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by Jan Walliser

January 2000

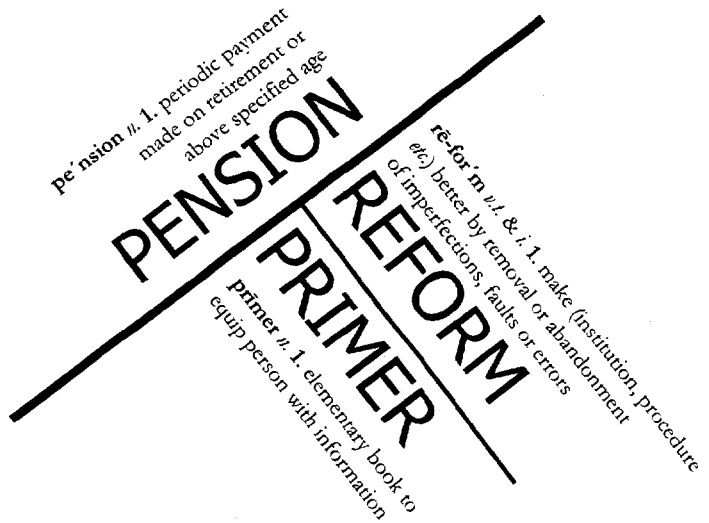


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## Abstract

Funded mandatory pension systems based on individual accounts are spreading around the world. With the maturation of those systems, regulating the withdrawal of retirement savings will become increasingly important. Government regulation of withdrawals should mandate the purchase of inflation-indexed life annuities exceeding income available from government welfare programs for the retiree and potential survivors. However, proper functioning of insurance markets does not require annuitizing the entire account balance. Instead, more flexibility for the choice of withdrawals could be permitted for any remaining funds, helping to tailor income streams to individual needs and living arrangements.

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## I. INTRODUCTION

Mandatory pension systems based on individual accounts are spreading around the world. Following the Chilean example of the early 1980s, many Latin American countries including Argentina, Colombia, Mexico, and Peru have introduced individual account systems in the 1990s. Eastern Europe and the former Soviet Republics in Asia constitute a second region with major reform activity, although reforms have often been less far-reaching than in Latin America. The major driving force behind most reform programs was the imminent financial problem of the countries' traditional pay-as-you-go systems.

Under the new systems, workers set aside earnings in individual accounts, which later replace some or all of the previously pay-as-you-go financed pensions. During the accumulation phase workers invest a percentage of their income in approved investment products. Following retirement workers withdraw the accumulated assets to finance consumption in old age. In addition to the retirement income financed with individual accounts ("second pillar"), the government generally offers a general-revenue financed benefit ("first pillar") in form of a basic pension or a welfare program for workers without sufficient resources.

Quite naturally, much of the initial interest in designing the new pension systems has been focused on the accumulation phase. Details concerning how much money to set aside, where to invest it, how to regulate investment companies and investment portfolios, and what type of survivor and disability insurance to establish have drawn much attention. The Chilean system, for example, features a 10 percent contribution rate for individual accounts, and imposes fairly tight regulation on investment portfolios, investment returns, and charges.

With the maturity of individual account systems, policy questions surrounding the design of the withdrawal phase will require more attention. Standard pay-as-you-go systems generally offer an inflation-indexed pension for the duration of a worker's life. Can private insurance markets replicate such a pension—called a life annuity—at reasonable cost? What flexibility should retirees have in choosing insurance products that convert their retirement account balance in retirement income? What form of government oversight and regulation would strike a reasonable balance between the interests of retirees and taxpayers who finance income protection programs? Those are among the core questions that policymakers face in reform countries.

The major conclusions of the discussion are the following: Optimal income allocation in old age depends on a large number of factors including the income received from other pensions, bequest motives and family arrangements, health and long-term care issues, housing, investment portfolio choices, and inflation protection. Therefore, weak observable life annuity demand in many industrialized countries does not necessarily indicate insurance market failure. Nonetheless, government regulation of the withdrawal of account balances should ensure an inflation-protected stream of income for the retiree and potential survivors that exceeds income available from government welfare programs. More flexibility for the choice of insurance product could be permitted for the remaining account balance, helping to tailor income streams to individual needs and arrangements.

The paper proceeds in two sections. It first discusses issues of consumption in old age. Starting with a simple model, different model extensions and their impact on the optimal consumption choice are outlined. The first part also reviews the importance of insurance market failure vis-à-vis other explanations for observable weak life annuity demand. Drawing on the conclusions of the first section, the second part lays out options for policymakers and weighs their respective advantages and disadvantages.

## II. INCOME AND CONSUMPTION IN OLD AGE

The goal of pension programs is to provide a stream of income in old age that is sufficient to meet consumption needs. To evaluate which insurance products and withdrawal regulations could help to meet retirees' needs, it is important to gain an understanding of optimal choices and how they vary in different settings. Consumption in old-age can be affected by a variety of circumstances, including uncertainty about the life span, the functioning of insurance markets, family arrangements, health risks, and fluctuations in the rate of return.

### *A Simple Model of Consumption Allocation*

Suppose workers reach retirement age with wealth  $W_t$ , which includes the savings in individual accounts. Workers would like to allocate this wealth over the remaining years of life to ensure that consumption needs can be met. In deciding how much to consume in each year, workers take into account that they might die at the end of year  $t$  with probability  $(1-\pi_{t+1})$  and might survive to year  $t+1$  with probability  $\pi_{t+1}$ . People are assumed to retire at age 65 and the maximum life span is 120 years. Suppose also that the only assets available in the economy are government securities with a fixed rate of return of  $r$ . For simplification, assume furthermore that a utility function with constant relative risk aversion governs consumption choices  $C_t$ . Under these assumptions, a worker solves the following optimization problem:

$$\max_C \frac{1}{1-\gamma} \sum_{t=65}^{120} (1+\delta)^{65-t} C_t^{1-\gamma} \prod_{s=65}^t \pi_s \quad (1)$$

$$s.t. C_t = (1+r)W_t - W_{t+1} \quad (2)$$

$$W_{120} \geq 0 \quad (3)$$



$\gamma$  represents the utility function parameter that determines the degree of risk aversion and  $\delta$  stands for the pure rate of time preference, the discount factor for future utility. The model can be solved using the following standard first-order conditions (Euler equations):

$$C_{i+1}^\gamma = C_i^\gamma \pi_{i+1} \frac{(1+r)}{(1+\delta)} \quad (4)$$

As shown by equation (4), optimal consumption growth depends on (a) the risk aversion of the retiree; (b) the rate of return that can be earned in the market; and (c) the impatience of the retiree, which in this case is represented by both the pure rate of time preference  $\delta$  and survival probabilities  $\pi$ . Generally speaking, more consumption is allocated to those periods in which a retiree is more likely to be alive.

