Life Insurance Death Spiral? Analyzing Adverse Selection in the Group Market

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The employer-sponsored life insurance (ESLI) market is particularly susceptible to adverse selection due to community-rated premiums, guaranteed issue coverage, and the existence of a well-functioning individual market. Using administrative data from a large university, I analyze the existence and welfare costs of adverse selection in the ESLI market. Despite the vulnerable structure of ESLI, I do not find evidence of significant adverse selection. This finding is partially driven by features of ESLI policies and financial complexities in comparing group and individual coverage. (JEL: D82, D31, G22, J33)

I. Introduction

Life insurance is one of the largest private insurance markets in the United States. In 2014, life insurance coverage totaled $20.1 trillion (ACLI, 2015) and individuals paid $133.8 billion in life insurance premiums (Insurance Information Institute, 2014). Notwithstanding, the widespread coverage, large disparities still exist between life insurance holdings and underlying vulnerabilities with some estimates exceeding $15 trillion (Bernheim et al., 2003; Conning, 2014; LIMRA, 2015*c*). In addition, life insurance ownership is at a 50-year low and sales have declined 45 percent since the mid-1980s (Prudential, 2013; Scism, 2014). Adverse selection in life insurance markets could be one of the causes of these uninsured vulnerabilities.

Previous empirical work on adverse selection in life insurance focuses almost exclusively on the individual market. The seminal paper by Cawley and Philipson (1999) finds no evidence of adverse selection. Subsequent work has mixed results; He (2009, 2011) finds evidence of adverse selection whereas Harris and Yelowitz (2014) find no evidence of adverse selection in the individual market. These studies provide useful insight into one portion of the life insurance market but little attention has been given to employer-sponsored life insurance (ESLI), which constitutes 41 percent of total life insurance coverage (ACLI, 2015).

Hedengren and Stratmann (2016) provide the only empirical study of adverse selection in the ESLI market and find some evidence of adverse selection. Nonetheless, they are unable to distinguish between coverage that is automatically provided by employers (basic coverage) and life insurance elected by the employee (supplemental coverage). In addition, they have no information on availability of ESLI through the individuals' employer. Consequently, the selection they observe could be driven by differences in provision/availability across industries and occupations rather than adverse selection.

In this study, I use detailed administrative data from a large public university ("the University" henceforth) to test for adverse selection in the ESLI market. These data differentiate between basic and supplemental coverage, which allows for the identification of adverse

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selection in supplemental ESLI. Supplemental ESLI at the University is particularly susceptible to adverse selection for several reasons. First, supplemental ESLI at the University is "guaranteed issue" and priced based on the characteristics of the group (community-rated). This implies that individuals with significant differences in probability of death (expected cost) face the same premiums. Cawley and Philipson (1999) cite individual underwriting in the term life insurance market as a possible explanation for the lack of adverse selection. If this were the case, then the University's ESLI—without individual underwriting—should exhibit adverse selection. The community-rated nature and guaranteed issue coverage provides an incentive for individuals with a higher probability of death to purchase coverage more often than the relatively healthy.

Second, individuals at the University may increase supplemental ESLI coverage on an annual basis without individual underwriting in many instances. As a result, individuals that receive negative health shocks (e.g. diagnosis of cancer) may increase coverage prior to death and receive significantly higher payouts. Data from the Heath and Retirement Study (HRS) show that a little under half of deaths of working age individuals were expected and roughly a quarter had more than a year from initial diagnosis to death. Consequently, individuals that received information of increased odds of death could elect more coverage, which in turn increases adverse selection.

Third, there are large differences in the levels of coverage available at the University. Cutler and Reber (1998) document the case of Harvard University where adverse selection led to an insurance "death spiral" that caused insurers to discontinue more generous employer-sponsored health insurance (ESHI) coverage. They noted that this problem is not an isolated occurrence and many such ESHI plans cannot maintain a more generous option without being subsidized primarily due to adverse selection. As a result, there is relatively little difference in the generosity of coverage across ESHI plans for employers with equal contribution rules. In contrast, at the University, the most comprehensive supplemental ESLI plan offers five times more coverage than the least comprehensive plan. This allows for adverse selection on not only the extensive margin (whether to have supplemental ESLI or not), but also on the intensive margin (value of ESLI coverage).

Fourth, individual term life insurance represents a viable alternative to ESLI. As mentioned, in contrast to the ESLI, term life insurance is individually underwritten (experience rated) and is not guaranteed issue (insurers may reject applicants). Consequently, term life insurance offers significantly cheaper premiums in comparison to ESLI premiums for healthy University employees. If healthier employees elect term life insurance rather than supplemental ESLI, then ESLI premiums would increase. The existence of a functioning term life insurance market should induce greater price sensitivity and more adverse selection in supplemental ESLI at the University.

Overall, these factors should exacerbate adverse selection in the ESLI at the University and potentially lead to an insurance death spiral. Despite the factors mentioned, I do not find evidence of significant adverse selection in the University's ESLI using both the widely implemented positive correlation test and the model presented in Einav, Finkelstein and Cullen (2010), which estimates welfare loss from adverse selection. Nonetheless, I find evidence of adverse selection among faculty.

To explore the overall lack of adverse selection, I analyze University employee behavior just prior to death. The data contain elections for 106 employees that died the following year. Of those employees only 10 were constrained by the guaranteed issue (GI) amount (i.e. they could not increase without medical underwriting). For the 89 employees that I observe elections for two years prior to death, only 8 increased coverage in their last year. Estimation shows that individuals just preceding their deaths do not increase coverage or have the maximum amount of coverage more often than comparable employees who do not die in the sample. A possible explanation for the lack of an increase in coverage or maximum coverage is accelerated death benefits (ADB). These ADB allows families to receive payments prior to death of the individual but disqualifies them from increased coverage. This option is attractive for individuals that are liquidity constrained or have a reduced bequest motive relative to when they originally elected coverage.

Additionally, I test the influence of the term life insurance market on supplemental ESLI participation using a sample of federal employees from the Survey of Income and Program Participation (SIPP). Contrary to theory, I find that premiums faced in the term life insurance do not significantly influence the decision of employees to purchase supplemental ESLI or term life insurance. Explanations for the lack of a significant influence include salience, lack of financial sophistication, and time costs associated with individual underwriting.

This paper contributes to the significant literature on adverse selection in insurance markets. Adverse selection has been analyzed in the health insurance (Cutler and Reber, 1998; Cardon and Hendel, 2001; Cutler, 2002; Einav, Finkelstein and Cullen, 2010), long-term care insurance (Finkelstein and McGarry, 2006), and annuities (Finkelstein and Poterba, 2004). This literature illustrates the heterogeneous influence of adverse selection on markets and the importance of nuanced differences in insurance plans.

The remainder of the paper is organized as follows. Section II provides a brief overview of life insurance markets, Section III describes the data, Section IV highlights features that could induce adverse selection. Section V sets up the empirical models to test for adverse selection, Section VI presents results and the welfare analysis, Section VII discusses the findings, and Section VIII concludes.

II. Life Insurance Overview

A. ESLI

In 2014, 120 million employees were covered by ESLI with coverage totaling $8.2 trillion (ACLI, 2015). ESLI typically has an automatic portion provided by the employer (basic coverage) and an option to purchase additional coverage through payroll deductions (supplemental coverage).[1] Three-quarters of all full-time workers had access to ESLI (U.S. Department of Labor, 2015) and about half of all workers had access to supplemental ESLI coverage (LIMRA, 2015*b*). Based on SIPP data, 51 percent of employed adults have life insurance coverage. Of those with coverage, 58 percent have some ESLI coverage and 34 percent exclusively have ESLI coverage.[2] As mentioned, ESLI is community-rated meaning that premiums are a function of the expected costs of the insured group rather than a single individual's probability of death.

[1] For 95 percent of covered workers, employers that provided basic coverage did not require employee contributions (U.S. Department of Labor, 2015).

[2] Percentages were calculated from tabulations of the Survey of Income and Program Participation (SIPP) from 1990 to 2008.

B. Individual Life Insurance

The individual market accounts for 59 percent of life insurance coverage. Within the individual market, policies are differentiated by term and whole life insurance.[3] Term life insurance provides coverage for a specified period of time (typically ranging from 10 to 30 years) and pays the face value of the policy upon death of the policyholder. Term life insurance accounts for 70 percent of the face value of individual life insurance policies (ACLI, 2015) and is a close substitute for supplemental ESLI. In contrast to ESLI, term life insurance is experience rated with premiums varying based on age, gender, smoking status, health status, family history, and participation in risky behaviors. This underwriting represents a cost to applicants as it commonly requires a medical examination, blood work, and detailed medical history. The most common form of term life insurance is a level term policy, which keeps premiums constant over the life of the policy.

III. Data

I use administrative (payroll) panel data from the University from 2008 to 2014 as the primary data source. To analyze adverse selection in the ESLI market, it is essential to be able to differentiate between basic coverage and supplemental elections. The data document complete benefit and retirement elections including basic and supplemental ESLI for 21,723 unique individuals. Employees make benefit elections during the open enrollment period for the University or after a qualifying event, which include birth, adoption, marriage, divorce, or employment status change.[4] All elections made during the open enrollment period take effect July 1 and continue until a new election is made. In general, employees cannot add or drop coverage during the year except in the case of a qualifying event.

Qualified employees at the university are automatically provided basic life insurance coverage of 1x annual salary.[5] In addition to this coverage, employees may elect supplemental life insurance up to 5x their annual salary. Employees may elect up to 3x annual salary after initially being hired without "evidence of insurability" up to the guaranteed issue (GI) amount of $375,000. Evidence of insurability consists of filling out a medical history form and in some cases receiving a medical examination to verify the employee is in good health. Employees may then increase coverage by 1x salary each subsequent year without evidence of insurability unless the increased coverage exceeds the GI amount. Additionally, if employees increase coverage by more than 1x annual salary during open enrollment then they must provide evidence of insurability. The maximum supplemental coverage is the lesser of 5x annual salary or $1,000,000. Supplemental life insurance is distinct from other benefits in that an employee may reduce insurance coverage at any time.

Generally, if the employee is no longer employed by the University then ESLI coverage lapses. However, if the employee qualifies for long-term disability (LTD) then the employee may continue coverage at the same rate until reaching age 67. If the employee wishes to continue coverage but does not qualify for LTD, he or she may convert the group policy into a whole life policy. Alternatively, the employee may continue group coverage, but at a

[3] Whole life insurance provides coverage for life and has an investment portion that accumulates a cash value over time. Given the investment nature of whole life insurance, it is much less of a substitute for supplemental ESLI and consequently not a focus of this paper. Other types of coverage include universal and permanent life insurance.

[4] The open enrollment period is approximately 30 days from mid-April to mid-May. In the case of a qualifying event, all changes must be made within 30 days of the event.

[5] Qualified employees include full-time and >.75 full-time equivalent. For brevity, I simply refer to these employees as full-time workers.

premium that reflects the group of employees that wish to continue coverage after leaving employment at the University. According to a Human Resource representative, the worker will "pay dearly" in premiums for the portable coverage. Therefore, employees may continue to have some type of coverage after leaving the employment at the University, but it will be more expensive and/or a different type of coverage. Consequently, employees that wish to continue ESLI coverage might experience lock-in similar to lock-in exhibited in employer-sponsored health insurance and cliff vesting for defined benefit pensions (Madrian, 1994; Kotlikoff and Wise, 1987).

