ANNUITY MARKETS AND RETIREMENT SECURITY

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Annuities are insurance policies that pay their beneficiaries for as long as these beneficiaries are alive. They solve the problem of planning consumption in a world with uncertain lifetimes and indemnify individuals against the risk of outliving their resources. In return for an initial capital payment, a life annuitant is assured of receiving a constant income stream for the remainder of his life. The annuity provider (an insurance company) pools mortality risk across individuals and offers each annuitant a payout that in theory exceeds the income he could earn if he invested his annuity premium in a financial asset, such as a bond. The annuity's additional return derives from the mortality risk facing the annuitant pool. The insurance company does not pay out the full amount of the annuity premium to annuitants that die earlier than the aggregate mortality experience would suggest. The principal that the insurance company does not pay out to those who die unexpectedly early permits a higher payout for those who remain alive.

Annuities are sometimes referred to as “reverse life insurance.” A life insurance policyholder pays the insurer each year until he or she dies. When the insured individual dies, the insurance company pays a lump sum to the beneficiaries of the life insurance policy. With annuities, the annuitant makes a lump-sum payment to the insurance company before the annuity payout begins. In return, the insurance company makes payments to the annuitant until the annuitant’s death.

Annuity markets have long attracted interest from economists. In simple life-cycle models, Yaari (1965) showed that an individual facing an uncertain lifetime, no consumption risk such as unexpected health care needs, and with no bequest motive, should annuitize all of his or her wealth at retirement. This prediction stands in stark contrast to actual experience with annuity markets. In most developed nations, these markets are small. In the United Kingdom, while there is an active "compulsory" annuitant market in which individuals are required to annuitize part of their pension plan accumulation, the market for voluntary annuities is very limited. The voluntary annuity market in the United States is also tiny.

Economists have offered a variety of explanations for the limited size of the annuity market. Adverse selection, the tendency for annuity buyers to live longer than randomly selected individuals in the population, is one of these explanations. This paper describes the role of adverse selection in annuity markets, and discusses the potential role

of compulsory annuitization for retirement plan accruals as a method of reducing adverse selection.

While annuity markets have long been of interest to economic researchers, these markets have recently begun to attract substantial public policy attention, for two reasons. First, the structure of private pensions in both the United Kingdom and the United States has increasingly emphasized defined-contribution rather than defined-benefit pension plans. While defined benefit plans provide life annuities to their participants, those who are covered by defined contribution plans have discretion in spreading their retirement resources across the period after their retirement. Annuities offer one way to do this.

Second, as government-provided retirement pension systems, such as Social Security in the United States, have encountered long-term fiscal balance problems, there has been growing interest in “private account alternatives” to these programs. When individuals accumulate balances in such accounts, a key policy design issue involves the way such balances should be drawn down. Understanding why individuals currently do not participate in voluntary annuity markets may provide very helpful insights for understanding the potential impact of annuitization requirements in "individual account" Social Security systems.

This paper investigates adverse selection in annuity markets, with a focus on the United Kingdom. The U.K. has a more developed and active individual annuity market than the United States, largely because of requirements that individuals who accumulate assets in some types of defined contribution retirement plans purchase annuities with part of their accumulation. The paper is divided into six sections. The first offers a brief historical perspective on the evolution of annuity markets, with particular reference to annuities and government finances in the United Kingdom. Section two outlines the structure of annuity products and the potential benefits that annuitants might expect to receive from buying annuities. Section three explains how selection effects can affect the market for annuity products, and motivates the notion of adverse selection by presenting simple comparisons between the mortality rates of annuitants and the population at large.

The fourth section summarizes recent research on the pricing of annuity products, and the degree to which adverse selection affects current prices. It describes the "moneysworth" conceptual framework that has been used in such pricing exercises, and

emphasizes the potential differences between annuity prices from the standpoint of producers (insurance companies) and consumers (individual buyers) of annuities. Adverse selection drives a wedge between the effective price of an annuity from the standpoint of a randomly-selected individual who faces the population mortality table, and the effective price to the representative annuity buyer.

Section five outlines a key policy choice with respect to annuitization of retirement balances: whether or not to compel some annuitization, and if so whether to restrict the annuity options available to annuitants. It explores the tradeoffs associated with voluntary versus compulsory annuitization within retirement saving systems. Voluntary annuitization offers potential annuitants greater flexibility in the policies that they choose, and in the time path of retirement decumulation that they select, than compulsory systems. Voluntary systems are also, however, likely to give rise to greater adverse selection in annuity markets. There is a brief concluding section.

1. Historical Perspective on the Evolution of Annuity Markets

Financial contracts similar to annuities have a long history. James (1947) reports that ancient Roman contracts known as *annua* promised an individual a stream of payments for a fixed term, or possibly for life, in return for an up-front payment. Speculators who dealt in marine and other lines of insurance offered such contracts. Beginning in 40 BC, at least one quarter of a decedent's property needed to pass to his legal heirs. Determining whether this condition was satisfied required some way of valuing the interest that heirs might have in annuity contracts. Wadsworth, Findlater, and Boardman (2001) report that by roughly 200 A.D., the Roman jurist Ulpianus had compiled the first recorded life table for the purpose of computing the estate value of annuities. His data suggest that life expectancy for a male at age 65 was 5.3 years. Today, in the U.K., the comparable life expectancy is 15.4 years.