Because a retiree is uncertain about the actual length of life, he or she must self-insure against longevity risk by always saving some wealth for the possible continuation of life. As a result, those workers who die before the maximum length of life leave some unintended bequests—wealth they were unable to consume owing to early death. How large those unintended bequests are depends on the actual age at death and the risk aversion of the retiree. The more risk averse a retiree (the larger  $\gamma$ ) the flatter is the desired consumption path and the more wealth is allocated to years with low survival probabilities.

Suppose an insurance company offers retirees a contract that charges them a premium  $Z_t$  in period  $t$ , pays an annuity  $a_{t+1}$  in period  $t+1$  if the retiree survives, and nothing if the retiree dies. Accordingly, the retiree's budget constraint (2) changes as follows:

$$C_t = (1+r)W_t - W_{t+1} - Z_t a_{t+1} + a_t \quad (5)$$

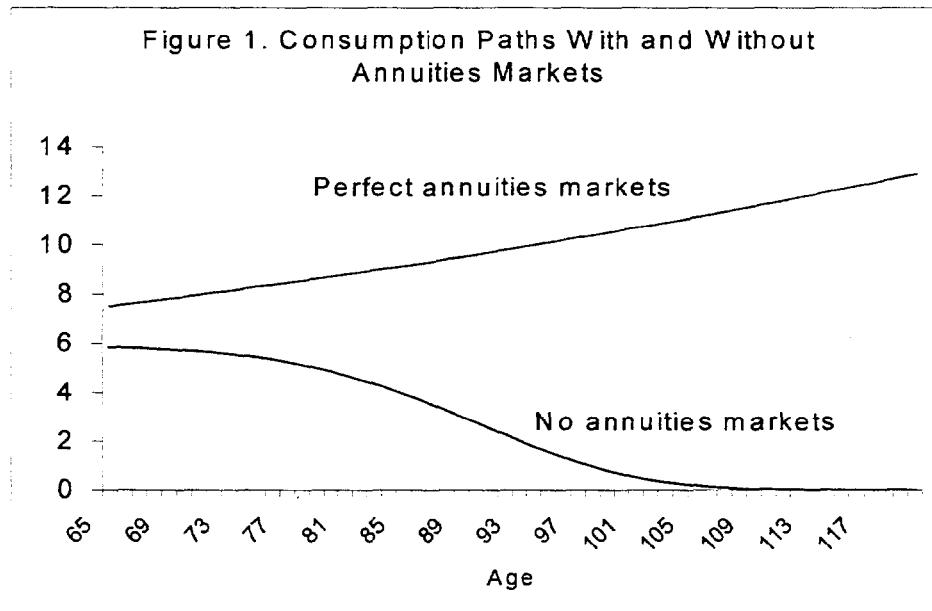
A retiree facing budget constraint (5) would decide to either purchase annuities with all of his wealth or hold his wealth entirely in bonds. The retiree has the choice between two assets, bonds and annuities, and which of the two instruments is held depends on the relative rates of return, that is the relationship between the safe rate of return  $r$  and the price of annuities  $Z$ . If  $1/Z$  exceeds  $(1+r)$ , a retiree would only purchase annuities because he or she could receive a higher rate of return  $1/Z$  through full annuitization.

Actuarially fair and frictionless annuity markets would charge retirees a price  $Z = \pi/(1+r)$ . The insurance company takes into account that a buyer of an annuity may die and collects the annuity with probability  $\pi < 1$ . The insurer thus charges a price that is smaller than the inverse of the rate of return, or equivalently  $1/Z > (1+r)$ . As a result, in a world with perfect insurance markets, all retirees should hold their entire wealth in annuities. The latter permits retirees to avoid unintended bequests and reap a higher rate of return. The observation that full annuitization is optimal under these circumstances has first been formalized by Yaari 1965.

The insurance against life span uncertainty offered by annuities can substantially increase a retiree's utility. The consumption path with annuities can be solved using the following Euler equations:

$$C_{t+1}^\gamma = C_t^\gamma \frac{\pi_{t+1}}{Z_t(1+\delta)} \tag{6}$$

If annuities markets are actuarially fair and  $Z_t = \pi_{t+1}/(1+r)$  the Euler equations collapse to an expression that is independent of survival probabilities and simply reflects the rate of return and the pure rate of time preference. In other words, in allocating consumption the retiree does not have to consider the risk that in some periods he or she would have very little wealth to consume because of an unexpectedly long life span. Figure 1 shows the consumption path for a 65-year-old male assuming (a) survival probabilities from the 1996 life tables compiled by the Office of the Actuary of the U.S. Social Security Administration 1999<sup>2</sup>; (b) normalized retirement wealth of 100 units; (c) a pure rate of time preference of 1 percent; and (d) an interest rate of 3 percent.<sup>3</sup>



Note:  $r=0.03$ ,  $\delta=0.01$ ,  $\gamma=2$ , 1996 life tables for the U.S., retirement wealth normalized to 100. Source: Author's calculations.

<sup>2</sup> The life tables do not reflect future mortality changes. The results should therefore be interpreted as illustrative because they rely on a cross section of survival probabilities.

<sup>3</sup> For illustrative purposes, an increasing path of consumption is assumed for perfect annuities markets, resulting from an interest rate that exceeds the pure rate of time preference. Alternatively a flat or declining consumption path could be constructed by increasing the pure rate of time preference.

