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Life Insurance: Nudges and Adverse Selection

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LIFE INSURANCE: NUDGES AND ADVERSE SELECTION

DISSERTATION

A dissertation submitted in partial fulfillment of the requirements for the degree of Doctor of Philosophy in the College of Business and Economics at the University of Kentucky

By
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ABSTRACT OF DISSERTATION

LIFE INSURANCE: NUDGES AND ADVERSE SELECTION

Death of a breadwinner can have devastating financial consequences on surviving dependents through lost earnings and medical expenses. Life insurance is designed to help mitigate these financial burdens. Nonetheless, there are documented shortages in life insurance coverage. Adverse selection—where higher risk individuals are more likely to purchase coverage leading to market failure—could be one of the causes of uninsured vulnerabilities. I analyze both the existence of and welfare costs from adverse selection in individual term life insurance and employer-sponsored life insurance (ESLI) at a large public university. In the individual term market, using a representative sample of purchasers, I do not find evidence of adverse selection in general likely due to extensive underwriting conducted by insurance companies. In contrast to term life insurance, ESLI does not individually underwrite life insurance policies. This in conjunction with the ability of employees to increase coverage annually without health screening and the existence of term life insurance as a substitute make ESLI at the university highly susceptible to adverse selection. Despite these vulnerabilities, I do not find evidence of economically significant adverse selection in general. Nonetheless, the most highly educated employees—faculty members—do exhibit significant adverse selection. These results together suggest that a lack of financial sophistication likely keeps the ESLI market from unraveling. Other possible explanations include the availability of accelerated death benefits, employee inertia, and financial complexities in comparing group and individual coverage.

In addition to analyzing the efficiency of the life insurance markets, I analyze the effectiveness of a policy designed to increase life insurance coverage. Using data from a large public university, I analyze a policy change that increased basic life insurance coverage and expanded coverage options for employees. The increased coverage represented a nudge for employees with supplemental coverage. In large part due to inertia, the nudge increased life insurance holdings one-for-one for those who could have undone it. Additionally, I find that expanding coverage options significantly increased total life insurance holdings for new hires who were not subject to inertia. The increased basic coverage and expanded options reduced uninsured vulnerabilities for two-thirds of employees. These findings have important policy implications for addressing widespread disparities in life insurance coverage.

KEYWORDS: Life Insurance; Adverse Selection; Inertia; Nudge; Asymmetric Information

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LIFE INSURANCE: NUDGES AND ADVERSE SELECTION

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TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

Chapter 1: Introduction

Death of a breadwinner can have devastating financial consequences on surviving dependents through lost earnings and end-of-life expenses (Attanasio and Hoynes, 2000; McGarry and Schoeni, 2005). Life insurance is designed to hedge against these financial risks by providing a payout in the case of early death. Notwithstanding its importance, life insurance ownership is at a 50-year low and sales have declined 45 percent since the mid-1980s (Prudential, 2013; Scism, 2014). In addition, large disparities exist between life insurance holdings and underlying vulnerabilities with some estimates exceeding $15 trillion (Bernheim et al., 2003; Conning, 2014; LIMRA, 2015c).

In this dissertation, I investigate some critical issues with the life insurance market. Is the life insurance market efficient, or does it suffer from adverse selection? Why are households underinsured? What policies—either in the workplace or the individual market—are effective at increasing coverage? In the following chapters, I analyze these questions using a combination of publicly-available and restricted-use data.

In Chapters 2 and 4, I analyze one important possibility for why uninsured vulnerabilities exist, adverse selection. Adverse selection in insurance markets occur when individuals that are of higher risk—greater mortality risk in the context of life insurance—purchase coverage more often or purchase more generous policies than lower risk individuals. This behavior results in higher premiums, which induces lower risk individual to leave the market. This behavior has proven to be a serious issue with the health insurance exchanges under the Affordable Care Act (ACA) leading to double-digit increases in premiums.

Previous literature has analyzed adverse selection in the individual life insurance market with mixed results. Nonetheless, these studies only focus on the decisions of individuals aged 51-61 due to data limitations even though individuals under age 50 account for 62 percent of life insurance purchases. Using publicly-available data, Chapter 4 analyzes a representative sample of purchasers and finds no evidence of significant adverse selection in the individual market. In contrast to the problems arising from adverse selection in the health care exchanges, it does not appear that adverse selection causes decreased participation in the individual market for life insurance. A key distinction between the health care exchanges and individual life insurance coverage is underwriting. Health insurance under the ACA is community-rated and mobility across health insurance plans is substantial, contributing to adverse selection. In contrast, the individual life insurance market involves substantial underwriting which adjusts premiums according to risk or rejects high risk applicants mitigating adverse selection.

In Chapter 2, I further analyze adverse selection in life insurance focusing on Employer-Sponsored Life Insurance (ESLI), which constitutes 41 percent of all life insurance coverage. I use administrative data from a large public university to analyze ESLI. In contrast to individual life insurance coverage but consistent with the ACA health care exchange, ESLI is community rated (not individually underwritten) and guaranteed issue (cannot deny coverage based on health). In addition to these features, University employees may increase coverage without health screening and elect coverage that varies greatly in generosity. Given these features, adverse selection is much more likely to contribute to gaps in life insurance coverage in ESLI relative to the individual life insurance. Nonetheless, I do not find evidence of economically meaningful adverse selection in general at the University. I do, however, find significant adverse selection when I analyze faculty members indicating that financial sophistication could be an important determining factor for the influence of adverse selection. Overall, across both studies, there is not sufficient adverse selection to cause an unraveling of the life insurance markets or lead to significant welfare loss.

Notwithstanding these findings, large uninsured vulnerabilities still exist. What policies would be effective at increasing total life insurance coverage? A possible option to increase life insurance coverage is through greater employer provision. Given that life insurance is designed to replace the lost earnings of a breadwinner, policy options at the employer level seem appropriate. As with any type of provision, crowd-out—where individuals offset the increase by decreasing individual life insurance coverage or supplemental ESLI—is a primary concern. Once again using data from a large public university, Chapter 3 analyzes the effectiveness of increased employer provision at increasing total life insurance holdings. In 2008, the University increased basic (mandatory) life insurance coverage for all employees. Economic theory predicts that individuals with supplemental ESLI should offset the increase by decreasing supplemental coverage. However, there was full pass-through of the increase in basic life insurance to total life insurance holdings for employees that could decrease supplemental ESLI coverage. Consequently, the policy increased total life insurance holdings for virtually all employees. However, the gap between actual and recommend coverage levels differs greatly by age. Younger employees have the greatest gaps between actual and recommended coverage with estimated gaps of almost \$300,000 whereas for those over 40, the gap was nearly \$100,000. To address this heterogeneity, the study also simulates alternative expenditure neutral policy options that may be used to further reduce coverage gaps. The study finds that constant employer contribution per employee reduces coverage gaps more effectively than a fixed amount or multiple of salary. Overall, increased provision on the employer-side can be used effectively to narrow gaps between actual and recommended levels due to a lack of crowd-out.

Chapter 2: Adverse Selection in the Group Life Insurance Market

2.1 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 $132.2 billion in life insurance premiums (Federal Insurance Office, 2015).[1] Notwithstanding 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, 2015c). 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—where higher risk individuals are more likely to purchase coverage leading to market failure—could be one of the causes of these uninsured vulnerabilities.

I use detailed administrative data from a large public university ("the University" henceforth) to test for adverse selection in employer-sponsored life insurance (ESLI). Supplemental ESLI at the University is particularly susceptible to adverse selection for several reasons. First, supplemental ESLI is "guaranteed issue" (cannot deny coverage based on health) and priced based on the characteristics of the group rather than individual health characteristics. Second, employees at the University may increase supplemental ESLI coverage on an annual basis without individual underwriting (health screening) 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. Third, there are large differences in the levels of coverage available at the University, which allows for adverse selection on not only the extensive margin (participation) but also on the intensive margin (level of coverage). Fourth, individual term life insurance represents a viable alternative to ESLI. In contrast to the ESLI, term life insurance is individually underwritten (experience rated) and is not guaranteed issue. Consequently, term life insurance offers significantly cheaper premiums in comparison to ESLI for healthy University employees potentially drawing away the good risks from the ESLI pool.[2] Overall, these factors could exacerbate adverse selection in ESLI at the University and potentially lead to an unraveling of the ESLI market. Despite these factors, supplemental ESLI with similarly structured policies are widespread indicating a lack of crippling adverse selection. Nonetheless, even in the absence of complete market failure, adverse selection can still lead to welfare loss and underinsurance.

Using the widely implemented positive correlation test, I find some evidence of adverse selection in supplemental ESLI at the University. However, following the work of Einav et al. (2010), I show that the resulting welfare loss is economically insignificant. Nonetheless, I do find significant adverse selection among highly educated

[1]For comparison, accident and health premiums jointly totaled $157.1 billion in 2014 (Federal Insurance Office, 2015).

[2]This is demonstrated in section 2.4.4.

employees. Faculty are more likely to purchase coverage and have higher levels of coverage as their probability of death increases whereas staff appear to be unresponsive to differences in probability of death. Although beneficial for faculty that adversely select coverage, this behavior decreases the welfare of other employees who experience higher prices due to faculty's actions. Given that the highly educated exhibit adverse selection, a plausible explanation for the overall lack of adverse selection could be lack of financial sophistication.

In addition to the previously described test for adverse selection, I analyze the behavior of University employees who eventually died to see if they took advantage of the ability to increase coverage without underwriting. Of those individuals, very few maxed-out guaranteed issue coverage or ramped up coverage prior to death. In fact, these employees behaved similarly to other employees after conditioning on individual characteristics. A possible explanation for the lack of adverse selection among this group is accelerated death benefits (ADB). These ADB allow families to receive a life insurance payout prior to an individual's death 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. Consistent with this, individuals that increased coverage had a higher salary and contributed to a retirement account more often than those that did not increase coverage, perhaps reflecting less liquidity constraints. Another explanation could once again be financial sophistication as faculty that pass away are also more likely to increase coverage consistent with the behavior observed in the positive correlation test.

To further understand adverse selection in ESLI, I also analyze whether the term life insurance market draws healthy employees away from supplemental ESLI, consequently increasing adverse selection. The University data do not contain information on term life insurance elections. Consequently, I turn to the Survey of Income and Program Participation (SIPP), which is unique in that it has information on both ESLI and individual market coverage. Nonetheless, the SIPP does not differentiate between coverage automatically provided by employers (basic coverage) and supplemental coverage elected by employees, which is essential for adverse selection analysis. Therefore, I restrict the sample to federal employees for whom the structure of ESLI is well-documented. This allows for differentiation between federal employees with only basic coverage and those that elected supplemental ESLI. Looking at a sample of federal employees that elected additional coverage (either supplemental ESLI or term life insurance), I show that health status does not significantly influence the decision to purchase term rather than supplemental ESLI even though there are large potential savings for the healthy. Despite the overall lack of adverse selection on this feature and consistent with the other tests, I once again find that highly educated employees (those with graduate degrees) take advantage of the available substitute exhibiting adverse selection. In addition to financial sophistication, other possible explanations for the lack of a significant influence of the term market include salience, 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 health insurance (Cutler and Reber, 1998; Cardon and Hendel, 2001; Cutler, 2002; Einav et al., 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 contractual arrangements in insurance plans. With regards to life insurance, previous empirical work on adverse selection focuses almost exclusively on the individual market. The seminal paper by Cawley and Philipson (1999) finds no evidence of adverse selection in the term life insurance market. Subsequent work has mixed results (He, 2009, 2011; Harris and Yelowitz, 2014; Hedengren and Stratmann, 2016). These studies provide useful insights into one portion of the life insurance market but little attention has been given to the ESLI market, 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. However, their data do not contain information on offerings or differences in benefit plans, only holdings. Furthermore, their data do not differentiate between basic and supplemental coverage. Basic coverage—which constitutes half of the total value of ESLI coverage—is irrelevant for the typical discussion of adverse selection as it is generally provided automatically at no cost to the employee.[3,4] Supplemental coverage, however, is susceptible to adverse selection as employees both elect the coverage and bear the cost. Nonetheless, only half of all workers have the option of purchasing supplemental ESLI (LIMRA, 2015b). Consequently, their finding is likely driven by differences in provision/availability across industries and occupations rather than individual adverse selection.[5]

This paper advances the literature by using detailed individual level data to analyze adverse selection in ESLI across two different settings, and by testing the individual and institutional components that in theory should lead to adverse selection. In addition, the paper contributes to the literature on welfare costs of adverse selection in insurance markets (e.g., see Bundorf et al., 2012; Einav et al., 2010; Beauchamp et al., 2013; Hackmann et al., 2015). Furthermore, this study contributes to research on the interaction between community-rated premiums and adverse selection (Buchmueller and Dinardo, 2002). More specifically, the findings increase understanding of the importance of education, specifically graduate degrees as a determinant for adverse selection. Lastly, this paper advances the knowledge of end of life decisions

[3]The statistic on the relative value of basic life insurance coverage is based on data from the 2008 SIPP panel in conjunction with the assumption of levels of basic coverage reported in the March 2013 National Compensation Survey.