Single-premium life annuities were available in the Middle Ages, and detailed records exist of special annuity pools known as tontines that operated in France during the 17th century. In return for an initial lump-sum payment, purchasers of tontines received life annuities. The amount of the annuity was increased each year for the survivors, as they claimed the payouts that would otherwise have gone to those who died. When the second-

to-last participant in a tontine pool died, the sole survivor received the entire remaining principal. The tontine thus combined insurance with an element of lottery-style gambling.

During the 1700s, governments in several nations, including England and Holland, sold annuities in lieu of government bonds. Holland sold annuities as early as 1554 to finance a war with France. In 1746, Britain employed an "annuity lottery" to raise funds. Just over sixty years later, in 1808, Chancellor of the Exchequer Spencer Percival inaugurated the British government's modern annuity finance program. The government received capital in return for a promise of lifetime payouts to the annuitants.

Murphy (1939) provides a detailed account of the sale of public annuities in England in the 18th and early 19th centuries. Annuities initially were sold to all individuals at a fixed price, regardless of their age or sex. This led to speculation in the annuity market by syndicates of investors who purchased annuities on behalf of individuals (such as newborn girls) whose remaining life expectancy was substantially greater than that for randomly selected individuals in the population. Since the annuities were priced using population averages, investing in annuities for long-lived individuals generated favorable returns for the syndicates. As it became clear over time that mortality rates for annuitants were lower than those for the population at large, a more refined pricing structure was introduced in the sale of government annuities.

The modern annuity market, in which private insurance companies sell insurance contracts to individuals who wish to avoid the risk of outliving their resources, emerged in the eighteenth century. Governments and private insurance companies both sold annuities during the eighteenth and nineteenth century. Wadsworth, Findlater, and Boardman (2001) provide an outline of major historical events in the growth and evolution of the U.K. annuity market during the last three centuries. The most important recent milestones involve the explicit connection between the private pension market and the annuity market. The 1986 Social Security Act allowed individuals in the U.K. to opt out of the State Earnings-Related Pension Scheme (SERPS) if they participated in a defined contribution pension plan that satisfied a set of minimal requirements. The 1986 Act also required a fraction of the balances built up in these defined contribution plans to be annuitized, which raised the demand for individual annuity products.

2. The Structure of Annuity Products and the Potential Benefits of Annuitization

The private market currently offers a range of different annuity products to individuals. These products are designed to insure against different risks, although virtually all annuities serve the core function of insuring against the risk of outliving one's resources. This section provides a brief introduction to the various types of annuity products, which differ in their provisions for asset accumulation and in the terms under which the accumulated principal is dispersed during the liquidation phase.

The prototypical annuity contract can be divided into two parts: an accumulation phase and a liquidation phase. During the accumulation phase, capital builds up; this capital is dispersed during the liquidation phase. Annuities that have an accumulation phase are "deferred annuities." Historically, one of the arguments for individuals purchasing deferred annuities was that they offered an opportunity to invest in assets that individuals would not otherwise be able to purchase. In recent years, with the growth of retail unit trusts and related investment vehicles that have "democratized" the investment process, this argument is not as compelling as it was in prior decades. This paper does not analyze deferred annuities, but rather focuses on annuities that begin liquidation as soon as they are purchased. These are known as single-premium immediate annuities.

Single-premium immediate annuities are the products that most participants in the compulsory annuity market purchase. They do not have an accumulation phase. Annuitants make lump-sum payments to the annuity provider of the accumulated capital that they wish to draw down. During the liquidation phase, the annuitants receive payouts contingent upon their survival or in accord with other terms specified in the annuity contract. In some annuity contracts, payouts are specified as a guaranteed minimum, with the opportunity for a dividend if mortality experience or rates of return on insurance company investments prove better than expected.

The annuity payout rate varies with both the annuitant’s prospective mortality risk and the rate of return that the annuity provider can earn on invested assets. Younger individuals, because they are expected to receive payments for a longer time period, receive lower annuity payouts than older annuitants for a given amount of capital invested. Higher rates of return generate greater income per dollar of capital for the insurance company, and therefore permit higher payout rates to annuitants. Variation in rates of return on bonds and

other investment vehicles appear to contribute to substantial variation in annuity payout rates over time.

There are several common payout methods associated with individual annuity contracts. The simplest individual annuity contract is a single-premium immediate annuity. In return for a single premium payment, the annuitant receives a guaranteed stream of future payments that begin immediately. These payments end when the annuitant dies (a simple life annuity), or at the death of both the annuitant and a co-annuitant, such as a spouse. It is also possible to structure the annuity so that the payments end at the later of a fixed number of years or the date of death of the annuitant. This type of contract is known as a life annuity with stipulated payments certain.

These different annuities address different insurance needs. A simple life annuity is primarily designed to insure annuitants against outliving their resources; a joint life survivorship annuity addresses this risk and also provides retirement income for dependents. The "payout certain" annuity is designed to address the fear, on the part of potential annuitants, that they will turn over a capital sum to an annuity provider and then die shortly thereafter without receiving many annuity payments. It overcomes this inhibition by ensuring that payments will be made to the annuitants' beneficiaries for at least a fixed period. The level of the annuity payout associated with a fixed payments certain contract is lower than that for a simple life annuity. Payment certain contracts may satisfy the annuitant's desire to purchase insurance against outliving his or her resources, while at the same time delivering some potential benefits to children or others to whom the annuitant might wish to leave a bequest.