Table 1 illustrates the welfare gains arising from the existence of annuities markets for the same parameter values used for Figure 1. Under those assumptions, men could gain between 65 and 110 percent of their original retirement wealth by having access to fair annuities, depending on the degree of risk aversion, and women could gain between 50 and 80 percent.

**Table 1. Welfare Gains from Perfect Annuities Markets (In Percent of Wealth at Age 65)**

Gamma	Male	Female
2	65.8	51.6
4	78.8	60.8
10	96.9	73.5
20	108.5	81.5

Note:  $r = 0.03$ ,  $\delta = 0.01$ , 1996 life tables for the U.S.  
Source: Author's calculations.

The large potential welfare gains from pooling longevity risk give rise to the question why observable annuities markets are so small. In most developed countries, many retirees hold substantial wealth in non-annuitized resources and the market for private life annuities is very small. If there is so much to be gained from full annuitization, why are private annuities so unpopular? Three possible explanations emerge: (a) annuitization through government programs and employers, (b) market imperfections; and (c) additional factors determining consumption allocation in old age that are missing from the simple model outlined above. The latter two could also affect the regulation of the withdrawal phase in individual account systems.

#### *Annuityization through Government Programs*

Most industrialized nations already provide their retirees with annuitized resources through mandatory government programs or employer pension coverage. In the United States, for example, retirees generally receive income from the Old-Age and Survivor Insurance and are covered by Medicare, the health insurance program for the elderly. Both programs reduce bequeathable wealth because they are financed by payroll taxes, which diminish income available for retirement saving. The resources that those programs offer are contingent on survival and can therefore not be turned over to potential heirs; in other words, by paying into the government retirement and health care system, potentially bequeathable wealth is transformed into annuitized wealth. Moreover, many employers offer private pensions, which constitute another form of annuitized wealth. An extensive study by Auerbach et al. 1995 shows that the overall annuitization of American retirees ranged between 40 and 50 percent between 1987 and 1990. Similarly, a study by Gustman and others 1997 finds that for the average U.S. household expected future government pension payments account for 27 percent of net worth, with another 23 percent of net worth being in the form of expected future private pension payments.

Government and private pensions could not on their own explain why people refrain from annuitizing their remaining resources as suggested by the simple model above. In the model, annuitized resources diminish the bequeathable wealth  $W$  and increase the annuity stream  $a$ . Hence, the existence of government and private pension programs would lead to smaller disposable resources for retirees. In order to explain observed behavior, namely the fact that very few people purchase private annuities in addition to pensions received from the government and employers, other aspects must be added to the model.

Studying the interaction between existing pension programs and annuity demand in industrialized countries is nonetheless important. First, those programs interact with annuities markets and may exacerbate market imperfections. Second, to the extent that observed behavior points at demand for annuities, it could give some indication about the demand for annuities in a system that replaces a government program with individual accounts.

Available empirical evidence for the United States does not support the notion that people wish to hold less annuitized wealth than offered to them by government and employers. In an actuarially fair insurance market, annuitization could be reversed through purchasing life insurance (Yaari 1965). Life insurance is a payment to one's heirs contingent on death, and purchase of life insurance therefore permits to convert a current stream of income into a lump sum wealth payment. However, Brown (1999) finds that the pattern of life insurance holding does not support the conclusion that people attempt to offset mandatory annuitization by purchasing life insurance. Hence, the limited empirical evidence is consistent with the view that retirees value the annuities in their portfolios.

### *Market Imperfections*

Insurance markets with imperfect information can give rise to adverse selection. An insurance is by definition a payment contingent on an uncertain event. Life annuities are income payments contingent on the annuitant's survival. Prices for annuities as for other types of insurance therefore depend on an insurance company's assessment of the probability that an uncertain event occurs. However, the particular risk properties of an insurance customer may be unknown to the insurance company although they are known to the customer himself. Because insurance is more attractive for the adverse risks (in the case of annuities, those with longer-than-average life expectancy) an insurance company cannot base its prices on probabilities for the average person but must raise its prices to account for the fact that bad risks purchase more insurance. That outcome, in turn, may reduce the attractiveness of insurance further for low-risk customers, who might decide to reduce their demand, necessitating further price increases by insurance companies and further reducing the attractiveness of insurance.

Rothschild and Stiglitz 1976 have evaluated the equilibrium in insurance markets with adverse selection in a seminal paper. They find that under certain assumptions insurance companies would segment the market in different risk classes, which would both receive insurance coverage at actuarially fair prices. However, insurers would restrict the insurance coverage of the good risks to avoid that bad risks have an incentive to purchase the same contract. Eckstein, Eichenbaum, and Peled 1985 applied the Rothschild-Stiglitz insurance

equilibrium to annuity markets. They show that mandatory annuitization might be Pareto-improving and argue that their finding supports Diamond's 1977 case for social old-age insurance.

The Rothschild-Stiglitz equilibrium may, however, not describe annuity insurance markets well. As Rothschild and Stiglitz 1976 discuss in detail, their separating equilibrium relies on the assumption that insurers can restrict the quantity of insurance. While it is reasonable to assume that insurers can restrict basic insurance against automobile accidents or health problems because it makes little sense to purchase that insurance twice, quantity constraints may not be applicable to annuity insurance. Annuities offer a stream of income and nothing prevents people from purchasing an income stream from different insurers to circumvent any quantity restriction. If insurers can only control prices but not the overall quantity, the price will be less favorable for low risks and more favorable for high risks than in a separating equilibrium. Moreover, the price will appear unfavorable for the average person in the population.