Table 1 shows summary statistics for full-time workers. The sample is majority white and 63 percent female. In addition, about half of the sample is married and about half has a child. I do not observe marital status or children directly in the data. The variables are determined based on health, dental, vision, and dependent life insurance elections as well as dependent flexible spending account (FSA). For example, if an employee elects spousal health insurance then he or she is labeled as married.[6] The University operates a hospital in addition to the main campus. Faculty make up 17 percent, and healthcare represents 42 percent of workers in 2014.[7] Median salary in 2014 was $46,000.

As shown in Table 1, roughly half of full-time employees elect supplemental ESLI. Mean supplemental coverage in 2014 was $164,842 or a multiple of 2.68x salary. Premiums for supplemental coverage are differentiated solely by 5-year age group as shown in Table 2. Supplemental ESLI premiums increase on the month following the employees' birthday even though elections must be made during open enrollment.

In addition, the University data contain information on reason for separation including death. The data contain information on 106 deaths of full-time employees. Nonetheless, this mortality data is censored as there is no mortality information for employees after they leave employment at the University.

A. *Representativeness*

Using the National Compensation Survey (NCS) conducted by the Bureau of Labor Statistics (BLS), Harris and Yelowitz (2016) show that the basic ESLI coverage for the University is within the norm for other colleges and universities. However, the NCS does not survey supplemental ESLI coverage. To get a sense of common features in supplemental ESLI policies, I use collected benefit books from more than 400 universities. The benefit booklets for many institutions were missing details on life insurance and I am hesitant to conclude that such institutions do not offer coverage. Of all the universities surveyed, 70 universities had well documented information on both basic and supplemental coverage. The average guaranteed issue amount (amount available without proof of insurability) for those universities is $254,344 with a maximum guaranteed issue amount of $750,000.[8] The University's guaranteed issue amount of $375,000 is not out of the ordinary in comparison to the other universities and colleges sampled. XX percent adjust supplemental premiums based solely on age and YY percent of plans allow employees to increase coverage without proof of insurability during open enrollment periods. Typically these plans only allow employees to

[6]This measure will not pick up individuals who have alternative sources of insurance such as a spouse's employer (Ritter, 2013). Also, this variable will miss individuals with children who are no longer considered dependents. See Harris and Yelowitz (2016) for a more complete discussion of the accuracy of these metrics.

[7]In the data, all healthcare workers are initially classified as staff even though some hold faculty positions. However, for matching purposes described later, all healthcare workers that make over $100,000 are reclassified as faculty.

[8]A small minority of the Universities specified the guaranteed issue amount as a multiple of salary. For those universities the multiple of guaranteed issue ranged from 2x to 7x salary.

increase coverage by a multiple of salary. Overall, it appears that the ESLI at the University in this study fits within the norm other colleges and universities.

B. *Probability of Death*

Studies of adverse selection require a metric that captures the individual's expected cost or the likelihood of using the insurance. For life insurance that metric is probability of death. Given that death in the working age population is a rare event, it is not realistic to estimate probability of death using only mortality within the University.[9] Additionally, rational expectations imply that individuals should base life insurance decisions on the probability of death of individuals of similar demographics rather than relying solely on the probability of death of coworkers. Furthermore, insurance companies likely calculate expected costs by pooling together many firms/universities rather than relying solely on information obtained from a single firm. Consequently, I use a much larger population, the entire United States, to impute the probability of death for employees at the university.

For the numerator of the probability of death metric, I use data from the CDC National Vital Statistics System Mortality Multiple Cause-of-Death Files for years 2003 to 2014. These data document the universe of deaths in the United States from 2003 to 2014 (30 million) with information on race/ethnicity, gender, marital status, education.[10] From the education variable, I define faculty to be those with 5+ years of college education and staff ranging from high school graduates to a bachelor's degree when merging to the University data.[11] For the denominator I use the American Community Survey (ACS) from corresponding years. The metric is obtained by totaling deaths by each unique socioeconomic group and dividing the counts by the corresponding population for the each socioeconomic group as measured in the ACS. For example, there is an average of 3,709 deaths per year for individuals that are age 50, male, not married, white, and have staff level education. On average, there are 441,603 individuals in the U.S. each year for this sociodemographic group. Therefore, for this group the one year probability of death is 840 in 100,000.

IV. Expected Adverse Selection in ESLI

As discussed in the introduction, there are several aspects of ESLI that could lead to crippling levels of adverse selection. In this section, I provide further motivation for adverse selection in the ESLI market.

A. *Heterogeneity in Underlying Probability of Death: Community-Rated/Guaranteed Issue*

The first aspect of University ESLI that could increase adverse selection is the guaranteed issue of life insurance with premiums only adjusting based on age. As a result, employees in the same age bin of varying health can purchase policies for equal amounts. For example, an employee who is age 49, male, African-American, obese, smokes, drinks, has diabetes and earns $30,000 a year pays the same premium as an employee who is age 45, female,

[9]Although the data contain information on some deaths, I am unable to observe the mortality of employees that leave the University then die. Therefore, any probability of death measure estimated using the model would be subject to selection bias from employees that continued employment up to death rather than left the University prior to death.

[10]I exclude individuals with an unknown or missing marital status, education level, and race/ethnicity, which constitutes 5.1 percent of the total working age sample.

[11]As mentioned earlier, I classify healthcare workers as faculty if they make more than $100,000 for purposes of assigning probability of death.

white, makes $150,000, and is a health conscious athlete. The guaranteed issue aspect in addition to the community-rated premiums could lead to adverse selection. If all employees purchase coverage, then the relatively unhealthy employees are subsidized by the relatively healthy employees. To illustrate, Figure 1 shows the probability of death for white, female, married, college educated individuals in comparison to African-American, male, high school graduates, who are not married. A 40-year old individual in the latter group is more than 10 times as likely to die that year than individuals in the former group (459 deaths compared to 43 deaths per 100,000). Figure 2 additionally shows the variation in probability of death by race, education, gender, and marital status respectively. Given this heterogeneity in risk and the homogeneity in premium within age groups, employees in higher risk groups should purchase coverage more often than those in lower risk socioeconomic groups. Despite this variation, death is a rare event with an average of 333 deaths per 100,000 for University employees.[12]

B. Ability to Increase Coverage with Health Shocks

Another feature of the University ESLI policy that should exacerbate adverse selection is the ability to ratchet up coverage without medical underwriting. University employees can increase coverage by 1x salary each year without proof of insurability, which means that on average they can increase coverage within 6 months of a negative health shock or diagnosis. The elected higher coverage going into effect shortly thereafter.[13] Consequently, individuals that receive negative health shocks or are diagnosed with a life threatening condition may increase coverage. A simple example helps illustrate how only a few employees with anticipated deaths can cause significant adverse selection. Suppose that a typical employer plan that covers 15,000 employees has 50 deaths per year and that half of all employees who die have supplemental coverage and equal salaries. Further suppose that the average employee receives a payout of 1x salary. Given these assumptions, only 6 employees would have to increase coverage to the maximum of 5x salary to cause payouts to double.

Data on 1,367 deaths as reported in the Health and Retirement Study (HRS) shed light on the degree of anticipation of death.[14] Follow-up exit interviews show that 44.7 percent of deaths were expected and that roughly a quarter of all deaths resulted from an illness that was diagnosed at least a year prior to the individual's death.[15] Additionally, based on CDC data and given the demographics of the University only an estimated 17 percent of employee deaths were a result of accidents.

Cancer represents a likely example where individuals might have forewarning prior to death. The 5-year survival rate for cancer (based on the age and gender profile at the University) is approximately 78 percent, which indicates that a significant portion of cancer patients have forewarning prior to death.[16] There is significant heterogeneity in survival

[12] Probability of death ranges from 9 to 3,158 per 100,000 for University employees.

[13] Open enrollment is in April and May and coverage goes into effect July 1.

[14] I use exit interviews conducted between 1996 and 2014. The HRS surveys initially interviews individuals between age 51 and 61 in addition to their spouses, which are not required to meet the age restrictions. Consequently, the data record deaths of spouses as young as 38, but as expected the majority of recorded deaths occurs at older ages both due to probability of death and the sample selection. Nonetheless, the sample should illustrate the likely distribution of deaths of working age individuals.

[15] The exact questions asked were: "Was the death expected at about the time it occurred, or was it unexpected?" and "About how long was it between the start of the final illness and the death?".

[16] Five-year survival rate data from the SEER Cancer Statistics Review 1975-2013 http://seer.cancer.gov/csr/

rates depending on the cancer site and stage of cancer with cases where a diagnosis of cancer is quickly followed by death (pancreatic cancer) and cases where individuals fully recover. Nonetheless, any diagnosis of cancer significantly increases an individual's likelihood of death in the immediate future.

To better approximate the potential influence of anticipated deaths on adverse selection, I simulate deaths based on individual age, race, ethnicity, gender, marital status, and education using data from the CDC and the American Community Survey (ACS).[17] Given the characteristics of employees at the University, approximately 46 employees die each year of which 12 (roughly a quarter) result from cancer. Weighing the sample by the probability of death and probability of dying from cancer, I repeatedly assign death and death from cancer to employees.[18] Table 3 shows the results from repeated simulations. The first panel shows that given the coverage levels of employees in 2014, the assigned 46 total deaths would result in life insurance payouts totaling $3.16 million given that none of these deaths were anticipated (example car wreck). The second panel shows how much total payouts from the life insurance company would increase if the 12 employees diagnosed with terminal cancer had time to adjust coverage taking into account the guaranteed issue amount of $375,000. As illustrated, total payouts would increase by 18.2 percent to 62.8 percent depending on the number of open enrollment periods the employees lives through. The life insurance company would consequently have to increase premiums by a similar amount in order to continue offering life insurance coverage. Given that the simulated deaths are weighted by probabilities of death, it is possible that some of the individuals assigned already increased coverage making the estimate of increased payout smaller.

When employees with cancer increase supplemental coverage, they also pay more in premiums. However, this increase in premiums paid is a small fraction of the increase in payouts. The last panel of Table 3 shows the total premiums paid in 2014 and how much premiums would increase if everyone that was diagnosed with cancer increased coverage to the maximum (which could take up to 5-years).[19] Based on the CDC data on cancer diagnoses and assuming a 50 percent 10-year survival rate with average employment of 10 years, there are 475 individuals with the diagnosis of cancer employed at the university. If every individual with the diagnosis of cancer increased supplemental coverage to the maximum guaranteed issue amount (i.e. they all had five years to adjust coverage) then premiums received would only increase by $366,758. This increased premium payment reported likely overestimates the actual increase in premiums due to individuals ramping up coverage as it assumes all employees with cancer have time to increase coverage to the maximum guaranteed issue amount. Even with this overestimation, the reaction of employees diagnosed with cancer still only accounts a fraction of the increase in total payouts from adverse selection due to cancer. Overall, it appears that the guaranteed issue and ability to increase coverage at the University should significantly increase adverse selection as employees anticipate their own deaths and respond by increasing coverage.

1975_2013/results_merged/topic_survival.pdf. The 5-year survival rate for all cancer types in the U.S. is 66.9 which is lower than the University specific measure largely due to different age distributions.

[17] I use the education level available in the CDC data as a proxy for faculty/staff positions as previously described to merge with the university data.

[18] Hambel et al. (2015) similarly use German cancer data to simulate health shocks.

[19] As shown in Table 3, total payouts exceed collected premiums in 2014. This likely comes from University employees having a lower probability of deaths than predicted based on their demographics. Nonetheless, these numbers are indicative of potential behavior of employees with the diagnosis of cancer.