Each of the annuity products described above is available in each of the two distinct annuity markets in the United Kingdom. These are the voluntary annuity market in which individuals with accumulated savings may use these accumulated assets to purchase an annuity, and the compulsory annuity market in which individuals who have accumulated savings in defined contribution pension plans are required to annuitize a portion of their accumulated balance. Annuitants in the compulsory annuity market buy annuities to drawn down their accumulation in both occupational defined contribution plans, which are offered by employers, and in personal pension plans, which are established by the individual. Both types of defined contribution plans can be used to opt

out of the State Earnings-Related Pension Scheme. The compulsory annuitization rules associated with these plans were instituted to insure that individuals who opt out of SERPS do not exhaust their defined contribution assets before their death.

The compulsory annuity market is currently much larger than the voluntary market. The Association of British Insurers (1999) reports that in 1998, annuity payments totaled £6.2 billion, with nearly ninety percent (£5.4 billion) coming from compulsory annuitants. Of the £6 billion spent on new annuity purchases in 1998, ninety-four percent was spent on compulsory annuities. These statistics on the value of annuity purchases can be compared with household-level data on the nature of annuity buyers. Banks and Emmerson (1999) use data from the 1996-98 Family Resources Survey to explore the source of funds for annuity purchases. They find that 27 percent of annuity buyers bought their annuity using occupational pension funds, 17 percent used personal pension funds, while 56 percent used other funds. Given the projected growth of defined contribution pension assets in both occupational pension plans and personal pension plans, the compulsory annuity market is likely to grow substantially in coming decades.

Many different annuity products are offered in both the voluntary and the compulsory annuity markets. Both markets offer level-payment nominal annuities that promise annuitants a fixed stream of nominal payouts for the duration of their lives, or possibly their lives as well as a guarantee period. Insurance companies also offer "graded payment" annuities that promise rising nominal benefit streams over the life of the annuity product. The most common example of such a policy promises a five percent nominal increase in benefits during each year of the annuity. Finkelstein and Poterba (2000) note that this rate of payout growth is greater than the estimate of the long-term inflation rate implied by the term structure of nominal and real interest rates.

In addition to these two nominal annuities, insurers offer inflation-protected annuities in both the voluntary and the compulsory markets. These annuities provide buyers against insurance against outliving their resources, and they also provide insurance against the risk that inflation erodes the value of nominal assets. The market for inflation-indexed annuities is much smaller than that for nominal annuities. This raises the question of why annuitants do not demand insurance against price level movements.

3. Adverse Selection in Annuity Markets

The limited size of private annuity markets has puzzled research economists, since calculations using standard economic models suggest that individuals facing uncertain lifetimes should be prepared to pay a significant amount to purchase insurance against outliving their resources. Historically, the puzzle was posed with respect to the size of the voluntary annuity markets in the United Kingdom and the United States. It also appears, however, that individuals in retirement plans who have the option to annuitize their resources, but who are not required to do so, are reluctant to annuitize. Mitchell (2001) reports that in Chile, where individuals can choose an annuity or a set of graduated payments to draw down the balance accumulated in their mandatory defined contribution individual account system, only 40 percent of the beneficiaries have elected a life annuity. The majority of beneficiaries have chosen a payout option that exposes them to some risk of exhausting their resources before death.

Three broad classes of explanations have been suggested to explain the apparently limited consumer interest in annuity products. The first is that households have bequest motives, and that buying annuities is not consistent with providing a bequest to ones heirs. While annuities that promise payouts for a fixed number of years do offer the prospect of combining insurance against longevity risk with some potential benefits to children or other heirs, these products nevertheless reduce the amount that a potential annuitant could expect to leave to his or her beneficiaries.

A second potential explanation for limited annuity demand holds that there is a demand, for precautionary or other reasons, for a stock of wealth that can be deployed as the holder wishes. The potential need to pay for nursing home expenses or medical care provides one rationale for this. There are likely to be substantial differences across countries in the importance of resource needs late in life. Using wealth to control the behavior of potential beneficiaries provides another explanation of why potential annuitants may prefer to retain their wealth rather than transfer their resources to an annuitized format.

A third explanation for the limited demand for annuities is that these products may be "expensive" when viewed from the perspective of the typical individual. The cost of an annuity depends on the relationship between the present discounted value of

payouts and the initial premium payment. Annuities could be expensive from the standpoint of potential buyers either because the insurance companies that offer them are charging substantial amounts for administration or for other costs, or because the typical buyers of annuities are longer-lived than the population at large. The latter would follow from the presence of adverse selection in the annuity market.

Economic research on insurance markets has long recognized that insurance buyers may know more about their risk of loss than the insurance companies who sell insurance. Rothschild and Stiglitz (1976) is a classic analysis of insurance market equilibrium in the presence of such asymmetric information. When insurers cannot tailor the policies that they offer to specific individual risk attributes, then those who purchase insurance may represent a higher risk group than those who choose not to purchase insurance. This is because insurance is worth more for those with higher risk of loss. The resulting pool of insurance buyers will be "adversely selected," from the standpoint of the insurance company, relative to the population. In the annuity market context, adverse selection implies that those who purchase annuities will have a higher-than-average risk of living for a long time. Thus adverse selection would be reflected in lower mortality rates among annuitants than among those in the general population.