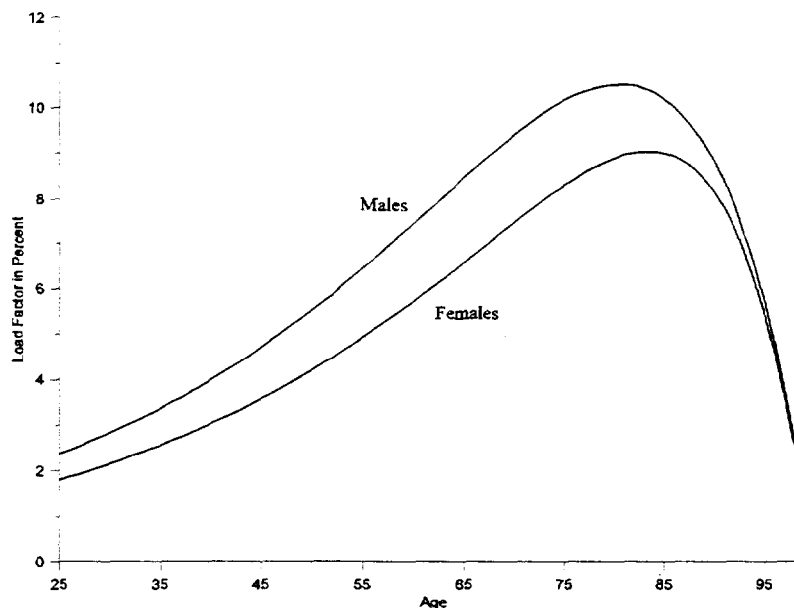
The economics literature shows that those who decide to purchase annuities live longer than average. Friedman and Warshawsky 1988, 1990 and more recently Mitchell and others 1999 demonstrate that life annuities in the United States tend to be more expensive than could be expected from average life expectancy. In particular, Mitchell and others calculate that for the average 65-year-old male, the value of an annuity stream is between 15 and 25 percent less than could be expected from average life tables. They also find that about half of that reduction is caused by the fact that annuitants live longer than the average American, with the remainder reflecting overhead costs. Finkelstein and Poterba 1999 report that the value of voluntary annuities for 65-year-old males in the United Kingdom is between 10 and 15 percent lower than average life tables would predict. More than 60 percent of that reduction in value is caused by the longer lives of annuitants compared with the average populations.

The observation that the value of annuity streams falls short of what would be considered actuarially fair for an average retiree could be attributed to two factors. The first has been mentioned above: adverse selection, the possibility that annuitants know more about their longevity than insurers and thus are more likely to purchase annuities. However, in both the United States and Great Britain, longevity is tied to lifetime income, and richer people tend to live longer. Economic theory would predict that people with more income purchase more annuities. Thus, the fact that annuitants live longer than average could also reflect a second fact, namely the income-mortality correlation. In other words, higher-income people buy more annuities because they have more wealth, and the observation that annuitants live longer than average arises because higher-income people also tend to live longer.

Whatever the exact explanation for the observed longer lives of annuitants, the lack of actuarial fairness for the average retiree on its own cannot explain the small private annuity demand. Friedman and Warshawsky 1988 impose the observable gap between actual and actuarial fair annuities on a model similar to the one outlined above by increasing the price of annuities  $Z$ . They conclude that even in the presence of an annuity provided by a public pension program, prices would have to be much higher to prevent annuity purchases in the private annuities market. Walliser 1997a derives annuity prices endogenously in a simulation model of private annuity demand with heterogeneous agents and a public pension program. Such a model can reproduce observable differences between equilibrium annuity prices and actuarially fair

prices (the so-called load factor) but does not drive people out of the annuities markets. Figure 2 shows the load factors for life annuities resulting from the interaction of optimizing agents differing in income and survival probabilities.<sup>4</sup> For example, the model produces equilibrium annuity prices for 65-year-old males that are about 8 percent higher than those derived from average survival probabilities. The magnitude of load factors corresponds to the load factors attributable to adverse selection found by Mitchell and others 1999. However, despite the lack of actuarial fairness for the average retiree, the model does not predict that people drop entirely out of the annuities market unless they wish to consume less than their public pension. Hence, market imperfections that raise annuity prices by the same percentage observed in the United States and the United Kingdom cannot on their own explain why people prefer to hold non-annuitized wealth.

**Figure 2. Percentage Increase in Annuity Prices for Males and Females Over Actuarially Fair Prices (Load Factor) Generated By a Life-Cycle Model**



Source: Walliser 1997a.

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<sup>4</sup> Another implication of his model is that a large proportion of the increase in annuity prices is caused by the correlation between income and mortality rather than classic adverse selection.

A second possible imperfection of annuities markets stems from transaction costs. If renegotiating a contract every period involves sufficiently high transaction costs for the insurance company and the annuitant, long-term contracts may be an attractive option. Indeed, most annuity and life insurance companies face large costs from selling contracts through their sales force<sup>5</sup>, and most observable contracts are long-term arrangements. As Yagi and Nishigaki 1993 show, those contracts have the consequence that the annuitant may not be able to match the annuity payments to his consumption. Therefore, retirees must optimize their consumption path through additional saving at the interest rate  $r$  if they desire to increase consumption over time. Moreover, if annuity contracts are closed at one point in time, the rate of return an annuitant reaps from the contract will be constant over time rather than vary with conditional survival probabilities as in the model outlined above. As a result, the annuitant would change his consumption path and allocate more consumption to the earlier years of retirement. Formally, a constant life annuity in an actuarially fair market would cost the following amount  $Z$  in each period  $t$ :

$$Z = \left( \sum_{t=65}^{120} (1+r)^{65-t} \prod_{s=65}^t \pi_s \right) / 56 \quad (7)$$

The price  $Z$  for a constant annuity purchased at age 65 initially falls short of the time-varying price  $Z_t$  and later exceeds  $Z_t$  of an actuarially fair, time-varying annuity. As can be seen from equation (6), the constant price would lead retirees to reduce their consumption growth and increase consumption earlier in life.

#### *Bequest Motives and Intrafamily Insurance*

Pensioners may want to leave bequests to their children or relatives for a variety of reasons. For example, they might include their children's utility directly in their considerations, receive joy from giving money (without caring directly about the utility of their children), or use bequests as a disciplining device to receive attention and care in old age (Bernheim, Shleifer, and Summers 1985). Whatever the reason, the desire to bequeath reduces the incentive to annuitize wealth at retirement.

