any case, even prudent advice need not stop someone from spending at an excessive rate.

E. The Pros and Cons of Mandatory Annuitization

Both the potential benefits and the costs of mandatory annuitization will depend on the share of the wealth of retiring persons it affects, and the generality of the policy's application—the flexibility with which it is applied. The main drawback of annuitization is that it reduces the welfare of individuals whose wealth is highly annuitized to begin with. This potential welfare loss is caused in part by an individual's lack of full control over the degree to which his wealth is annuitized. A participant in a company pension plan, for example, may not be able to choose a lump sum or programmed series of distributions over the standard life annuity. Some arbitrage is possible. For example, a retired person on a pension planning to leave a bequest can acquire life insurance. However, in general, it is unlikely that everybody will be able to reverse the impact of mandatory annuitization in this fashion.

Mandatory annuitization could be very harmful for the terminally ill. If the administrative complexities of such an exception are overlooked, a case can be made for making an exception to a general rule in their favor.³⁹ It can also be argued that annuitization is disadvantageous for those groups in a population whose life expectancy is significantly lower than that of the general population, unless the premiums of the annuities that members of these groups buy reflect their lower life expectancies. The redistributive income of social security on the lifetime incomes of the poor may be offset to some degree by their lower life expectancies.⁴⁰ However, calculations of the implicit rate of return of annuities for different classes of the population do not capture the insurance value of annuities, as Section II explains. (The argument can be also be made, as already discussed, that the standard form of the state pension discriminates against men in favor of women because the difference in life expectancies is not reflected in the value of the pension.)

Mandatory annuitization could also confer important benefits. First, by bringing the general population into the pool of annuitants, it reduces adverse selection, and lowers average life expectancies of the pool. This should lower premiums. Walliser (2000) has estimated that the drop in adverse selection resulting from social security privatization would lower premiums by 2–3 percent in the United States. However, a simple comparison of the MWRs calculated by Mitchell et al (1999) and James and Vittas (1999) for the general population and those calculated for the population of annuitants suggest the gains might be greater than this (see Table 1). The gains would be greater still if a system of group annuitization could be put in

³⁹ A closely related issue is whether the terminally ill should be able to receive distributions from their IA before the standard age at which a distribution is permitted.

⁴⁰ For discussions and analyses of this issue in the U.S. setting, see Cohen, Steuerle, and Carasso (2001). Tanner (2001) argues that OASI's automatic annuitization using what is in effect a common life table discriminates against African Americans, and helps perpetuate poverty among them.

place. This idea is discussed further in Section V. Second, it should reduce the risk of poverty among those elderly whose wealth would otherwise not be annuitized, and who lack the discipline, foresight or good luck to make their resources last through old age.

Although the issue of mandatory annuitization can be seen in black and white terms—make the purchase of an annuity mandatory, don't make it mandatory—it is more constructive to make the question one of degree, and to address questions such as: what share of the funds accumulated in an IA should be annuitized; and what exceptions should be allowed. Many of the arguments advanced against mandatory annuitization are really arguments against excess annuitization. The lower the share of the funds accumulated in an IA that must be used to purchase an annuity, the less the risk of over-annuitization, the higher is the minimum bequest an individual leaves to his heirs, and the easier it is for him to finance exceptional but necessary expenditure. On the other hand, the lower the share of annuitization, the less the amount of longevity insurance an individual enjoys, and the more he has to rely on self-control and discipline to avoid improvident spending. A decision as to the degree of annuitization should be informed by reliable information on the level and composition of wealth upon retirement, which will reveal the extent to which individuals already have annuitized income. Countries lacking reliable information on the role of annuitized wealth in the total wealth of individuals of retirement age and planning or implementing an individual accounts reform should place a high priority on conducting a survey of individual wealth.

The administrative demands of a policy that permits even very limited exceptions to a rule of mandatory annuitization should not be overlooked. It would be important not to snarl up the exemptions process in red tape. At the same time, safeguards would have to be built in to guard against the abuses to which a policy of this sort can be subject.⁴¹ This and other administrative aspects of a IA reform with mandatory annuitization are discussed further in Section V.

If mandatory annuitization is necessary, how much is enough? One possible answer is that the share of the funds in an IA that should be annuitized should be whatever is necessary to buy a life annuity with payments that when combined with the (reduced) state pension will equal or exceed some stipulated minimum, related perhaps to the poverty line (in the United States) or some measure of subsistence income. Funds exceeding this amount would be freely withdrawn. Under this approach, mandatory annuitization would not aim at achieving some stipulated ratio of income in retirement to income in working life (a minimum replacement ratio), but instead would aim at ensuring a minimum retirement pension in absolute terms. This approach, which might be complemented by an exemption for the terminally ill if that were feasible administratively would be a way of addressing the problem of excess annuitization.

⁴¹ In the 1980s, several European countries deliberately relaxed the conditions for eligibility for state disability insurance in an effort to reduce the measured rate of unemployment.

Requiring the purchase of an annuity that generates a minimum income level may not, however, provide the needed amount of longevity insurance for a large share of the population. For individuals whose working life income was well above subsistence, the minimum pension might replace only a small part of that income, and conceivably provide too little longevity insurance (as well as protection against improvidence). This problem could be addressed by requiring that the share of the funds in an IA devoted to an annuity, in combination with the state pension, be enough to achieve both a floor on income and, over a certain range of income, a minimum replacement ratio. Typically, this is what state pensions do. In Chile, the minimum amount of the funds accumulated in the IA that must be annuitized is that amount which would guarantee a pension equal to the greater of 120 percent of the minimum pension and 70 percent of the account holder's average salary over the last ten years of his working life. Any excess may be withdrawn at the account holder's discretion.⁴²

Both of these approaches have to contend with the problem of shortfalls in the accumulated funds in an IA, particularly if the government guarantees a minimum income level. Any guaranteed income level creates a potential moral hazard problem, especially an unconditional and full guarantee. The potential seriousness of the problem would depend on how high the minimum income level (in absolute terms) and/or minimum replacement ratio were set and on the income range over which the latter would apply. In the case of the minimum replacement ratio approach, a full guarantee—i.e., a guarantee that the account holder would be entitled to an annuity with annual income satisfying the minimum replacement ratio—might be very costly, since it might stimulate excessively risky investments by the account holder prior to retirement.⁴³

The need to contain the risk of moral hazard might call for only a partial guarantee. The cost to society of an offer of a minimum pension would be reduced by making the terms of the guarantee consistent with the existing social safety net. Integration would imply that there would be no separate minimum guarantee for the minimum annuity. Instead the rules of the social assistance program would apply, and state assistance would be provided only if the sum of the annuity funded by an individual account and other income fell short of the minimum income under social assistance.

A further decision needs to be made regarding indexation: should the annuity that account holders are required to buy be indexed, or should the account holders have the choice of a

⁴² Note that the minimum pension guarantee does not guarantee a replacement rate of 70 percent. If the account holder has insufficient funds to finance a life annuity equivalent to the minimum pension, he makes programmed withdrawals of this amount until he runs out of funds, at which point the government pays him the minimum pension. See the website of the Chilean Pension Fund Administrators (<http://www.safp.cl>).