There is a substantial literature on the presence of adverse selection in a range of insurance markets. Cutler (2000) provides a summary of the experience in health insurance markets, and Chiappori and Salanie (2000) describe evidence on adverse selection in other insurance markets. With respect to health insurance, when individuals have choices across a range of insurance plans, there is a tendency for the least healthy individuals to opt for the most generous insurance coverage. This can lead to insurance company losses on generous policies when these policies are priced assuming that the buyers will face expenditure risks similar to those in the population at large. In some cases, a dynamic adverse selection effect can lead to the disappearance of some insurance markets.

Both the voluntary and the compulsory annuity market in the United Kingdom display adverse selection of annuitants relative to the population at large. This can be illustrated by comparing the mortality rates of annuitants with population mortality rates in the U.K. Table 1 shows the projected future mortality rates for U.K. men who were 65

years of age in 2000. The table shows three sets of mortality rates. The first assumes that the 65-year-old faces the average mortality rates for the population as a whole. The second shows mortality rates corresponding to individuals who purchase voluntary annuities, while the third shows the mortality rates for those who buy annuities in the compulsory market. Finkelstein and Poterba (2001) provide a detailed description of the construction of these mortality tables, which are based on data from the Institute of Actuaries and the Faculty of Actuaries (1999a, 1999b).

The entries in Table 1 show that mortality rates are higher for those in the population at large than for those who buy annuities in the compulsory market. The mortality rates for "compulsory annuitants" are in turn higher than the mortality rates for voluntary annuitants. The differences in the mortality rates are striking. A randomly chosen 65-year-old man in the U.K. population has a 2.12 percent of dying during the year when he is 65. A randomly chosen compulsory annuitant has a 1.53 percent chance of dying, which is less than three-quarters of the probability for someone in the population at large. A randomly chosen voluntary annuitant has only a 0.89 percent probability of dying, less than half of that for someone in the population at large.

The differences between the mortality rates for the two groups of annuitants and the population at large are evident at all ages. They become somewhat smaller, in proportionate terms, at older ages, as the level of the mortality rate for all groups rises. Discussions with actuaries also suggest that the degree of adverse selection is most pronounced in the first few years after annuitants purchase their annuities. The mortality difference between annuitants who purchased annuities ten years ago, and individuals in the population, is less pronounced than that between annuitants who purchased annuities one year ago, and those in the population.

An unresolved issue with respect to adverse selection in markets like that for annuities is the degree to which this selection is the result of private information about risk factors on the part of individuals. While private information could lead to the mortality patterns that we observe in Table 1, these patterns could also arise if there was a correlation between the attributes of annuity buyers and underlying mortality risk, even if the annuitants were unaware of this correlation. Finkelstein and Poterba (2000) discuss this "active" versus "passive" selection distinction in further detail. Annuitants tend to

have higher net worth and to have higher incomes than randomly selected individuals in the population. Since individuals with these attributes live longer than other individuals, as Attanasio and Hoynes (2000) and Attanasio and Emmerson (2001) suggest, passive selection may be operating in the annuity market.

4. Empirical Evidence on the "Moneysworth" of Annuity Products

Evaluating the importance of adverse selection in annuity markets requires more than a simple demonstration that mortality rates are lower for annuitants than for non-annuitants. It requires a quantitative measure of how adverse selection affects the price of annuity contracts. Fortunately, a substantial recent literature has developed just such a measure of annuity pricing: the "moneysworth ratio." This is defined as the ratio of the expected present discounted value of the (uncertain) future payment stream associated with an annuity product, to the product's purchase price. Several studies that compute moneysworth ratios for various annuity products can be found in Brown, Mitchell, Poterba, and Warshawsky (2001). It is also possible to evaluate adverse selection by computing the rate of return that annuitants earn on their annuity investments, and comparing that with the rate of return available elsewhere. Murthi, Orszag, and Orszag (2000) adopt this approach to analyzing the compulsory annuity market in the U.K.

The expected present discounted value of a nominal annuity with an annual payout A_n, purchased by an individual of age b, assuming that the individual will not live past age 115, is:

$$V_b(A_n) = \sum_{j=1}^{115-b} \frac{A_n * P_j}{\Pi_{k=1}^{j}(1+i_k)}. \quad (1)$$

P_j denotes the probability that an individual of age b years at the time of the annuity purchase survives for at least j years after buying the annuity, while i_k denotes the one-year nominal interest rate k years after the annuity purchase. This expression focuses on the pre-tax value of annuity payouts and applies a pre-tax interest rate for discounting, which follows much of the prior literature on this subject. The parallel expression for the value of a real annuity, an annuity with an inflation-indexed payout stream, is

$$V_b(A_r) = \sum_{j=1}^{115-b} \frac{A_r * P_j}{\Pi_{k=1}^{j}(1+r_k)}. \quad (2)$$

In this expression, A_r denotes the real annual payout, and r_k denotes the annual real interest rate k years after the annuity purchase.