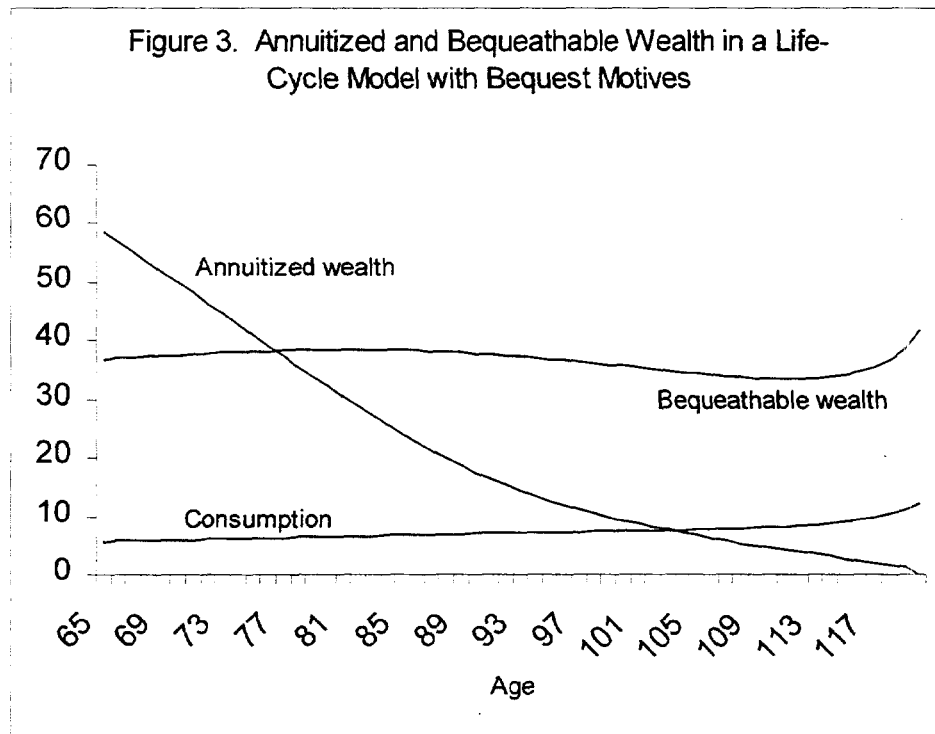
Consider the allocation of wealth between bequeathable and annuitized wealth with a joy-of-giving bequest motive as in Fischer 1973. Assuming for simplification that bequests enter utility in the same fashion as other consumption, the utility function (1) changes as follows:

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<sup>5</sup> Warshawsky (1998) reports that in the state of New York sales commissions can be as large as the legally imposed limit of 7 percent of the annuity premium.

$$\max_{C, W} \frac{1}{1-\gamma} \sum_{t=65}^{120} (1+\delta)^{65-t} \left( C_t^{1-\gamma} + \frac{\eta_{t+1}}{1+\delta} W_{t+1}^{1-\gamma} (1-\pi_{t+1}) \right) \prod_{s=65}^t \pi_s \quad (8)$$

$\eta_t$  stands for the relative utility weight of bequests made at the beginning of age  $t$ , and  $W_t$  for the respective bequest, which equals non-annuitized wealth. The problem can be solved recursively from the last period of life when death is certain and the purchase of annuities would be irrational (see Fischer 1973, and Friedman and Warshawsky 1988). Figure 3 shows the paths of consumption and bequeathable wealth for different ages. With utility weights for bequests generating bequests of about 4 times annual consumption, actuarially fair annuity markets, and a risk preference parameter of 2, about 60 percent of wealth would be annuitized at age 65. This share would fall with age. Moreover, overhead costs for annuities would furthermore reduce the attractiveness of annuities as would the existence of a social security program that provides annuity income (see Friedman and Warshawsky 1990).



Note:  $r=0.03$ ,  $\delta=0.01$ ,  $\gamma=2$ , 1996 life tables for the U.S., retirement wealth normalized to 100.

Source: Author's calculations



Family annuity contracts may be another reason why people refrain from purchasing private annuities. If family members jointly optimize their joint consumption path while taking into account individual survival probabilities, they could achieve substantial welfare gains over a situation without annuities markets. Kotlikoff and Spivak 1981 calculate that a two-person household with identical survival probabilities could achieve almost 50 percent of the utility level achievable with fair annuities markets.<sup>6</sup> The utility gain rises the more household members participate in the intra-family insurance scheme, and those schemes could be more attractive if private annuities are costly owing to adverse selection or transaction costs.

Empirical evidence in the United States points does not support risk sharing within extended families. Altonji, Hayashi, and Kotlikoff 1992, 1997 find that the pattern of consumption and income transfers between households belonging to the same extended family is not consistent with perfect risk sharing. However, the studies cannot rule out limited risk-sharing arrangements, for example between couples, which would still crowd out life annuity demand, particularly in the presence of government and employer-provided pensions. Moreover, to the extent that families in less developed countries are larger and encompass several generations living together, implicit intrafamily insurance could be very important, with the concomitant decline in observable annuity demand.

#### *Health and Long-term Care Insurance*

The discussion has thus far assumed that retirees face uncertainty about the length of their life. However, other risks loom in old age. In particular, health care spending and long-term care needs rise with old age. To the extent that insurance markets for health and long-term care insurance are imperfect, retirees might wish to keep a stock of non-annuitized wealth in order to meet sudden expensive medical care needs.

Significant extensions to the standard model are necessary to explain a rational non-purchase of annuities. Simply adding health risks in a similar fashion as longevity risk to the above model without bequest motive would not result in a reduction in annuity insurance. If annuity contracts can be renewed annually the retiree could still reap a higher rate of return by annuitizing all wealth notwithstanding the lack of health or long-term care insurance markets. However, as discussed earlier, transaction costs may lead to non-reversible long-term contracts. In that case, the retiree might not be able to meet the health care spending out of current income and might keep a buffer stock of non-annuitized wealth.

Lack of control over long-term care spending could also explain why retirees refrain from fully annuitizing their wealth. Richter and Ritzberger 1995 analyze a principal-agent model of long-term care insurance. If long-term care insurance is unavailable and retirees cannot control the quantity of care once they become frail, retirees must provide incentives to their

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<sup>6</sup> For a discussion of the demand for joint life annuities and the consumption allocation of couples, see Brown and Poterba 1999. Hurd 1999 discusses a life-cycle model for couples and the interaction between observable bequests and intra-family insurance.

caregivers to provide adequate care. If health risks and longevity risks are positively correlated, it can be shown that it is optimal not to annuitize all wealth. The result follows because holding non-annuitized wealth allows to hedge against long-term care risks.