⁴³ A guarantee applying to the income generated by the accumulated funds in an IA at retirement has the effect of truncating the distribution of outcomes associated with the investments the account holder makes during his working life; that is, it cuts off the left-hand side of the distribution. By both reducing the variance and raising the effective return of investments, it raises the return for a given level of risk.

fixed or an indexed annuity? Given the problems of self-insuring against inflation, a strong case can be made for at least allowing the purchase of an indexed annuity, if not requiring it. If the purchase of an indexed annuity is required, it will be important that such annuities be available on competitive terms. *Inter alia*, this requires an active market for indexed public debt covering the full maturity spectrum. Developing a deep market for indexed debt could take some time. Moreover, as long as the flow of new indexed debt issues is large relative to the existing stock, changes in the public sector borrowing requirement could have a substantial impact on the rate of growth of the market, and might cause significant fluctuations in the yield of indexed debt.

Indexed annuities may appear unattractive to prospective annuitants because their initial nominal values have to be well below the fixed value of a nominal annuity. Notwithstanding this deceptive difference in starting values, the indexed life annuity that most governments provide is the only such annuity available to most people in most countries. If the choice of one or the other is allowed, the minimum annuity income requirement has to be adjusted, in the case of an indexed annuity, to take account of the lower initial income. There are precedents for an indexation requirement: Australia, the United Kingdom, and Germany require that private pensions be indexed.⁴⁴

Some other issues of design arise from the nature of annuities and the annuities market. Since the income stream generated per dollar, pound, or peso of premium will vary with the level of interest rates, so will the value of the premium required to purchase an annuity that conforms to a minimum annuity income requirement. Similarly, the balance in the IA of a woman needed to acquire a minimum annuity will exceed that of a man with an identical earnings history. These consequences of annuitization might be considered problematic, and could be avoided by expressing the minimum requirement in terms of the amount of funds in the IA. The rationale for this approach would not be obvious, however, since security in retirement depends on the level of income that may be sustained during retirement, not on the amount of wealth as of the start of retirement. Consequently, using a measure of income as the target variable is preferable.

IV. IMPLICATIONS OF INCREASED ANNUITIZATION FOR REGULATION OF ANNUITY PROVIDERS AND THE PUBLIC INFORMATION FUNCTION

A. Regulatory Issues

Whether or not annuitization is made mandatory, the increase in the role of the private annuities market that an IA reform will foster increases a society's stake in sound and honest financial management of life insurance companies and other annuity providers. With

⁴⁴ In Australia, the requirement began in 1994; in the United Kingdom, in 1995. In Germany, the requirement applies to pensions with a book reserve—when the pension plan does not have assets that are segregated from those of the company (OECD (undated)).

mandatory annuitization, effective financial regulation and supervision becomes essential, since otherwise the purpose of annuitization will be defeated.

The sound regulation of the annuities market requires the sound regulation of the insurance market. Annuities are normally sold by life insurance companies in both advanced and emerging market economies, but are only one of a number of financial products they sell. The assets that back them are typically not segregated or managed separately from the other assets of the company. This means that regulation must promote the sound financial management of the life insurance business as a whole.⁴⁵

Life insurance companies in OECD member countries have typically been subject to both a prudent person rule and to quantitative restrictions on their investment choices. The role of quantitative restrictions on the asset allocation decisions of insurance companies has been more significant than it has been with the portfolios of pension plans. As Section II explained, there are some differences of view as to whether such restrictions are appropriate. One difficulty may be the fact that a given set of restrictions may not be appropriate for all life insurance companies, since the mix of their business may vary in ways that calls for different asset allocations. For example, some insurance companies in OECD countries offer what are essentially investment vehicles—e.g., variable annuities—where it is understood that the client shares both the gains and the losses from the securities in which the company invests. Others emphasize more traditional life insurance products, and the asset allocation that is appropriate for the second group of companies may not be right for the first. This issue needs to be investigated. It is hard to tailor a set of limits on asset allocations that will be optimal for even one insurance company, let alone all of them, unless the limits are so broad that they cease to be binding. Broad limits can nonetheless serve as guidelines, signaling to insurance companies that a large concentration of assets in an asset class like common stock will generally be inappropriate.

Competent regulation of the life insurance business is no easy matter in any country. Life insurance is a technically demanding business, and the regulatory office would have to be staffed by individuals with a wide range of skills, including actuarial science and financial analysis, and ideally with some relevant industry experience. Recruiting a skilled staff might prove challenging in very small countries with a dearth of skilled financial professionals, particularly if the supervisory agency is unable to pay its skilled employees salaries that are comparable to what they could earn in the private sector or abroad.⁴⁶

⁴⁵ In fact, engaging in both life and insurance and the sale of life annuities allows companies to offset mortality risk against longevity risk, as noted in Section II. Argentina is an exception to the rule of diversified insurance business. By law, the companies that sell annuities to retiring IA holders specialize in that activity.

⁴⁶ Currie (undated) notes that regional supervision (for example, in the Caribbean) may be a possible solution to this problem.

The regulation of life insurance in the smaller emerging market countries may pose special challenges. If the experience of the Latin American countries with defined-contributions systems is anything to go by, the number of insurance companies in countries following their lead will be small and the degree of concentration high. The small number of firms will facilitate communication, and reduce the workload of the regulatory agency. The relatively high degree of concentration may increase the cost of premiums unnecessarily, however.

The question arises as to whether the case for quantitative restrictions is greater in such countries than elsewhere. The key question is: do such regulations facilitate the task of solvency regulation? The answer is not clear cut. The goal of solvency regulation should be to maximize the chances that a life insurance company's portfolio has the right maturity composition and quality to keep interest rate risk at acceptable levels, and to ensure that reserves are large enough to minimize longevity or mortality risk. In principle, and provided the regulatory authority has sufficient clout, this can be done by analyzing the composition of an insurance company's assets directly to see whether the degree of immunization to interest risk is adequate, whether provisioning reflects the riskiness of the company's portfolio, etc. Such an approach will require a skilled if not a large staff. Currie (undated) notes that many off-the-shelf software products are available to both companies and regulatory agencies to test the strength of insurance companies' financial positions.

The use of quantitative restrictions and the restrictions that apply in some countries on the choice of life tables and the interest rate used to calculate reserves can be interpreted as devices to ease the task of regulation by minimizing the risk of default and by simplifying financial decision-making (i.e., if a company cannot invest in equity or real estate the task of its investment department and that of the regulatory agency is that much easier; if there is no choice regarding the life table the demand for actuarial services by both industry and the regulatory agency is reduced). By the same token, these restrictions discourage healthy competition. It is possible, for example, that the premiums for annuities may be set unnecessarily high, both because the life table that the industry is required to use has lower mortality rates, and because future annuity payments must be discounted at a relatively low rate in pricing them. If reserves held against the risk of default and other contingencies are relatively high, and the interest rate applied to them is also low, the premium is further increased, which could result in super-normal profits. Whether it does or not depends on how commissions are determined, since this will be the only element of the price that will be free to vary. Conceivably there may be limits on how low commissions will go, since the role of individual salesmanship is important in the defined-contributions systems of South America.

This brief discussion suggests that quantitative restrictions entail a trade off. They may simplify the regulatory task and reduce the risk of insolvency, particularly in the early stages of the development of the life insurance business, or the annuity component of that business. Once the regulatory function matures, they may become onerous, and the trade off becomes unfavorable. Interestingly, regulation in Chile has come to rely less and less on quantitative and other restrictions. It may be that there is a natural evolution, as Doyle and Piggott (2001) suggest, away from an initial dependence on quantitative restrictions.