[4]For 95 percent of covered workers, employers that provided basic coverage did not require employee contributions (U.S. Department of Labor, 2015). The provision of such coverage, however, does seem to help mitigate the incidence of poverty among surviving spouses (Harris and Yelowitz, ming).

[5]Hedengren and Stratmann (2016) could be picking up adverse selection into a firm that offers ESLI. However, it is very unlikely that a significant portion of the population chooses employment based on the availability of ESLI.

including the potential for liquidity constraints and ADB to mitigate anticipatory adverse selection.

The remainder of the paper is organized as follows. Section 2.2 provides a brief overview of life insurance markets, Section 3.3 describes the data, Section 2.4 highlights features that could induce adverse selection, Section 3.4 sets up the empirical models to test for adverse selection, Section 2.6 presents results and the welfare analysis, Section 2.7 discusses the findings and provided additional tests for adverse selection, and Section 2.8 concludes.

2.2 Life Insurance Overview

In 2014, 120 million employees were covered by ESLI with coverage totaling $8.2 trillion (ACLI, 2015). ESLI customarily has an automatic portion provided by the employer (basic coverage) and an option to purchase additional coverage through payroll deductions (supplemental coverage). 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, 2015b). 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.[6] As mentioned, ESLI is generally 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.

The individual market accounts for 59 percent of life insurance coverage. Within the individual market, policies are differentiated by term and whole life insurance.[7] 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 meaning that premiums vary based on individual characteristics including 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.

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

[7]Whole or permanent 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.

2.3 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.[8] All elections made during the open enrollment period take effect within two to three months 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.[9,10] In addition to this coverage, employees may elect supplemental life insurance up to 5x their annual salary through payroll deductions on an after-tax basis. Employees may elect up to 3x annual salary after initially being hired without "evidence of insurability" up to the guaranteed issue amount of $375,000.[11] Evidence of insurability consists of filling out a medical history form and in some cases a medical examination to verify the employee is "insurable." For each subsequent year following the initial hiring, employees may increase coverage by 1x salary without evidence of insurability unless the increased coverage exceeds the guaranteed issue amount. Therefore, within two years of being hired, employees can have 5x annual salary in supplemental ESLI without providing proof of insurability (conditional on it being less than $375,000). 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. Premiums for supplemental coverage are differentiated solely by 5-year age group.

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 premium that reflects the risk of the group of em-

[8] 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.

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

[10] Basic premiums paid by the employer for the first $50,000 worth of coverage are not classified as a taxable fringe benefit. For example, a 40-year old employee does not pay income taxes on the first $60 the employer pays toward basic life insurance per year. See https://www.irs.gov/government-entities/federal-state-local-governments/group-term-life-insurance.

[11] In 2014, 19.9 percent of employees earned enough to elect more than $375,000 in coverage and only 3.2 percent of all employees had supplemental coverage that exceeded $375,000 in that same year.

ployees that 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 2.1 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 have at least one child. I do not observe marital status or children directly in the data but infer these characteristics from elections for health, dental, vision, and dependent life insurance as well as the existence of a dependent flexible spending account (FSA). For example, if an employee ever elects spousal health insurance then he or she is labeled as married.[12] The University operates a hospital in addition to the main campus with the healthcare sector accounting for 42 percent of workers in 2014. Additionally, in 2014 faculty make up 15 percent of workers and the median salary was $46,000 for all workers. Table 2.1 also shows that roughly half of full-time employees elect supplemental ESLI. Conditional on electing supplemental ESLI, mean supplemental coverage in 2014 was $164,842 or a multiple of 2.68x salary. Overall, supplemental coverage represents 56.6 percent of the total face value of ESLI at the University in 2014.

Table 2.2 further compares employees with and without supplemental ESLI. As illustrated, the main differences are that those with supplemental ESLI are more likely to have children and be married, consistent with theoretical models of life insurance demand (Lewis, 1989; Hong and Ríos-Rull, 2012). There do not appear to be any substantive differences in gender, race/ethnicity, or salary for those that have coverage relative to those that do not.

2.3.1 Representativeness

Given that I primarily analyze a single university in this study, it is important to understand how representative the University is of other universities and firms to gauge the external validity of the findings. Using the National Compensation Survey (NCS) conducted by the Bureau of Labor Statistics (BLS), Harris and Yelowitz (2017) show that the basic ESLI coverage for the University is within the norm for other colleges and universities. However, the NCS does not have information about supplemental ESLI coverage. To get a sense of common features in supplemental ESLI policies, I use benefit books collected from more than 400 universities. The benefit booklets for many institutions were missing details on life insurance and I

[12] This measure will not pick up individuals who have alternative sources of health insurance such as a spouse's employer (Ritter, 2013). In addition, this variable will miss individuals with children who are no longer considered dependents. See Harris and Yelowitz (2017) for a more complete discussion of the accuracy of these metrics.

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.[13] The University's guaranteed issue amount of $375,000 is not out of the ordinary in comparison to the other universities and colleges sampled. From the survey of benefit books, all but one University adjust supplemental premiums based solely on age.[14] Roughly half of plans with requisite details allow employees to increase coverage without proof of insurability during open enrollment periods with the allowed increases ranging from $5,000 to $300,000 with the mode of 1x annual salary. It is less common for employees to be able to elect coverage without evidence of insurability if they did not elect supplemental ESLI when they were initially hired. Overall, it appears that the ESLI at the University in this study fits within the norm for colleges and universities in regards to guaranteed issue amounts and underwriting, but is on the more generous side of allowing employees to enroll/increase coverage during open enrollments. Consequently, if there is not evidence of significant adverse selection at the University with a vulnerable ESLI structure, then it is likely that there is not significant adverse selection at less generous institutions.

2.3.2 Probability of Death

To gauge adverse selection in life insurance, a metric for probability of death is required. Previous studies have used sample attrition (Cawley and Philipson, 1999), actual mortality of an older sample (He, 2009; Harris and Yelowitz, 2014), or administrative records with large sample sizes (Hedengren and Stratmann, 2016).[15] Although, the University data contain information on actual deaths, mortality for the employed working age population is a rare event. Additionally, the data are censored by termination of employment so there is no information on longevity following employment at the University. Cawley and Philipson (1999) use the fitted value from a logit regression as their measure of probability of death given that they do not observe mortality for a long window. A similar approach is not feasible given the small number of actual recorded deaths at the University. Furthermore, although mortality of coworkers is an important determination of expectations, individuals likely form expectations of longevity based on the probability of death of individuals of similar demographics

[13]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.

[14]Purdue University adjusts premiums based on age and tobacco use.

[15]In Cawley and Philipson (1999), the authors used the fitted values from a logit regression making assumptions about sample attrition and death. He (2009) use an indicator for mortality within a 12-year window of observation. Both of these studies use the HRS that initially interviews individuals aged 51 to 61. Hedengren and Stratmann (2016) merge administrative records from the Social Security Administration (that contain individual mortality) onto the SIPP, which has large sample sizes.

in general rather than relying solely on the probability of death of coworkers. 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.[16] 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.[17] 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. per year for this sociodemographic group. Therefore, for this group the one-year probability of death is 840 in 100,000.

This metric is subject to measurement error and fails to fully capture idiosyncrasies in mortality risk. Nonetheless, this metric is likely highly correlated with actual probability of death. To test the usefulness of the constructed probability of death metric, I compare the measure with self-reported health status as measured in the SIPP. Studies have shown that self-reported health is a reasonable measure because it captures not only health status, but also individual interpretation of health status (Bound, 1991; Wallace and Herzog, 1995). As reported in Appendix Table A.1, the mean imputed probability of death consistently increases as the self-reported health worsens. Nonetheless, this metric is imprecise and consequently the results are likely attenuated. Later on, I show that the results using this metric are consistent with results using self-reported health, which add credibility to its use.

2.4 Expected Adverse Selection in ESLI

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

2.4.1 Heterogeneity in Underlying Probability of Death: Community-Rated/Guaranteed Issue

Guaranteed issue coverage and community rated premiums that only adjust based on age could cause significant adverse selection in ESLI at the University. These

[16] 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.

[17] Similarly, for healthcare workers that make more than $100,000 I assume that they have 5+ years of education strictly for purposes of assigning probability of death.

features imply that 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, 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 healthy employees subsidize the relatively unhealthy employees.

To illustrate, Figure 2.1 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 as individuals in the former group (459 deaths compared to 43 deaths per 100,000). Additionally, Figure 2.2 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 for University employees with an average of 333 deaths per 100,000.[18]

2.4.2 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 with the elected higher coverage going into effect shortly thereafter.[19] 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 six employees would have to increase coverage to the maximum of 5x salary to cause payouts to double.

However, employees will only ratchet up coverage inasmuch as they are aware of pending death. Data on 1,367 deaths as reported in the Health and Retirement Study

[18]Probability of death ranges from 9 to 3,158 per 100,000 for University employees with a standard deviation of 365 deaths per 100,000.

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

(HRS) shed light on the degree of anticipation of death.[20] Follow-up exit interviews of surviving relatives 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.[21,22] 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.[23] There is significant heterogeneity in survival 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 at the University, 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).[24] 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.[25] Table 2.3 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 conditional on all deaths being unanticipated (e.g. car accident). 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

[20] 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.

[21] 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?".

[22] Restricting the sample to those that worked within the last couple of years prior to death does not significantly change the proportion of deaths that were expected or the time from diagnosis to death.

[23] Five-year survival rate data from the SEER Cancer Statistics Review 1975-2013 http://seer.cancer.gov/csr/1975_2013/results_merged/topic_survival.pdf. The 5-year survival rate for all cancer types in the U.S. is 66.9 percent, which is lower than the University specific measure largely due to different age distributions.

[24] 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.

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

62.8 percent depending on the number of open enrollment periods the employees live 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 2.3 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).[26] 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 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 for 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.

2.4.3 Vast Differences in Benefit Levels

Another important aspect of ESLI that could increase adverse selection is the wide range of coverage offered. Employees at the University may ultimately elect supplemental coverage from 1x salary to 5x salary without medical underwriting inasmuch as the policy does not exceed the guaranteed issue amount ($375,000). Cutler and Reber (1998) illustrate how adverse selection across different levels of generosity can significantly affect health insurance markets. They document an insurance "death spiral" where adverse selection led to the discontinuation of the most generous health insurance plan (PPO) at Harvard University after the university stopped subsidizing the plan. They noted that this problem is not an isolated occurrence and many such employer-sponsored health insurance (ESHI) plans cannot maintain a significantly more generous option without it being subsidized, primarily due to adverse selec-

[26]As shown in Table 2.3, 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.

tion.[27] As a result, there is relatively little difference in the generosity of coverage across ESHI plans for employers with equal contribution rules. 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.