### *Portfolio Choice*

Generally speaking, extending the model to include risky assets could not explain why people do not purchase annuities. The model outlined above assumes that there exists only a safe asset in the economy. Replacing the safe asset with a risky asset would not alter the analysis. The safe return  $r$  would simply have to be replaced with an expected rate of return, implying that the return to annuities would also be uncertain. If both risky and non-risky assets coexist in the economy, annuities could be backed by a set of both assets reflecting the optimal portfolio allocation of the retiree, and full annuitization of wealth would remain optimal.

The portfolio of annuities may differ from the desired portfolio choices for two reasons. First, many governments offer some guarantees for annuity payments. However, in return for that guarantee, they impose certain portfolio restrictions on annuity companies to limit the risk of failure. As a result of those restrictions, fairly conservative investment portfolios could be required for annuities, and retirees might choose to purchase risky assets in addition to the annuity.

Second, the annuities backed by risky portfolios, so-called variable annuities that are offered in the United States, are investment-insurance hybrids. Because both the investment firm and the insurance firm charge fees, variable annuities tend to cost substantially more than investments in the underlying portfolio without annuity component. As a result of the high costs, variable annuities have become more of a tax shelter for high-income savers than a product that insures against longevity risks.

Another portfolio risk stems from inflation. Few governments offer indexed bonds that could be employed to back an inflation-protected annuity. Moreover, in countries where they exist, the markets for inflation-indexed bonds are thin. As a result, very few annuity products protect against inflation risk. However, even if such products are widely available as in the United Kingdom, they are reportedly not very popular among retirees. Brown and others 1999 calculate that the money's worth (expected discounted present value of the annuity divided by the price of the annuity) of inflation-indexed annuities in Britain is about 5 percentage points lower than the money's worth of standard annuities. That difference could be interpreted as the cost of inflation protection and is apparently more than many retirees are willing to pay.

### *Policy Implications*

The previous discussion demonstrates that the decision about consumption allocation in old age is complex and that many choices remain ill understood. It is therefore difficult to draw a single conclusion or guiding principle from economic theory for the design of the withdrawal phase in individual account systems. Instead, policy recommendations for the design of the

withdrawal phase in individual account systems should take into account a whole set of issues. How strictly withdrawals are regulated and which forms they take would depend on country-specific circumstances including the way in which a society cares for their elderly and how large a role the government plays in providing a safety net and medical insurance.

The lack of annuity demand in industrialized countries is likely caused by a number of factors, and adverse selection is probably not the main reason why people refrain from converting their wealth into annuities. The evidence for the United States shows that annuitants have a longer life expectancy than those who do not purchase annuities. However, a similar outcome could be result from the correlation between income and longevity and the link between the size of public pension benefits and longevity. Moreover, theoretical results reveal that unfavorably priced annuities alone could not explain the lack of demand. Bequest motives, self-insurance against health risks, the inability to adapt annuities exactly to the desired consumption stream, lack of inflation protection and most importantly the existence of a public pension system all contribute to the weak demand for additional annuity coverage. Hence, regulating withdrawals should aim at more than simply avoiding adverse selection in annuities markets.

### III. REGULATION OF THE WITHDRAWAL PHASE

Most economists believe that the provision for old-age consumption should be at least partly mandatory. The rationale for enforcing retirement savings is that workers may be myopic or would otherwise rely on publicly provided income support because the government cannot credibly commit to let retirees starve. That argument can be extended to the withdrawal phase of individual account systems. Insurance market imperfections would lend further support for government regulation of withdrawals.

A variety of insurance products could be considered to tailor withdrawals to a retiree's needs. In which way those products should be regulated depends on the size of other government programs, government guarantees for annuity firms, and equity considerations in annuity pricing.

#### *Reasons for Government Intervention*

Workers and retirees may be uninformed or myopic. Providing for old age and allocating savings requires forward looking and rational choices. Because some of those choices are complex, workers and retirees may fail to provide adequately for their retirement years. Bayer, Bernheim and Scholz 1996 offer empirical evidence that educational support can markedly improve retirement saving choices. Similar arguments apply to the withdrawal of retirement savings. Moreover, retirees may simply be impatient and therefore consume more of their retirement savings than would be considered prudent from a paternalistic perspective. Imposing rules on withdrawals would force retirees to act within boundaries set by the government.

The lack of forward-looking behavior may also result from explicit or implicit government income guarantees. If the government cannot credibly commit to ignore retirees without sufficient means, those with sufficient retirement savings may feel compelled to spend down their wealth and rely on government income support programs afterwards, a moral hazard created by government guarantees. Withdrawal rules would avoid the potential costs of a large retiree population drawing welfare benefits and ensure that retirement savings are used for consumption in old age.

Aspects of the insurance market may also warrant government intervention. First, government withdrawal rules may change the pricing of annuities by expanding the pool of annuitants and possibly limiting people from dropping out of the market based on private information. Accordingly, adverse selection could be limited by government intervention. Moreover, in many countries the government guarantees at least a portion of the annuity payments in case an annuity company fails. Because government guarantees could otherwise encourage overly risky investment strategies of insurance firms, some government regulation of insurance portfolios would be warranted.

#### *Types of Withdrawals*

The theoretical discussion in section II focused on simple life annuities as a type of withdrawal. However, financial markets in industrialized countries have developed a whole set of annuity products. In general, those products can be distinguished by the following five characteristics (see also Poterba 1997):

*The method of payment.* Some annuities must be purchased with a single premium (single premium annuities); others must be purchased with a series of annual payments (fixed-annual-premium annuities, flexible-premium annuities). Retirees in an individual account system would typically purchase their annuity with a single premium.

*The number of people covered.* Annuities can be purchased for an individual (individual annuity) or several people (joint life annuities, joint and survivor annuities).

*The waiting period for benefits.* Annuity payments can begin immediately after the purchase of the annuity (immediate annuity), or the annuity can be deferred until a certain age is reached (deferred annuity). Both options could be attractive in an individual account system. Currently, individual accounts are typically converted into immediate annuities.