The moneysworth ratio is computed by dividing the value that results from evaluating equation (1) or equation (2) by the purchase price of an annuity, say £100,000. This ratio offers a scale-free metric for comparing annuities over time or across countries. Computing the moneysworth ratio requires information on mortality rates, such as that shown in Table 1, as well as on the payouts offered by annuity contracts and on the discount rates that potential annuity buyers might apply to those payouts. The moneysworth ratio can be computed using either the population or annuitant mortality table, and the ratio will often differ substantially in the two cases. The moneysworth ratio will be higher if the mortality rates used to evaluate it are lower, and vice versa.

Table 2 presents information on the moneysworth ratios for fixed nominal annuities that were available to 65-year old men and women in the U.K. at the end of May 2000. Finkelstein and Poterba (2001) present similar tabulations for an earlier time period. Moneyfacts, a leading U.K. annuity broker, provided the annuity prices for the voluntary and compulsory markets. Thirteen insurance companies in the Moneyfacts database offered annuities that were broadly available, i.e. were not restricted to particular types of workers or those with a specified minimum investment. For an initial premium of £10000, the average annual payout on a level payment annuity in the compulsory market was £875. The analogous average for the voluntary annuity market was £820. Average payouts for escalating annuities (£541 and £503) and inflation protected annuities (£630 and £628) were substantially lower than those for fixed nominal annuities.

Table 2 shows moneysworth ratios evaluated using the population, voluntary annuitant, and compulsory annuitant mortality tables. The moneysworth ratios are evaluated using data on the term structure of interest rates (both nominal and real) drawn from the U.K. gilt market. The results highlight the important difference between the valuation of an annuity from the perspective of a potential buyer, and the valuation from the standpoint of an insurance company that sells the annuity product. Consider a randomly selected 65-year-old woman in the population who is contemplating the purchase of an annuity in the voluntary market. From this woman's perspective, the

natural way to compute the moneysworth ratio is to use the population mortality table, so it appears that the expected present discounted value of annuity payouts is 85.7 percent of the annuity's premium cost.

From the standpoint of an insurance company offering the voluntary annuity, however, the expected present discounted value of payouts is much greater than the moneysworth from this woman's perspective. That is because the woman is not representative of the individuals who purchase annuities in the voluntary market. On average, these buyers have mortality rates that are described by the voluntary annuitant mortality table. From the insurer's perspective, therefore, the expected present discounted value of payouts is 94.9 percent of the premium cost. This is also the expected value of payouts, as a fraction of the premium, for the typical buyer of a voluntary annuity.

This dichotomy between the "producer's perspective" and the "consumer's perspective" is potentially important for evaluating how the private annuity market might respond to substantial changes in the nature of retirement saving arrangements. If the "producer's perspective" describes the relationship between expected payouts and premium costs that insurers need in order to cover their costs, then it may offer useful insight on the relationship between expected payouts and premiums that might emerge in an expanded private annuity market. Such a market might arise with a universal, or expanded, system of individual retirement saving accounts.

The moneysworth values in Table 2 can be used to estimate the component of the deviation between observed moneysworth, and an "actuarially fair" moneysworth ratio of unity, that is attributable to adverse selection in the set of individuals who purchase annuity policies. Consider the moneysworth ratios for 65-year-old men. Using the population mortality table, the moneysworth ratio for a fixed nominal annuity is 0.844. Valuing the same annuity using the voluntary annuitant mortality table yields a moneysworth ratio of 0.974. The difference between the moneysworth value for an actuarially fair annuity (1) and the value using the population mortality table is 0.156. Of this difference, however, 0.130 is due to the difference between the voluntary and the annuitant mortality tables. This suggests that 83 percent of the disparity between the

annuity valuation using the population mortality table, and the idealized "actuarially fair annuity," is due to adverse selection.

It is not clear that the idealized annuity with a moneysworth ratio of unity is a useful benchmark for these comparisons. Insurers need to cover their costs and provide for a profit margin in pricing their annuities. These factors would tend to reduce annuity payouts relative to the actuarially fair benchmark. The extent of this reduction may be a function of the size of the annuity market, the regulatory environment, and a host of other factors.

Table 3 presents information on the moneysworth ratios associated with different types of annuity products. The first column focuses on level payment nominal annuities, the same annuity products that were considered in Table 2. The next column focuses on index-linked annuities, which provide inflation insurance to their purchasers. The final column considers annuities that offer payouts that rise at five percent each year. The table shows that there are differences in the moneysworth values for these different annuity products, and that the patterns are similar in the annuity markets for men and for women. The moneysworth ratio is highest on the nominal level payout annuities. The moneysworth ratios for the real and escalating annuities are roughly four percentage points lower in the voluntary annuity markets for both men and women. In the compulsory annuity market, the much larger market, the moneysworth for the index-linked annuity is approximately nine percentage points lower than that for the nominal annuity. The escalating annuity is between the nominal and inflation-indexed annuity in this case.

One explanation of the differences in the moneysworth values for different annuity products is adverse selection across product types. Finkelstein and Poterba (2000) argue that because the payouts on an inflation-indexed annuity or an escalating annuity are backloaded relative to the payouts on a fixed nominal annuity, annuitants who expect to be long-lived should be attracted to these products rather than fixed nominal annuities. This results in selection across annuity products based on the perceived mortality risk of potential annuitants.