C. Vast Differences in Benefit Levels

Another important aspect of ESLI that could potentially increase adverse selection is the wide range of coverage offered. For example, employees at the University may elect supplemental coverage from 1x salary to 5x salary without medical underwriting inasmuch as the policy does not exceed the guaranteed issue maximum ($375,000). In Cutler and Reber (1998) the authors find that a death spiral occurs with community-rated health insurance due to differences in generosity of available plans. They note that in several circumstances the market cannot support plans that differ greatly in the generosity of benefits and that several universities had to forgo offering more generous health insurance plans due to adverse selection. Nonetheless, plans similar to the one studied in this paper (where the highest coverage can be 5x more generous than the lowest coverage option) are common.

D. Outside Option: Non-group Life Insurance

The last major factor that influences adverse selection in the ESLI market is the existence of a functioning, competitive term market. In stark contrast to ESLI, term policies are individually underwritten in varying degrees based on the term length and face value (amount payable at death) of the policy. Consequently, healthy employees may purchase term life insurance for lower rates than supplemental ESLI. Similarly, under the Affordable Care Act (ACA) the health care exchange offers an alternative to ESHI. However, insurers in the health care exchange cannot legally price discriminate based on preexisting conditions which greatly lessens the "cream skimming" from the ESHI market.

To understand the difference in premiums between ESLI and term coverage I use scraped premiums from term4sale.com (N=5.85 million). Term4sale is a life insurance quoting website run by CompuLife that provides life insurance quoting software to insurance agents.[20] The website uses age, gender, along with health and smoking status and matches the characteristics with insurance products currently on the market.[21] Using the raw scraped premiums from term4sale, Figure 3 compares the present value of premiums for a 20-year $250,000 policy purchased though the University to a comparable term policy for a healthy, non-smoking, female employee.[22] As shown, healthy employees may get a substantial discount by purchasing coverage through the individual market, which only increases with age. For example, a healthy 40-year old female employee working at the University could save $6,314 (present value using a 3 percent discount rate) by purchasing a 20-year $250,000 term policy rather than electing supplemental ESLI of equal value for the next 20 years through the University.

To gauge the influence of the term market on adverse selection in the ESLI market it is important to understand the fraction of employees that face lower premiums in the term market. The University data does not have information on self-reported health or smoking

[20]A potential concern of using Internet pricing data is that all consumers do not purchase life insurance online. However, a recent study show that 71 percent of Americans report researching life insurance online http://www.limra.com/uploadedFiles/limra.com/LIMRA_Root/Posts/PR/_Media/PDFs/2015-LIAM-Fact-Sheet.pdf. Additionally, Brown and Goolsbee (2002) find that the advent of insurance pricing websites reduced term life prices (including off-line pricing) by 8-15 percent. Consequently, even if all individuals do not use the Internet to purchase life insurance, offline premiums are highly correlated with online premiums.

[21]See appendix Figure A1 for a screen shot of the required fields from the website.

[22]Term life insurance is typically purchased for 10 to 30 year periods with 20 year policies being the most common (CITE).

status so I cannot directly obtain individual quotes through term4sale. Nonetheless, the University data contains information on race, education, and income level, which are highly correlated with smoking and health status. For example, comparing 40 year old individuals, 4.6 percent of those with a college degree, income greater than $75,000, that are female and non-white smoke whereas 66.8 percent of those that did not graduate from high school, with income less than $10,000, that are male and white smoke.

To leverage this information, I use data from the Behavioral Risk Factor Surveillance System (BRFSS) from 2006 to 2014, which contains information on all the metrics used on term4sale in addition to variables on race, education and income level (N=1.5 million). I run each surveyed individual from the BRFSS through term4sale to get premiums for individual term policies. Following which, I take random draws of individuals from in the BRFSS within income, race, gender, faculty/staff, and 5 year age bins to assign term premiums to University employees of the same socioeconomic group. Looking at 20-year $150,000 term policies, with repeated simulations I find that 77.5 percent of University employees age 45 and younger in 2014 could have saved money by purchasing a term policy rather than ESLI. Furthermore, 43.4 percent could have saved more than $1,000 by purchasing a term policy rather than supplemental ESLI. The average savings is $1,680 or 42.0 percent for employees age 45 and younger that faced lower costs in the term market. Table 4 shows the proportion of University employees that could get cheaper coverage through the term market conditional on term length and face value. As expected, as the face value increases the fixed costs associated with underwriting become less important making term comparatively cheaper per unit. Longer terms are only advantageous given that the term does not exceed normal retirement age when term life insurance become increasingly expensive. Overall, it appears that there are significant potential savings for a large portion of employees at the University by purchasing term life insurance rather than supplemental ESLI.

In addition to cheaper coverage, another advantage of term life insurance is the policy is only contingent on premium payments. In contrast, ESLI coverage is conditional on employment at the given institution. For example, if an individual has ESLI coverage but switches jobs, he or she will generally not be able to continue the same coverage.[23] If the new employment does not offer ESLI the individual will need to turn to the term market for coverage. If an individual purchases term coverage later in life (due to lapsing ESLI coverage) he or she is more likely to have some medical condition that triggers higher rates. Therefore, the conditional nature of ESLI should also influence employees to purchase term coverage rather than ESLI.

Even though there are significant potential savings depending on the employee's age, term of the policy, and face value, there are higher fixed costs associated with term life insurance relative to supplemental ESLI. Supplemental ESLI has the advantage of payroll deductions, simplified choice set, and no medical underwriting. The implicit costs associated with determining the correct policy from a wide array of options, in addition to the inconvenience of medical exams and intrusive questions might be a rational justification of purchasing the simplified ESLI policy. Nonetheless, the significant savings from the term market have the potential to overcome these costs. Overall, the nature of ESLI in addition to the existence of the term market allows for significant adverse selection in the ESLI market.

[23]As explained earlier, there are some options that allow employees to continue coverage, but they are more expensive and/or require a change in insurance type.

V. Empirical Models

A. Positive Correlation Test

To gauge the existence of adverse selection in the ESLI market, I use the commonly implemented positive correlation test (Cawley and Philipson, 1999; Chiappori and Salanie, 2000; Harris and Yelowitz, 2014; Finkelstein and McGarry, 2006; Einav, Finkelstein and Cullen, 2010). The model tests if individuals that are more likely to use insurance are also more likely to purchase coverage. A positive correlation indicates either the existence of moral hazard or adverse selection. Moral hazard is minimal given the steep requirement to receive a payout along with policy exemptions for suicide.[24] Consequently, a "positive correlation" finding is likely indicative of adverse selection. Inasmuch as moral hazard is present, it will bias the results toward finding more adverse selection. The model is given by:

$$Supplemental\ ESLI_i = \beta_0 + \beta_1 ProbDeath_i + \beta_2 AgeBin_i + \beta_3 X_i + \varepsilon_i \tag{1}$$

where $Supplemental\ ESLI_i$ is one if they have any supplemental coverage and zero otherwise. $ProbDeath_i$ is the imputed probability of death from the CDC and ACS. $AgeBin_i$ is an indicator for individual i's age bin that corresponds with the premiums bins. X_{it} is a vector of covariates that include gender, race/ethnicity, marital status, children, faculty/staff, main campus/healthcare, annual salary. If β_1 is greater than zero, then there is evidence of adverse selection.

The specification that excludes the X vector of covariates is commonly used to gauge the existence of adverse selection. In a sense, the specification tests for the adverse selection from any source that is not explicitly underwritten, but does not get at deliberate selection (i.e. individuals selecting coverage because they are higher risk). For example, the more educated could elect coverage because of the increased realization of needed coverage. However, higher education is also correlated with lower probability of death. This would result in the finding of advantageous selection. Consequently, the uncontrolled specification picks up both coincidental and deliberate selection.

The specification that includes the X vector, helps test for deliberate adverse selection. After controlling for characteristics that might be correlated with preferences for coverage (sex, race/ethnicity, position, salary, and dependents) then any remaining effect of probability of death on life insurance elections would be coming from deliberate adverse selection (i.e. selecting coverage because of the recognition of increased risk).

B. Welfare Estimation

The positive correlation test is useful for identifying selection issues but falls short of estimating the welfare consequences of asymmetric information. In addition, even after controlling for covariates, the positive correlation test still compares individuals that want coverage to those individuals that potentially have little need for life insurance (e.g. no children or dependents). The second model estimates the cost of adverse selection using

[24]Most life insurance policies exclude payouts from suicide within a specified time frame from purchase. At the University, the policy will not payout for deaths caused by suicide within 2 years of purchasing the policy.

price variation that originates for discontinuous pricing commonly used in ESLI. Consequently, the model estimates adverse selection coming from changes to the pool of insured employees as prices changes. This measure will estimate dynamic adverse selection, which is not captured by the positive correlation test.[25] The positive correlation test compares individual that have coverage to those that do not have coverage. This metric compares the average cost of the pool of employees that had coverage prior to the premium increase to the average cost of the endogenous sample of employees that have coverage following a premium increase.

Similar to other goods commonly modeled, demand for life insurance is a function of price. However, unlike traditional goods, the average cost faced by the insurance company is a function of the composition of purchasers and not just the quantity. Consequently, the average cost is a function of the price. Einav, Finkelstein and Cullen (2010) show that a measure of welfare loss can be obtained in an insurance market if there is sufficient price variation to identify the demand and average cost curves. They further illustrate that estimates of the demand and average cost curves enable derivation of the marginal cost curve. The authors derive efficiency and equilibrium conditions under the assumption of perfect competition using the estimated demand, average cost, and marginal cost curves.

The source of price variation used to identify both the demand and cost curves comes from age bins that determine premiums in the ESLI market at the University. Figure 4 shows the discontinuous prices that jump at 5-year increments for University employees. In contrast, both term premiums and probability of death increase smoothly with age. Therefore, the discontinuous jumps in ESLI pricing do not accurately reflect actuarial adjustments for a *one year* increase in age and can be used as exogenous price variation. For example, an individual that ages from 44 to 45 experiences a slight (almost negligible) increase in the probability of death whereas the ESLI premium increases by 50 percent.

For this analysis, I use employees that are employed continuously for 5 years around the premium change (2 years before, the year of, and 2 years after the price change). However, I exclude the observation for the year of the premium increase for the employee. The premium change goes into effect starting the month after the employee's birthday, elections only occur at the start of the fiscal year, employees may decrease coverage at any point in time, and the data is reported annually. All of these factors make it unclear whether an employees that exhibits adverse selection should drop coverage in the year of the premium increase. For example, I include observations for employees who I see from age 48 to 52 but I omit the employee's observation at age 50. Given the small window, it is unlikely that there are other discontinuous changes to demand for life insurance other than the change through the premium.

C. Demand Estimation

The price changes allows for a simple approach to the demand estimation. All covariates such as gender, marital status, income, are orthogonal to the price change. Therefore, their inclusion should not affect the slope coefficient for the demand estimation. As well, Einav, Finkelstein and Cullen (2010) prescribe only using variables that are explicitly priced by the insurance company. With that in mind, the following fixed effects equation will be used to estimate demand for ESLI:

[25]See He (2011) for an example of dynamic adverse selection.

$$D_{it} = \beta p_{it} + \tau age_i + a_i + \varepsilon_{it} \tag{2}$$

where D_{it} is an indicator variable for having supplemental life insurance, p_{it} is the annual premium per \$1,000 in coverage, age_i is the employee's age, and a_i is the individual fixed effect. The model presented here uses the extensive margin—whether one has supplemental ESLI or not— as the measure of life insurance participation.[26]

D. *Cost Estimation*

To estimate the average cost, I use the probability of death measure multiplied by the payout for the median policy (\$100,000). Ideally, the model could take into account the continuous nature of supplemental ESLI election, but in order to be consistent with the demand estimation (due to model limitations), I use the median level of coverage. Additionally, to verify that any increased average costs are not a result of increased probability of death from aging, I keep the probability of death metric constant across the 5 years surrounding the change. For example, the probability of death measure used is the same for a 44-year old employees as for a 46-year old employee holding other characteristics constant. If not, merely aging two years would modestly increase the probability of death and would bias the results toward finding adverse selection.

