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Preference Heterogeneity and Insurance Markets: Explaining a Puzzle of Insurance

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The textbook approach to insurance markets emphasizes the role of private information about risk in determining who purchases insurance. In the classic adverse selection model of Michael Rothschild and Joseph Stiglitz (1976), individuals with higher expected claims buy more insurance than those with lower expected claims, who may be out of the market entirely. This basic prediction of asymmetric information models of a "positive correlation" between insurance coverage and accident occurrence has been shown to be robust to a variety of extensions to the standard framework (Pierre-André Chiappori and Bernard Salanie 2000; Chiappori et al. 2006).

In practice, however, insurance markets differ substantially in whether higher-risk individuals or lower-risk individuals have more coverage. In acute health insurance markets and in annuity markets, for example, the preponderance of evidence suggests that higher-risk people have more insurance, as the standard theory would predict. However, the opposite is true in life insurance, long-term care insurance, and Medigap markets, which tend to exhibit either no selection or "advantageous selection"—those who have more insurance are lower risk.[1] Such advantageous selection has been detected even in cases where individuals have private information about their risk type that is positively correlated with insurance demand (Finkelstein and McGarry 2006). Indeed, the discrepancy between theory and reality is even more striking, given that moral hazard would tend to increase the risk occurrence of those with more coverage, even in the absence of adverse selection.

One explanation for this puzzle is that individuals may vary in their tolerance for risk, in addition to their exogenous risk status. When individuals are heterogeneous in their preferences as well as their risk type, the relationship between insurance coverage and risk occurrence can be of any sign (e.g., Chiappori et al. 2006). For example, individuals with lower tolerance for risk may not only demand more insurance but may also invest in activities that lower their expected claims, leading the lower risk to have more coverage. In this case, the insurance market may exhibit *over-insurance* relative to the first best, rather than the under-insurance of classic adverse selection models (David de Meza and David C. Webb 2001). In other situations, the standard adverse selection result may prevail. The theory is not definitive.

Empirical evidence suggests significant heterogeneity in preferences for insurance that is important for understanding insurance demand. Examples include automobile insurance (Alma Cohen and Liran Einav 2007), long-term care insurance (Finkelstein and McGarry 2006), Medigap (Fang, Keane, and Silverman 2006), and annuities (Einav, Finkelstein, and Paul Schrimpf 2007). These papers raise the possibility that heterogeneity in preferences may be as, or more, important than heterogeneity in risk in explaining insurance demand. They also suggest that the correlation between preferences for insurance and expected claims is not the same across markets. For example, in both annuities and auto insurance, there is evidence

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[1] See, e.g., Finkelstein and James M. Poterba (2004) on annuities, John Cawley and Tomas Philipson (1999) on life insurance, Finkelstein and McGarry (2006) on long-term care insurance, Hanming Fang, Michael Keane, and Daniel Silverman (2006) on life insurance, and Cutler and Richard Zeckhauser (2000) for a review of the evidence in health insurance. We provide a more comprehensive literature review in Cutler, Finkelstein, and McGarry (2008).

that those with greater preferences for insurance have higher expected insurance claims, which would reinforce the standard asymmetric information effect (Einav, Finkelstein, and Schrimpf 2007; Cohen and Einav 2007). In the Medigap market and in the long-term care insurance market, however, those with higher preferences for insurance appear to have lower expected claims, creating offsetting advantageous selection (Fang, Keane, and Silverman 2006; Finkelstein and McGarry 2006). These findings suggest that differences in the relationship between preferences and expected claims may help explain differences across markets in whether they are advantageously or adversely selected.

In this paper, we examine the relation between risky behaviors, insurance purchases, and risk occurrence in five different insurance markets: life insurance, acute health insurance, annuities, long-term care insurance, and Medicare supplemental insurance (Medigap).

I. Data and Empirical Framework

Our analysis uses individual-level data from the Health and Retirement Study (HRS). We use the original HRS cohort to examine the holding of term life insurance and private acute health insurance among people age 51 to 61 in 1992. We use a second HRS cohort, the Asset and Health Dynamics (AHEAD) sample, to examine Medigap insurance, long-term care insurance, and annuities among people age 65 to 90 in 1995. We examine contemporaneous reports of medical care use, and also use the panel nature of these data to track mortality and nursing home outcomes for individuals in both cohorts through 2002. The working paper version (Cutler, Finkelstein, and McGarry 2008) contains more detailed information on the definitions of the variables we use, as well as summary statistics.