The increased importance of annuities as a source of retirement income may be of no particular consequence for the regulatory function in advanced economies, if financial regulation there may be safely assumed to be effective. On the other hand, mandatory annuitization could conceivably be coupled with a state guarantee on annuity payments in the event that the annuity provider is unable to fulfill its contractual obligations. If there is no explicit guarantee, political pressures may lead to an implicit guarantee.⁴⁷ Among countries with IA systems that have reached the annuitization stage or have made a decision on the matter, Chile guarantees the life annuity payment in the event of the insolvency of the insurance company for 100 percent of its value up to the minimum pension, and for 75 percent of the difference between the annuity payment and the minimum pension up to a specified ceiling. Argentina guarantees 100 percent of the value of the annuity payment up to a limit of five times the so-called “maximum basic pension,” which amounts to about 1.6 times the average economy-wide wage (Palacios and Rofman (2001)). Peru has no guarantee. Poland, however, was planning a full guarantee.

Just as a state guarantee of an annuity of some minimum size at retirement creates an incentive for risky investment behavior by the holder of an IA, so a guarantee on the income an annuity provides creates an incentive for risky investment behavior by the insurance company, and thus a potentially serious risk of moral hazard. The moral hazard risk created by an annuity guarantee is similar to that created by deposit insurance. In particular, life insurance companies could offer lower premiums on their annuities, which they would finance with investments with a relatively high mean return and risk. If all goes well, the investments are successful, and the annuity payments are honored. If things go badly, the state becomes a partner with the insurance company, and the general taxpayer shares the loss. There is little evidence on the point. Mitchell et al (1999) in a study of the U.S. market found no relationship between low premiums and poor ratings of the insurance company offering the premium.⁴⁸

The design of deposit insurance schemes tries to strike a balance between the goals of preventing banking system panics and avoiding creating a stimulus to the kind of behavior that contributed to the Savings and Loan debacle in the United States. As far as deposit insurance itself is concerned, the imposition of a cap can afford some basic protection to the smaller saver and business, while discouraging the holding of larger sums that would

⁴⁷ This guarantee differs from the one discussed earlier, where the state if necessary tops up the funds in an IA so that the holder can acquire the minimum guaranteed annuity. The guarantee discussed here is effectively insurance against malfeasance or incompetent management on the part of the annuity provider.

⁴⁸ Some lessons can be learned from the experience with deposit insurance. Deposit insurance was once justified as a means of preventing unnecessary and destructive runs on the banking system, which could—and in the United States in the 1930s did—result in the bankruptcy or closure of essentially sound institutions. The banking system was seen as a public good, and deposit insurance as a means of discouraging massive cash withdrawals that entailed large negative externalities (the collapse of the clearing and credit system). Subsequent experience made clear that deposit insurance could have some highly undesirable side-effects in the form of the incentives to excessive risk-taking just discussed.

normally be invested in other financial instruments. However, a deposit insurance scheme should be only one part of a regulatory framework that creates appropriate incentives for sound lending by bank management and effective surveillance by shareholders, while encouraging depositors to hold accounts with the better managed banks.⁴⁹

The provision of annuities, even when these are mandatory, may not be a public good in the strict sense of the term. On the other hand, it can be argued that the state would have a moral responsibility—and would certainly be under political pressure—to ensure sound investment and management by annuity providers. As with deposit insurance, the provision of a limited and not an open-ended guarantee might best balance the interests of the annuitant and the taxpayer. That said, a guarantee with a ceiling (like those offered in Argentina and Chile) might be seen by the public as inequitable in a system that did not limit in a consistent manner the amount of the funds in the IA to be subject to mandatory annuitization.⁵⁰ The combination of a full guarantee with mandatory annuitization that targeted a comparatively high replacement ratio would be very unwise.

B. The Public Information Function

The debate over an IA reform has emphasized the dangers of ill-advised investment choices by IA holders during the accumulation phase. Similar dangers lurk at the distribution phase. The growth in the market for annuities will bring a great many people into the market with little or no knowledge of financial issues in both advanced and middle-income economies. The standard of financial literacy may be higher in the former group, but the range of financial products on the market and the sheer volume of the information available on retirement planning is bewildering. Nor will there be any shortage of sales representatives eager to sell annuity products when an IA reform increases demand for them. Is there a case for regulation of the provision of this information, and of the sales function, or for the public provision of information on annuities and financial planning?

The basic argument for the state's provision of information on privately produced and marketed goods and services is that either the quantity or quality (including coverage) of information provided by the private industry is inadequate. Casual inspection of websites and other sources suggests that there is no problem with the sheer quantity of information available on annuities sold in countries with well-developed markets. As for quality, it is certainly possible to obtain clear and comprehensive discussions of annuities at various websites. What is less certain is how many potential annuitants will have access to or will visit them. There may be a role for the state in the direct provision of similar information to individuals approaching retirement, since many may lack access to or be unaware of the relevant sources.

⁴⁹ See Garcia (2000) for a comprehensive discussion of these issues.

⁵⁰ Heller (1998) argues that such an arrangement would entail what he calls a conjectural liability.

If annuitization is mandatory, and the form the eligible annuities may take is restricted (for example, to life annuities with a spousal right of survivorship), then the information to be provided could be relatively simple, particularly if the goal of the information were simply to help the prospective annuitant make an informed decision regarding the options mandatory annuitization allowed. In the extreme case of group annuitization, (see below), where the individual was not the negotiating agent, there would be no compelling need for advice and council on the choice of annuity. A statement of the rationale of the policy of group annuitization as well as general information on how the annuity would fit into an individual's finances might nonetheless be helpful. It would also be helpful to explain, in the case of partial annuitization, how the share of the balance in the IA to be annuitized is determined.

If annuities are to be sold individually as well as on a group basis, it will be important to see that annuity salespersons confront the right incentives when they promote their companies' products.⁵¹ In some countries, salespersons are required to acknowledge that they work on commission, and to prepare an account of their discussion of the clients' needs and product characteristics with a copy to the client (Currie (undated)). Typically, the sales and other marketing functions are not regulated by the agency overseeing the financial position of the insurance companies.⁵²

V. FAMILY AND TAX ISSUES AND ADMINISTRATIVE ISSUES

A. Family and Tax Issues

The paper has stressed the state pension's role as an indexed life annuity, arguing that the longevity and inflation insurance it provides are of great value. Nonetheless, the typical state pension has also been designed to benefit vulnerable members of the contributor's family and to redistribute income in favor of the low-paid. For example, in most OECD and middle-income countries, the state pension provides an additional benefit to the widow/widower and surviving children of a contributor, but in the form of an additional pension, and not an actuarially fair joint survivors' annuity. Benefits will also often be paid to the homemaker spouse of an insured worker. In the United States, for example, if the spouse has never worked outside the home she is eligible at age 65 for a pension equal to one-half of the social security pension her spouse receives. If she has worked outside the home she is eligible for the greater of 50 percent of her spouse's benefit or the benefit to which her own contributions would entitle her.

⁵¹ Currie (undated) notes that "Insurance is a complex business and it sometimes appears that the vendors of insurance products, and those who design them, have a vested interest in complexity. And so they do, in the sense that as long as consumers don't have a good understanding of the products they are buying, the salesperson will be at an advantage."

⁵² The United States, where the individual state agencies are responsible for both solvency regulation and marketplace regulation, is an exception to this rule (Currie (undated)).