The following equation relies on the same identifying assumption used in the demand estimation. However, in contrast to the demand estimation, the cost estimation includes only the endogenous sample of employees with supplemental ESLI. This allows the model to capture the change in average cost of the endogenously selected sample due to the change in premium. The model is given by:

$$C_{it} = \Gamma + \delta p_{it} + \lambda AgeBin_i + u_{it} \tag{3}$$

where C_{it} is the expected cost per individual with a supplemental life insurance policy of \$100,000 and p_{it} is once again the annual premium per \$1,000 in life insurance coverage. $AgeBin_i$ is a vector of indicator variables for the age bins surrounding the price changes. A positive δ indicates that as premiums increase, the average cost of remaining endogenous sample of life insurance holders has increased relative to the average cost of life insurance holders prior to the premium increase. A positive coefficient would therefore indicate adverse selection (the relatively unhealthy individuals are more likely to keep coverage with an increase in premiums). Changes in the composition of faculty/staff, race, gender, etc. are not controlled for as these changes are what constitute the selection the specification is meant to estimate.

E. *Welfare Calculations*

The estimated demand and average costs curves are given respectively by $D = \alpha + \beta p$ and $C = \gamma + \delta p$ where α is the average fixed effect plus $\tau \cdot E[age_i]$ and γ is defined as

[26] The framework does not support continuous measures of insurance. The assumption that individuals react by turning off coverage rather than reducing coverage seems reasonable given the relatively small cost of coverage. For the University, of those that decrease coverage 48.0 percent completely turn off supplemental coverage. Therefore, this model does fail to capture the full influence of selection due to the changing premium.

$\Gamma + \lambda * E[AgeBin_i]$. Given the demand and average cost curves, the marginal cost curve can be derived as shown in Einav, Finkelstein and Cullen (2010) by the following expression:

$$MC(p) = \frac{\partial TC(p)}{\partial D(p)} = \frac{\partial(AC(p) \cdot D(p))}{\partial D(p)} = \left(\frac{\partial D(p)}{\partial p}\right)^{-1} \frac{\partial(AC(p) \cdot D(p))}{\partial p} \tag{4}$$

Substituting the estimated coefficients yields:

$$MC = \frac{1}{\beta}\left(\frac{\partial(\alpha + \beta p)(\gamma + \delta p)}{\partial p}\right) = \frac{\alpha\delta}{\beta} + \gamma + 2\delta p \tag{5}$$

Using the equilibrium condition $AC(p)$=p with the estimated cost gives P_{eq}=$\gamma/(1-\delta)$ and consequently Q_{eq}=$\alpha + \beta(\gamma/(1-\delta))$. Equation (5) and the efficiency condition $MC(p)$=p yield P_{eff}=$1/(1-2\delta)(\frac{\alpha\delta}{\beta} + \gamma)$ and consequently Q_{eff}=$\alpha + 1/(1-2\delta)(\alpha\delta + \beta\gamma)$.

Combining the equilibrium conditions gives the following equation that measures the efficiency cost due to adverse selection.

$$DWL = \frac{1}{2}(Q_{eff} - Q_{eq})(P_{eq} - MC(P_{eq})) = \frac{-\delta^2}{2(1-2\delta)\beta}\left(\alpha + \frac{\beta\gamma}{1-\delta}\right)^2 \tag{6}$$

VI. Results

A. Positive Correlation Test

Table 5 presents the results from the positive correlation test for the University from equation (1) for 2014.[27] On the extensive margin, the first column shows that a one standard deviation increase in probability of death results in a 5.6 percentage point decrease in the probability of having supplemental coverage indicating advantageous selection, not adverse selection. After controlling for family and socioeconomic variables, the coefficient for probability of death becomes statistically insignificant. The intensive margin (using multiple of income) leads to similar conclusions of either advantageous selection or no selection.

Even though adverse selection is not present for the entire population, it is possible that more educated employees respond to differences in probability of death. Table 6 illustrates that as probability of death increases, faculty members are more likely to increase supplemental ESLI coverage consistent with adverse selection. Therefore, the overall effect of adverse selection is negated by staff not responding to higher risk of death by having increased levels of life insurance coverage.

B. Welfare Analysis

In order to gauge any welfare loss associated with adverse or advantageous selection I apply the framework of Einav, Finkelstein and Cullen (2010) as previously described. The first column of Table 7 gives the results for the demand estimation from equation (2). As

[27] I use 2014 data as it is the most recent year, but the main result is robust to preforming the positive correlation test on other years.

shown, a \$100 increase in annual premiums result in a 2.5 percentage point decrease in supplemental ESLI participation. The inelastic response seems reasonable given the budget share associated with life insurance coverage and inertia from past decisions (Harris and Yelowitz, 2016). The second column of Table 7 presents the results from estimating the average cost. The estimation implies that a \$100 increase in the annual premium causes the average cost per employee to increase by \$3.03. The statistically significant positive coefficient on premiums in the second column indicates adverse selection; as premiums increase the endogenously decreased sample of insured employees has a higher average cost than before the premium increase.

Using the framework previously described, I use the demand and average cost estimation to determine welfare loss. The bottom panel of Table 7 and Figure 5 report the equilibrium and efficient prices and quantities using the framework of Einav, Finkelstein and Cullen (2010). As shown, the equilibrium quantity is only slightly less than the efficient quantity with a difference of only 2 percentage points. However, the equilibrium price of \$308 is considerably higher than the efficient price of \$230 due to adverse selection. While the difference between the efficient and equilibrium premiums are economically significant, the resulting welfare loss is economically insignificant at a cost of only \$0.71 per employee per year. For comparison, Einav, Finkelstein and Cullen (2010) estimate the welfare loss of ESHI at Alcoa to be \$9.55, which they describe as "quantitatively small."

VII. Discussion: Why is there not more Adverse Selection?

Given that the positive correlation tests show no evidence of adverse selection and the dynamic adverse selection has negligible welfare costs from adverse selection, the question remains as to why there is not a greater selection issue. A possible explanation for the lack of adverse selection is a negative correlation between risky behaviors and risk aversion (Anderson and Mellor, 2008). Cutler, Finkelstein and McGarry (2008) find that individuals that engage in risky behavior (smoking) are less likely to purchase term life insurance. In addition, they find that those that take part in preventative medical care and that always wear seat belts are more likely to purchase term life insurance. However, unlike ESLI, term life insurance is directly priced based on smoking status and frequently priced based on alcohol consumption. Therefore, some of the relationship is likely caused by underwriting and rejection of risky applicants. Inasmuch as there is a negative correlation between risky behaviors and risk aversion it could help explain the lack of adverse selection.

Nonetheless, the guaranteed issue with ability to increase coverage and the existence of the individual life insurance market still has a great potential of causing debilitating adverse selection in the ESLI market. In this section, I directly examine these two mechanisms.

A. Anticipatory Responses to Death

As discussed, death can be a random event such as a car accident, but many deaths at the University are likely anticipated. How do employees react in the years preceding death? Although the University data is incomplete with regards to mortality of employees, the data does contain information on 106 total observed deaths from 2006 to 2014.[28]

[28] I use data from 2006 and 2007 in this section in order to increase the sample size. These two years were excluded earlier due to a policy change that increased basic coverage starting in 2008 that could potentially confound the interpretation of the results.

I analyze the response of full-time employees in the last year of life. Theory suggests that they should be more likely to increase coverage and also more likely to have the maximum face value allowed under guaranteed issue. Of the 106 employees that I observe elections, only 10 had the maximum guaranteed issue amount of coverage. Of the 89 employees for whom I observe 2 years worth of elections, only 8 increase coverage in the last year of available increased coverage. Additionally, for the 69 employees that I observe 3 years worth of elections prior to death that were unconstrained by the GI limit, none increased coverage consecutively for the last two year of available increased coverage.

To see if these elections differ from similar employees that did not die in the sample period, I estimate the average treatment effect using nearest neighbor matching (NNM) based on age, salary, race, employment position, marital status, children, and exact matching with gender and year. The results, presented in Table 8 indicate that individuals that die are not more likely to have coverage, increase coverage in the last year, or have the maximum guaranteed coverage.

A possible reason for why individuals did not increase coverage is that death was unanticipated (accidental, sudden heart attach, etc.). However, as explained, there is a nontrivial amount of employees that likely anticipated death. Another possible explanation is a moral objection to increasing deathbed coverage. Although this might apply to a small minority of employees it is likely that when faced with the decision of preserving profits for a multi million dollar corporation or leaving a sizable bequest to dependents most employees would ramp up coverage.

Perhaps the most likely reason for the lack of increase in the year preceding death is Accelerated Death Benefits (ADB). As highlighted by Finkelstein and Poterba (2004), detailed features of insurance contracts—such as ADB—are important for understanding adverse selection. ADB or “living benefits” allow employees with a terminal diagnosis to receive a portion of the life insurance payout prior to death in a lump sum payment. The remaining portion is paid to the beneficiary at the time of death. For the University, employees may receive up to 75 percent of the face value of the policy conditional on a life expectancy of less than a year.[29] These ADB are attractive for employees that have liquidity constraints, medical costs, and the loss of a bequest motive (Januário and Naik, 2013). Employees that do not qualify for ADB or long-term disability, may consider converting their insurance to a permanent life insurance policy which can be sold to receive a viatical or life settlement. These settlements involve an investor purchasing the policy at a discount and then receiving the payout at the time of the individual’s death. This process helps reduce the ‘job lock” associated with employer-sponsored insurance and allows employees to quit work earlier and still be able to cover medical costs and pay for health insurance.[30] If employees use either ADB or viatical settlements, then the employee forgoes the option of increasing coverage prior to death consequently lessening adverse selection from anticipated deaths.

B. Market Interaction: Term and Supplemental ESLI

As discussed, another potential contributer of adverse selection in the ESLI market is the availability of the term life insurance market. The University data does not have information

[29] At the University, an employee must be employed for 60 days and be certified as Terminally Ill with a life expectancy of less than a year. The employee must be insured for more that $20,000 and can request a maximum of $500,000.

[30] United States Government Accountability Office (2010) report references estimates between $9 and $12 billion for total face values settled through life settlements in 2008.

on term life insurance coverage. Therefore, to test the hypothesis that healthier individuals avail themselves of the term market (experience rated) in lieu of supplemental ESLI, I turn to a sample of federal employees from the SIPP. This sample is unique in that I can identify individuals who elected supplemental ESLI and those that elected individual term life insurance.