2.4.4 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 for employees with available ESHI even though they are generally not subsidized.[28] 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 quotes). Term4sale is a life insurance quoting website run by CompuLife that provides life insurance quoting software to insurance agents.[29] The website uses age, gender, along with health and smoking status and matches the characteristics with insurance products currently on the market.[30] Using the raw scraped premiums from term4sale, Figure 2.3 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.[31] 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 (64.5 percent of the cost of supplemental ESLI) by purchasing a 20-year $250,000 term policy rather than electing supplemental ESLI of equal face value for the next 20 years.[32]

[27]See Strombom et al. (2002) for another example of a death spiral resulting from a shift to a fixed dollar contribution policy.

[28]Employees may qualify for subsidies from the premium tax credit if ESHI is deemed unaffordable. See https://www.healthcare.gov/have-job-based-coverage/options/.

[29]A potential concern of using Internet pricing data is that not all consumers purchase life insurance online. However, a recent study shows 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 not all individuals use the Internet to purchase life insurance, offline premiums are highly correlated with online premiums.

[30]See appendix Figure A.1 for a screen shot of the required fields from the website.

[31]Term life insurance is typically purchased for 10 to 30 year periods with 20-year policies being the most common. See http://www.iii.org/article/what-are-different-types-term-life-insurance-policies.

[32]Costs are reported in present value using a 3 percent discount rate.

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 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 these correlations, 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. I then 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. For these individuals who can get cheaper coverage by purchasing term life insurance, the average savings is $1,680 or 42.0 percent of the cost of ESLI. Furthermore, 43.4 percent could have saved more than $1,000 by purchasing a term policy rather than supplemental ESLI. Table 2.4 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 from 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.[33] 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

[33] 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.

age, term of the policy, and face value, there are also higher fixed costs associated with term life insurance relative to supplemental ESLI. Supplemental ESLI has the advantage of payroll deductions, simplified choice set, and generally no medical underwriting. In addition, since supplemental ESLI is elected in multiples of income, coverage automatically adjusts for changes in salary. 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 for 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.

2.5 Empirical Models

2.5.1 Positive Correlation Test

To determine 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 et al., 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 in life insurance is unlikely given the steep requirement to receive a payout along with policy exemptions for suicide.[34] Consequently, a "positive correlation" finding for supplemental ESLI is likely indicative of adverse selection.[35] The model is given by:

$$Supplemental\ ESLI_i = \beta_0 + \beta_1 ProbDeath_i + \beta_2 AgeBin_i + \beta_3 X_i + \varepsilon_i \tag{2.1}$$

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. By controlling for age bin, the specification compares individuals offered identical prices and allows for analysis within the risk class assigned by the insurance company (He, 2009; Einav and Finkelstein, 2011). Adverse selection resulting in increased premiums from a welfare perspective is only relevant for those individuals whose decision to purchase coverage or whose cost of coverage is influenced by an increased price due to adverse selection. In other words, the mortality risk of individuals that do not desire life insurance coverage even at actuarially fair premiums should not cause welfare loss. Therefore, following the work of Cawley and Philipson (1999) and Hedengren and Stratmann (2016) I in-

[34]Most life insurance policies exclude payouts from suicide within a specified time frame from purchase. At the University, the policy excludes payouts for deaths caused by suicide within 2 years of purchasing the policy.

[35]Inasmuch as moral hazard is present, it will bias the results toward finding more adverse selection.

clude controls, X_i, for the main demand-side determinants of life insurance coverage: marital status and children.

2.5.2 Welfare Estimation

The positive correlation test is useful for identifying adverse selection but falls short of estimating the welfare consequences of asymmetric information. In addition, even after controlling for the main demand-side covariates, the positive correlation test still compares individuals that want coverage to those individuals that potentially have little need for life insurance. For example, even some employees without children might have need for life insurance and some low income employees with dependents might choose to rely on the social safety net rather than purchase supplemental ESLI.[36]

To overcome both of these limitations, I follow the work of Einav et al. (2010) to estimate welfare loss from adverse selection in supplemental ESLI. Similar to other goods commonly modeled, quantity demanded 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 also a function of the price. Einav et al. (2010) show that a measure of welfare loss can be obtained in an insurance market if there is sufficient price variation, which can be used to identify both demand and average cost curves. They further illustrate that estimates of the demand and average cost curves enable derivation of the marginal cost curve. Efficiency and equilibrium conditions under the assumption of perfect competition can then be derived 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 2.4 shows the discontinuous prices that jump at 5-year increments for University employees. In contrast, both term premiums (experience rated) 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. Ultimately, this test 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.

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

[36] For example, Social Security Survivors Benefits.

decrease coverage at any point in time, and the data is reported annually. All of these factors make it unclear whether employees who exhibit 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.

The price changes allows for a simple approach to the demand estimation. All covariates, except age, 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 et al. (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:

$$D_{it} = \beta p_{it} + \tau age_{it} + a_i + \varepsilon_{it} \tag{2.2}$$

where D_{it} is an indicator variable for having supplemental life insurance, p_{it} is the annual premium per \$1,000 in coverage, age_{it} 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.[37]

To estimate the average cost curve, I use probability of death multiplied by the payout for the median policy (\$100,000). Ideally, the model could take into account the different levels of supplemental ESLI elections, but in order to be consistent with the demand estimation that looks at participation only (due to model limitations) I use the median level of coverage multiplied by probability of death for the average cost. 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 employee and 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:

$$C_{it} = \Gamma + \delta p_{it} + \lambda AgeBin_i + u_{it} \tag{2.3}$$

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

[37]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. Of those that decrease coverage at the University, 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.

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.

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

$$MC(p) = \frac{\partial TC(p)}{\partial D(p)} = \frac{\partial (AC(p) \cdot D(p))}{\partial D(p)} = \left(\frac{\partial D(p)}{\partial p}\right)^{-1} \frac{\partial (AC(p) \cdot D(p))}{\partial p} \tag{2.4}$$

Substituting the estimated coefficients yields:

$$MC = \frac{1}{\beta}\left(\frac{\partial(\alpha + \beta p)(\gamma + \delta p)}{\partial p}\right) = \frac{\alpha\delta}{\beta} + \gamma + 2\delta p \tag{2.5}$$

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 (2.5) 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.

$$DWL = \frac{1}{2}(Q_{eff} - Q_{eq})(P_{eq} - MC(P_{eq})) = \frac{-\delta^2}{2(1-2\delta)\beta}\left(\alpha + \frac{\beta\gamma}{1-\delta}\right)^2 \tag{2.6}$$

2.6 Results

2.6.1 Positive Correlation Test

Table 2.5 presents the results from the positive correlation test for the most recent year of data, 2014, for the University from equation (2.1). The main result is robust to performing the positive correlation test on other years. On the extensive margin, only controlling for age bin, the first column shows that a one standard deviation increase in probability of death is correlated with a 5.6 percentage point decrease in the probability of having supplemental ESLI, indicative of advantageous selection. However, after controlling for bequest motive proxied by marital status and having a child, the results provide evidence of adverse selection with a one standard deviation increase in probability of death being correlated with a 3.1 percentage point increase in the probability of having supplemental ESLI. This stark contrast in results across the two specification highlights the importance of including major demand side covariates. Similar qualitative results hold on the intensive margin estimated using a

Tobit that account for individuals without any coverage and those constrained by the maximum coverage as shown in the latter two columns of Table 2.5. Comparing the magnitudes of the coefficient on probability of death in columns (2) and (4) indicates that participation seems to be much more responsive to changes in probability of death than changes in multiples of coverage, which increases less than a tenth of a multiple for a one standard deviation increase in probability of death.

Given the complexities associated with financial planning, it is possible that more educated employees understand and are more likely to take advantage of the structure of ESLI. The first column of Table 2.6 illustrates that as probability of death increases by one standard deviation, faculty members are 16.6 percentage points more likely than staff to have supplemental ESLI controlling for bequest motive. The second column shows that this result is robust to including interactions of probability of death with different levels of salary, which indicates that the result is not just capturing differences in income. Similar results were obtained looking at the multiple of supplemental coverage as depicted in the last two columns of Table 2.6. Inasmuch as being a faculty member is correlated with financial literacy this finding is consistent with the literature on retirement planning (Hilgert et al., 2003; Bernheim, 1998; Lusardi and Mitchell, 2007a). This result implies that even though faculty take advantage of the structure of supplemental ESLI, the overall effect of adverse selection is mitigated by staff not responding as much to higher risk of death with increased participation/levels of life insurance coverage. Consequently, the lack of individual underwriting implicitly benefits the more educated at the cost of those that do not take advantage of the policies. Therefore, increasing underwriting at the University would likely disproportionately benefit staff who are not as sensitive to the implications of increased probability of death.

2.6.2 Welfare Analysis

In order to gauge any welfare loss associated with adverse selection I apply the framework of Einav et al. (2010) as previously described.[38] The first column of Table 2.7 gives the results for the demand estimation from equation (2.2). As shown, a \$100 increase in annual premiums results 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, 2017). The second column of Table 2.7 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

[38]Inefficiencies may also arise from advantageous selection which result in over-insurance where individual marginal cost exceeds willingness to pay (De Meza and Webb, 2001).

estimation to determine welfare loss. The bottom panel of Table 2.7 and Figure 2.5 report the equilibrium and efficient prices and quantities using the framework of Einav et al. (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 or 0.3 percent of the average individual premium for supplemental life insurance. For comparison, Einav et al. (2010) estimate the welfare loss of ESHI at Alcoa to be $9.55, which they describe as "quantitatively small."[39] This result highlights the importance of moving beyond the standard positive correlation test in determining the influence of adverse selection in insurance markets.

2.7 Discussion of Results and Further Tests

Given that the welfare analysis shows negligible losses due to 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 et al. (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. 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. Another likely explanation is that employees do not change life insurance elections in response to changes in health due to inertia lessening adverse selection (Handel, 2013; Harris and Yelowitz, 2017).

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.

2.7.1 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 their own death? Although the University data is incomplete with regards

[39]For comparison, Einav et al. (2010) state that the average pretax employee premium for the more comprehensive plan was $1,500. This implies that the welfare loss was 0.6 percent of annual premiums paid by the employee.

to mortality of employees due to censoring, the data does contain information on 106 total observed deaths from 2006 to 2014.[40]

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 died for whom I observe elections, only 10 had the maximum guaranteed issue amount of coverage. Of the 89 employees who died 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 guaranteed issue limit, none increased coverage consecutively for the last two year of available increased coverage.

Unsurprisingly, these 106 employees differ on observable characteristics, in particular age; average age was 52 for this group compared to 44 for the full-sample. 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, gender, and year. The results, presented in Table 2.8 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 attack, etc.). However, as explained, there is a nontrivial number of employees that likely anticipated death. Another possible explanation is a moral objection to increasing deathbed coverage. Although this might apply to some individuals, it is likely that when faced with the decision of preserving profits for a multimillion-dollar corporation or leaving a sizable bequest to dependents, most employees would ramp up coverage.

Yet another possible explanation for the lack of employees ramping up coverage could be that they leave their employment when faced with life threatening illness. However, conditional on the employee physically being able to perform the job, the employee might continue employment because of financial need or health insurance.[41] To gauge the employment response prior to death, I turn once again to the HRS. I isolate individuals that passed away prior to age 65 that were employed 4-5 years prior to death (N=311).[42] Of those individuals, 76.4 percent were employed 2-3 years prior to death and 64.1 percent were employed in the last observation before they passed away. The main question is what proportion of the decreased labor force

[40] 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 for the demand estimation.

[41] Employees may continue health insurance coverage through the Consolidated Omnibus Budget Reconciliation Act (COBRA), but they forgo any subsidy provided by the employer for health insurance, which could significantly increase the cost of health insurance. Individuals may continue coverage for up to 18 months through COBRA. See https://www.dol.gov/sites/default/files/ebsa/laws-and-regulations/laws/cobra/COBRAemployee.pdf.