Our basic test is to examine how measures of risk tolerance are related to the occurrence of risk, and to whether the individual has insurance. Risk tolerance is not easily measured. We proxy for risk tolerance using five measures of behaviors that likely capture individual risk aversion: smoking; drinking; job-based mortality risk; receipt of preventive health care; and use of seat belts. While each of these variables will reflect factors in addition to risk tolerance, results that are consistent across the variables suggest that risk tolerance is an important part of their variability. We have also examined the relationship between the behavior measures and a proxy for risk aversion based on respondents' reported willingness to engage in various hypothetical income gambles. The two are moderately related (see working paper for results), which is consistent with prior analyses (Robert Barsky et al. 1997).

Our estimating equations are of the form:

(1)

$$\mathbb{1}(insurance)_i = \beta_0 + \beta_1 Behavior_i + X_i\Gamma + \varepsilon_i;$$

(2)

$$Riskoccurrence_i = \alpha_0 + \alpha_1 Behavior_i + X_i\Pi + \eta_i,$$

where $\mathbb{1}(insurance)_i$ is an indicator variable for whether the individual has a particular type of insurance, $Riskoccurrence_i$ is a measure of the occurrence of the risk the insurance in question would cover, $Behavior_i$ is one of our measures of risk tolerance, and X represents covariates.

We use five measures of insurance holdings: whether the individual has term life insurance in 1992, whether the individual has private acute health insurance in 1992 (through either an employer or the nongroup market)[2], whether the individual has an annuity in 1995, whether the individual has Medicare supplemental coverage in 1995 (termed "Medigap") to cover some of the expenses not insured by the public Medicare insurance, and whether the individual has long-term-care insurance in 1995. The corresponding risk occurrence measures for these five insurance products are: whether the individual dies by 2002 (for life insurance), whether the individual reports having entered a hospital in the previous two years (for acute health insurance), whether the individual survives to 2002 (for annuities), contemporaneous medical expenses not covered by Medicare (for Medigap), and whether the individual goes into a nursing home by 2002 (for long-term-care insurance).[3]

[2] For our analysis of the acute health insurance market, we exclude individuals who report public health insurance coverage.

[3] For our risk occurrence measure for Medigap, we impute medical expenditures not covered by Medicare based on information in the HRS on hospital and doctor visits, and the deductible and coinsurance rules for

Table 1—Relationship between Risky (or Risk-Reducing) Behavior and Insurance Coverage

	Insurance product				
Independent variable	Term Life (1)	Annuity (2)	Long-term care (3)	Medigap (4)	Acute health (5)
Mean dep var	0.50	0.07	0.10	0.65	0.84
Smoking	−0.034***	−0.027***	0.007	−0.083***	−0.084***
	(0.010)	(0.009)	(0.014)	(0.022)	(0.009)
	[11,453]	[6,420]	[6,401]	[6,383]	[10,945]
Drinking	−0.017	−0.013	0.016	−0.022	−0.046***
	(0.021)	(0.016)	(0.023)	(0.035)	(0.017)
	[11,453]	[6,393]	[6,376]	[6,357]	[10,945]
Job risk	−0.002*	−0.003***	−0.002***	−0.016***	−0.005***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)
	[10,556]	[4,878]	[4,845]	[4,852]	[10,207]
Preventive care	0.115***	0.053***	0.082***	0.187***	0.220***
	(0.016)	(0.010)	(0.011)	(0.020)	(0.013)
	[9,773]	[6,251]	[6,233]	[6,218]	[9,411]
Always wears seat belt	0.063***	0.030***	0.037***	0.058***	0.058***
	(0.013)	(0.007)	(0.009)	(0.016)	(0.010)
	[9,805]	[6,408]	[6,390]	[6,373]	[9,488]

Notes: Table reports results from OLS estimation of equation (1). Binary dependent variable is given in column headings. Each cell reports the results from a separate regression; it reports the coefficient on right-hand-side variable listed in the first column. Insurance is measured in the 1992 HRS in columns 1 and 5, and in the 1995 AHEAD in columns 2, 3, and 4. All right-hand-side variables are measured in the year insurance is measured (1992 or 1995 as indicated) except for preventive health activity and seat belt use for 1992 insurance coverage where they are measured in 1996. Heteroskedasticity-robust standard errors are in parentheses. Sample size is in square brackets.