This secondary dataset is constructed using nine panels of the SIPP ranging from 1990 to 2008. The SIPP has been used in several recent studies on life insurance (Harris and Yelowitz, 2014, 2015, 2016; Hedengren and Stratmann, 2016). While the survey does explicitly ask about ESLI coverage, it does not differentiate between basic and supplemental elections. Consequently, I cannot use the full SIPP sample to analyze who purchases term life insurance coverage rather than supplemental ESLI. Nonetheless, the survey does ask about employment through the federal government, which is the largest provider of ESLI in the United States. Information is readily available regarding the level of basic coverage for Federal Employees' Group Life Insurance (FEGLI). Consequently, supplemental ESLI participation may be implied from the difference between total ESLI coverage and the basic amount provided for federal employees.[31]

FEGLI has several different options for ESLI. Basic is automatically received by all employees unless the individual waves coverage. Basic coverage is equal to 1x the employee's annual salary plus $2,000. The employer pays for one-third of the cost of coverage and the employee pays the remaining two-thirds equal to $0.15 biweekly for each $1,000 of your Basic Insurance Amount (BIA).[32] The employee's age does not affect the cost of basic insurance. However, employees under age 35 receive an "extra benefit" equal to double the BIA. This amount is linearly reduced until the employee is 45 and receives no extra benefit. The employee does not pay any additional premiums for the extra benefit essentially making basic coverage cheaper per unit for younger employees.

Federal employees have two options for supplemental coverage. Option A gives $10,000 in coverage with premiums based on 5-year age bins. Through Option B, employees may elect between 1x and 5x annual salary with premiums based on 5-year age bins similar to the structure of ESLI at the University. Presumably with the intent of curbing adverse selection, outside of a qualifying event or initial hiring employees may only change coverage during infrequent open seasons.[33] In addition ESLI elections made during open seasons do not become effective until one year latter. These two aspects should greatly reduce or eliminate adverse selection from employees with terminal illnesses increasing coverage prior to death. This is in contrast to the University's ELSI policy which allows for annual increases with quick implementation of increased coverage. Similar to University coverage, FEGLI coverage can be converted to whole life insurance policies after leaving employment. However, FEGLI is not portable (cannot continue group coverage after leaving). Also, in contrast to ESLI at the University, ADB are not available for supplemental life insurance for federal employees. This lack of ADB for supplemental ESLI is consistent with the idea that the offering of supplemental ADB for University employees is meant to reduce adverse selection from anticipatory increases in coverage.

From the SIPP, there are 4,400 Federal employees between age 18 and 64. Summary

[31]This approach of identifying a individual employer within survey data has been done using the PSID (Shea, 1995).

[32]Employees of the U.S. post office have basic coverage at no cost to them. There is no identifier in the SIPP that allows for identification of postal workers.

[33]The most recent open seasons occurred in 1999, 2004, and 2016.

statistics are presented in Table 9. The sample is comparable in age and income with the University sample, but has a greater percent male. The sample also has more married individuals and more that have children possibly coming from the under representation in the University data as these metrics are inferred though elections for the University sample. In addition to the variables available through the University, the SIPP has metrics on household net worth, and for the 1996-2008 panels self-reported health status. The SIPP also asks about total life insurance holdings, which in conjunction with total ESLI coverage gives total individual life insurance coverage. For the federal employees, 80 percent had some life insurance, 64 percent had ESLI, and 39 percent had individual life insurance. Of those with life insurance coverage, 51 only had ESLI, 20 only had individual, and the remaining 29 had both types of coverage.

For comparability with the finding presented for University employees, I preform the positive correlation test on the sample of federal employees in the SIPP. Table 10 presents the results from the positive correlation test and shows no evidence of adverse selection and some evidence of advantageous selection along both intensive and extensive margins. These finding are consistent with the findings from the University data.

Even though the positive correlation test on federal employees makes the findings from the University more robust, the main reason for introducing the SIPP data is to test the interaction between term life insurance and supplemental ESLI. To do this, I further restrict the sample to federal employees to individuals that either elected supplemental ESLI or term life insurance.[34] Table 11 compares those that elect term coverage with those that elect supplemental ESLI. As shown, those who elect term life insurance are more educated and have higher earnings and net worth. In addition, the face value of the policy is larger for those that elect term life insurance possibly coming from insuring higher incomes.[35] However, there is no statistical difference between the self-reported health of the two groups.

The following model formally tests the hypothesis that individuals are less likely to have supplemental ESLI who face lower premiums in the term life insurance market.

$$Term_i = \theta_0 + \theta_1 TermPrem_i + \theta_2 X_i + e_i \tag{7}$$

$Term_i$ is an indicator variable for having term life insurance rather than supplemental ESLI (since the sample only consists of those with supplemental ESLI or term life insurance). $TermPrem_i$ is the premium that the individual would face in expectation in the term life insurance market imputed using term4sale.com and BRFSS data.[36] The term premium is a metric that not only is a measure of the explicit cost of term life insurance, but it also captures the insurance company's assessment of risk for the individual. A negative

[34]Employees that selected both options account for 11.8 percent of employees with supplemental or term life insurance. These employees could represent individuals that had term coverage, had a negative health shock and then elected additional coverage through the employer. Alternatively, employees could have both types of life insurance to diversify their life insurance portfolio. Another possible option is that employees had the maximum allowed under ESLI and turned to the individual market to have the desired level of coverage even though the individual market had higher premiums. Given the structure of FEGLI, individuals are automatically enrolled in basic life insurance and have to actively opt out. Even though employees mostly pay for this coverage, inertia could cause employees to not opt out of basic coverage even though they elect term life insurance coverage. Consequently, I define extra coverage to be supplemental ESLI or term life insurance even though since individuals pay for basic it is technically optional.

[35]See appendix Figure A2 for the distribution of additional coverage for federal employees.

[36]The measure is obtained by running the full BRFSS sample through the term4sale.com quoting system and then averaging the premium for each socioeconomic group determined by income bin, gender, race/ethnicity, education, age, and for later panels self-reported health status. This average is then applied to each federal employee within the socioeconomic group.

coefficient for θ_1 would provide evidence for adverse selection originating from the option for term life insurance. The covariates, X_i, include age bin (which corresponds to the pricing for supplemental premiums), gender, income, race, marital status, children, net worth. In addition, X_i includes the face value of the additional policy. As the face value increases, ceteris paribus, the term policy is relatively cheaper for the healthy as the fixed costs of underwriting become less important.

The first column of Table 12 presents the results from estimating equation (7). The results in the first column indicate that term premiums do not significantly influence the decision to purchase term life insurance rather than supplemental ESLI.[37] Consistent with decreasing per unit costs of term life insurance, as the face value of the policy increases, employees are more likely to get term coverage rather than supplemental ESLI. Males are less likely to elect term life insurance and those with greater net worth are more likely to purchase a term policy. For robustness, in the latter two columns I include estimation that uses the constructed probability of death measure and self-reported health status respectively as the main independent variables.[38] The results from these two specifications are consistent with the findings from the main specification.[39]

This result begs the question of why individuals do not take advantage of these potential savings. Possible explanations include salience of term life insurance, convenience of supplemental ESLI, and time costs of supplemental coverage. A recent study found that 80 percent of Americans misjudged the cost of life insurance (LIMRA, 2015*a*). Another reason to elect the more expensive supplemental ESLI coverage is the simplified decision in contrast to the individual market with numerous types and variants of policies (e.g. term length, face value, company).

Another potential reason why individuals do not purchase more term coverage is the complexity in comparing the products. Many individuals struggle to correctly answer even rudimentary financial questions (Lusardi and Mitchell, 2006, 2007), which might cause them to incorrectly compare the two coverage options. The most common form of term life insurance is level term which has constant premiums for the life of the policy. Consequently, premiums are inherently front loaded because of inflation and the fact that individual risk increases with age. Therefore, a naive or myopic consumer might compare the premiums in the first year rather than comparing the present value of premiums for the entire policy. In many circumstances, this type of comparison would lead to the incorrect conclusion that supplemental ESLI is cheaper than term life insurance.

One potential concern for this analysis is the timing of life insurance purchases. This analysis uses a cross-section, which might miss information. For example, individuals could have purchased term coverage at a younger age when they were healthy and could get a cheaper policy, yet when they appear in the sample their health could have deteriorated. Ideally, I would restrict the sample to new federal employees that did not have life insurance coverage prior to taking the position to see if they elect term or supplemental ESLI. Nonetheless, sample sizes for federal employees in the SIPP are prohibitively small for such an analysis. Given the uncertainty of job duration and ESLI at a subsequent employer,

[37]For this specification I restrict the sample to panels 1996 to 2008 for whom there is self-reported health. This limits the measurement error associated with imputing self-reported health used by term4sale.

[38]Self-reported health is useful because it captures both knowledge of health status as well as individual interpretation (Wallace and Herzog, 1995).

[39]These results are also robust to excluding employees with life insurance policies that exceed the maximum coverage available through FEGLI who might have selected term coverage because they could not elect the desired level of coverage through ESLI.

an alternative explanation could be that employees in worse health have increased demand for stable coverage and consequently elect term coverage rather than supplemental ESLI. Regardless of the reason for the selection, there does not appear to be adverse selection in supplemental ESLI coming from healthy employees purchasing term life insurance instead of supplemental ESLI coverage.

VIII. Conclusion

Supplemental ESLI provides a a textbook example of a market that could have potentially devastating adverse selection. Premiums are community-rated, coverage is mainly guaranteed issue, individuals can increase coverage after a negative health shock, and there exists a competitive term life insurance market that offers lower premiums for the healthy. All of these features of supplemental ESLI should exacerbate adverse selection. Nonetheless, using two different estimation techniques, I find no evidence of significant adverse selection in the supplemental ESLI market and some evidence of advantageous selection.

To reconcile these results, I tested the influence of the term life insurance market and anticipatory increases in coverage prior to death. The results indicate that the term life insurance market does not significantly influence selection of supplemental ESLI. Additionally, I do not find evidence that individuals increase coverage prior to death even when the coverage is guaranteed issue. A possible explanation for this finding is the availability of accelerated death benefits, which allow families to receive payouts prior to the death of the breadwinner.

These results shed light on the effectiveness of some policies designed to curb adverse selection in ESLI. For example, FEGLI limits employees to electing coverage during rare open seasons likely to deter adverse selection. Given the results, this federal policy might be unnecessarily restrictive. If so, there would be welfare loss from restricting employees that might want more coverage due to changing preferences rather than private health information.

REFERENCES

American Council of Life Insurers. 2015. "2015 Life Insurance Fact Book." https://www.acli.com/Tools/Industry%20Facts/Life%20Insurers%20Fact%20Book/Documents/FB15_All.pdf.

Anderson, Lisa R, and Jennifer M Mellor. 2008. "Predicting Health Behaviors with an Experimental Measure of Risk Preference." *Journal of health economics*, 27(5): 1260–1274.

Bernheim, B. Douglas, Lorenzo Forni, Jagadeesh Gokhale, and Laurence J. Kotlikoff. 2003. "The Mismatch between Life Insurance Holdings and Financial Vulnerabilities: Evidence from the Health and Retirement Study." *American Economic Review*, 93(1): 354–365.

Brown, Jeffrey R., and Austan Goolsbee. 2002. "Does the Internet Make Markets More Competitive? Evidence from the Life Insurance Industry." *Journal of Political Economy*, 110(3): 481–507.

Cardon, James H, and Igal Hendel. 2001. "Asymmetric Information in Health Insurance: Evidence from the National Medical Expenditure Survey." *RAND Journal of Economics*, 408–427.

Cawley, John, and Tomas Philipson. 1999. "An Empirical Examination of Information Barriers to Trade in Insurance." *American Economic Review*, 89(4): 827–846.