[42] The survey is conducted biennially hence the two year grouping.

participation is due to anticipated death rather than the usual retirement process. Given that the average age of death for this group of working age individuals is 59.5, it is likely that a significant portion retired independent of anticipated death. To gauge to what extent anticipated death is the cause of the decreased labor force participation I split the sample based on the time from diagnosis to death. For individuals that had over a year from initial diagnosis to death 70 percent were employed in the last observation prior to death. For those that were diagnosed within a month of death, 64 percent were employed in their last year. This result indicates that individuals that anticipated death did not leave the labor force more than those that did not and if anything, they are more likely to remain employed. Therefore, even though it is feasible that individuals leave the employer and consequently do not increase life insurance coverage due to pending death, it does not appear to be the case, on average at least, for the limited sample analyzed from the HRS.

Perhaps the most likely reason for the lack of increase in the year preceding death is Accelerated Death Benefits (ADB).[43] As highlighted by Finkelstein and Poterba (2004) study of annuities, detailed features of insurance contracts 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.[44] These ADB are especially attractive for employees that have liquidity constraints, medical costs, and the loss of a bequest motive (Januário and Naik, 2013). Once an employee uses ADB, they forgo the option of increasing coverage prior to death consequently lessening adverse selection from anticipated deaths.[45]

Employees that are more liquidity constrained likely have lower incomes and are less likely to contribute to voluntary retirement accounts. Those that increased coverage in the last year of life voluntarily contributed to a 403(b) retirement account two years before death more than twice as often as those that did not. Additionally, those that increased coverage had average earnings two years before death that were $29,188 more than those that did not increase. Both of these findings are consistent with the explanation of ADB being used by those that are more liquidity constrained consequently precluding them from increasing coverage. For these comparisons, it is

[43] A survey of twelve large providers of group life insurance indicates that ADB are very prevalent for supplemental ESLI. Over 80 percent offer coverage as a standard feature without an additional premium while the remainder offer it as an optional rider (Shah, 2005). In part, ADB are meant to reduce the lost profits resulting from the growth of the secondary market of life settlements. See Daily et al. (2008) for a discussion on life settlements.

[44] 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 than $20,000 and can request a maximum of $500,000.

[45] Once the beneficiary receives ADB, the structure of the insurance contract fundamentally changes. The individual no longer pays premiums for the policy and active work is no longer required for continued coverage.

important to qualify that they are based on a small sample of deaths. Nonetheless, these findings are consistent with the idea that ADB lessen the anticipatory adverse selection that would occur otherwise. Ideally, the influence of ADB could be determined by comparing these adverse selection findings with results from a similar university with ESLI that does not offer ADB.

An alternative explanation is that increasing coverage in the last years of life is related to education and financial literacy. The employees for whom I observe elections in the last year of life are disproportionately staff likely originating from differences in underlying probability of death and relatively higher staff employment at the University. However, for faculty that I observe prior to death, 44 percent increased coverage in their last year of life whereas only 5 percent of staff increased ESLI coverage. This result is consistent with the earlier findings from the positive correlation test that faculty are more likely to exhibit adverse selection.

2.7.2 Market Interaction: Term and Supplemental ESLI

As discussed, another potential contributor of adverse selection in the ESLI market is the availability of the term life insurance market. The University data does not have information 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, 2016, 2017; 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 inferred from the difference between total ESLI coverage and the basic amount provided for federal employees.[46]

FEGLI has several different options for ESLI. Employees are defaulted into basic life insurance coverage but they can choose opt-out of the 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 $0.33 a month for each $1,000 of your Basic Insurance Amount (BIA) for all federal workers except postal workers who receive the coverage free of charge. The employee's age

[46]This approach of identifying an individual employer within survey data has been done using the Panel Study of Income Dynamics (PSID) (Shea, 1995).

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.[47] In addition, ESLI elections made during open seasons do not become effective until one year later. 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 that 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 from FEGLI, but with other protections from adverse selection, 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 5,845 Federal employees between ages 18 and 64. Summary statistics are presented in Table 2.9. 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. The SIPP asks about total life insurance holdings, which in conjunction with total ESLI coverage gives total individual life insurance coverage. For the federal employees, 77 percent had some life insurance, 61 percent had ESLI, and 37 percent had individual life insurance. Given that employees are defaulted into ESLI coverage, reported participation in ESLI coverage seems low. As a benchmark, conditional on being offered ESLI, 80 percent of U.S. employees take up the coverage (LIMRA, 2015b). Federal employees, however, are defaulted into basic coverage, which should increase participation relative to the average U.S. worker. In contrast to most basic coverage, federal employees have to pay for the coverage, which could decrease participation. However, only 68.2 percent of federal postal workers—who do not have to pay for basic coverage—report having ESLI indicating that it is not just payment that lowers reported ESLI for federal workers in general. Another possible explanation for relatively low levels of reported ESLI coverage for federal employees is that many employees are ignorant that they are actually receiving coverage

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

and consequently misreport in the survey.[48] Regardless, employees that actively elect supplemental coverage, who are the focus of this analysis, should be much less likely to misreport ESLI coverage. For those that did report having life insurance coverage, 50 percent only had ESLI, 21 percent only had individual, and the remaining 28 percent had both types of coverage.

For comparability with the finding presented for University employees, I perform the positive correlation test on the sample of federal employees in the SIPP. The first two columns of Table 2.10 use imputed probability of death from the CDC and ACS as the main independent variable. The results show some advantageous selection in the specification that just controls for age bins used in pricing and then some evidence of adverse selection in the specification with controls for family structure consistent with the findings from the University sample. One advantage of the SIPP is that it has information on self-reported health, which is useful because it captures both knowledge of health status as well as individual interpretation (Bound, 1991; Wallace and Herzog, 1995). Additionally, this metric does capture idiosyncrasies that the probability of death metric misses. A priori, those individuals with a worse self-reported health status should be more likely to have supplemental ESLI coverage. The latter two columns of Table 2.10 show no evidence of adverse selection using this metric. Those with worse self-reported health status are not any more likely to elect supplemental ESLI than those in excellent health. Table 2.11 presents results for the intensive margin from the Tobit estimation with no evidence of adverse selection using both probability of death and self-reported health metrics after controlling for bequest motive.

Once again, for comparison purposes, I analyze the differential behavior of the highly educated federal employees in relation to lesser-educated employees. Table 2.12 shows results from specifications that interact probability of death with having a graduate degree. Consistent with the results from the regression that interacted faculty status with probability of death for the University, I find that federal employees with a graduate degree are more likely to have coverage and have more coverage as their probability of death increases relative to other employees.

With those preliminaries aside, the main reason for introducing the SIPP data is to test for substitution between term life insurance and supplemental ESLI. To do this, I further restrict the sample to federal employees that either elected supplemental

[48]LIMRA (2015a) found that 14 percent of full-time employees did not know if they had the option of ESLI.

ESLI or term life insurance.[49] Table 2.13 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.[50] 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.

$$Term_i = \theta_0 + \theta_1 Risk_i + \theta_2 AgeBin_i + e_i \tag{2.7}$$

$Term_i$ 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). $Risk_i$ is probability of death, self-reported health, or the premium that the individual would face in expectation in the term life insurance market for a \$250,000 20-year policy imputed using term4sale.com and BRFSS data.[51] 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 coefficient for θ_1 would provide evidence for adverse selection originating from the option for term life insurance. In this specification, I just control for age bin (which corresponds to the pricing for supplemental ESLI). There is not a need to control for demand-side determinants since the sample is already constrained to individuals that purchased additional coverage.

The first column of Table 2.14 presents the results from estimating equation (2.7). 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.[52] For robustness, in the latter two columns I include estimations that use the constructed probability of death measure and self-reported health status respectively as the main

[49]Employees that selected both options account for 11.7 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 notwithstanding basic coverage technically being optional since employees pay for it.

[50]See appendix Figure A.2 for the distribution of additional coverage for federal employees.

[51]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.

[52]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.

independent variables. The results from these two specifications are consistent with the findings from the main specification.[53]

This result begs the question of why individuals do not take advantage of these potential savings. A possible explanation includes the lack of salience of term life insurance. A recent study found that 80 percent of Americans misjudged the cost of life insurance (LIMRA, 2015a). Other possible explanations include time costs and disutility associated with the underwriting including medical exams, extensive family history forms, and blood work. In addition, ESLI represents a simplified decision in which employees typically only have to select a level of coverage. In contrast, the individual market choice set involves numerous types and variants of policies including type of coverage (term or whole), term length, face value, and insurance 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, 2007b), 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. As education increases, these types of errors could decrease. In Table 2.15, I interact having a graduate degree with the independent variable of interest. The specification that uses annual term premiums does not show adverse selection—those in better health purchasing term life insurance–among federal employees with a graduate degree. However, the specification that uses probability of death does indicate that federal employees with a graduate degree are less likely to purchase term life insurance (more likely to purchase supplemental ESLI) as there probability of death increases. Therefore, there appears to be adverse selection by highly educated federal employees coming from the available substitute of term life insurance, but the finding is sensitive to the specification.

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, an alternative explanation could be

[53] 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.

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 general coming from healthy employees purchasing term life insurance instead of supplemental ESLI coverage.

2.8 Conclusion

Supplemental ESLI provides a textbook example of a market that could have ruinous adverse selection. At the University analyzed in this study, 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, across several different tests for adverse selection, I do not find evidence of economically significant adverse selection in the supplemental ESLI at the University. Furthermore, I find consistent result analyzing a sample of federal employees.

Even though there is not significant adverse selection in general, across both the University and federal employee samples, highly educated individuals, faculty members or those with graduate degrees respectively, do exhibit adverse selection. This finding points to the importance of education and—inasmuch as it is correlated—financial acumen in the existence of adverse selection in ESLI. Another explanation for the lack of meaningful adverse selection in general in ESLI is the availability of accelerated death benefits (ADB), which allow families to receive payouts prior to the death of the breadwinner but precludes them from increasing coverage. Other possibilities include salience of term life insurance pricing, fixed costs, and complexities associated with evaluating different policies, employee inertia, and a negative correlation between risk aversion and actual risk.

Given that University ESLI is ripe for adverse selection and I do not find evidence of it in general, it is likely that other ESLI plans with features that discourage adverse selection also would not have significant adverse selection. The results also indicate that the educational composition of workers covered by ESLI is also important for determining the influence of adverse selection. For example, firms that primarily consisting of highly educated employees could potentially have significant welfare loss from adverse selection. However, these results are derived using a metric for probability of death that misses some idiosyncrasies in individual risk and likely attenuates the results. An improved measure of risk and expected costs could be derived using health expenditure data from the University, which would capture idiosyncrasies that the imputed probability of death metric misses. Nonetheless, the main results hold when using measures of self-reported health and while directly observing the behavior of employees just prior to death, which gives credibility to the main findings. Furthermore, there continues to be widespread supplemental ESLI coverage despite the vulnerable nature of the coverage. This indicates that there are not sufficiently high levels of adverse selection in supplemental ESLI to unravel the market.

These results shed light on the effectiveness of contractual features designed to curb adverse selection in ESLI that are not modeled in most economic analyses. For example, federal employee life insurance, FEGLI, limits employees to electing coverage during rare open seasons likely to deter adverse selection. Given the results, these types of policies might be unnecessarily restrictive and lead to welfare loss for individuals that might want coverage merely due to changing preferences rather than because of negative health shocks.

