



# Adverse selection in annuity markets: Evidence from the British Life Annuity Act of 1808<sup>☆</sup>

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## ABSTRACT

We study adverse selection using data from an 1808 Act of British Parliament that effectively opened a market for life annuities. Our analysis indicates significant selection effects. The evidence for adverse selection is strongest for a sub-sample of annuitants whose annuities were purchased by profit-seeking speculators, a sub-sample in which “advantageous selection” resulting from multi-dimensional heterogeneity is unlikely to have been significant. These results support the view that adverse selection can be masked by advantageous selection in empirical studies of standard insurance markets.

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## 1. Introduction

In 1808, Britain's Parliament passed the Life Annuity Act, effectively opening a market for government-provided life annuities. The unique features of the Act provide an unusual opportunity to explore the empirical relevance of adverse selection.

Adverse selection has played an important role in economic theory since the seminal works of Akerlof (1970), Spence (1973), and others. Studying its empirical importance has proved challenging in several respects. First, as emphasized by Chiappori and Salanié (2000), it is difficult to distinguish empirically between moral hazard and adverse selection.

Second, researchers are unlikely to observe information hidden from insurers; this has motivated tests based on the correlation between insurance choices and *ex-post* risk, conditional on insurer-observed information. But these tests are still empirically problematic since econometricians often lack access to insurer-observed information.

Third, the existing empirical evidence for even the most theoretically robust consequences of informational asymmetries is surprisingly weak. For example, Cawley and Philipson (1999) find no evidence

of selection in life insurance markets, Cardon and Hendel (2001) find no evidence in health insurance markets, and Chiappori and Salanié (2000) and Dionne et al. (2001) find no evidence in auto insurance markets (in contrast to Puelzt and Snow (1994)). This absence of evidence may be due to insurance providers' countervailing informational advantages (Villeneuve, 2003) or else to a fourth empirical challenge: the confounding effects of “advantageous selection” resulting from, e.g., heterogeneity in risk aversion (de Meza and Webb, 2001; Cohen and Einav, 2007; Finkelstein and McGarry, 2006).

Annuity markets are a particularly interesting setting for studying informational asymmetries, not least because many of these challenges are less problematic. Moral hazard is plausibly negligible in annuity markets, and, since annuity providers typically do relatively little risk-classification, it is comparatively easy for researchers to observe the entire set of information employed by insurers in writing policies. Furthermore, highly risk averse individuals are likely both to be longer lived and to find longevity insurance more intrinsically appealing. Heterogeneity in risk aversion can thus be expected to reinforce rather than to mask the longevity-enhancing effects of adverse selection in annuity markets (Cutler et al., 2008).

Finkelstein and Poterba's (2002, 2004, 2006) studies of annuity markets have yielded some of the strongest empirical evidence of adverse selection, likely in part for these reasons. Unfortunately, the applicability and generality of their evidence is limited in at least two ways. First, it comes from a market where annuitization is mandatory. The substantial literature documenting a puzzling dearth of voluntary annuitization (Mitchell et al., 1999; Davidoff et al., 2005) suggests caution in extrapolating from this evidence. Second, although advantageous

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selection due to heterogeneity in risk aversion is likely to reinforce rather than obscure selection in annuity markets, the possibility of confounding advantageous selection arising from other dimensions of heterogeneity nevertheless remains a concern.

This paper uses the 1808 Act to provide a novel empirical look at adverse selection in the purely voluntary annuity market it effectively opened. We first provide evidence of adverse selection by showing that the annuitants in this market were longer lived than age- and gender-specific population mortality tables would have suggested. Since annuity pricing under this Act varied only by age and gender, our evidence indicates selection relative to the risk-classification scheme employed by the U.K. government. We also document additional selection in response to an 1829 price increase designed to account for the enhanced longevity of early annuitants.

The most novel contribution of this paper stems from an odd feature of the 1808 Act that permitted “speculators” to purchase annuities on the lives of *others*. Selection by profit-seeking speculators was presumably based exclusively on longevity, thus mitigating concerns about the confounding effects of advantageous selection. In Section 5, we document that adverse selection was strongest among these speculator nominated annuitants. This supports the view that advantageous selection can significantly mask the empirical importance of adverse selection in standard insurance markets.

We describe the 1808 Life Annuity Act and its subsequent evolution in Section 2. Section 3 describes the available data, which are in an awkwardly condensed form that renders standard survival-curve analysis impossible. Section 4 presents some suggestive graphical evidence using “synthetic” survival curves and then develops a formal statistical test that we use in Section 5 to present our main results. Details of the formal test are contained in Appendix A. Section 6 concludes.

## 2. The 1808 Act

Prior to the Life Annuity Act of 1808, British government debt consisted almost exclusively of Consols—coupon bonds with infinite maturity. The explicit goal of the Act was to replace them with finite-lived debt by allowing individuals to exchange Consols for life annuities.<sup>1</sup> Since Consols were tradable assets, the act effectively opened a life-annuity market.