*** Significant at, or below, 1 percent.
** Significant at, or below, 5 percent.
* Significant at, or below, 10 percent.

Our behavioral measures are relatively standard. Smoking behavior is defined as current smoking status. Drinking is a dummy variable for whether the individual has three or more drinks per day (a common measure of problem drinking). Job risk is defined as the mortality rates per 100,000 employees in the individual's industry-occupation cell (for the HRS) or occupation cell (for the AHEAD). We also construct two measures of active steps individuals can take to reduce mortality and healthy risk: the fraction of gender-appropriate preventive health activity undertaken,[4] and whether the individual reports always wearing a seat belt. For our 1995 AHEAD sample, we observe these precautionary measures contemporaneously in 1995. Unfortunately, for the 1992 HRS sample, these measures are first available in 1996; we observe them for people who are alive at that age.

On average, in our 1992 sample of near-elderly, 27 percent of people smoke, 5 percent have a drinking problem, and the average mortality risk by industry-occupation cell is 4 fatalities per 100,000 employees. The average person undertakes 60 percent of gender-appropriate health activities, and 80 percent report always wearing a seat belt. Smoking rates are substantially lower (7.6 percent) in our 1995 sample of the elderly, reflecting the strong difference in mortality by smoking status at older ages, but the other characteristics are similar.

II. Results

Table 1 reports the bivariate relationship between each behavior and insurance coverage. Table 2 shows the analogous relationship with risk occurrence. For completeness and comparability

Medicare. The exact imputation procedure is described in detail in the working paper version. Results using the utilization measures directly are similar (not shown). For our risk occurrence measure for acute health insurance, we use an indicator variable for whether the individual entered a hospital, but do not impute total spending, as it would require more detailed information than is available about medical care utilization.

[4] These activities are: whether the individual had a flu shot; had a blood test for cholesterol; checked her breasts for lumps monthly; had a mammogram or breast x-ray; had a Pap smear; had a prostate screen.

Table 2—Relationship between Risky (or Risk-Reducing) Behavior and Risky Outcomes

	Risky outcome				
Independent variable	Mortality (1992–2002 HRS) (1)	Mortality (1995–2002 AHEAD) (2)	Used nursing home (1995–2002 AHEAD) (3)	Medical costs that Medigap could cover (1995 AHEAD) (4)	Entered a hospital in preceding two years? (1992 HRS) (5)
Mean dep var	0.13	0.38	0.24	$911	0.09
Smoking	0.110***	0.098***	−0.011	−103.1***	−0.006
	(0.008)	(0.022)	(0.019)	(40.2)	(0.006)
	[11,191]	[6,455]	[6,217]	[6,317]	[11,910]
Drinking	0.083***	0.021	−0.030	−112.3**	0.010
	(0.017)	(0.035)	(0.029)	(54.5)	(0.013)
	[11,191]	[6,428]	[6,193]	[6,294]	[11,910]
Job risk	0.004***	0.007***	−0.001	9.3***	0.002***
	(0.001)	(0.002)	(0.001)	(3.6)	(0.001)
	[10,295]	[5,681]	[4,849]	[4,782]	[10,950]
Preventive care	−0.011	−0.148***	−0.127***	305.1***	0.060***
	(0.010)	(0.020)	(0.018)	(36.6)	(0.009)
	[10,085]	[6,285]	[6,080]	[6,168]	[10,123]
Always wears seat belt	−0.048***	−0.104***	−0.053***	−99.4*	−0.021***
	(0.008)	(0.016)	(0.015)	(59.9)	(0.008)
	[10,123]	[6,432]	[6,203]	[6,307]	[10,156]

Note: Table reports results from OLS estimation of equation (2). Dependent variables are given in column headings. Each cell reports the results from a separate regression; it reports the coefficient on right-hand-side variable listed in the first column. All right-hand-side variables are measured in 1992 in columns 1 and 5, except for preventive health activity and seat belt use, which are measured in 1996; all right-hand-side variables are measured in 1995 in columns 2, 3, and 4. Heteroskedasticity-robust standard errors are in parentheses. Sample size is in square brackets.

*** Significant at, or below, 1 percent.
** Significant at, or below, 5 percent.
* Significant at, or below, 10 percent.

with the existing literature, the working paper version also reports results in which we control for covariates (X) designed to capture the risk classification used by insurers. Conditioning on the characteristics used in pricing insurance is crucial for papers testing the predictions of standard adverse selection models, as these predictions are about how people behave *conditional* on the menu of contracts they face (Chiappori and Salanie 2000). However, when examining the influence of preferences on insurance demand and risk type, the unconditional relationships may be of greater interest, since we are primarily interested in how preferences mediate the insurance–risk occurrence relationship and risk classification may be endogenous to preferences. In practice, the two sets of results are very similar.