The entries in Tables 2 and 3 suggest that the degree of adverse selection is greater in the voluntary annuity market than in the compulsory annuity market. The

difference between the valuation of a compulsory annuity using the population mortality table, and that using a plausible proxy for the compulsory annuitant mortality table, is smaller than the difference between the valuation of voluntary annuities using the population and the voluntary annuitant tables.

The moneysworth calculations in Tables 2 and 3 focus on the current U.K. annuity market. To provide some perspective on these results, it is useful to compare them with findings on annuity moneysworths for other time periods in the United Kingdom. It is also useful to make comparisons with other nations.

There is no continuous time series on moneysworth values for the U.K., but Murthi, Orszag, and Orszag (1999a, 1999b) present evidence on the moneysworth ratio for nominal annuities in the compulsory annuity market for several years in the 1990s. While their algorithm for computing moneysworth values is not exactly the same as that used in Tables 2 and 3, it is very similar. In 1990, they estimate that the moneysworth value for the average annuity in the compulsory market was 0.996. By 1994, they report that this value had declined to 0.921, and in 1999, they report a value of 0.905. This evidence, along with related evidence spanning a longer time period in the U.S. annuity market reported in Warshawsky (1988) and Brown, Mitchell, and Poterba (2001), suggest that there are non-trivial changes over time in the moneysworth ratio.

The decade-long decline in the moneysworth of compulsory annuities in the United Kingdom has coincided with a decline in the ratio of the typical monthly payout, as a fraction of the premium, on new annuities. This decline is at least partly a result of declining nominal interest rates over the same period. The decline in nominal payouts has nonetheless led to concern about the operation of annuity markets, and fueled some calls for changing the current requirements for annuitization of defined contribution balances. Orszag (2000) notes that the falling ratio of payouts to premiums has led to a perception that annuities are poor value for the money, and that this is an important driver of proposals to reform the current compulsory annuitization structure.

While most studies of the pricing of annuities have relied on data from either the United States or the United Kingdom, there is also a small literature that provides insights on the annuity market in other nations. Table 4 summarizes some calculations from James and Vittas (1999) study of annuity markets around the world. These international

comparisons should be viewed with some caution. The institutional structure of annuity markets may differ across nations, and these differences may affect the estimated moneysworth values. There is also very little evidence on mortality rates for countries other than the U.S. and the U.K., so it is sometimes necessary to use the mortality data from one or the other of these nations to evaluate the moneysworth of annuity products in other nations. Bearing these cautions in mind, Table 4 offers some guidance on the differences across markets in annuity moneysworth. The table shows moneysworth values for voluntary annuities of more than 0.950 in all of the countries under consideration.

The results in Table 4 confirm the findings in Tables 2 and 3 and in other studies of the U.S. and U.K. annuity markets. They suggest that the moneysworth ratio from the standpoint of insurance companies, i.e. valuing the present discounted value of annuity payouts using the mortality rates of typical annuity buyers, is relatively close to one. This suggests that the reason we sometimes observe low moneysworth values when annuities are valued using the population mortality table is adverse selection, rather than high profits or administrative charges on the part of insurance companies.

This conclusion is important for discussions of how annuity markets might operate if a larger fraction of the population participated in defined contribution retirement plans, either in the private sector or through an individual accounts Social Security system. Expanding the pool of individuals who purchase annuities would probably reduce the disparity between the mortality rates of annuitants and those in the broad population, thereby reducing the observed degree of adverse selection. This, in turn, would presumably increase the moneysworth ratio when annuities are evaluated using the population mortality table.

5. Tradeoffs in Voluntary vs. Compulsory Annuitization

The presence of adverse selection in the voluntary individual annuity market, and to a smaller degree in the compulsory market, highlights the key tradeoff between individual choice and adverse selection in insurance markets. When individuals can decide whether to annuitize, how much to annuitize, and what type of annuity to purchase, as they currently can in the U.K. voluntary annuity market, there is substantial

opportunity for adverse selection. From the standpoint of a random individual in the population, the resulting moneysworth ratio will be lower than that when participation in the annuity market is compulsory.

Compulsory annuitization could take a variety of forms. As in the present U.K. market, it could entail a requirement that individuals annuitize part or all of their accumulated retirement balance, with relatively little restriction on the type of annuity purchased. It could also involve more sweeping constraints, specifying the particular annuity product that individuals need to purchase. Blake (1999) discusses a range of options that involve regulation of annuity providers or restrictions on the available set of policies that annuitants can buy.

Whenever individuals have some discretion over the amount that they annuitize or the form in which they receive annuity payments, it is possible that the annuity market will be characterized by adverse selection. This is illustrated by the current patterns of annuity choice within the compulsory annuity market in the U.K., where longer-lived individuals appear to choose annuity products that offer back-loaded payout streams. Individuals with defined contribution plans can also choose how much of their accumulated defined contribution balance to annuitize and at what age to annuitize. A potential annuitant may delay the purchase of their annuity after retirement until age 75 provided that he or she draws an income from the pension fund that is between 35 and 100 percent of the amount that would be obtained from a single life, nominal annuity. Potential annuitants who believe that they face higher-than-average mortality rates may choose to defer their annuitization date for their pension balances. This implies that the set of persons who do purchase annuities at younger ages may be selected toward the longer-lived segment of the population.