Table 2.1: 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	0.16	0.16	0.16	0.16	0.16	0.15
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 2.2: Mean Comparison: University Supplemental ESLI Coverage

	No Supp. ESLI	Has Supp. ESLI
Demographics		
Age	41.86	45.76***
Male	0.36	0.36
White	0.85	0.87**
Black	0.08	0.09
Other race/ethnicity	0.06	0.05***
Family		
Ever Married	0.36	0.60***
Has Child	0.37	0.62***
Employment		
Faculty	0.16	0.14***
Healthcare	0.41	0.42
Salary ($1k)	60.54	61.43
Observations	7,160	6,560

Note: Sample consists of University employees in 2014. Indicators for statistical difference between means are given by *** p<0.01, ** p<0.05, * p<0.1

Table 2.3: Simulated Adverse Selection from Cancer 2014

	(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 2014	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 2014. 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 2.4: 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 2.5: ESLI Positive Correlation Test: University Employees 2014

Dependent Variable:	Has Supplemental		Supplemental Multi.	
	(1)	(2)	(3)	(4)
Probability of Death (Z-score)	-0.056^{***}	0.031^{***}	-0.079^{***}	0.057^{***}
	(0.008)	(0.009)	(0.011)	(0.012)
Age 35-39	0.203^{***}	0.117^{***}	0.299^{***}	0.205^{***}
	(0.033)	(0.021)	(0.047)	(0.032)
Age 40-44	0.308^{***}	0.202^{***}	0.438^{***}	0.322^{***}
	(0.036)	(0.021)	(0.052)	(0.032)
Age 45-49	0.338^{***}	0.215^{***}	0.471^{***}	0.329^{***}
	(0.030)	(0.020)	(0.045)	(0.031)
Age 50-54	0.356^{***}	0.213^{***}	0.470^{***}	0.294^{***}
	(0.030)	(0.021)	(0.045)	(0.032)
Age 55-59	0.330^{***}	0.154^{***}	0.413^{***}	0.181^{***}
	(0.029)	(0.025)	(0.042)	(0.035)
Age 60-64	0.281^{***}	0.056^{*}	0.339^{***}	0.030
	(0.035)	(0.032)	(0.047)	(0.042)
Ever Married		0.162^{***}		0.255^{***}
		(0.014)		(0.020)
Indicator for Children		0.153^{***}		0.223^{***}
		(0.012)		(0.015)
Model	OLS	OLS	Tobit	Tobit

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 2.6: ESLI Positive Correlation Test, University Employees 2014: Faculty Interaction

Dependent Variable:	Has Supplemental		Supplemental Multi.	
	(1)	(2)	(3)	(4)
Probability of Death (Z-score)	0.027***	0.022	0.050***	0.030
	(0.009)	(0.020)	(0.011)	(0.025)
Probability of Death × Faculty	0.166***	0.169***	0.241***	0.252***
	(0.024)	(0.023)	(0.032)	(0.032)
Probability of Death × Salary < $25k		−0.025		−0.025
		(0.022)		(0.029)
Probability of Death × Salary $25k-$49k		0.014		0.034
		(0.018)		(0.024)
Probability of Death × Salary $50k-$99k		0.008		0.023
		(0.020)		(0.025)
Model	OLS	OLS	Tobit	Tobit

Note: Marginal effects for the tobit analysis are reported. There are 13,720 observations for each regression. Controls for age bin, marital status, and any child 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 2.7: Welfare Costs of Adverse Selection

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 2.5)		Q=0.598, P=308.24
Efficient outcome (see Point E in Figure 2.5)		Q=0.617, P=229.66
Efficiency cost from selection (triangle CDE)		0.71

Note: Sample 1 includes both employees 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 2.8: Response to death, Nearest Neighbor Matching

Dependent Variable:	Has Supplemental	Multiple	Increase Coverage	Max Coverage
ATE				
Last Year to Increase	0.046	0.068	0.031	0.036
	(0.059)	(0.154)	(0.039)	(0.023)
Obs.	90,889	90,889	73,796	90,889

Note: 1:3 nearest neighbor matching was used with matching on age, gender, year, salary, race, faculty status, main campus/healthcare, marriage, and children. Standard errors are clustered at the individual level and shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 2.9: Summary Stats SIPP-Federal Employees

	(1)
Demographics	
Age	41.15
Male	0.60
White	0.69
Black	0.16
Other race/ethnicity	0.15
Income	
Earned Income ($1k)	57.82
Household Net Worth ($1k)	192.18
Family	
Married	0.67
Has Child	0.60
Education	
Less than High School	0.03
High School Grad.	0.61
Bachelor's Degree	0.21
Graduate Degree	0.15
Health	
Excellent	0.36
Very Good	0.36
Good	0.23
Fair	0.05
Poor	0.01
Life Insurance	
Has Life Insurance	0.77
Has ESLI	0.61
Has Individual Life Ins.	0.37
If Life Insurance>0	
Basic	0.19
Basic+Supplemental	0.31
Basic+Individual	0.15
Basic+Supplemental+Indiv.	0.13
Individual	0.21
Value if >0	
Supplemental ESLI ($1k)	160.71
Individual Life ($1k)	169.44
Observations	5,845

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

Table 2.10: FEGLI Positive Correlation Test: Has Supplemental ESLI

	(1)	(2)	(3)	(4)
Probability of Death (Z-score)	-0.033^{***}	0.023^{**}		
	(0.011)	(0.011)		
Poor Health			-0.008	0.004
			(0.084)	(0.082)
Fair Health			-0.076^{**}	-0.044
			(0.036)	(0.035)
Good Health			-0.048^{**}	-0.039^{**}
			(0.020)	(0.019)
Very Good Health			-0.031^{*}	-0.029^{*}
			(0.017)	(0.017)
Age 35-39	0.039	-0.018	0.015	-0.038^{*}
	(0.029)	(0.026)	(0.023)	(0.023)
Age 40-44	0.082^{***}	0.014	0.040^{*}	-0.020
	(0.028)	(0.026)	(0.024)	(0.024)
Age 45-49	0.080^{***}	-0.008	0.037	-0.022
	(0.030)	(0.028)	(0.023)	(0.023)
Age 50-54	0.068^{**}	-0.047^{*}	0.008	-0.050^{**}
	(0.030)	(0.028)	(0.024)	(0.025)
Age 55-59	0.075^{**}	-0.077^{**}	-0.015	-0.079^{***}
	(0.036)	(0.036)	(0.028)	(0.029)
Age 60-64	0.049	-0.157^{***}	-0.031	-0.097^{**}
	(0.047)	(0.049)	(0.038)	(0.038)
Married		0.279^{***}		0.290^{***}
		(0.019)		(0.020)
Widowed		0.039		0.074
		(0.049)		(0.066)
Divorced		0.132^{***}		0.136^{***}
		(0.023)		(0.027)
Has Child		0.020		0.012
		(0.014)		(0.016)

Note: The sample includes 5,845 federal employees between age 18 and 64 for each regression. The omitted category for self-reported health is Excellent. Panel fixed effects are included, but not reported. Standard errors are clustered at the demographic level used to impute probability of death and are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 2.11: FEGLI Positive Correlation Test: Supplemental Face Value ($1k), Tobit

	(1)	(2)	(3)	(4)
Probability of Death (Z-score)	-7.765^{***}	2.511		
	(1.931)	(1.659)		
Poor Health			-3.709	-1.198
			(15.325)	(14.549)
Fair Health			-15.469^{**}	-9.335
			(6.844)	(6.537)
Good Health			-10.919^{***}	-8.943^{**}
			(3.684)	(3.508)
Very Good Health			-6.355^{**}	-5.626^{*}
			(3.169)	(3.018)
Age 35-39	5.502	-3.445	1.616	-7.325^{*}
	(4.969)	(4.400)	(4.302)	(4.177)
Age 40-44	13.096^{***}	2.232	5.432	-4.250
	(4.929)	(4.487)	(4.440)	(4.324)
Age 45-49	15.360^{***}	1.098	7.795^{*}	-1.862
	(5.179)	(4.620)	(4.362)	(4.257)
Age 50-54	15.139^{***}	-4.135	2.196	-7.127
	(5.360)	(4.805)	(4.482)	(4.418)
Age 55-59	13.105^{**}	-11.933^{**}	-6.476	-16.005^{***}
	(6.441)	(5.724)	(5.044)	(4.930)
Age 60-64	11.858	-21.891^{***}	-10.314	-19.809^{***}
	(8.156)	(7.038)	(6.709)	(6.431)
Married		53.861^{***}		60.709^{***}
		(3.809)		(4.009)
Widowed		13.206		18.046
		(8.871)		(13.109)
Divorced		27.762^{***}		29.217^{***}
		(4.338)		(5.276)
Has Child		4.141^{*}		3.268
		(2.341)		(2.839)

Note: Marginal effects for the Tobit analysis are reported. The sample includes 5,845 federal employees between age 18 and 64 for each regression. The omitted category for self-reported health is Excellent. Panel fixed effects are included, but not reported. Standard errors are clustered at the demographic level used to impute probability of death and are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 2.12: FEGLI Positive Correlation Test: Graduate Degree Interaction

Dependent Variable:	Has Supplemental (1)	Supplemental ($1k) (2)
Probability of Death (Z-score)	0.022**	2.366
	(0.011)	(1.683)
Prob. of Death × Graduate Degree	0.071***	12.903***
	(0.027)	(4.658)
Age 35-39	−0.016	−3.040
	(0.026)	(4.424)
Age 40-44	0.015	2.536
	(0.026)	(4.603)
Age 45-49	−0.009	1.073
	(0.028)	(4.662)
Age 50-54	−0.052*	−4.963
	(0.028)	(4.816)
Age 55-59	−0.087**	−13.654**
	(0.035)	(5.631)
Age 60-64	−0.175***	−24.698***
	(0.048)	(6.720)
Married	0.283***	54.543***
	(0.019)	(3.784)
Widowed	0.038	12.687
	(0.049)	(8.857)
Divorced	0.131***	27.453***
	(0.023)	(4.317)
Has Child	0.018	3.881*
	(0.014)	(2.321)
Model:	OLS	Tobit

Note: Marginal effects for the Tobit analysis are reported. The sample includes 5,845 federal employees between age 18 and 64 for each regression. Panel fixed effects are included, but not reported. Standard errors are clustered at the demographic level used to impute probability of death and are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 2.13: 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 Grad.	0.65	0.54***
Bachelor's Degree	0.20	0.24*
Graduate Degree	0.14	0.19***
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	901	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 2.14: Market Interaction Analysis, Dependent Variable: Has Term Life Ins.

	(1)	(2)	(3)
Annual Term Premium ($100)	−0.014		
	(0.009)		
Probability of Death (Z-score)		−0.015	
		(0.018)	
Excellent Health			−0.116
			(0.186)
Very Good Health			−0.122
			(0.186)
Good Health			−0.165
			(0.186)
Fair Health			−0.182
			(0.197)
Age 35-39	0.101**	0.078*	0.099**
	(0.046)	(0.042)	(0.045)
Age 40-44	0.141***	0.101**	0.130***
	(0.046)	(0.042)	(0.045)
Age 45-49	0.170***	0.120***	0.142***
	(0.049)	(0.044)	(0.043)
Age 50-54	0.228***	0.124***	0.170***
	(0.062)	(0.044)	(0.046)
Age 55-59	0.322***	0.205***	0.231***
	(0.086)	(0.054)	(0.053)
Age 60-65	0.461***	0.299***	0.296***
	(0.136)	(0.084)	(0.075)
Obs.	1,269	1,639	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, and age. Columns (1) and (3) are restricted to panels 1996 to 2008 that contain self-reported health metrics. Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1 and are clustered at the demographic level used to impute annual term premium and probability of death respectively for specification (1) and (2).

Table 2.15: Market Interaction, Graduate Degree Effect; Dependent Variable: Has Term Life Ins.

	(1)	(2)
Annual Term Premium ($100)	−0.014	
	(0.009)	
Annual Term Premium × Graduate Degree	−0.002	
	(0.007)	
Probability of Death (Z-score)		−0.010
		(0.018)
Prob. of Death × Graduate Degree		−0.184***
		(0.051)
Obs.	1,269	1,639

Note: The sample includes federal employees that elected either supplemental ESLI or individual life insurance. Non-reported covariates include age bin and panel fixed effects. Column (1) is restricted to panels 1996 to 2008 that contain self-reported health metrics. Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1 and are clustered at the demographic level used to impute annual term premium and probability of death respectively for specification (1) and (2).