Critics of the U.S. system's treatment of the spouse point out that it was conceived at a time when most social security contributors were men with a homemaker wife. The increase in the divorce rate and in the role of two-earner and single or divorced female households means that the spousal benefit is ill conceived for the current family. Whatever its merits, the provision means that the implicit rate of return to contributions from a married worker can be much higher than the implicit return to contributions from a single worker with exactly the same earnings history. Similarly, the return to the contributions of a two earner household will be less than that of a single earner husband and wife household with the same income. Similar departures from actuarial fairness characterize the pension systems of many other countries (Thompson and Carasso (2002)). A decision would have to be made whether to retain the spousal benefit or phase it out under an IA reform.

Social security systems also aim to protect women from the economic consequences of divorce. An issue to be addressed is whether the annuity or other income funded by the IA system should be accorded special status, or treated like other marital property. If it is treated like other marital property, then its disposition in the event of divorce is covered in most countries by the provisions of the separation agreement. An alternative treatment is to stipulate that that part of an annuity payment that can be attributed to the increase in the balance of IA over the period of the marriage (or perhaps less fairly, but more simply, the entire annuity payment) be split in half in the event of the divorce, regardless of the legal form of the title in which the IA is held. Several OECD countries now apply a "splitting" system. It is particularly important in the case of a spouse without a long history of work outside the home, and without a substantial pension of her own.

An IA reform will also need to address the issue of the tax treatment of social security benefits. Typically, the state pension receives favorable treatment. In the United States, 15 percent of the benefit is exempt from tax regardless of the overall income of the recipient. The benefits are totally exempt for recipients whose incomes fall below a certain threshold: US\$32,000 in the case of a recipient taxpayer filing jointly.⁵³ This treatment increases social security's redistributive character, and might also be justified by the absence of income tax relief for employee payroll tax contributions.

Broadly speaking, in taxing annuity or pension income, a country can follow either the consumption tax model or the income tax model. Under the income tax model, contributions are taxed as part of current income, and the income component of the pension benefit is taxed when it is paid. The income that contributions earn during the accumulation phase is generally not taxed. Under the consumption tax model, either contributions or the pension

⁵³ The threshold is defined using a modified version of adjusted gross income that for most taxpayers includes tax-exempt interest income but excludes one-half of social security benefits. Mackenzie (2002) discusses tax issues as they apply to the case of the United States at greater length.

benefit is taxed, but not both.⁵⁴ To be consistent with the consumption model, if contributions to an IA are not taxable, the income from the annuity or other distribution should be.

The taxation of pension and annuity income is itself not straightforward, however, since the periodic payment the pensioner or annuitant receives includes both a return of principal and accumulated earnings. The share of principal repayment in the payment is small to begin with, and rises over time, like the share of principal repayments in a monthly mortgage payment. In addition, the amortization period (the period over which the principal is repaid) varies depending on the age and sex of the annuitant, and its length is uncertain. Consequently, the average share of income from an annuity that should be taxed should vary with both the age and the sex of the annuitant. In the United States, the IRS Publication 939, which sets out the general rules and tax schedules for taxation of pensions and annuities runs to more than 75 pages (United States Department of the Treasury (1997)).

This brief discussion has simply flagged the great importance of these two issues. They are worthy of separate papers in themselves.

B. Administrative Aspects of Reform

The growth expected for the market for annuities in countries undertaking an IA reform will require a review of the current regulatory and supervisory framework. This review should take place even in the *laissez-faire* case of no guarantees and no mandatory annuitization. It will be important to ensure that the regulatory and supervisory framework applying to life insurance companies adequately protects annuitants.

If the purchase of a private sector annuity becomes mandatory, if complicated restrictions apply to the form that the annuity may take and if a minimum guarantee on its payment is provided, then the preparatory work for reform will be much more substantial. Specifically, successful reform will require the establishment of new systems and procedures for the monitoring, control and regulation of the annuities market and its participants. Setting up these systems and procedures will pose demands on both the financial institutions engaged in offering IA accounts and annuities, and on the government itself. The following would be the main tasks of the new systems:

1. An IA holder education system to educate IA holders as to their rights and responsibilities regarding annuitization. To the extent that a choice was allowed among different forms of annuities, the merits and drawbacks of each form would have to be *very* carefully explained. A decision would need to be made as to the role played by annuity

⁵⁴ This treatment is intended to provide relief for saving, and is not strictly consistent with a pure income tax. A pure income tax would not permit the deduction of contributions from taxable income, and include the interest component of the pension or annuity in taxable income.

providers in providing prospective annuitants with information.⁵⁵ The educational campaign would have to begin some years before annuitization took place.

2. A notification system (coordinated with the educational program) to inform prospective annuitants of the deadlines for important decisions well in advance of the deadlines.
3. A registration system for mandatory purchases of annuities, and—depending on whether the payments process could be self-policing or not—a system to record and monitor payments to annuitants. Procedures will also have to be worked out to deal with deferred annuity purchases, and the consequent partial withdrawals.
4. A system to ensure that annuities were purchased only from eligible institutions, and a means of vetting these institutions. The vetting could be handled automatically by the agency responsible for regulating life insurance companies, if they were to be the only providers of annuities.
5. A system to verify that annuities conformed to the model prescribed by law.
6. Arrangements for financing payments by the government to increase the balance in an IA at annuitization to the minimum guaranteed by law.
7. Arrangements for the financing of the fund that would guarantee the payment of annuities by insurance companies unable to honor their commitments (if there were to be such a guarantee).
8. Rules to determine the conditions under which an individual could be exempt from the requirement to purchase an annuity, and procedures to vet applications for exemptions to mandatory annuitization (if exemptions were allowed). These procedures could perhaps piggy-back on existing procedures for determining eligibility for a disability pension.

Chile was the first country to adopt an IA system, and one with substantial restrictions on the form and amount of the withdrawals that may be made from an IA. Its experience might suggest that the demands of good administration are not overwhelming. On the other hand, the characteristics of the Chilean annuity market would argue for caution in drawing lessons for other countries. The number of firms involved in the Chilean market is small (there are only seven pension fund companies and about 27 life insurance companies); and the variety of annuity products from which the choice is made is essentially limited to two. Moreover, as noted, life insurance companies must all use the same life table and the same interest rate in calculating reserves. The small size of the market, the small number of institutions involved

⁵⁵ Annuity providers could be required, at a minimum to distribute reasonably frequent statements on the balance of the IA. In Chile, the companies that administer the IA advise prospective annuitants on the choices open to them, which may entail a conflict of interest.

and the restricted choice allowed prospective annuitants in Chile all facilitate the administration of the system. Interestingly, some observers of the Chilean system maintain that prospective annuitants have not always been fully aware of the opportunities open to them (Palacios and Rofman (2001)).

All reforms involve issues of sequencing. In the case of an IA reform, it appears that all of these components of the regulatory apparatus would have to be in place before a single IA holder withdrew his funds. The speed with which the market for annuities would grow would depend on the way the reform was implemented, however. There could be a substantial interval between the inception of an IA system and the signing of the first annuity contract. The length of time will depend mainly on the treatment of middle-aged contributors to the state system, and on the treatment of their accrued pension rights under that system. For example, if workers who are close to retirement do not have the choice of moving to the new IA system, their retirement cannot create a demand for annuities.