*The nature of payouts.* Life annuities provide income until the death of the annuitant. A fixed-payments-certain life annuity provides payments until the death of the annuitant and also guarantees a certain number of payments even if the annuitant dies early. Refund annuities return a portion of the premium should the annuitant die before a certain date. Some annuities provide payments only for an agreed-upon fixed period of time so that payments may end before the death of the annuitant. Those annuities do not insure against life span uncertainty. They resemble so-called phased withdrawals, which divide the account balance according to the expected remaining life span.

*The variability of payouts.* Annuity payouts can be fixed or variable. A fixed annuity guarantees a minimum payment. The “nonparticipating” fixed annuity pays a constant stream of annuity payments whereas a “participating” fixed annuity provides a guaranteed minimum payment and additional dividend payments that depend on the performance of the insurance company's investment portfolio. Variable annuities also rise and fall with the performance of the annuity insurer's investment portfolio, but they do not guarantee a minimum payment.

#### *Issues in Regulating Withdrawals*

For the reasons outlined above, there seems to be a consensus among economic analysts that some regulation of withdrawals is reasonable. However, such consensus does not cover the details of the regulation. Specific questions that need to be answered include the following:

- Which portion of the account balance should be subject to withdrawal rules and which portion could be withdrawn in a lump sum?

The portion of the account balance that should be preserved for withdrawal over time should depend on the generosity of other government old-age income support programs. Imposing withdrawal rules on retirees has the ultimate goal to limit the potential cost arising from government income support for the elderly. Hence, the withdrawal rules would have to cover only that portion of account balances sufficient to finance a level of retirement income above government welfare levels. For example, the Chilean government allows the lump-sum withdrawal of those funds that exceed the level necessary to purchase an annuity of 120 percent of the guaranteed pension level. Thus, retirees may reduce their income level compared to pre-retirement years by spending savings too quickly, but their income will remain high enough such that they do not qualify for government assistance.

How much higher the income from the individual accounts should be than a guaranteed minimum pension depends largely on the rules governing the income support system. Rules should be set such that the retirement income derived from individual accounts remains above guaranteed pension levels throughout retirement. For example, if guaranteed pension levels rise with productivity, guaranteed pension levels may catch up with income withdrawals from individual accounts if the latter are fixed in nominal terms. Moreover, pension guarantees may be smaller than what would be considered a comfortable level of consumption. Both reasons would support regulation that sets mandatory income withdrawal from individual accounts above the pension level guaranteed by the government.

Regulation could ensure participation in the insurance market and avoid any adverse selection. If only a portion of the account balance must be converted into an annuity or some other form of withdrawal such regulation would effectively split the insurance market in one market for regulated withdrawals and one market for voluntary purchases. Clearly, both markets would interact. The market for regulated purchases would not be subject to adverse selection but the market for voluntary purchases would likely be subject to even stronger adverse selection (Walliser 1997b). Imposing a mandate on the entire account balance that would largely eliminate the voluntary market could avoid adverse selection but would restrict the flexibility of retirees to adapt income streams to their needs.

How extensive the mandate should be depends thus largely on the weight of the argument to ensure the functioning of insurance markets against the argument for flexible provision of retirement income. First, if the accounts provide a relatively small portion of **overall** retirement income, mandatory purchase of annuities or another form of withdrawal over time with the entire account balance would not restrict the ability to adapt income streams to consumption needs. (It would, however, affect the selection in the market for voluntary purchases.) If individual accounts accumulate a large proportion of worker's retirement wealth, some more flexibility is warranted given the evidence that some generous pay-as-you-go pension systems may force retirees to hold too much wealth in annuities.<sup>7</sup> Second, the portion of the balance covered by the mandate hinges on the importance of the insurance market argument. Although people who participate in annuity insurance markets in the United States clearly live longer than other retirees the extent to which this phenomenon is caused by private information about life expectancy is unclear. Further study of the experiences with newly emerging annuities markets is necessary to clarify that question. However, first figures from Chile seem to indicate that annuities are a very popular withdrawal option (Valdés-Prieto 1998), especially among those with sufficient wealth to retire early.

- Which types of withdrawal should be permitted for the regulated withdrawal of the account balance?

One of the major questions is whether only life annuities or also other forms of withdrawal over time should be allowed. Life annuities protect the retiree (and potentially his or her survivors) against the uncertainty about the length of life. Other products, which distribute the regulated portion of the account balance over a certain time span do not offer such a protection. For example, so-called phased withdrawals in Chile divide the remaining account balance (after a possible lump-sum withdrawal) over the expected length of life taking into account the interest accrued over time.

Protecting government finances and ensuring participation in the insurance market would both suggest prohibiting phased withdrawals as alternative for annuities. Because phased withdrawals do not protect against life span uncertainty, those with unexpectedly long lives could qualify for government assistance at the end of their life span. Moreover, phased withdrawals would allow those who expect to live only short lives to opt out of the annuities market and thus encourage adverse selection.

A second question concerns the types of annuities people should be allowed to purchase with the regulated portion of their account. As outlined above, annuities come in a variety of forms. Some annuities allow the refund of wealth to heirs others vary with the performance of capital markets. Refund- and period-certain annuities could raise the concern that they may lead to adverse selection in annuities markets because people who choose them presumably believe that they will not live long. They would therefore prefer to return some of the annuity premium

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<sup>7</sup> For example, Börsch-Supan 1994 shows that many German retirees save a substantial portion of their public pension income.

to their heirs in exchange for a lower annual income payment. However, because those annuities protect the retiree against life span uncertainty they do not raise any issue of moral hazard concerning government welfare programs. Thus, government could allow retirees to choose those options under the condition that the remaining income payments exceed the guaranteed pension by sufficient amounts. The resulting separation of the annuities market into subgroups would also support some self-selection of annuitants into risk classes.

Some restriction on the risk properties of so-called variable annuities is necessary. Most individual account systems impose some portfolio restrictions to limit the risk of losses, implicitly protecting the government's financial position. For the same reason, restricting the portfolio choices of retirees in some ways is warranted. One possibility would be to restrict the income variation to the portion of retirement income that is above the guaranteed minimum pension, similar to the fixed and participating annuities currently offered by TIAA in the United States. A fixed and participating annuity guarantees a minimum income payment for the rest of life. The income is raised when the return of the underlying portfolio exceeds certain thresholds.