Chetty, Raj, John N. Friedman, Søren Leth-Petersen, Torben Heien Nielsen, and Tore Olsen. 2014. "Active vs. Passive Decisions and Crowd-Out in Retirement Savings Accounts: Evidence from Denmark." *Quarterly Journal of Economics*, 129(3): 1141–1219.

Chiappori, Pierre-André, and Bernard Salanie. 2000. "Testing for Asymmetric Information in Insurance Markets." *Journal of political Economy*, 108(1): 56–78.

Conning, Inc. 2014. "2014 Life-Annuity Consumer Markets Annual." *https://www.conning.com/pressrelease-detail.aspx?id=10477*.

Cutler, David M. 2002. "Health Care and the Public Sector." *Handbook of Public Economics*, 4: 2143–2243.

Cutler, David M., Amy Finkelstein, and Kathleen McGarry. 2008. "Preference Heterogeneity and Insurance Markets: Explaining a Puzzle of Insurance." *American Economic Review*, 98(2): 157–62.

Cutler, David M., and Sarah J. Reber. 1998. "Paying For Health Insurance: The Trade-Off Between Competition And Adverse Selection." *The Quarterly Journal of Economics*, 113(2): 433–466.

Einav, Liran, Amy Finkelstein, and Mark R. Cullen. 2010. "Estimating Welfare in Insurance Markets Using Variation in Prices." *The Quarterly Journal of Economics*, 125(3): 877–921.

Finkelstein, Amy, and James Poterba. 2004. "Adverse Selection in Insurance Markets: Policyholder Evidence from the UK Annuity Market." *Journal of Political Economy*, 112(1): 183–208.

Finkelstein, Amy, and Kathleen McGarry. 2006. "Multiple Dimensions of Private Information: Evidence from the Long-term Care Insurance Market." *American Economic Review*, 96(4): 938–958.

Hambel, Christoph, Holger Kraft, Lorenz Schendel, and Mogens Steffensen. 2015. "Life Insurance Demand under Health Shock Risk." *Working Paper*, http://ssrn.com/abstract=2392384.

Harris, Timothy F., and Aaron Yelowitz. 2014. "Is there Adverse Selection in the Life Insurance Market? Evidence from a Representative Sample of Purchasers." *Economics Letters*, 124(3): 520–522.

Harris, Timothy F., and Aaron Yelowitz. 2015. "Racial Disparities in Life Insurance Coverage." *Working Paper*, http://ssrn.com/abstract=2600328.

Harris, Timothy F., and Aaron Yelowitz. 2016. "Nudging Life Insurance in the Workplace." *Economic Inquiry Forthcoming*, http://ssrn.com/abstract=2671846.

He, Daifeng. 2009. "The Life Insurance Market: Asymmetric Information Revisited." *Journal of Public Economics*, 93(9-10): 1090–1097.

He, Daifeng. 2011. "Is There Dynamic Adverse Selection in the Life Insurance Market?" *Economics Letters*, 112(1): 113–115.

Hedengren, David, and Thomas Stratmann. 2016. "Is there Adverse Selection in Life Insurance Markets?" *Economic Inquiry*, 54(1): 450–463.

Insurance Information Institute. 2014. "Industry Overview." *http://www.iii.org/fact-statistic/industry-overview*.

Januário, Afonso V, and Narayan Y Naik. 2013. "Empirical Investigation of Life Settlements: The Secondary Market for Life Insurance Policies." *Working Paper*, http://ssrn.com/abstract=2278299.

Kotlikoff, Laurence J, and David A Wise. 1987. "The Incentive Effects of Private Pension Plans." In *Issues in pension economics*. 283–340. University of Chicago Press.

LIMRA. 2015*a*. "2015 Insurance Barometer Study Finds Americans Continue to Overestimate Cost of Life Insurance." *http://www.limra.com/Posts/PR/News_Releases/2015_Insurance_Barometer_Study_Finds_Americans_Continue_to_Overestimate__Cost_of_Life_Insurance.aspx*.

LIMRA. 2015*b*. "Facts of Life: Life Insurance Available through the Workplace." *http://www.limra.com/uploadedFiles/limra.com/LIMRA_Root/Posts/PR/_Media/PDFs/2015-LIAM-fact-sheet_Group.pdf*.

LIMRA. 2015*c*. "Life Insurance Coverage Gap Substantial and Growing." *http://www.limra.com/Posts/PR/Industry_Trends_Blog/LIMRA__Life_Insurance_Coverage_Gap_Substantial_and_Growing.aspx*.

Lusardi, Annamaria, and Olivia S. Mitchell. 2006. "Financial Literacy and Planning: Implications for Retirement Well-Being." *Pension Research Council Working Paper WP2006-01*

Lusardi, Annamaria, and Olivia S. Mitchell. 2007. "Financial Literacy and Retirement Preparedness: Evidence and Implications for Financial Education." *Business Economics*, 42(1): 35–44.

Madrian, Brigitte C. 1994. "Employment-Based Health Insurance and Job Mobility: Is There Evidence of Job-Lock?" *Quarterly Journal of Economics*, 109(1): pp. 27–54.

Prudential. 2013. "The Life Insurance Coverage Gap: Strategies for Financial Professionals to Close the Gap." *https://www.lifehappens.org/wp-content/uploads/2015/02/Research_TheLifeInsuranceCoverageGap.pdf*.

Ritter, Joseph A. 2013. "Racial and Ethnic Differences in Nonwage Compensation." *Industrial Relations: A Journal of Economy and Society*, 52(4): 829–852.

Scism, Leslie. 2014. "Struggling Life-Insurance Companies Look to Middle-Class for Revival." *The Wall Street Journal*

Shea, John. 1995. "Union Contracts and the Life-Cycle/Permanent-Income Hypothesis." *The American Economic Review*, 85(1): 186–200.

United States Government Accountability Office. 2010. "Report to the Special Committee on Aging, U.S. Senate, Life Insurance Settlements - Regulatory Inconsistencies May Pose a Number of Challenges - GAO-10-775."

U.S. Department of Labor. 2015. "National Compensation Survey: Employee Benetis in the United States, March 2015." http://www.bls.gov/ncs/ebs/benefits/2015/ebbl0057.pdf.

Wallace, Robert B, and A Regula Herzog. 1995. "Overview of the Health Measures in the Health and Retirement Study." *Journal of Human Resources*, S84–S107.