Table 1 shows that individuals who engage in more risky behavior (or less risk reducing behavior) are systematically less likely to have each type of insurance. The results are remarkably consistent across behavior measures and across insurance types. They are particularly strong for preventive health activity, seat belt use, and the mortality rate of the individual's industry-occupation cell. Similar patterns are present—but are somewhat less robust—for smoking and drinking. To take one example, people who always wear a seat belt are 6.3 percentage points (~13 percent) more likely to have life insurance, 3.0 percentage points (~43 percent) more likely to have an annuity, 3.7 percentage points (~37 percent) more likely to have long-term-care insurance, and 5.8 percentage points (~9 percent) more likely to have Medigap or acute health coverage. Each of these is statistically significant at the 1 percent level.

Table 2 examines the relationship between risky behavior and risk occurrence. The first two columns examine the relationship between more risky (less risk reducing) behaviors and mortality in the life insurance sample (column 1) and in the annuity sample (column 2). Not surprisingly, riskier behavior is associated with higher mortality, and people who undertake more preventive activities have lower mortality.

Column 3 examines the relationship between behaviors and subsequent use of nursing homes. Although there is no systematic relationship between smoking, drinking, and job-based mortality risk and nursing home use, preventive health activity and seat belt use are negatively associated with the probability of going into a nursing home. Since people who use preventive care or wear seat belts are also more likely to have long-term-care insurance (Table 1), these patterns may help explain why the market is not, on net, adversely selected.

Finally, columns 4 and 5 look at the relationship between the various behaviors and medical costs that Medigap policies would cover (column 4) and the relationship between the behaviors and hospital use, which is an important component of the costs that acute private health insurance would cover (column 5). The results are mixed; some risky behaviors are correlated with lower medical expenditures and utilization, while others are correlated with higher spending. Some of these behaviors, therefore, act to offset the standard asymmetric information effects, while others serve to reinforce them.

III. Interpretation and Conclusions

Our analysis yields two main findings. First, in all five markets, we find that individuals who engage in what are commonly thought of as risky behaviors (smoking, drinking, or prior employment in jobs with higher mortality rates) or who do not take measures to reduce risk (preventive health activities or wearing a seat belt) are systematically less likely to hold each of these insurance products.[5] Second, we find that these same individuals tend to have higher expected claims for life insurance and long-term-care insurance, but lower expected claims for annuities; for Medigap and acute health insurance, there is no systematic relationship between the behavior measures and expected claims.

[5] Here we use the term "risk" to denote the chance of what is generally considered to be an undesirable event for the individual (namely, worse health or death). Of course, in the context of insurance purchasing, the "risk" depends on what is being insured. For example, from the insurance company's perspective, a high mortality individual will be "high risk" as a life insurance consumer but "low risk" as an annuity buyer.

These results can help to explain the puzzle of insurance we started with: why is adverse selection not more common? In annuity markets, there is clear evidence of adverse selection: people who live longer are more likely to buy insurance. The standard adverse selection model is one explanation for this, but so is variation in risk tolerance; people who have less risky behaviors live longer and are more likely to buy annuities. In life insurance, our results suggest that differential risk tolerance can help explain why people with lower mortality rates have more insurance. Similarly, in the case of long-term-care insurance, people who use more preventive care or are more likely to wear seat belts buy insurance more readily, but also stay out of nursing homes. For acute health insurance, the lack of any systematic offsetting effect of risk tolerance may explain why the preponderance of studies have found that this market is, on net, adversely selected. In the case of Medigap, other sources of advantageous selection than risk tolerance appear to be necessary to understand why this market is, on net, advantageously selected; indeed, Fang, Keane, and Silverman (2006) have documented that those with higher cognitive ability are more likely both to purchase Medigap and to have lower expected claims.

Overall, our findings suggest that preferences for insurance—and their impact on risk occurrence and insurance purchase—may help explain the different patterns of selection observed in different insurance markets. These preference effects thus provide a potential unifying explanation for the differential patterns in insurance coverage across different markets.

Our results have a number of implications. Most importantly, they suggest that in considering the nature of market inefficiencies created by private information in insurance markets, the possibility of over-insurance from advantageous selection should be considered in addition to the under-insurance concern of classic, unidimensional adverse selection models. The implications of this for welfare have received some attention (de Meza and Webb 2001) and are a fruitful subject for future research.

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