The treatment of accrued pension rights is also important. Under a Chilean style reform, participants in the old state system receive a “recognition bond” that is intended to represent the present value of the claims they had accumulated under the state system. When such former participants retire from the new IA system, the bond is credited to their account, and can be used to fund an annuity (or a series of programmed withdrawals). The issue of these bonds makes the private annuities market grow more rapidly than it otherwise would. The recognition bond approach is not the only way to deal with accrued pension rights, however. Participants in the old system could simply have been paid a pension by the state whose amount was determined by their earnings history under the old system. In general, the speed with which the annuity market can be expected to grow is of relevance to decisions regarding the budgets of those governmental agencies involved in regulation. Nonetheless, the administrative apparatus needs to be in place from the time the very first annuity contract is signed.

The complexity of the annuitization process might be greatly reduced, along with the cost of annuities, if a system of group purchases of annuities could be established.⁵⁶ Group annuitization might work as follows: the government could group annuitants of a given age cohort in subcohorts of some minimum number, using a selection procedure that would insure that different sub-cohorts would have the same average life expectancy.⁵⁷ It would then invite bids from life insurance companies. The combination of the economies of scale entailed by grouping and the elimination of adverse selection would reduce the cost of annuities substantially. This could be particularly important for small annuities. The

⁵⁶ Group annuitization was discussed by the expert panel of the National Academy of Social Insurance appointed to evaluate issues in privatizing social security in the United States (see Diamond (1999)).

⁵⁷ Grouping would effectively deal with the problems posed by a unisex premium, since the government could determine the male-female composition of all the groups, setting it equal to the composition of the entire age cohort.

administration of the annuity contracts could be carried out by the life insurance companies who had bid successfully for the business, or might even be stripped off, and undertaken by the government agency responsible for administering the state pension (i.e., the Social Security Administration in the United States). In this latter case, the life insurance companies would bear interest rate and longevity risks, but not the costs of administration. They would, however, be responsible for making periodic (presumably monthly) payments to the administrative agency (which would in turn have to advise the life insurance companies on the size of the payment, and monitor deaths of annuitants).⁵⁸

Finally, given the importance of sound regulation and the other prerequisites for the successful provision of annuities by the private sector, it is conceivable that in countries where the conditions for private sector provision were not yet opportune, the state should continue to be the sole supplier of mandatory annuities. Even in countries where private sector provision is deemed to be feasible, continued public sector provision may be the best way to address the various concerns this paper has explored.

⁵⁸ There is a family resemblance between an annuity and a mortgage, except that the service of the mortgage does not stop with the death of the mortgage-holder. Mortgages have been securitized in the United States, and conceivably it might be able to securitize these group annuity packages. Could a market for such an unusual instrument develop? The new instrument would not be sold. It does not give its holder a claim on some other company or institution: rather, the holder of the group contract would pay money to trade the obligation to another entity. However, the institutions eligible to participate in trades would have to be life insurance companies, and solvent ones. Note that if the annuitants making up the group were chosen at random, then the instruments would be relatively homogeneous. It would not be necessary to devote a great deal of time to an analysis of their risk-return characteristics.

THE BASIC ECONOMICS OF ANNUITIES

A. What is an Annuity?

The annuity has a time-honored lineage, which dates back to classical Rome. The English government, following the example of The Netherlands was relying on life annuities to raise money as early as 1540 (Bernstein (1996)).⁵⁹ In exchange for a sum of money, the annuity owner would receive annual payments for life.

The life annuity is only one of a large number of different kinds of annuities now available in the United States and other countries with well-developed financial systems. Annuities may be classified according to the timing and number of the premium payments made before the annuity payments (i.e., the regular payments made by the annuity provider) start; whether the annuity payments are fixed or variable, or have a fixed component; and if fixed, whether fixed in nominal or in real terms; whether payments are contingent on the life of the annuitant or whether they can continue for specified period even if the annuitant has died; and whether there are rights of survivorship (see Table 5).

Table 5. Different Forms Annuities Can Take

Duration of distribution phase
a. Post-annuitization life of annuitant/ beneficiaries (life annuity)
b. The longer of the post-annuitization life of annuitant and a specified period after annuitization (term certain and life annuity)
c. Specified period after annuitization (term certain annuity)
Character of payment
a. Fixed in nominal terms
b. Variable
c. Indexed (fixed in real terms)
Timing of payment
a. Immediate
b. Deferred: (i) single payment (ii) multiple payments
Right of survivorship
a. No right of survivorship
b. Joint annuity (spousal right of survivorship): (i) reduced pension (ii) unreduced pension

⁵⁹ The annuities sold in England 1,540 repaid their premium in seven years (i.e., they paid more than 14 percent per year assuming the annuitant survived to receive the payment). The premium was the same whatever the age of the annuitant. Bernstein (op. cit.) notes that by the 18th century, it took 14 years to earn the premium, which continued to be the same for all annuitants. Life annuities were also the major source of funding for the ancient régime on the eve of the French Revolution (Ferguson (2001)). Not until the late 18th century were annuities priced on the basis of life expectancy.

What makes an annuity special is the insurance that it provides against the consequences of living an unexpectedly long life and exhausting one's savings before life ends. This appendix will concentrate on the life annuity, given its special role in this respect.

B. The Single Premium Immediate Payment Life Annuity ("Life Annuity")

It is helpful in grasping the basic features of life annuities if we can make the standard assumption that financial markets are perfect. This means that financial intermediation is costless (there are no commissions or sales charges, etc) so that borrowing and lending rates are equal. In addition, to simplify the exposition further it is assumed that risk-free bonds are available across the whole maturity spectrum, that future interest rates are known with certainty and that the longest maturity is no less than the maximum number of years a retiree can survive in retirement. The only uncertainty will be the date of death of a particular individual. However, the probability that any one of age n in year t survives to year t+1, t+2, t+3 is assumed to be identical for all members of that age cohort and to be known with certainty. Finally, to rule out the need for substantial holdings of liquid assets as precautionary balances, consumption expenditure is assumed to be completely predictable, and the price level to be stable. These extreme assumptions will all be relaxed in what follows, but they are a useful starting point.

Given the assumptions, an insurance company selling annuities, provided it has enough customers so that the law of large numbers is approximately valid, can predict with great accuracy the proportion of individuals retiring in a given year who will live for a given number of years in post-retirement. For example, it could predict that 1.0 percent of those who retire at age 65 in 2001 will not survive to age 66; another 1.3 percent will not survive to age 67, and so on.

Armed with this information, the insurance company then acquires a portfolio of bonds that maximizes its rate of return. However, given the assumptions, the insurance company will be indifferent as to the maturity structure of its portfolio. It has no interest rate risk to contend with, and with no possibility of profits from arbitrage, the rates of interest on longer maturities will be a geometric average of the short-term rates that will prevail in the future.⁶⁰ If the yield curve slopes upward, what the company gains in higher interest earnings by holding longer-term maturities is offset by the capital loss it incurs when it sells the bonds in a period when bond values fall in response to higher interest rates. By assumption, there are no costs to trading.

⁶⁰ Given the assumptions, the rate of interest on a bond of maturity T will be equal to the geometric average of future year-by-year interest rates. For example, the rate of interest on a five year bond will be equal to

$$\left(\sqrt[5]{\prod_{i=1}^5 (1 + r_i)}\right) - 1, \text{ where } r_i \text{ is the annual interest rate expected in year } i. \text{ This implies that, given the}$$

(assumed) absence of transactions costs, investors planning to maintain a position in the bond market for n years will be indifferent as between acquiring bonds with a one year maturity and reinvesting each year for n years or acquiring an n-year bond and holding it for n years.