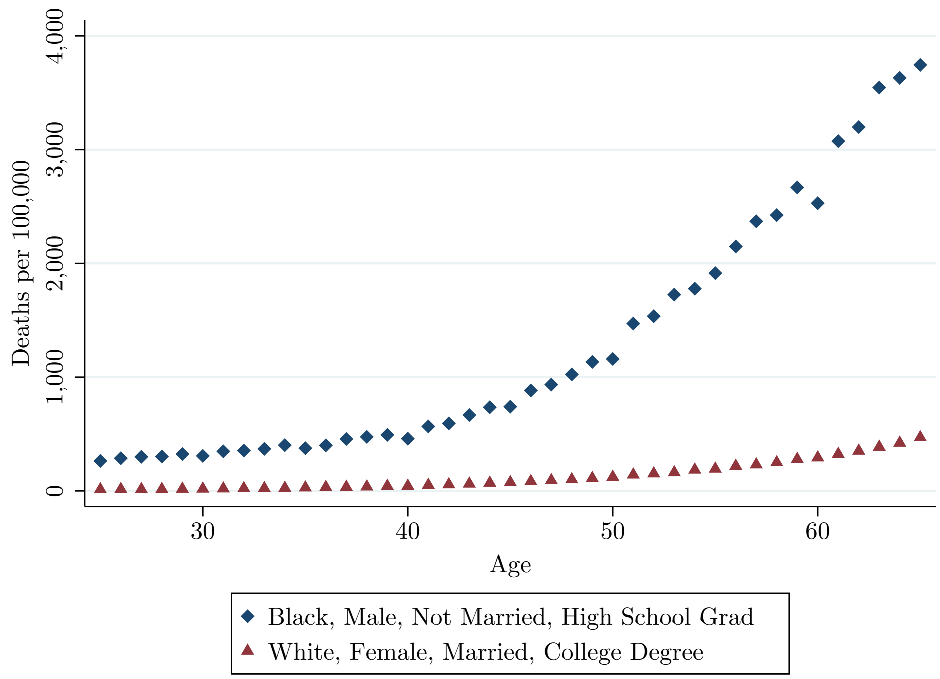


Figure 2.1: Heterogeneity in underlying probability of death

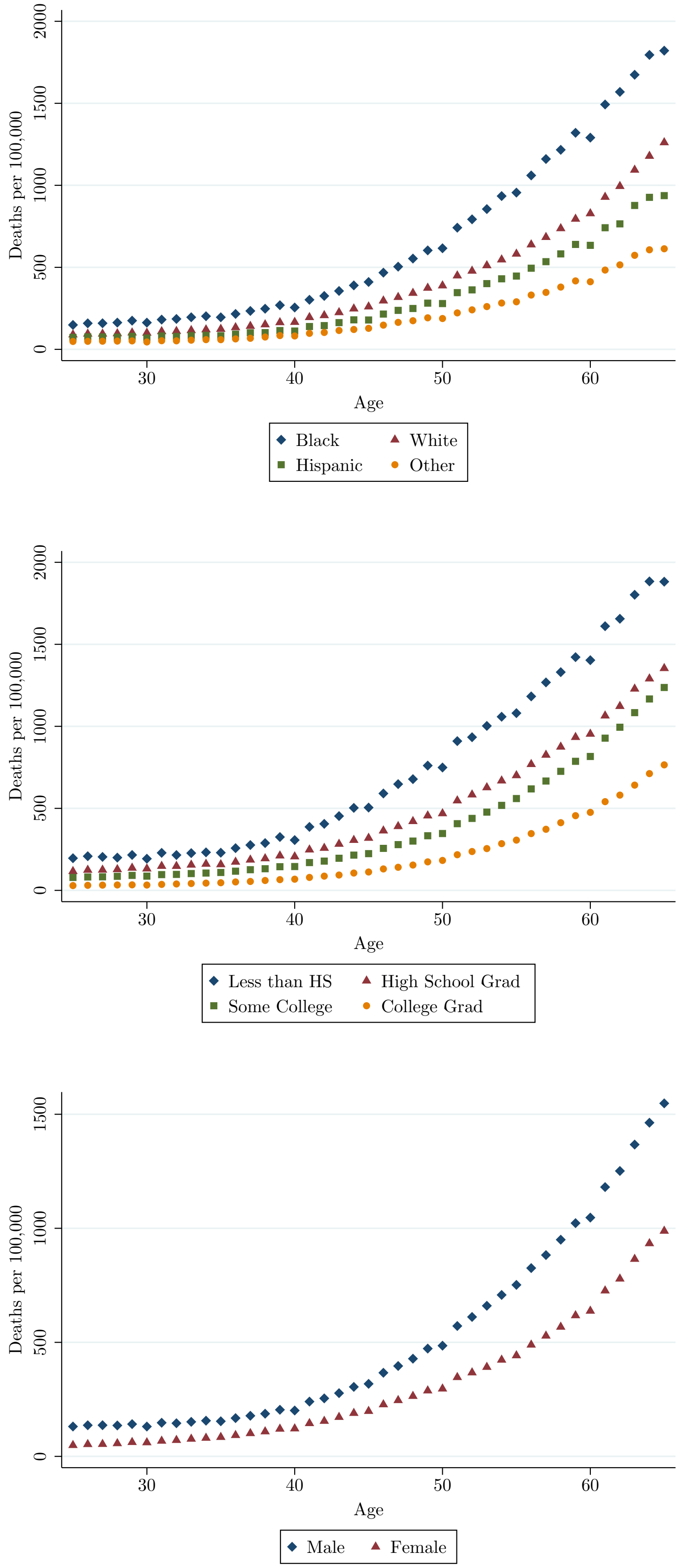


Figure 2.2: Heterogeneity in Probability of Death

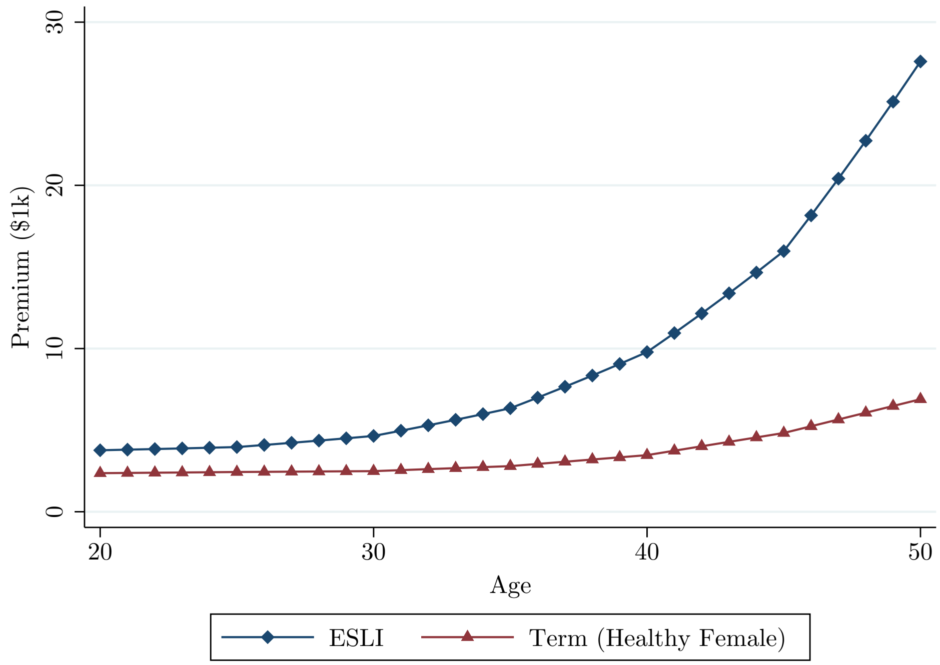


Figure 2.3: Present value of Premiums for a 20-year $250,000 policy

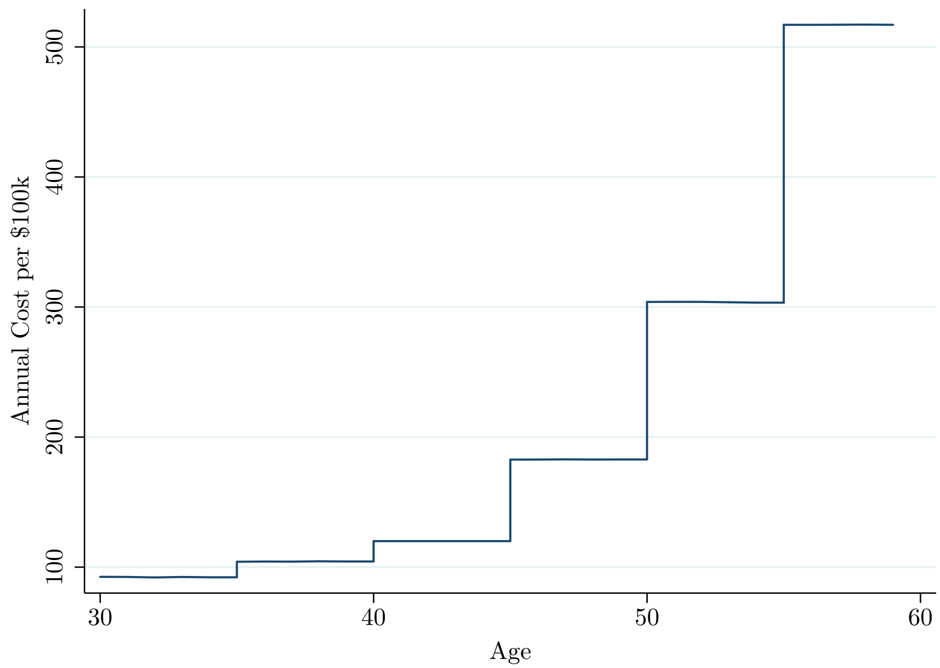


Figure 2.4: University Supplemental ESLI Premiums

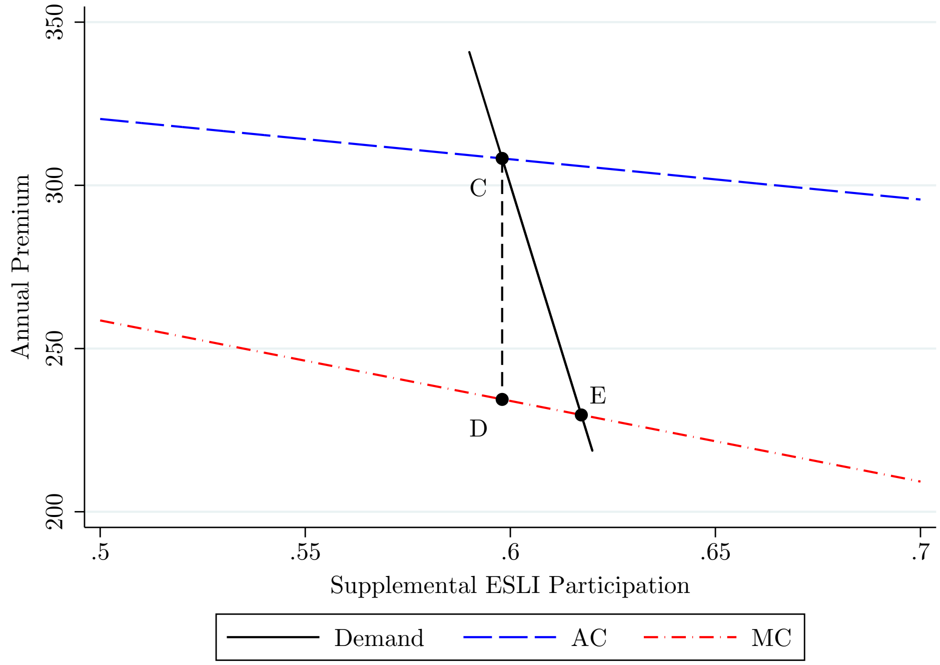


Figure 2.5: Life Insurance Selection

Chapter 3: Nudging Life Insurance Holdings in the Workplace (with Aaron Yelowitz)

3.1 Introduction

Life insurance ownership is at a 50-year low and sales have declined 45 percent since the mid-1980s (Prudential, 2013; Scism, 2014). Large disparities exist between life insurance holdings and underlying vulnerabilities with some estimates exceeding $15 trillion (Bernheim et al., 2003; Conning, 2014; LIMRA, 2015c). These disparities are partially explained by many individuals' inability to correctly answer rudimentary financial questions and difficulties associated with thinking about death and gauging mortality risk (Lusardi and Mitchell, 2006, 2007b; Kopczuk and Slemrod, 2005).