Annuities sold under this act made twice-yearly tax-exempt payments. The size of these payments depended on the interest rate (the market Consol price) and the age of the annuitant (henceforth: the *nominee*). Prices were designed to be actuarially fair; to that end, they were priced to be 2% more expensive than the actuarially fair price implied by the Northampton life table. This table, first published by Richard Price in 1771<sup>2</sup>, was based on the mortality experience of all residents of the town of Northampton and was in wide use by life assurance companies (Francis, 1853).

Nominees had to be at least 35 years of age, and annuity yields were capped at age 75, strongly discouraging purchases by older annuitants. A minister- or magistrate-certified register of birth or baptism was required for age verification. Similarly, verification of non-decease was required for receipt of each payment. Finally, the Act

allowed individuals to “speculate on lives” by purchasing and owning annuities contingent on the lives of *others*. The nominee was required to be from Britain or Ireland for these purchases.

Shortly after passage of the Act, there appears to have been a recognition that the use of the Northampton tables was leading to large government losses. Murphy (1939) writes that it “was wholly unsuitable as a measure of the lower rates of mortality experienced by a self-selected group of annuitants. It was not long before this shortcoming was brought to the attention of the Exchequer.” In contrast, Francis (1853) suggests that self-selection may have been a minor concern relative to speculation. He writes: “The speculators soon found out that the Government charge for a life annuity afforded a very remunerative investment, and the insurance offices made considerable profits by purchasing and re-selling them.... The mistake made by the Government in its calculations was no secret.”

In 1823, Parliament finally took active steps to address this perceived mispricing by commissioning John Finlaison to study the mortality experience of the early nominees.<sup>3</sup> His 1829 report developed a new set of gender-specific life tables (henceforth the “Finlaison tables”) based on the observed mortality experience of these nominees. After some debate and a brief suspension of the life annuity program, Parliament determined to resume it with gender-specific pricing based on these new tables.

This re-pricing made annuities significantly more expensive: using pricing in Hendriks (1856) and a 3.75% interest rate, we calculate, for example, that periodic payments fell by 4.4% and 17% for sixty year old males and females. Since the re-pricing was based on the longevity of the early annuitants and was designed to be actuarially fair, we infer significant government losses on early annuity sales, in spite of the 2% loading over the Northampton tables.

Ironically, the 1829 price increase appears to have coincided with a boom in speculation, thanks to a contemporaneous decision to increase the maximum yield to age 90. Because of the age 75 yield cap on early annuities, the old-age mortality experience underlying Finlaison’s tables (hence new annuity prices) was primarily that of young nominees who subsequently grew old. John Francis (1853) relates a number of amusing anecdotes about speculators who, realizing that this would tend to cause Finlaison’s tables to overstate the mortality of newly selected older lives, profitably combed the countryside for “hale and hardy” old men to nominate for annuities.<sup>4</sup>

To address this speculation, an 1834 law reduced the maximum yield to age 80 and effectively eliminated speculative purchases above age 65 (Murphy, 1939); speculation was then banned outright in 1852 (Cohen, 1953). The market for self-nominees continued, with periodic revisions to the life tables, until its dissolution under Parliament’s 1962 Finance Act. Murphy (1939) suggests that these revisions prevented the government from experiencing significant losses after 1852—perhaps in part because private companies entered the market offering better pricing.<sup>5</sup>

## 3. Data

Data are available from two Parliament-commissioned reports examining the profitability of the annuities sold under the 1808 Act. The first is John Finlaison’s 1829 report, which contains data on annuities sold between 1808 and 1826. The second is his son Alexander Glen Finlaison’s 1860 report, which examines annuities sold between 1808 and 1850.

<sup>1</sup> There may well have been more subtle motivations leading to its passage. Spencer Perseval, addressing Parliament in 1808 (*viz* Hendriks, 1856), argued that the Act would allow the government to retire debt at favorable interest rates without causing interest rates to rise—an argument Murphy ridicules as indicating Perseval’s desire to “have his cake and eat it too” (Murphy, 1939, page 6) but which is plausible if the government believed it could extract surplus by filling a missing market. Alternatively, there could have been a political desire to align the interests of the retired monied classes with the government by providing them with a valued service—as argued by Weir (1989) for the French government-issued Tontines of the 18th century.

<sup>2</sup> We transcribed the tables from a republished version in Bailly (1813).

<sup>3</sup> He also studied nominees of several earlier, smaller, life-contingent debt issues.

<sup>4</sup> Among these are tales of speculators paying surgeons and clergymen to maintain the health of the nominees—a rare case of moral hazard in annuity markets.

<sup>5</sup> See Parliamentary Papers (1808), Hendriks (1856), Murphy (1939), and The Insurance Institute of London (1969) for additional historical details.

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