Compelling all retirees to purchase the same annuity product, at the same age, would reduce the degree of adverse selection. It would also, however, entail costs. When individual preferences differ, a “one size fits all” annuitization requirement may inefficiently restrict consumer preferences and force some buyers to accept policies that they would not choose to purchase, even in the absence of adverse selection. For example, when consumers differ in their discount rates as well as their mortality prospects, some consumers may prefer annuity products that offer front-loaded rather

than back-loaded payout streams. If all retirees are required to purchase an annuity with a pre-specified payout structure, priced using the single mortality table, the resulting time profile of annuity payouts may be substantially different from the ideal policy from the standpoint of some potential annuitants.

Whether individuals can undo the effects of an annuity payout profile that differs from their preferred profile is an open issue. If the annuity payments are front-loaded, and the potential annuitant would prefer a back-loaded profile, then it should be possible to save a portion of the early payouts and to use them to finance consumption (if alive) at a later date. It may be very difficult to borrow against future annuity payouts if the potential annuitant would like a front-loaded payout stream, and the required annuity offers only back-loaded payments.

Restrictions on the time profile of annuity payouts are not the only potential difficulty associated with restrictions on annuity options. Orszag (2000) argues that individuals are also likely to differ in their risk tolerance, and that some individuals are likely to demand annuities that offer returns that are at least partially linked to the performance of risky assets, such as corporate equities. While the present annuitization requirements in the U.K. do not prohibit the purchase of "with profit" annuities that allow some participation in the equity market, these annuities have historically accounted for a very small share of the market. Wadsworth, Findlater, and Boardman (2001) suggest that "non-standard" annuities are likely to grow, but they also imply that the potential demand for these products is greater than the current level of activity in this market.

Those who argue in favor of compulsory annuitization sometimes point to adverse selection as a basis for this policy prescription, but there are also two other potential justifications for such a policy. One concerns the need for some type of annuitization, while the other concerns the need to restrict the set of options available to potential annuitants. The argument for requiring some degree of annuitization holds that without such a requirement, at least some households would either spend their accumulated retirement wealth, or invest their wealth in assets that have some chance of losing their value, and become impoverished in their old age. The likelihood of such behavior is difficult to judge based on historical experience. McCarthy (2000) suggests that a recent

policy change in Ireland, which removed the mandatory annuitization requirement in that nation, may offer some leads.

The argument for limiting the set of annuity choices available to consumers concerns the difficulty of selecting an annuity product from the wealth of options available in the private market. McDonald (1999) raises this issue, and points to the "bewildering" array of annuity options that currently confront retirees in the United Kingdom. Annuities can be complicated financial products, and for some households, it may be difficult to evaluate the alternative annuity options. For example, it may be difficult for households to compare the relative merits of real and nominal annuities, since this requires some judgement about the degree of inflation risk over a long horizon.

Whether the fact that some consumers may lack the financial acumen to evaluate alternative annuity options provides a warrant for compulsory annuitization, or for restricting the set of annuity products available to retirees, is unclear at best. Other household decisions with respect to asset accumulation, such as the choice of investment vehicle in employer-sponsored retirement saving plans, involve similarly complex choices. In the United States, a number of financial service providers have developed products that help consumers evaluate their investment options. In part out of concern about potential liability that may flow from uninformed choices by workers, firms have begun to offer various types of financial education to assist their employees in making decisions about retirement saving options. On average, the mix between corporate stocks and bonds in self-directed retirement plans in the United States appears to be similar to that in defined benefit pension plans that are managed by professional investors. As more households reach retirement with substantial defined contribution balances in self-directed retirement accounts, similar services may arise with respect to annuity options.

This discussion of tradeoffs between compulsory annuitization and alternative schemes under which individuals would decide how to draw down their retirement income does not offer a definitive answer to the question of how to proceed. Such an evaluation requires measures of the degree of adverse selection in annuity markets with different degrees of compulsion, and of the likelihood that individuals would make poor judgements either with respect to their wealth decumulation profile, or their investment choices, in an unconstrained system. Research on these issues is just beginning. Doyle

and Piggott (1999), for example, attempt to compare various annuity products in which annuitants bear different degrees of aggregate mortality risk and aggregate investment risk. Calculations of this type are needed to better assess the tradeoffs outlined here.

6. Conclusion

This paper describes the role of adverse selection in annuity markets, and sketches some of the public policy implications of the existence of such selection effects. It shows that a substantial fraction of the difference between the expected value of the payouts on both voluntary and compulsory annuity products in the U.K., and the premium cost of those products, is attributable to adverse selection. This is simply the fact that the individuals who currently choose to purchase annuities are on average longer-lived than randomly-selected individuals in the U.K. population. Adverse selection is most pronounced in the voluntary annuity market, but there is also some evidence of selection in the compulsory market, where individuals can choose which type of annuity to purchase and how much of their defined contribution balance to annuitize.

Requiring all persons to annuitize their retirement account balances at a specified age is one way to substantially reduce the degree of adverse selection in the annuity market. More generally, however, any policy that encourages a large fraction of the population to participate in the annuity market is likely to have a similar effect. Doyle, Mitchell, and Piggott (2001) compare the annuity markets in Australia and Singapore, and they find a greater degree of adverse selection in the former than the latter. They attribute this difference to the relatively generous government old-age safety net in Australia, which reduces the fraction of households that find it attractive to purchase private annuities.