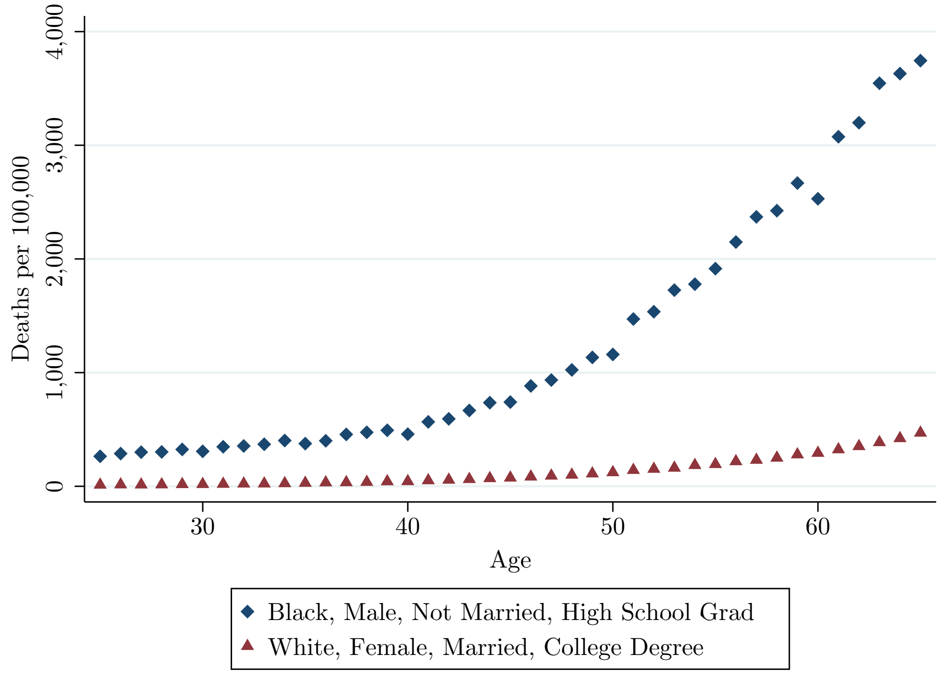

Figure 1. Heterogeneity in underlying probability of death

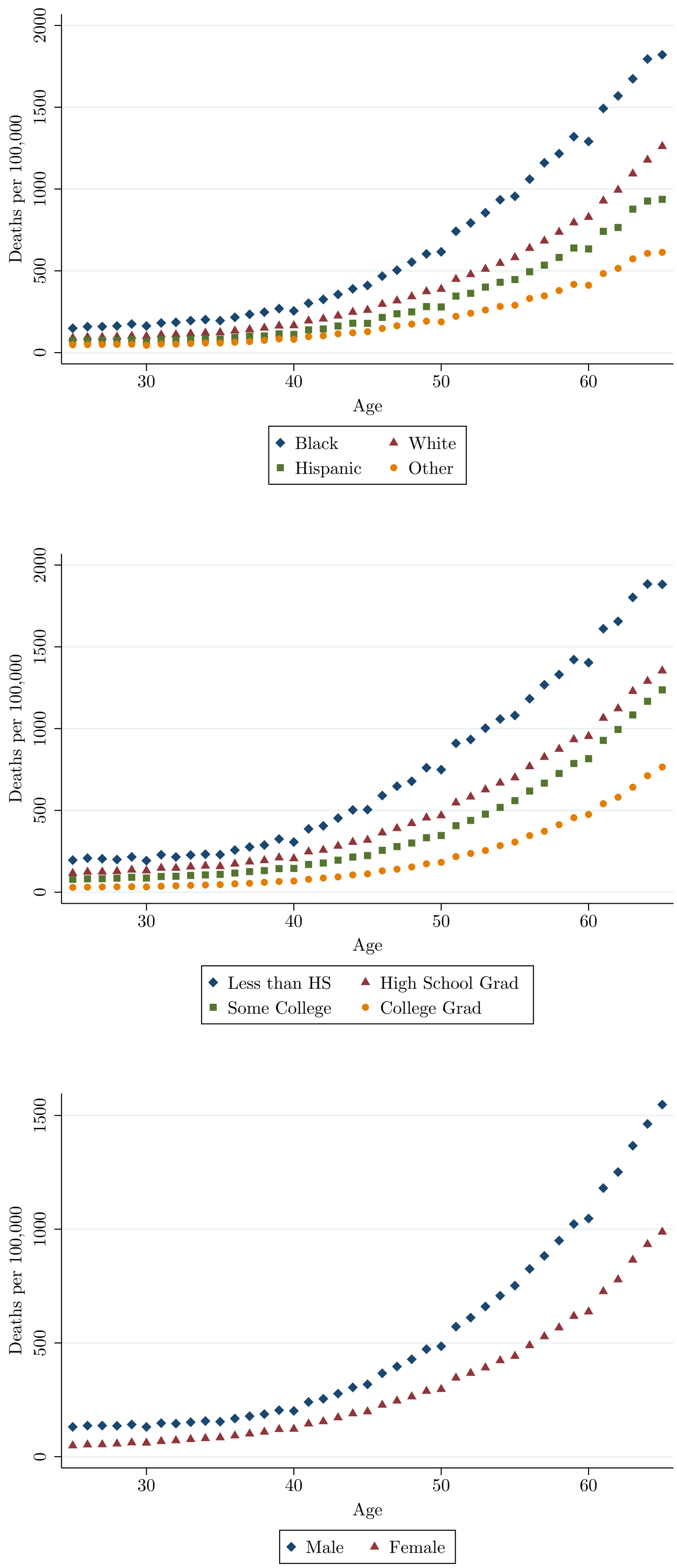

Figure 2. Heterogeneity in Probability of Death

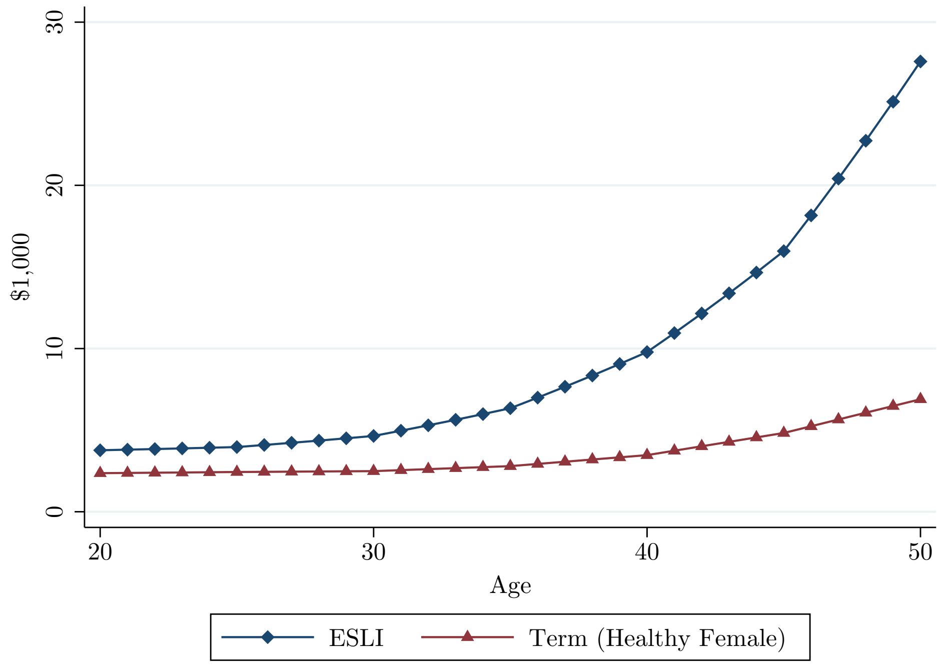

Figure 3. Present value of Premiums for a 20-year $250,000 policy

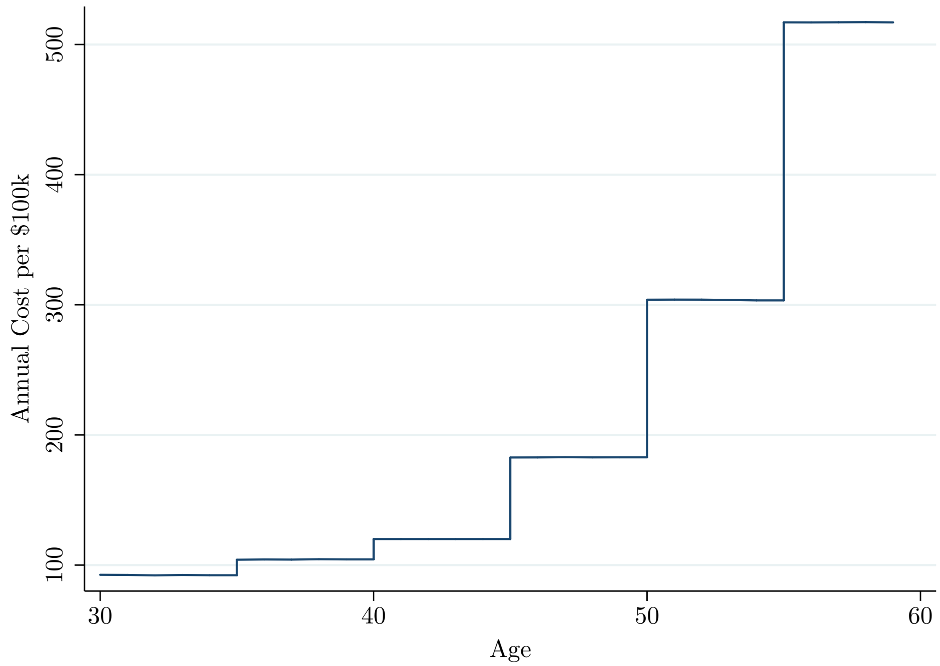

Figure 4. University Supplemental ESLI Premiums

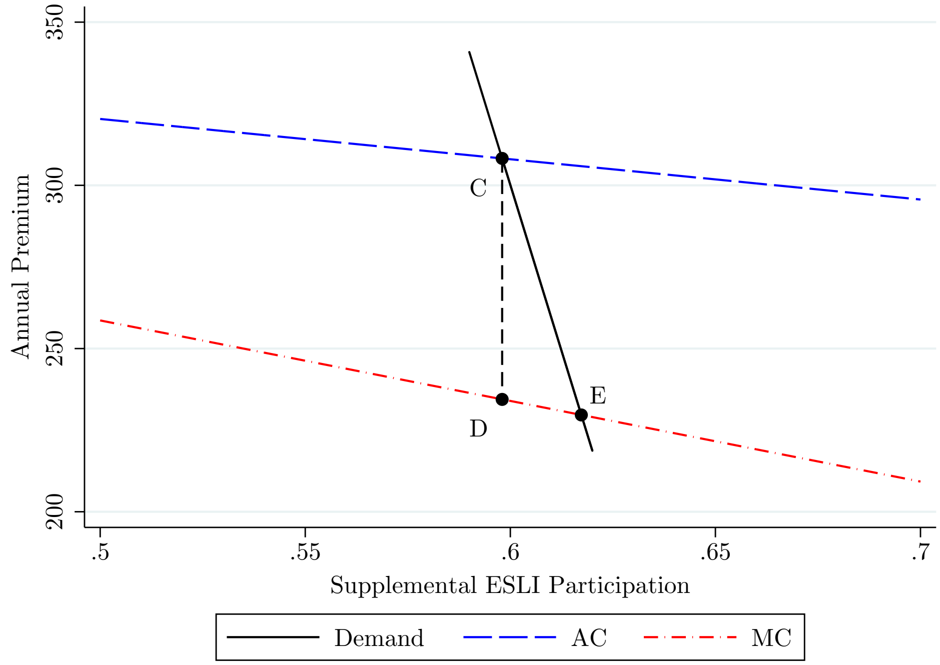

Figure 5. Life Insurance Selection

Table 1—Summary Stats-University Employees

	2008	2009	2010	2011	2012	2013	2014
Demographics							
Age	43.72	43.79	43.74	43.86	43.67	43.85	43.73
Male	0.37	0.37	0.37	0.37	0.36	0.37	0.36
White	0.86	0.86	0.86	0.86	0.86	0.86	0.86
Black	0.10	0.09	0.09	0.09	0.09	0.09	0.09
Other race/ethnicity	0.05	0.05	0.05	0.05	0.05	0.06	0.06
Family							
Ever Married	0.49	0.50	0.49	0.49	0.49	0.48	0.48
Has Child	0.47	0.48	0.48	0.49	0.49	0.50	0.49
Employment							
Faculty	0.16	0.17	0.17	0.17	0.17	0.17	0.17
Healthcare	0.27	0.36	0.38	0.38	0.40	0.40	0.42
Salary ($1k)	53.41	54.61	55.43	55.77	57.73	59.07	60.96
Supplemental ESLI							
Has Supplemental	0.56	0.54	0.52	0.51	0.50	0.49	0.48
Face Value if >0 ($1k)	140.24	146.81	148.48	151.08	155.75	159.25	164.84
Multiple if >0	2.56	2.63	2.63	2.66	2.67	2.69	2.68
Observations	12,023	12,509	13,112	13,210	13,581	13,630	13,720

Note: The sample includes full-time university employees age 18 to 64 from 2008 to 2014.

Table 2—ESLI Monthly Cost per $1,000 and Percent Change

	Premium	Next Bin (% Δ)
Age<35	$0.08	-
Age 35-39	$0.09	13%
Age 40-44	$0.10	11%
Age 45-49	$0.15	50%
Age 50-54	$0.25	67%
Age 55-59	$0.43	72%
Age 60-64	$0.69	60%
Age 65-69	$1.27	84%
Age 70+	$2.22	75%

Table 3—Simulated Adverse Selection from Cancer 2013

	(1)
Total payout (46 deaths) without time to adjust ESLI ($1)	3,159,946
	(682,885)
Increased total payout from cancer deaths (12/46) if survive for:	
1 open enrollment ($1)	575,766
	(112,056)
2 open enrollments ($1)	1,074,814
	(175,509)
3 open enrollments ($1)	1,460,937
	(235,713)
4 open enrollments ($1)	1,767,627
	(288,021)
5 open enrollments ($1)	1,983,734
	(326,717)
Total premiums collected in 2013	2,970,317
	(.)
Increased total premiums from employees with cancer (475)	366,758
	(15,723)

Note: The sample includes 13,720 employees aged 18 to 64 in 2013. Random sampling weighted by probability of death and probability of dying from cancer for each demographic group (age, race, gender, marital status, faculty/staff) were used to assign deaths. The hypothetical increase in payouts assumes employees will increase coverage until the guaranteed issue limit. Standard errors are shown in parentheses based on 1000 repetitions.

Table 4—Proportion of University Employees who could get term coverage cheaper

Face Value ($1k)	10-year	20-year	30-year
25	0.24	0.31	0.33
50	0.40	0.53	0.45
100	0.79	0.74	0.67
150	0.84	0.85	0.72
200	0.84	0.86	0.75
500	0.91	0.92	0.82
1000	0.93	0.93	0.83

Table 5—ESLI Positive Correlation Test: University Employees 2014

Dependent Variable:	Has Supplemental		Supplemental Multi.	
	(1)	(2)	(3)	(4)
Probability Death (Z-score)	−0.056***	0.005	−0.192***	0.012
	(0.008)	(0.010)	(0.026)	(0.029)
Age 35-39	0.203***	0.145***	0.692***	0.492***
	(0.033)	(0.020)	(0.103)	(0.059)
Age 40-44	0.308***	0.232***	1.060***	0.800***
	(0.036)	(0.021)	(0.122)	(0.067)
Age 45-49	0.338***	0.256***	1.145***	0.864***
	(0.030)	(0.020)	(0.103)	(0.062)
Age 50-54	0.356***	0.266***	1.105***	0.799***
	(0.030)	(0.022)	(0.106)	(0.074)
Age 55-59	0.330***	0.224***	0.924***	0.567***
	(0.029)	(0.026)	(0.093)	(0.082)
Age 60-64	0.281***	0.150***	0.740***	0.289***
	(0.035)	(0.033)	(0.102)	(0.103)
Ever Married		0.152***		0.526***
		(0.015)		(0.046)
Indicator for Children		0.161***		0.543***
		(0.011)		(0.034)
Male		0.004		0.099**
		(0.012)		(0.040)
Black		0.006		−0.130***
		(0.015)		(0.047)
Other Race/Ethnicity		−0.102***		−0.332***
		(0.020)		(0.060)
Faculty		−0.045***		−0.165***
		(0.016)		(0.051)
Healthcare		0.025***		0.077***
		(0.009)		(0.027)
Salary ($10k)		−0.005***		−0.019***
		(0.001)		(0.003)