Notwithstanding these disparities, 70 percent of households have some form of life insurance coverage, which is split between individual and group markets. The two markets differ in that individual market premiums are experience rated with extensive underwriting, while group markets typically have some form of community rating and guaranteed issue. Previous work has focused almost exclusively on the individual market (Cawley and Philipson, 1999; He, 2009, 2011; Harris and Yelowitz, 2014, 2016; Hedengren and Stratmann, 2016). Little attention, however, has been given to the group or employer-sponsored life insurance (ESLI) market where 39 percent of households have coverage.

In a recent paper on behavioral economic interventions, Madrian (2014) proposed prompting individuals to make a concrete plan to elect life insurance in order to increase coverage. A different approach to address uninsured vulnerabilities is through an increase in employer provision. As with any type of employer or government provision, there is the principal concern of crowd-out. A growing literature, however, documents considerable levels of inertia that lessens the crowd-out effect (Thaler and Sunstein, 2008; Handel, 2013; Chetty et al., 2014).

We use administrative data from a large public university ("the University" henceforth) with approximately 16,000 employees to analyze the impact of increased employer provision of life insurance on total life insurance coverage. There are two types of ESLI available for employees at the University: basic, which is automatically provided by the employer, and supplemental which is available in multiples of salary. In 2008, the University increased provision of basic life insurance coverage from $10,000 to 1x the worker's annual salary and increased the maximum coverage from $375,000 to $1 million. For existing employees, the choice of supplemental coverage remained at the default level chosen in 2007; to undo the nudge to increase total coverage, an employee would actively have to scale back supplemental coverage. The neoclassical model predicts one-for-one crowd-out for those electing supplemental coverage in 2007.

Using two distinct samples, we observe considerable levels of inertia. The first group we analyze consists of existing employees who elected a multiple of 1x or 2x salary (interior) in 2007 (1,867 employees). These individuals were in a position to completely undo the increase in basic coverage and were not constrained by a maximum contribution limit. For example, an employee with 1x salary in supplemental coverage making $60,000 would experience an increase in total coverage from $70,000 to $120,000 (1.17x salary to 2x salary) if they did not reduce supplemental coverage. For this sample, we find full pass-through of the increase in basic coverage with a precisely estimated 97 percent pass-through as a lower bound.[1] Full pass-through is found in both the short and long-run and for every demographic group. The second group contains highly compensated employees (making $125,000 to $187,500) who were constrained by the maximum contribution limit in 2007 and who chose supplemental coverage worth 3x salary (86 employees). Due to the $375,000 maximum, they were effectively assigned a multiple less than 3x salary. For example, an employee making $160,000 (who elected 3x salary) was constrained to have only 2.34x salary ($375,000) in supplemental coverage. The policy change automatically increased both basic coverage as well as supplemental coverage from 2.34x to 3x salary. In the case of full inertia, this policy change increased total coverage from 2.4x to 4x salary ($385,000 to $640,000). Over 75 percent of this group did nothing in response to this change consistent with inertia.

New employees, however, are not influenced by inertia because they are required to complete a form where they name a beneficiary and make an active decision regarding the multiple of salary for supplemental ESLI. For new hires, we find that a $100 increase in basic life insurance coverage decreases supplemental coverage by $23. The reduction in supplemental coverage for those without the influence of inertia is consistent with partial crowd-out. Therefore, we conclude that inertia in part drives the full pass-through of the increase in basic coverage for existing employees.

Potential reasons why we do not find full crowd-out of the increase in basic coverage for new hires include context effects, implicit advice, and flypaper effects. Individuals tend to elect the middle option due to compromise effects and avoidance of extremes (Simonson, 1989; Simonson and Tversky, 1992; Kamenica, 2008). Consequently, the expansions of the maximum face value (from $375,000 to $1,000,000) and the available multiples of coverage (from 0-3x to 0-5x salary) could have increased new hire supplemental elections. Employees could have also interpreted the expanded options as implicit advice to increase supplemental ESLI coverage. Additionally, Choi et al. (2009) find that employees fail to take into account the allocation of employer contributions when choosing their own allocations for 401(k) accounts. It could be the case that employees partially fail to take into account employer contribution when determining their level of supplemental ESLI coverage thus leading to less than full crowd-out for new hires.

Even though we do not find crowd-out of the perfect substitute, supplemental ESLI, for existing employees, it is possible that employees reacted to the increased provision of basic coverage by decreasing an imperfect substitute, individual life insurance (term or whole life policies). We cannot directly observe this response for the University's employees, so we use the Survey of Income and Program Participation

[1] Lower bound calculated using a 99 percent confidence interval. The point estimate shows that a 0.74x salary increase in basic coverage resulted in a 0.78x salary increase in total coverage.

(SIPP) and a quasi-experimental approach that examines job switchers to identify the effect. Even among job switchers, who should be the most responsive, we find little substitution between employer-sponsored and individual markets with less than 1 in 10 workers changing individual coverage in reaction to changes in ESLI. If University employees react in a similar fashion, then increases in ESLI coverage, by and large, represent increases in total life insurance holdings.

Overall, the nudge was effective in the sense that it increased life insurance coverage, but was it a sensible nudge? We analyze how employees' holdings relate to the recommended levels of life insurance coverage. In 2007, approximately two-thirds of employees were below recommended levels and the remainder were above. The increased provision of basic coverage reduced the average disparity between actual and recommended coverage. Of those with adequate coverage prior to the increase, over 90 percent had no dependents and consequently had little need for coverage. In addition to analyzing the effectiveness of the increase in basic coverage to 1x salary, we explore alternative expenditure neutral policies. We find that equal contributions to premiums mitigate disparities better than multiples of salary or fixed coverage amounts.

This paper contributes to the body of literature on inertia. Researchers have analyzed inertia on the extensive margin related to default participation in 401(k) plans (Madrian and Shea, 2001; Choi et al., 2002, 2004) and organ donation (Johnson and Goldstein, 2003; Abadie and Gay, 2006). Additional research has explored inertia on the intensive margin in the context of Medicare Part D choice (Ericson, 2014), retirement contribution (Chetty et al., 2014; Messacar, 2014), private health insurance choice (Handel, 2013), income tax refunds (Jones, 2012) and Medicaid plan choice (Marton and Yelowitz, 2015). This study primarily examines the intensive margin where employees first choose coverage and then encounter frictions that lead to inertia despite a changing default.

Although inertia and pass-through have been found in previous studies as outlined above, the degree of inertia varies significantly depending on the context. For example, Chetty et al. (2014) find that 85 percent of employees are passive (inert) and save more due to increased automatic retirement contributions, whereas Dahl and Forbes (2016) find in the context of health insurance that only 16 percent of employees are inert one year after the policy change. Benefits that are used more frequently or are more salient (i.e. carry a greater financial cost) are harder to nudge. Life insurance represents a small budget share and payouts are received only in the case of a low probability event. Therefore, it is unlikely that the degree of inertia for ESLI would be equivalent to findings in other markets. The sheer magnitude of inertia and not merely its existence is important for policy makers seeking to address widespread uninsured vulnerabilities in life insurance coverage.

The remainder of the paper is organized as follows. Section 3.2 describes the policy change and theoretical predictions. Section 3.3 describes the data and representativeness of the University sample. Section 3.4 provides the empirical specification. Section 3.5 presents our results. Section 3.6 analyzes the relationship between the individual and non-group markets. Section 3.7 explores the desirability of the nudge and alternative policies. Section 3.8 concludes.

3.2 Policy Changes and Theoretical Predictions

Prior to detailing the policy change at the University, we present a simplified model to describe a representative agent's choice of supplemental life insurance coverage given basic coverage provided by an employer. In the model, the individual chooses supplemental ESLI coverage, d_S and pays an actuarially fair premium.[2] After choosing coverage and paying the corresponding premium, the employee either dies and her family receives a payout or she lives and receives an income stream, y. The utility maximization problem is given by the following objective function:

$$\max_{d_S} V = (1-\rho)U(y + w - \rho d_S - \rho d_B) + \rho U(w - \rho d_S - \rho d_B + d_S + d_B) \qquad (3.1)$$

where $U(.)$ represents a concave utility function, ρ is the probability of death, and w is wealth (transferable). Payouts are given by d_S and d_B respectively for supplemental and basic coverage. In this model, we assume that employees bear the cost of basic ESLI. Nonetheless, the results do not change if the employer merely gives the employee's dependents d_B in the case of the employee's death.[3]

The basic optimization problem leads to the familiar result of full insurance with $d_S^* = y - d_B$. As is apparent from the solution, supplemental coverage should decrease one-for-one as basic coverage increases for those at an interior solution. If d_S^* is zero, then employees cannot reduce coverage in response to increases in basic coverage. Additionally, if d_S is constrained to be below d_S^*, then employees should not decrease coverage with an increase in basic ESLI inasmuch as the increase does not exceed the optimal level of total insurance. The main result, for those at an interior solution, is one-for-one crowd-out of supplemental coverage with an increase in basic coverage.

In 2008, the University increased basic coverage from \$10,000 (0.18x salary on average) to 1x annual base salary for all qualified employees.[4,5] This increase in basic coverage, given no employee response, results in an increase of life insurance of approximately 1x the employees' annual salary. The increase in basic coverage is crucial for understanding the responsiveness of employees to changes in life insurance coverage. In the absence of the increase in basic coverage, preferences and needs for life

[2]The results are robust to consideration of actuarially unfair premiums.

[3]Given the specification of the model, there is no income effect from the increase in basic life insurance even if the employee does not pay the premium. This is the case because inherent to the model is that life insurance is meant to insure against potential lost earnings and not to insure against already received wealth. Any "income effect" would just increase wealth in this model, which is present in both states of the world and therefore irrelevant in the decision of how much life insurance to have. Nonetheless, a model that incorporates more time periods could result in an income effect if provision of basic coverage raised total compensation in later periods.

[4]Qualified employees include regular full-time employees or part time $\geq .75$ full-time equivalent and constitute 91 percent of all workers.

[5]We do not have information on the exact announcement date of the increase in basic life insurance. Nonetheless, it would be atypical for the University to announce the change significantly before the open enrollment period in which it would go into effect. Therefore, there likely were not any anticipatory effects.

insurance evolve slowly over time and lead to relatively few changes in supplemental coverage. Additionally, ESLI automatically adjusts for changes in income because coverage is elected in multiples of salary. In the year preceding the increase in basic coverage, 90 percent of employees with supplemental ESLI kept the same level of coverage. The lack of change in the year before cannot be deemed inertia because preferences and needs for coverage likely did not sufficiently change in a single year to merit adjustments to supplemental coverage. On the other hand, increased provision of life insurance should elicit a response.

Table 3.1 outlines the life insurance parameters both before and after the increase in basic coverage.[6] Qualified employees could always elect supplemental life insurance in multiples of annual salary. Although near ubiquitous in the individual life insurance market, health screening has a minimal role in ESLI. At the University, health screening is only required for supplemental coverage over $375,000 or for large jumps in coverage.[7] Premiums on supplemental life insurance are community rated and assigned based on 5-year age bins, which workers pay on an after-tax basis through payroll deductions. Premiums changed between 2006 and 2007 and then remain unchanged for the duration of the sample. Premiums increased by 60 and 50 percent for those aged 18-34 and 35-39 respectively. The increased premiums could have caused employees to reduce coverage.[8] If there were a lagged effect—employees react the following year—then this would indicate crowd-out of the increase in basic coverage when it was the result of changing premiums. Therefore, for those under age 40, our analysis will overstate crowd-out. In 2007, employees were required to resubmit a life insurance elections form to update beneficiaries. The forced recalibration of ELSI made the price change more salient and if employees wanted to alter supplemental coverage, they likely would have done it in 2007. Regardless, we use older employees who did not experience a premium change to verify the robustness of our findings.