Given the predictability of interest rates, and the predictability of mortality in the aggregate, the insurance company knows exactly what premium to charge when it sells a life annuity to a person of a particular age. Specifically, the insurance company can sell an annuity and price it according to the following formula, where C stands for the cost or premium value, A for the periodic fixed payment (the payment period being assumed to be one year), r for the interest rate, which is assumed to be constant, and π_i for the probability that the annuitant survives until the i th year following his or her retirement and purchase of the annuity. No one lives more than n years after retiring.

$$C = \sum_{i=1}^n (A * \pi_i) / (1 + r)^i \quad (1)$$

If we assume for convenience that the probability that a given cohort of retirees alive in year t will survive to year $t+1$ is $1/(1+p)$, $p > 0$, for all t then the formula can be re-expressed as:

$$C = \sum_{i=1}^n A / \{(1 + r)^i (1 + p)^i\} \quad (2)$$

The form of equation two is functionally equivalent to an equation expressing the present value of a stream of income A over n years during which the probability of survival is 100 percent but the rate of discount, ignoring the cross term, equals $(1+r+p)$. Supposing for example that r was 0.05 and p was 0.02, then the effective rate of return the company can offer to annuitants who survive to receive the annuity payment is 7 percent, compared with a rate of interest on bonds of 5 percent. In effect, a life annuity is a state-contingent bond where the coupon is payable as long as, but only as long as the owner is alive. It is precisely because the annuitant's probability of survival is less than 100 percent that life insurance companies, given the assumption of perfect financial markets, can offer the annuitant a conditional rate of return that is higher than the rate of return on a bond.

Consider the situation of an individual who is about to retire, and assume that he or she lacks a bequest motive (because, for example, he has no heirs to be concerned with). Assume further that he can save either by acquiring a bond, or by acquiring an annuity. Since financial intermediation is costless, it may be further assumed that one period annuities are available. The annuitant purchases these instruments in period t , and receives a return r_a equal to $(1+r)/\pi$ in year $t+1$, where r is the rate of return on one-year bonds, and π is the probability that he survives for at least one year. The one-year probability of survival has to be less than one, so that r_a must exceed r . Consequently, in the absence of a bequest motive, and even if the annuitant were completely feckless, and intended to spend every penny of his accumulated savings as of year t in the following year (year $t+1$), he would be better off purchasing an annuity than buying a bond. A fortiori, if he wishes to spread his consumption evenly over time, annuities will always (given these simplifying assumptions) be the savings vehicle of choice. However, the superiority of annuities over bonds does not depend on the

assumption that the annuitant is far-sighted, and wishes to avoid having too little income in later years, but on the assumption of costless financial intermediation (and no bequest motive). Complete annuitization will maximize the level of consumption that is indefinitely sustainable.⁶¹

C. Relaxing the Assumptions

Imperfect capital markets: (i) costly financial intermediation

The conclusion that annuities dominate bonds in the absence of a bequest motive is not necessarily valid if we relax the assumption that financial intermediation is costless. The impact of introducing costs (including profit margins) in the provision of annuities is to reduce the conditional rate of return. Assuming that costs have a lump sum element and a component that is proportional to the size of the annuity, then it becomes necessary to specify the size of the premium to determine the effective conditional rate of return that the annuitant will obtain. To illustrate, assume that the rate of interest is 5 percent, and the conditional rate of return to the annuity is 7 percent, as in the earlier example. If a fee of \$100 is charged on the purchase of the annuity regardless of its size, and if a management fee of 1 percent of the premium is also levied, then the return on a one-year annuity with a premium of \$10,000 including the up-front load charge would be reduced to about 5 percent, the same as the one-year bond. The presence of lump sum charges may help explain why term certain annuities with a short term are not a feature of any country's annuity markets. Sales costs can be important: single annuities are generally sold by salesmen on commissions in the United States and elsewhere, and these commissions can be substantial, although the increasing role of internet sales may be lowering costs.

The cost of providing annuities will also vary with the average maturity of the bonds that life insurance companies acquire to fund them. A portfolio with a low average maturity has to be turned over more often than one of high average maturity, and the trading costs of the first in relation to portfolio size will exceed the costs of the second. Even if interest rates were completely predictable, and their term structure determined as assumed as described above, the existing of trading costs implies that the insurance company would no longer be indifferent to the maturity composition of its portfolio, but would choose a portfolio that minimized average turnover. Given interest rate uncertainty, however, the portfolio decision is more complicated.

Imperfect capital markets: (ii) incomplete bond markets; interest rate uncertainty

Bonds are not necessarily available in maturities as long as needed for a life annuity. For example, a portfolio of bonds with a maximum maturity of 25 years is not sufficient to cover all the payments that would be made on life annuities sold to a cohort of 65-year olds in most

⁶¹ Yaari (1965) is the source for these insights. Walliser (2001) provides a comprehensive analysis of the economics of annuities.

countries. Moreover, since interest rates are not known with certainty six months hence, let alone 25 years, the insurance company selling life annuities will be exposed to interest rate risk. Having guaranteed to pay an annuity of some fixed amount based on some assumed path of interest rates in the future, it may find that actual interest rates differ substantially from projected rates.

Apart from the problem posed by limits on maturities, the uncertainty that surrounds the future course of interest rates has implications for the maturity composition of the insurance company's bond portfolio. If the average maturity of its portfolio was short relative to the expected stream of annuity payments, a lasting decline in interest rates could make it very difficult for an insurance company to meet its obligations. As its holdings of bonds matured, it would replace them with bonds earning a lower rate of return. If the interest rate decline had not been built into its calculations of the premium it could charge, given costs and desired profit margins, it would suffer losses. Holding longer-term bonds would provide a hedge against the risk of a drop in interest rates, but would lose the company money if it had to liquidate bonds in a market of declining bond prices.

To minimize interest rate uncertainty, a portfolio would contain a fairly even distribution of maturities that would mature roughly as needed to finance the stream of annuity payments. There is no obvious way, however, to insure against the interest risk that results when annuitants' post-annuitization life-spans exceed the maturity of the longest available bond, although the likelihood of unfavorable experience on this score may not be great, if the longest maturity substantially exceeds average life expectancy. The risk (or problem) of incomplete bond markets is less important for government bonds than corporate bonds, which typically have a shorter maturity. High-yield corporate debt may in any case be too risky to constitute a major component of a portfolio funding life annuities. Nonetheless, investment grade corporate debt has a significantly higher return than government debt, albeit at the cost of some default risk.

Risk could also be mitigated by the use of options. For example, a company could acquire a put option on part of its long-term bond portfolio, which would give it the right to sell that part of its bond holdings at the price determined by the option contract on or before its expiry. Such insurance can be expensive, and must be frequently renewed, since it is not available over long periods.

The lack of applicability of the law of large numbers

Even if the probability of dying is known with certainty, an insurance company may conceivably not have a sufficiently large number of annuitants to enable it to predict the mortality rates of a given age group with great accuracy. Presumably this would not be a problem for the larger companies, although it might affect the market for annuitants of an advanced age (because there are fewer of them). Companies just entering the annuities business might have to allow for a higher variance in their estimates of mortality risk during the period when the number of annuity policies is still small. This means they will have to

make relatively high provisions for longevity risk, which may entail below normal profits in their initial operating period.