Note: There are 13,720 observations for each regression. Standard errors are clustered at the demographic level used to match with CDC probability of death (age, gender, marital status, race, and faculty/staff) and are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 6—ESLI Positive Correlation Test: University Employees 2014: Faculty Interation

Dependent Variable:	Has Supplemental (1)	Supplemental Multi. (2)
Probability Death (Z-score)	0.012	0.036
	(0.011)	(0.031)
Probability Death*Faculty	0.067***	0.218***
	(0.025)	(0.073)

Note: There are 13,720 observations for each regression. Controls for age, gender, race/ethnicity, marital status, salary, faculty, and main campus/healthcare were included but not reported. Standard errors are clustered at the demographic level used to match with CDC probability of death (age, gender, marital status, race, and faculty/staff) and are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 7—Estimation Results

Dependent Variable (sample)	1 if has supplemental ESLI (both with and without) (1)	Incremental cost (only with supplemental) (2)
Annual Premium ($100)	−0.025***	3.033**
	(0.003)	(1.380)
Age	0.010***	
	(0.001)	
Age 38-42		35.090***
		(5.995)
Age 43-47		129.986***
		(8.349)
Age 48-52		264.313***
		(11.043)
Age 53-57		432.958***
		(15.259)
Constant	0.208***	105.164***
	(0.045)	(4.510)
Obs.	15,088	9,354
Individuals	3,772	
Mean Dependent Variable	0.620	305.42
Competitive outcome (see Point C in Figure 5)		Q=0.598, P=308.24
Efficient outcome (see Point E in Figure 5)		Q=0.617, P=229.66
Efficiency cost from selection (triangle CDE)		0.71

Note: Sample 1 includes both employes with and without supplemental ESLI. Sample 2 is restricted to employees that endogenously choose supplemental ESLI. Both samples are further restricted to employees that were continuous employed for the year prior to the price change to at least one year after the price change. For example, for the price change associated with turning 50, an employee would need to be continuously employed from age 49 to 51 to be included. The price change occurs on the employees' birthday while elections occur at the start of the fiscal year. Consequently, we drop the observation for the individual in the year of the price change. Standard errors are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$. We clustered at the individual level for the cost estimation.

Table 8—Response to death, Nearest Neighbor Matching

Dependent Variable:	Has Supplemental	Multiple	Increase Coverage	Max Coverage
ATE				
Last Year to Increase	0.008	0.059	0.035	0.039
	(0.077)	(0.214)	(0.040)	(0.025)
Obs.	90,346	90,346	73,364	90,346

Note: 1:1 nearest neighbor matching was used with matching on age, gender, year, salary, race, faculty status, main campus/healthcare, marriage, and children. Standard errors are are clustered at the individual level and shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 9—Summary Stats SIPP-Federal Employees Life Insurance

	(1)
Demographics	
Age	41.45
Male	0.61
White	0.69
Black	0.16
Other race/ethnicity	0.15
Income	
Earned Income ($1k)	59.26
Household Net Worth ($1k)	194.44
Family	
Married	0.68
Has Child	0.60
Education	
Less than High School	0.03
High School Grad.	0.60
College Grad.	0.38
Health	
Excelent	0.36
Very Good	0.35
Good	0.23
Fair	0.04
Poor	0.01
Life Insurance	
Has Life Insurance	0.80
Has ESLI	0.64
Has Individual Life Ins.	0.39
If Life Insurance>0	
Basic	0.20
Basic+Supplemental	0.31
Basic+Individual	0.15
Basic+Supplemental+Indiv.	0.14
Individual	0.20
Value if >0	
Supplemental ESLI ($1k)	157.61
Individual Life ($1k)	170.11
Observations	4,400

The sample includes federal employees between age 18 and 64 from the SIPP. Monetary variables are measured in 2014 dollars.

Table 10—ESLI Positive Correlation Test: Federal Employees

Dependent Variable:	Has Supplemental		Supplemental ($1k)	
	(1)	(2)	(3)	(4)
Probability of Death (Z-score)	−0.026**	−0.004	−9.942***	−4.831**
	(0.013)	(0.017)	(2.091)	(2.434)
Age 35-39	0.040	−0.010	5.989	−5.549
	(0.031)	(0.023)	(6.763)	(5.191)
Age 40-44	0.076**	0.022	12.117*	−1.532
	(0.030)	(0.025)	(6.990)	(5.626)
Age 45-49	0.067**	0.004	14.490*	−1.473
	(0.032)	(0.029)	(7.586)	(6.288)
Age 50-54	0.043	−0.033	4.012	−15.680**
	(0.031)	(0.032)	(7.183)	(6.348)
Age 55-59	0.071*	−0.011	9.018	−13.399
	(0.042)	(0.044)	(8.569)	(8.562)
Age 60-64	0.036	−0.067	−1.651	−28.106**
	(0.056)	(0.061)	(10.668)	(11.201)
Male		0.164***		39.524***
		(0.017)		(3.416)
Black		0.018		−0.196
		(0.022)		(4.741)
Other race/ethnicity		−0.083***		−16.537***
		(0.020)		(4.642)
High School Grad.		0.153***		25.835***
		(0.043)		(6.917)
College Grad.		0.116**		15.154*
		(0.048)		(8.099)
Married		0.217***		48.278***
		(0.022)		(4.479)
Widowed		0.100*		26.130***
		(0.055)		(8.121)
Divorced		0.129***		29.719***
		(0.027)		(5.293)
Has Child		0.031*		6.457*
		(0.016)		(3.802)
Annual Earnings ($10k)		0.014***		3.133***
		(0.003)		(0.673)
Household Net Worth ($10k)		−0.001***		−0.066
		(0.000)		(0.074)

Note: The sample includes 4,400 federal employees between age 18 and 64 for each regression. Panel fixed effects are included, but not reported. Standard errors are clustered at the deomographic level used to impute probability of death and are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 11—Source of Life Insurance Comparison

	Supplemental ESLI	Term Life Insurance
Demographics		
Age	40.39	44.33***
Male	0.74	0.57***
White	0.72	0.71
Black	0.16	0.15
Other race/ethnicity	0.12	0.14
Family		
Married	0.78	0.75
Has Child	0.64	0.60
Finances		
Earnings ($1k)	60.59	68.99***
Net Worth ($10k)	16.02	27.85***
Education		
No High School Diploma	0.01	0.02
High School Graduate	0.65	0.54***
College Graduate	0.34	0.43***
Health		
Excellent	0.40	0.37
Very Good	0.34	0.37
Good	0.22	0.21
Fair	0.04	0.04
Poor	0.00	0.01
Life Insurance		
Extra Life Ins. Face ($1k)	136.78	166.35***
Observations	899	738

Note: Sample consists of Federal employees from the 1990 to 2008 panels of the SIPP. Monetary units are measured in 2014 dollars. Indicators for statistical difference between means are given by *** p<0.01, ** p<0.05, * p<0.1

Table 12—Market Interaction Analysis, Dependent Variable: Has Term Life Ins.

	(1)	(2)	(3)
Annual Term Premium ($100)	0.013		
	(0.010)		
Probability of Death (Z-score)		0.034	
		(0.025)	
Excellent Health			−0.125
			(0.183)
Very Good Health			−0.138
			(0.182)
Good Health			−0.164
			(0.183)
Fair Health			−0.147
			(0.193)
Extra Life Ins. Value ($100k)	0.034***	0.051***	0.034***
	(0.008)	(0.007)	(0.009)
Age 35-39	0.047	0.037	0.058
	(0.044)	(0.037)	(0.045)
Age 40-44	0.050	0.043	0.077*
	(0.047)	(0.042)	(0.045)
Age 45-49	0.047	0.059	0.093**
	(0.054)	(0.044)	(0.044)
Age 50-54	0.044	0.039	0.121**
	(0.068)	(0.048)	(0.047)
Age 55-59	0.035	0.063	0.148***
	(0.098)	(0.066)	(0.055)
Age 60-65	0.062	0.130	0.249***
	(0.152)	(0.094)	(0.076)
Male	−0.186***	−0.175***	−0.169***
	(0.034)	(0.028)	(0.030)
Black	0.006	0.016	0.007
	(0.039)	(0.038)	(0.039)
Other race/ethnicity	0.044	0.030	0.044
	(0.041)	(0.038)	(0.041)
Married	−0.028	0.008	−0.025
	(0.037)	(0.037)	(0.035)
Has Child	−0.015	−0.014	−0.020
	(0.030)	(0.028)	(0.031)
High School Graduate	−0.164	−0.039	−0.172*
	(0.105)	(0.100)	(0.103)
College Graduate	−0.120	0.007	−0.138
	(0.107)	(0.107)	(0.105)
Earnings ($1k)	0.000	−0.000	−0.000
	(0.000)	(0.000)	(0.000)
Net Worth ($10k)	0.002***	0.002***	0.002***
	(0.000)	(0.000)	(0.000)
Obs.	1,269	1,637	1,269

Note: The sample includes federal employees that elected either supplemental ESLI or individual life insurance. The omitted health category is Poor. Non-reported covariates include panel fixed effects, value of policy, age, gender, race/ethnicity, marital status, children, education, earnings, and household net worth. Columns (1) and (3) are restricted to panels 1996 to 2008 that contain self-reported health metrics. Standard errors are are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$ and are clustered at the demographic level used to impute probability of death for specification (1).

Appendix

Figure A1. term4sale

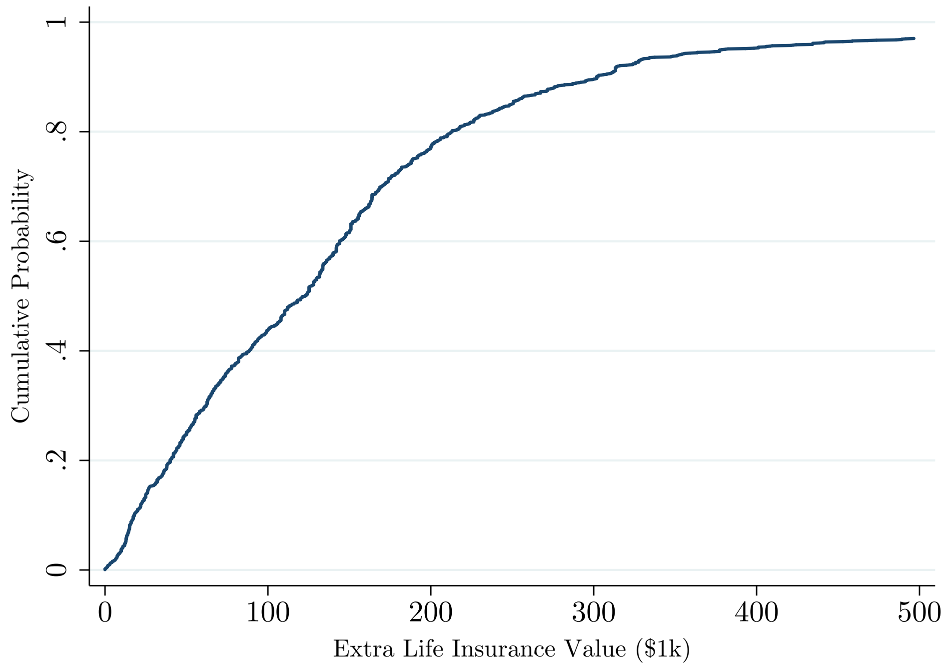

Figure A2. Federal Employees: CDF of Extra Coverage (either supplemental ESLI or Term)