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# Redistribution by insurance market regulation: Analyzing a ban on gender-based retirement annuities ☆

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ABSTRACT

We illustrate how equilibrium screening models can be used to evaluate the economic consequences of insurance market regulation. We calibrate and solve a model of the United Kingdom's compulsory annuity market and examine the impact of gender-based pricing restrictions. We find that the endogenous adjustment of annuity contract menus in response to such restrictions can undo up to half of the redistribution from men to women that would occur with exogenous Social Security-like annuity contracts. Our findings indicate the importance of endogenous contract responses and illustrate the feasibility of employing theoretical insurance market equilibrium models for quantitative policy analysis.



## 1. Introduction

Regulators often restrict the use of race, gender, and other buyer characteristics in pricing insurance policies. These restrictions are likely to become more prevalent as genetic testing and other technologies enrich the information set that insurers might use in setting individual-specific prices. Several theoretical studies, including Hoy (1982), Crocker and Snow (1986), and Rea (1987), analyze restrictions on characteristic-based pricing and show that they have unavoidable negative efficiency consequences. Empirical work supports the key predictions of the models that underlie these efficiency analyses. Buchmueller and DiNardo (2002) and Simon (2005), for example, show a decline in insurance coverage when characteristic-based pricing is banned in health insurance markets. Hoy and Witt (2007) is the only study we know of that offers estimates of the efficiency costs of restricting characteristic-based pricing. It focuses on the case of genetic testing bans in term life insurance. We are not aware of any empirical research that simultaneously measures the efficiency and distributional consequences of such restrictions.

This paper takes a first step toward developing such estimates. We extend existing theoretical models and

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adapt them to estimate both the efficiency and redistributive effects of a unisex pricing requirement for pension annuities in the United Kingdom. Restrictions on characteristic-based pricing are usually thought to transfer resources from individuals with a low risk of a loss to those with greater risks. Since women are at greater risk of living for many years after they purchase an annuity than men, unisex pricing restrictions on pensions redistribute from men to women. We find that the extent of such redistribution depends critically on the nature of insurance market equilibrium and on the way insurance companies respond to the unisex pricing requirement. Our findings extend Rea's (1987) analysis of how a unisex pricing rule would affect the policies purchased by prospective annuitants.

The redistribution associated with pricing restrictions in insurance markets is similar to that associated with a broad class of other regulatory policies. Conditional on an individual's gender, the redistribution from men to women of a unisex pricing rule is similar to the redistribution from low-cost to high-cost consumers under uniform pricing regulations in industries such as telephone and electricity distribution. Posner (1971) labels such redistribution "taxation by regulation." Hirshleifer (1971) argues for a different approach to such redistribution, however, that takes an ex ante perspective. Before individual characteristics are known, the redistribution associated with gender-blind pricing may be viewed as a form of insurance against drawing a high-cost characteristic. In the annuity market, belonging to a long-lived group, as women do, corresponds to being a high-cost annuity buyer.

The pension annuity market provides a convenient setting for applying theoretical models of asymmetric information to quantify regulatory impact. It is also interesting in its own right because of its size, its importance for retiree welfare, and the salience of its unisex pricing regulations. Private annuity arrangements, typically defined benefit pension payouts, represent an important source of income for many elderly households. Employers in the United States were once free to offer different pension annuity payouts to men and women, but litigation in the 1970s and early 1980s eliminated this practice. The European Union is currently debating regulatory reforms that may eliminate gender-based pricing in insurance markets, including those for annuities. Analyzing how restrictions affect annuity markets may also have broader implications for the design and regulation of annuitized payout structures associated with defined contribution Social Security systems.

Our institutional analysis focuses on the U.K. retirement annuity market. Workers who have accumulated tax-preferred retirement savings are required to purchase an annuity. This eliminates the possibility that unisex pricing regulations might alter the set of annuity market participants. Participants nevertheless have substantial flexibility in choosing their annuity policy, and Finkelstein and Poterba (2004) suggest that this choice is affected by private information about mortality risk. The compulsory participation requirements in this market simplify our analysis, but they also suggest caution in generalizing our quantitative findings on the efficiency and distributional consequences of a ban on gender-based pricing to annuity markets or other insurance markets where participation is voluntary.

We are not aware of any previous attempts to calibrate and solve a stylized theoretical model of insurance market equilibrium. Doing so requires adapting a model to incorporate many institutional features of actual insurance markets. For example, it is important to determine whether individuals have recourse to any informal, if inefficient, substitutes for insurance. Our analysis recognizes that policyholders may save against the contingency of a long life, and that insurance companies may not observe this saving. When insurance companies can observe and contract on saving, banning gender-based pricing may not have any redistributive or efficiency consequences. This lack of efficiency consequences is a special case of a result in Crocker and Snow (2007): when there are no informal substitutes for insurance, the efficiency consequences of introducing asymmetric information are minimal whenever the dimensionality of insurance contracts is sufficiently large. In contrast, regulatory interventions may have non-trivial consequences when individuals can draw on unobservable savings as a substitute for buying annuities.

Our analysis demonstrates that theoretical models of insurance market equilibrium can be adapted to offer quantitative predictions on regulatory issues. We find that estimates of the impact of regulation are substantially affected by recognizing that insurers may alter their product offerings in response to regulation. Insurer response may substantially reduce the amount of redistribution from men to women associated with a ban on gender-based pricing. This finding highlights the importance of modeling insurance market equilibrium when analyzing regulatory policy. Golosov and Tsyvinski (2007) make a similar observation with regard to tax policy. Even after we allow for insurance companies to alter their menu of annuity products, we find that banning gender-based pricing in the U.K. retirement annuity market would redistribute resources. In most cases we consider, men would be worse off by an amount equivalent to losing at least 3% of their retirement wealth. We also estimate small efficiency costs associated with this redistribution, although our estimates of these costs are likely to be very sensitive to the compulsory nature of the U.K. retirement annuity market. This feature rules out the possibility that some individuals who might buy annuities when gender-based prices are permitted would chose not to do so when prices are gender-blind. This potentially important source of inefficiency associated with regulation of voluntary insurance markets is not relevant to our analysis, but it could be substantial in other markets.

This paper is organized as follows. Section 2 briefly reviews the qualitative impact of uniform pricing requirements in insurance markets with asymmetric information. Section 3 models the range of possible contracts offered and purchased in equilibrium under the assumption that the annuity market equilibrium is constrained Pareto efficient. It also introduces our algorithm for solving for equilibrium contract structure; a technical