Longevity risk (from the insurer's point of view)

A more serious problem is the lack of complete predictability of survival probabilities. Many countries publish detailed statistics by race and sex (life or period tables) on the proportion of persons alive at the beginning of a particular year who died during that year. A life insurance company selling annuities to 65-year-olds in a given year t needs to be able to predict the proportion of its annuitants who will be alive in years $t+1$, $t+2$, $t+3$, etc. This requires the calculation of conditional survival probabilities for a cohort—the probability that a person aged 65 in year t will live n additional years. To derive such probabilities from the life tables requires specific assumptions about the relationship between past, present and future mortality rates. One possibility is to use the life tables for two different years—e.g., 1988 and 1998, and calculate the change in year-to-year survival probabilities that took place between the two periods. This change can then be used as the basis for extrapolating future survival probabilities.

As is well known, the increase in survival rates in the mid-to late 20th century that contributed to the world wide aging phenomenon was not accurately predicted. Some UK life insurance companies have reportedly underestimated the average life expectancies of their pool of annuitants by up to two years (Blake (1999)). An insurance company can insure itself against the unpredictability of a given individual's life span compared with the average life span for his generation by insuring enough people. However, it has more difficulty insuring itself against a general change in life expectancies that affects whole generations.⁶²

A comparatively small error in predicting survival rates can have substantial consequences for the cost of an annuity contract to an insurance company. For example, and taking the life tables of the United States as the starting point, a uniform increase of 1 percent in the probability of surviving a given year after age 65 increases the life expectancy of a 65-year old male American by 1.3 years. The decline in mortality would increase the present discounted value of a life annuity sold to a 65-year old American male by about 8 cents on the dollar.⁶³ It is generally expected that life expectancy at retirement will continue to increase, but there is no way of predicting the increase precisely. Given the state of knowledge, life insurance companies have little choice but to be conservative.

Some possibilities for hedging against longevity risk do exist: notably, life insurance. To the extent that the forces prolonging life expectancies work in the same way on the life expectancies of annuitants and persons who insure their lives, mortality risk associated with

⁶² In this respect, mortality risk is akin to market (Beta) risk. A diversified stock portfolio can insure against industry or sector-specific risks, but not risks that affect the economy as a whole.

⁶³ It would increase the MWR ratio (see next section) by about 0.08.

annuities can be offset by holding life insurance contracts. It has also been suggested that governments make available “survivor or mortality bonds,” bonds whose value increases with the proportion of the population still alive on the date of the coupon payment (Blake (1999)). This proposal transfers longevity risk from the insurance company to the taxpayer.

Lack of uniform life expectancies—the problem of adverse selection

The exposition began by assuming that survival probabilities were constant across the population. It is in fact well known that the life expectancies of annuitants tend to be higher than those of the general population of the same age. Anyone who knows his or her days are numbered is not likely to buy a life annuity, so that the pool of annuitants will have an average age that exceeds that of the population at large.

Even if persons with very short life expectancies were excluded from the general population pool, there would still be some difference in life expectancies between annuitants and the pool. A prospective annuitant can have a better sense than the insurance company of whether he or she will be long-lived. The annuitant’s assessment does not have to depend on an assessment of “objective” factors known to him but not to the insurance company—that, for example, he is a fitness fanatic, does not drink, has never smoked—although the annuitant may have more complete information on these relevant factors. His assessment can be based simply on intuition. It may also be that prospective annuitants are cautious and avoid risky pursuits like stockcar driving and hang-gliding. Their cautious outlook on life may both prompt the demand for annuities and justify it. Whatever the reason, annuitants live longer.

Life insurance companies take annuitants’ longer life expectancies into account in setting their premiums, with the result that annuities become less attractive to the rest of the population.⁶⁴ The fact that annuitants are not a random sample of the population—the problem of adverse selection—may go some way to explaining the small size of the market for life annuities in the United States and elsewhere, although it is not the only influence.

Money’s Worth Ratio (MWR)

In the abstract world reflected in the initial assumptions of the exposition, the premium an insurance company would charge would be given by equation one: that is, the cost of an annuity with a fixed nominal payment of A dollars per year would be derived by discounting the annual stream weighted by the survival probability of annuitants of a given age upon purchase of the annuity, using as the discount factor the expected risk-free interest rate.⁶⁵ Because of adverse selection and costs of financial intermediation, however, and the need to

⁶⁴ Referring to the first equation, the π_i are less for individuals who do not purchase annuities than for those of the same age who do.

⁶⁵ Annuities are normally paid on a monthly basis, but assuming an annual payment period does not alter the basic exposition.

compensate for interest-rate and mortality risk, there is reason to believe that premiums would in fact exceed the results of these calculations.

A growing body of research has investigated the issue of the extent to which the premium annuitants pay for life annuities differs from the present discounted value calculation of equation one.⁶⁶ These studies calculate what has come to be known as the Money's Worth Ratio (MWR), or the ratio of the present discounted value calculated using equation one to actual premium costs.

Studies of annuities markets in the small group of countries where such markets flourish have found that the MWR is usually less than one for the general population (i.e., when the survival probabilities used in equation one are those of the general population). This is especially true of the United States and the United Kingdom (see Table 1). The available studies also find that the MWRs for the annuitant population are consistently higher than those of the general population, which points to the ubiquity of the phenomenon of adverse selection. The study by Mitchell et al (1999) finds that the gap between the MWRs for the general and annuitant population varies from about four cents on the dollar to more than ten cents (see Table 1, where some of the results of this study are reported).

Studies on the United Kingdom and the United States have usually found that the MWRs for the annuitant population remain below 1. Studies in other markets, and specifically those of Canada, Singapore and Switzerland, have calculated MWRs well above one in some cases (see Table 1), at least when the government bond rate is used to discount expected future payments. James and Vitas (1999) suggest that, in Switzerland and Singapore's case this may reflect the impact of a steep yield curve on the average maturity of the portfolio of annuity providers. By increasing the average maturity and interest rate earned on its assets, insurance companies may feel able to offer highly competitive premiums. However, a maturity mismatch could entail capital losses as bonds are sold to finance annuity markets when interest rates are rising. In addition, Swiss annuities have a non-guaranteed component—i.e., the annuity payments are not in fact fixed.

The MWRs above one in these countries and in Canada could also reflect the fact that the investments funding annuities include corporate debt, equities and real estate, which normally have a higher yield than the government bond rate. This raises the issue of whether the government bond rate is the appropriate discount rate with a portfolio of risky assets. It may be that life insurance companies are able to diversify risk in a way not open to individuals, and thus offer annuitants a rate of return above what they could get on their own in addition to providing them with longevity insurance. On the other hand, in the United States and some other countries, the development of financial markets allows individuals to achieve a substantial degree of risk diversification on their own. If so, the government bond rate may not be the correct choice for discount rate in an MWR calculation. The significance

⁶⁶ Recent studies of the U.S. market include: Brown (2001) and Mitchell et al (1999). On the U.K. see Poterba (2001); for the U.K., Chile, and other countries, see James and Vitas (1999).

of the high MWRs calculated for these three countries deserves to be further explored, particularly given the administrative costs that life insurance companies incur, and the potential impact on their costs of interest-rate and mortality risk.

The MWR calculation typically assumes that the prospective annuitant incurs no trading costs when he or she acquires bonds or other financial instruments. This means that the relevant discount rate is a bond rate unadjusted for the costs of financial intermediation. This assumption may in effect bias the MWR measure downwards in countries where brokerage fees or commissions are substantial. In principle, the rate of return of an annuity (which is a net rate of return) should be compared to the net rate of return to direct investing by the annuitant.