Whether government policy should compel participants in defined contribution retirement saving programs to annuitize all or part of their accumulated balance, and whether there should be restrictions on the set of annuity policies that individuals can purchase, is an important and controversial policy issue. There are key tradeoffs associated with any policy choice. Compelling annuity purchase reduces the chance that some elderly households will outlive their resources, and it reduces the degree of adverse selection in the annuity market. Compulsion may also limit the choices available to

retirees, and force some retirees to purchase annuity products that are substantially different than the products they would choose in an unconstrained market. Developing models that can evaluate the welfare costs of adverse selection and of limiting consumer choice in a world with heterogeneous consumer preferences should be a central goal for future work.

Part of this research agenda will involve improved estimates of the factors that underpin consumer demand for annuities. Choices within the annuity market, as well as the choice of whether or not to annuitize when the annuitization decision is voluntary, require attention. The overwhelming majority of annuity buyers in the U.K. purchase simple nominal annuities, rather than annuity products that offer some degree of inflation protection. Inflation-protected annuities appear to be priced less favorably than nominal annuities, which may explain this pattern. In the United States, even though inflation-indexed bonds have existed for several years and at least one insurance company offers an inflation-indexed annuity, Brown, Mitchell, and Poterba (2000) report that there has been virtually no consumer interest in this product. Why consumers evidence little interest in annuity products that could protect them from longevity risk as well as inflation risk is not clear.

Another element of the research agenda should involve analysis of the time series variation in annuity prices. One objection that is sometimes leveled at compulsory annuitization systems is that they require potential annuitants to annuitize their wealth at a single point in time, even though there is substantial variation over time in annuity prices. Understanding the source of this price variation would be extremely helpful for evaluating the potential costs that annuitants bear when they lose the option to diversify their annuitization decisions over time.

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Table 1: Mortality Rates in the U.K. Annuity Market, 1998

Age	Population Mortality	Voluntary Annuitant	Compulsory Annuitant
65	0.0212	0.0089	0.0153
66	0.0230	0.0132	0.0169
67	0.0249	0.0145	0.0186
68	0.0268	0.0160	0.0206
69	0.0293	0.0176	0.0227
70	0.0320	0.0194	0.0251
71	0.0347	0.0214	0.0277
72	0.0378	0.0236	0.0306
73	0.0411	0.0261	0.0337
74	0.0448	0.0288	0.0372
75	0.0494	0.0319	0.0410
76	0.0542	0.0352	0.0451
77	0.0592	0.0390	0.0497
78	0.0648	0.0431	0.0546
79	0.0711	0.0476	0.0599
80	0.0781	0.0527	0.0657
81	0.0862	0.0582	0.0720
82	0.0947	0.0643	0.0788
83	0.1033	0.0709	0.0860
84	0.1117	0.0782	0.0938
85	0.1195	0.0862	0.1021
86	0.1279	0.0949	0.1110
87	0.1380	0.1043	0.1205
88	0.1492	0.1146	0.1305
89	0.1600	0.1258	0.1411
90	0.1705	0.1379	0.1522
91	0.1828	0.1509	0.1640
92	0.1967	0.1649	0.1763
93	0.2097	0.1800	0.1891
94	0.2222	0.1962	0.2024
95	0.2354	0.2134	0.2163
96	0.2492	0.2318	0.2306
97	0.2635	0.2513	0.2454
98	0.2781	0.2719	0.2606
99	0.2951	0.2937	0.2761
100	0.3140	0.3167	0.2920

Source: Government Actuaries Department and Institute of Actuaries Continuous Mortality Improvement Bureau. See text for further description. Each entry shows the probability of dying within a year, divided by 100.

Table 2: Moneysworth Values for Annuities Available to 65-Year-Olds in May 2000

	Mortality Table		
	Population	Voluntary Annuitants	Compulsory Annuitants
Men – Voluntary Market	0.844	0.974	0.910
Men – Compulsory Market	0.908	1.040	0.971
Women – Voluntary Market	0. 857	0.949	0.901
Women – Compulsory Market	0.929	1.028	0.975

Source: Author's calculations using data provided by "Moneyfacts," a U.K. annuity broker. Mortality rates are from the Government Actuaries Department and the Institute of Actuaries. Annuities are nominal level-payment annuities.

Table 3: Moneysworth Values for Different Annuity Products, Evaluated Using Population Mortality Table for 65-Year-Olds, May 2000

	Annuity Product		
	Nominal Annuities	Index-Linked Annuities	5 Percent Escalating Annuities
Men – Voluntary Market	0.844	0.806	0.802
Men – Compulsory Market	0.908	0.814	0.866
Women – Voluntary Market	0.857	0.824	0.820
Women – Compulsory Market	0.929	0.825	0.897

Source: Author's calculations using data provided by "Moneyfacts," a U.K. annuity broker. Mortality rates are from the Government Actuaries Department and the Institute of Actuaries.

Table 4: International Comparisons of Moneysworth Values for Voluntary Annuities Purchased by 65-Year-Olds, 1999

Country	Men	Women
Australia	0.986	0.970
Canada	1.014	1.015
United States	0.970	0.950
United Kingdom	0.966	0.957

Source: James and Vittas (1999).