Inflation protection should be mandatory for at least the portion of accounts whose withdrawal over time is regulated. Otherwise, the real value of the pension could decline substantially and surprisingly, necessitating government support. To the extent that inflation protection is unavailable in the marketplace, the government might have to issue inflation-indexed securities to facilitate the market-provision of inflation-protected annuities. In some countries with limited financial market capacity for government securities, ensuring inflation protection may therefore be a difficult task.

Withdrawals should ensure some form of survivor protection. Without sufficient regulation, some retirees could choose to tie the annuity only to their own survival. If their surviving spouses were without other means, the government would have to step in with income support. In essence, those retirees would free ride on the government's income support program by choosing a higher annuity payment for themselves without protecting their survivors.

- At what age should the withdrawal begin?

The withdrawal age poses the problems of portfolio risk and adverse selection. Unless the portfolio during the accumulation phase coincides exactly with the portfolio backing the life annuity, annuitization implies a portfolio change. Because of large fluctuations in equity markets, enforcing portfolio switches at one point in time may be perceived as unfavorable. However, it must be noted that, unless equity markets have a mean-reverting property, predicting the market movement is impossible, and allowing retirees to choose the point of conversion themselves does not resolve the underlying portfolio risk. Thus, while allowing retirees to choose the age of conversion may give additional flexibility, it does not solve the portfolio risk problem. Instead, it encourages adverse selection because those with illnesses and shorter life expectancy will never annuitize their wealth or wait until the greatest possible age. The best solution to portfolio risk thus would be to limit the portfolio changes necessary at

retirement by allowing annuity providers to offer variable annuities based on a variety of investment portfolios.

- What restrictions should be imposed on annuity providers in pricing annuities?

Annuity companies could attempt to separate annuitants into risk classes based on sex, marital status, forebears' longevity, income, and health habits. However, such pricing would cause conflicts between the protection of individual privacy and the informational demands of annuity insurers. For example, would insurance companies be able to use the results of genetic tests, or would that information remain private? The extent to which privacy remained protected would generally determine the ability of certain groups to reduce their annuity coverage based on private information about longevity prospects.

Equally difficult is the distinction between market separation and the perception of discrimination. For example, would insurers be allowed to sell differently priced annuities to men and women, or would unisex policies be required? Many may perceive it as discriminatory if women receive a smaller pension than men for an identical insurance premium. However, from a pure insurance perspective, a lower pension for women is actuarially fair because women tend to live longer than men, and, thus, their retirement savings likely have to provide income over a longer time span.

If annuitization is not mandatory, enforcing the same premium for different risk classes would make mandatory annuities unattractive to people with shorter life expectancy and exacerbate adverse selection. Specifically, if there are alternatives to full annuitization (phased withdrawals, say) those with shorter life expectancy might simply stay out of the annuities market, raising the price of annuities for other market participants.

If annuitization is mandatory, prohibiting the segmentation of annuitants into risk classes implies redistribution among different risk classes. If low-income retirees with shorter life expectancy pay the same price for an annuity as high-income people with above-average life expectancy, wealth is redistributed from the low-income retiree to the high-income one. If unisex annuities are required, resources will be implicitly redistributed from men to women since women live longer on average than men. Both types of redistribution could have substantial effects on the welfare of certain groups (Walliser 1997b).

- How should annuity insurers' portfolios be regulated?

If policymakers implicitly or explicitly guarantee the annuity contracts offered by private insurers, regulation of annuity insurers' funds would be necessary to reduce the risk to the government. Annuity insurers are exposed to the risk that their investment portfolios underperform or their investments fail. As a result, a company may be unable to meet its obligations, and policymakers may feel obliged to help out retirees whose annuities cannot be paid any more. One possibility is to create some formal insurance for annuity companies.



However, such insurance could lead to overly risky investment strategies of annuity insurers unless it is properly priced or policymakers develop regulations to limit risk taking. Hence, if implicit or explicit guarantees are extended to annuity payments, policymakers might decide to restrict portfolio choices of annuity firms. Effectively, regulating the insurer's investment choices or the annuitant's investment choices (for variable annuities) as discussed above are just two manifestations of the same issue: the entity that bears the risk may take on too much risk if the government offers guarantees.

#### IV. CONCLUSIONS

Theoretical models of consumption in old age depend on a variety of factors, including uncertainty about longevity, health and long-term care, portfolio choices and risk, and bequests and intrafamily arrangements. Although there is considerable evidence that annuitants live longer than average retirees, the extent to which this phenomenon is caused by private information about life span uncertainty is uncertain. As a result, the regulation of the withdrawals from individual accounts has to strike a balance between flexible arrangements that can accommodate individual circumstances and the reduction of adverse selection that may affect the pricing of insurance products.

Regulation should ensure a sufficient inflation-protected stream of retirement income with coverage of survivors. Annuitization of a portion of accumulated funds with some survivor coverage should be mandatory to reduce the government's exposure to welfare payments for retirees with insufficient means. However, some flexibility over the choice of annuities could be permitted, enabling retirees who expect shorter lives to purchase refund annuities. Funds exceeding the amounts necessary to finance a sufficient retirement income could be made available for lump-sum withdrawals. Such option would allow the retiree to choose among a variety of withdrawal options and ensure that individual circumstances and needs could be met.

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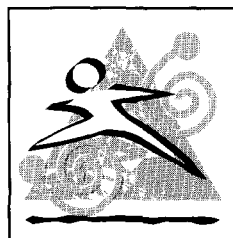
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### Summary Findings

Funded mandatory pension systems based on individual accounts are spreading around the world. With the maturation of those systems, regulating the withdrawal of retirement savings will become increasingly important. Government regulation of withdrawals should mandate the purchase of inflation-indexed life annuities exceeding income available from government welfare programs for the retiree and potential survivors. However, proper functioning of insurance markets does not require annuitizing the entire account balance. Instead, more flexibility for the choice of withdrawals could be permitted for any remaining funds, helping to tailor income streams to individual needs and living arrangements.

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