In some countries, one potential source of financial intermediation costs for the small investor is the indivisibility of the relevant financial instruments. The fact that bonds might not come in denominations less than the equivalent of US\$100,000 could pose a real problem for the small investor.⁶⁷ This is not a problem in the United States. On the other hand, a substantial sales commission on bond purchases and sales could have a noticeable impact on the net rate of return to the investor.

Annuities versus self-insurance

The term money's worth ratio is potentially misleading, since properly measured, the MWR should be less than one, and since the insurance element of an annuity means that its value or utility to the individual annuitant is not reflected by equation one. That there is a load factor does not necessarily mean that retirees are better off self-insuring, to the extent possible, against longevity and avoiding purchasing an annuity. As an illustrative example, consider a male American retiring at age 65 with US\$200,000 in savings. By means of prudent investing and gradual encroachment upon his initial capital of US\$200,000, he could sustain annual consumption of about US\$15,650 for 25 years if his investments earned a steady 6 percent per year, thereby partially, but not fully insuring himself against longevity risk.⁶⁸ By comparison, he could purchase a life annuity generating the same annual payment for about US\$168,000, assuming a load factor of 0.10 (a MWR of 0.90). The life annuity would save him about US\$32,000, and provide insurance against the contingency of running out of

⁶⁷ It would be a problem both in the pre-retirement period of accumulation of savings, and in the post-retirement phase.

⁶⁸ The assumption is that the rate of return is constant; an average rate of return of 6 percent may not be enough to achieve the targeted consumption figure if rates of return drop significantly below that in the initial years of retirement.

money at age 91.⁶⁹ Some one fearful of destitution or straitened circumstances in old age could find the purchase of such an annuity more attractive than self-insurance.

Stochastic consumption

Predicting the optimal consumption path in retirement with certainty is not possible. Relaxing the assumption that it can be done makes clear a major drawback with a life annuity—its irrevocability. Some one who has tied up too much of his retirement nest-egg in annuities may lack the liquid funds necessary to defray unexpected large expenditures. For example, a retired person may incur heavy unforeseen expenditures for medical and long-term nursing care. The relative importance of such unforeseen expenditures will depend on the retired person's insurance arrangements, and long-term nursing care is not paid for typically as a lump sum. The severity of the problem will also depend on the extent to which the retired person can borrow on the strength of his future income stream. With annuities this is not generally possible, because of their contingent character.

Bequests

The bequest motive makes life annuities less attractive than they otherwise would be, since the money invested in a life annuity cannot be bequeathed. The prospective annuitant who desires to leave a legacy has to balance two opposing risks—the risk of exhausting his resources in old age, and the risk of dying prematurely, having annuitized wealth that could have been left to his heirs. The relatively wealthy typically adopt the strategy of keeping their consumption expenditure at a level that will not exhaust their wealth even if their lives are exceptionally long. The surplus wealth acts as a shock absorber or buffer, and whatever is left at their death passes to their heirs. Unless the retired person, like Balzac's Old Man Goriot, is willing to starve himself to benefit his heirs, he needs to begin his post-retirement life with a cushion of wealth above what is necessary to sustain his normal consumption pattern. For persons who retire with wealth that is no more than adequate to support them in retirement, this is not a feasible strategy.

Whether a retired person should purchase an annuity, and the size of that annuity, will depend on his wealth upon retirement, the form that wealth takes, and the importance of leaving a bequest, in addition to the terms of the annuity. It is not irrational to plan to leave a bequest and to purchase a life annuity of some amount. If a retiring person thinks he will be long-lived, he does his heirs a favor by purchasing an annuity, since they will inherit more as a result. In the terms of the previous example, the annuitant, even if he lives to age 91 can bequeath US\$32,000 plus accumulated interest if he has stuck to his consumption plan. Had he self-insured, he would be penniless, and a financial burden on his heirs.

⁶⁹ The estimated premium of US\$168,000 is premised on the survival probabilities taken from the U.S. Government Life Tables. It assumes no further decline in mortality rates and implies that a 65 year old American male would have a life expectancy of about 15 years.

What may make annuities unattractive to retiring persons (and their heirs) is the risk, albeit small, that the annuitant dies soon after annuitization. It is possible to mitigate the consequences of the early death of the retiree, however, by purchasing an annuity with the feature that the payments will go on being made to the annuitant's designated beneficiary for a period specified by the contract even in the event of the annuitant's death. Another way of reducing the impact of premature death on the size of bequests is to purchase a joint annuity. For example, with a joint annuity in the names of a married couple, payments continue being made to the spouse after her husband has died.

The expected value of the bequest foregone as a result of annuitization is likely to be substantially smaller than the premium. Returning to the example of the retiree faced with the choice of self-insuring versus annuitization, the expected value of his bequest if he self-insures discounted to the time of retirement will be about US\$52,000, versus that part of the savings of US\$200,000 not invested in a life annuity, which was US\$32,000.⁷⁰

The share of annuitized wealth in total wealth

The demand for an annuity from a life insurance company should in principle be inversely related to the share of wealth that takes the form of annuities. Some one receiving a substantial occupational pension may have little need for an annuity. Other things being equal, as noted above, health care insurance reduces the need for precautionary liquid assets, and should increase the demand for annuities. The indexed annuity the state provides reduces the demand for private sector annuities. Its partial or total elimination for some individuals in a reform introducing individual accounts should increase the demand for life and other forms of annuities.

A discussion of the irrevocability of annuities should also acknowledge that this drawback is also a potential strength, and not an inconsiderable one at that, for many potential annuitants. The purchase of an annuity, in addition to being a spur to a temperate life, provides insurance against shortsightedness or weakness of will. It is akin to a contractual saving scheme (actually a scheme to moderate the pace of dissaving). The indexed life annuity that public pension systems normally provide may be playing such a role for the elderly population in both advanced and emerging market economies.

Inflation

The standard life annuity provides a payment fixed in nominal terms. A retired person with a standard life annuity who makes no provision for inflation could expect to suffer a substantial reduction in purchasing power before she dies even in an environment of low inflation.

It is possible to make provision for low, predictable inflation, by for example, saving and investing the appropriate share of the annuity payment, although the rate of return of these

⁷⁰ This calculation takes into account the possibility that he outlives his resources.

investments may be below the conditional rate of return of the annuity.⁷¹ The issue in an environment of low and stable inflation may be the self-control needed to smooth the real as opposed to the nominal value of consumption over time. It is far more difficult to offset the consequences of unpredictable inflation. Bodie (1990) suggests that equity prices are not closely correlated with inflation, and do not provide protection against unexpected increases in the price level.

The existence of a market for indexed annuities appears to depend on the existence of indexed public debt. In effect, the government, rather than the insurance company assumes the inflation risk. Indexed annuities are available in the United Kingdom, Chile, and Israel. The governments of all of these countries issue indexed bills and/or bonds. Indexed annuities markets are also developing in several other countries that have adopted a version of the Chilean model. The market for indexed annuities in the United States is only just developing, although indexed Treasury debt has been available since 1997. Brown et al (1999) find that the MWR for such annuities in the United Kingdom is about 0.05 lower than the MWR of standard annuities with an average payout, implying that inflation-protection through annuitization is expensive (Table 4). Poterba (2001) reports similar findings.

⁷¹ The rate of return of the annuity conditional on the annuitant's survival will exceed that the rate of return of bonds and similar savings vehicles for the reasons discussed earlier.

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