As illustrated in Table 3.1, prior to 2008, qualified employees could elect supple-

[6]The University also switched insurance companies in 2008. Both companies have identical and excellent credit ratings. Given the straightforward nature of these life insurance policies, it is unlikely that this switch significantly influenced participation.

[7]Prior to 2008, employees were only required to submit a medical evidence of insurability form if they increased supplemental coverage by more than 1x annual salary in a given year. Nonetheless, employees can quickly raise coverage without health screening by increasing supplemental elections by a multiple each year. This requirement should mainly influence the small proportion of employees that received large negative health shocks with imminent mortality (e.g. diagnosis of terminal cancer). Starting in 2008, employees that elected more than $375,000 in supplemental coverage were required to submit a medical evidence of insurability form. This restriction only potentially applies to 14 percent of employees (those that made more than $75,000). New hires after 2008 could elect 0-3x salary in supplemental coverage without proof of insurability, but were required to submit the form if they initially elected 4x or 5x salary. Nonetheless, new hires desiring more coverage can increase to the maximum level of coverage within 2 years without proof of insurability (conditional on not exceeding $375,000).

[8]Previous studies have estimated the price elasticity of demand for term life insurance to be between -0.30 and -0.66 (Pauly et al., 2003; Viswanathan et al., 2007)

mental life insurance at multiples of 1-3x base salary up to a maximum of \$375,000.[9] Beginning in 2008, the multiple limit was expanded to include 4x and 5x annual salary with a \$1 million maximum contribution limit. The increased maximum election should only affect those individuals who elected 3x annual salary prior to 2008 or those constrained by the \$375,000 maximum.

Although the simplified representative agent model predicts full crowd-out of increased basic ESLI, it does not perfectly describe the situation at the University. Due to the restriction of selecting whole multiples of supplemental coverage and given that the increase is not exactly the same as a multiple of supplemental coverage, it is possible that non-response is optimal for some individuals. For example, suppose the optimum for an individual is total ESLI of 2x salary. Prior to 2008, the individual selects 1x salary in supplemental coverage if $V(1x + \$10k) > V(2x + \$10k)$. After 2008 the individual has 2x salary in total coverage due to the increase in basic coverage and optimally does not reduce supplemental coverage because $V(2x) > V(1x)$. Although possible, this scenario likely only applies to a small minority of employees.[10] Additionally, the likelihood of this scenario should decrease for higher earners where \$10,000 in coverage represents a smaller proportion of total coverage.

We illustrate the increase in basic coverage and the expanded maximum in Figure 3.1 assuming that employees are utility maximizers and that life insurance is a normal good. This figure depicts the life insurance decision for a 45-year-old employee with an annual income of \$100,000. Prior to the policy change, individuals faced budget constraint BC_0 and optimally choose bundle A, which consists of total life insurance coverage worth 2x annual salary. After the policy change, employees were subject to BC_1, which incorporates the provision of 1x salary in basic coverage and the increase in available multiples. If an employee does not react to the changing budget constraint, she ends up at point C with increased life insurance coverage. Optimally, the employee selects bundle B but due to the restriction of purchasing whole multiples of coverage the individual continues with 2x salary in total ESLI coverage. Therefore, for this interior solution, the increase in basic life insurance from essentially 0x to 1x salary is completely offset due to one-for-one crowd-out such that the individual optimally demands the same level of total coverage.

There is a minimal increase in total compensation—on the order of 0.2 percent—

[9] An employee gets \$375,000 in supplemental coverage if their selected multiple would cause coverage to exceed the maximum. For example, an employee with a base salary of \$200,000 that selected 2x salary in supplemental coverage would be assigned a multiple of 1.875x salary due to the \$375,000 maximum. Consequently, highly compensated employees (salary > \$125,000) could have a "partial" multiple of supplemental coverage prior to 2008.

[10] For a majority of employees examined in this study, the election of supplemental coverage was chosen before 2006 under a framework where employees elected a *total* multiple of coverage (1x, 2x, 3x salary) rather than the current system of electing supplemental multiples to be added to basic coverage. It is unlikely that a significant amount of employees lowered supplemental coverage due to the slight increase in total coverage in 2006. Therefore, by revealed preference, a majority of employees preferred the lower multiple rather than the higher multiple that resulted due to the increase in basic coverage.

from this increase in basic coverage, which leads to a tiny income effect.[11] The average worker receives a $121 annual increase in total compensation because of the increase in basic coverage (based on supplemental premiums). Employees likely pay for the increase in coverage in the form of smaller raises or bonuses. Inasmuch as employees recognize this implication, the tiny income effect only decreases. Therefore, the likely prediction is one-for-one crowd-out and no increase in total life insurance holdings for those with 1-2x salary in 2007.

A possible explanation for any lack of response is that the initial supplemental ESLI election became suboptimal over time due to changing needs or acquired information indicating a need for more coverage. If this were the case, the increase in basic coverage reflected a costless adjustment to a optimum that individuals did not undertake themselves due to time costs of updating supplemental coverage. However, as previously mentioned, all employees in 2007 were required to fill out a life insurance form to update beneficiaries. Included on the same one-page form was the option to change supplemental coverage by merely checking a box. Therefore, if employees had latent demand for more coverage, there was a virtually costless opportunity to increase coverage the year before the increase in basic coverage making the scenario less likely.

Failure to observe crowd-out for employees at the interior solution (i.e. 1x or 2x) could be a result of employee inattention or lack of understanding. The University mails benefit booklets to employees, which inform them of changes and benefit availability (see Appendix A). This information is also available through the Human Resource website. Nonetheless, it is possible that employees were unaware of the increase in basic coverage or did not understand that supplemental elections would remain the same. Later, we use overall activity and changes in other benefits to infer awareness.

An alternative explanation for not finding crowd-out could be prohibitively expensive costs of changing coverage. Various psychological frictions or costs exist that could cause deviations from the rational frictionless model. Implicit costs due to the difficulty of evaluating the relative advantages for the various types of life insurance can decrease coverage (Iyengar et al., 2004; Handel, 2013). Furthermore, the psychological cost of thinking about death decreases the likelihood of changing life insurance elections (Kopczuk and Slemrod, 2005). In addition, employees needed to submit a paper form to the benefits office to decrease supplemental coverage, which represents a time cost for changing the policy. We account for this time cost by analyzing employees that made simultaneous changes to other benefits and consequently have reduced costs for making an additional change to supplemental life insurance.

Even though our analysis primarily focuses on those at the interior, it is important

[11] The income elasticity of life insurance coverage has been estimated to be between 0.32 and 0.6, which translates into a negligible increase in life insurance coverage due to the slight increase in total compensation (Browne and Kim, 1993; Li et al., 2007). For example, a 35-year-old employee making $50,000 with 1x salary in supplemental coverage would increase coverage to $50,026 as a result of the income effect using an income elasticity of 0.6. Therefore, it is unlikely that any non-response originates from an income effect.

to understand the response of employees at the corners when considering the overall impact of the increase in basic coverage. For individuals who did not elect supplemental coverage, the increase in basic coverage mechanically increases ("shoves") total coverage from \$10,000 to 1x annual salary. Any change in total coverage above 1x salary could be due to perceived implicit advice from the employer or referencing coverage based on the available maximum. For those at 3x salary in 2007, it is likely that they were constrained by the maximum and have latent demand for more coverage. As the available multiple increases from 3x to 5x in 2008, they likely elect more coverage. However, if 3x salary was the desired level of coverage then they should experience complete crowd-out of the increase in basic coverage.[12]

3.3 Data

3.3.1 Description

We use administrative (payroll) panel data from the University from 2006 to 2014.[13] The data document complete benefit and retirement elections. 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.[14] All elections made during the open enrollment period take effect July 1 and continue until a new election in made. In general, employees cannot add or drop coverage during the year except in the case of a qualifying event. Supplemental life insurance is distinct from other benefits in that an employee may reduce insurance coverage at any time.

If an employee leaves the University for any reason his or her coverage for either basic or supplemental life insurance lapses unless the individual qualifies for long-term disability (LTD) or the employee dies within the three months.[15] This lock-in aspect of ESLI is contrasted with individual market coverage, which is contingent on premium payments alone and not employment. Evidence of lock-in has been shown in employer-sponsored health insurance and cliff vesting for defined benefit pensions (Madrian, 1994; Kotlikoff and Wise, 1987).

Table 3.2 shows the summary statistics for 23,132 unique workers from 2006 to 2014

[12]It is possible that corner constrained individuals had preferences such that $V(4x) > V(3x + \$10k)$ and $V(4x) > V(5x)$ salary such that it was not optimal to increase or decrease supplemental coverage.

[13]For the University, fiscal years go from July to June. For example, fiscal year 2006 begins July 1, 2005 and ends June 30, 2006.

[14]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.

[15]If the employee chooses to leave the University, the worker does have the option of switching the policy over to the insurer without health screening. However, according to a Human Resource representative, the worker will "pay dearly" in premiums for the policy. This is referred to as "portability" in the insurance contract. This university is far less explicit than some others with respect to job related leaves and portability, but seems very similar. If a worker qualifies for LTD, the life insurance policy will end upon turning age 67.

who are eligible for supplemental life insurance coverage. The sample is predominately female (63 percent) and white (86 percent). Roughly half of the sample is married and over 40 percent of the sample has a child.[16] Faculty make up less than 20 percent of the sample. In addition to the main campus, the University operates a hospital. The relative employment share for healthcare increased 17 percentage points over the period; all healthcare workers are classified as staff.[17] The data report annual base salary in thousand dollar increments top-coded at $375,000. Median salary increased in nominal terms from $38,000 to $46,000 over the 9 years of the sample. This value does not take into account bonuses, raises that occur during the year, or summer ninths.

Figure 3.2 shows that supplemental participation increased until 2008 and then decreased from 56 percent to 48 percent in the course of six years for all employees. However, this decline is not present for continuously employed workers. This indicates that the decrease in supplemental participation is driven by new hires. Generally, we do not observe new hires in the data until the year following their hire date as many were hired during the fiscal year.[18] Therefore, as shown in the figure, the decline in participation begins a year later than would be expected from crowd-out due to the lagged observation of new hires.

The second panel of Table 3.2 breaks out supplemental life insurance participation by different demographic groups. The participation profile is hump-shaped with respect to age and peaks between ages 40 and 45. Life insurance's primary purpose is to replace the lost earnings of a breadwinner, which means as the individual approaches retirement demand might decrease as potential lost earnings decrease. For employees under age 55, participation rates increased from 2006 to 2008 and then consistently fell for the remainder of the sample. For those under age 35, participation dropped from 46 percent in 2008 to 29 percent in 2014. No decline exists for employees older than 50.

Table 3.2 further shows how income levels influence participation. For employees that make less than $100,000, there is the same trend of increasing participation up to 2008 followed by steady significant decline. This trend exists for faculty, staff, main campus, and healthcare employees. Faculty are less likely to hold supplemental ESLI in comparison to staff for every year except 2006. This perhaps could be the result of

[16] We 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). If an employee ever elects either spousal or family insurance (of any type) then the individual is categorized as "Married in Sample." Similarly, if an employee elects child or family insurance (of any type) or uses a dependent FSA then they are classified as having a "Child in Sample." This measure will not pick up individuals who have alternative sources of insurance such as a spouse's employer (Ritter, 2013). In addition, this variable will miss individuals with children who are no longer dependents.

[17] Even though we do not explicitly observe education, the position of faculty or staff at the main campus is correlated with level of education (Brown and Previtero, 2014).

[18] Note that most of the employees are staff and a majority of new hires in 2008 and 2009 were made for the healthcare portion of the University. This is important because both staff and hospital personnel do not necessarily follow the same hiring patterns as faculty.

differential participation in the individual term life insurance market. There are no significant gender differences.

3.3.2 Representativeness

Many universities publish online benefits booklets through their human resource offices with varying degrees of detail on fringe benefits, including ESLI. We collected benefits booklets in 2014 from more than 400 institutions. Of these, we select 70 institutions that have well-documented information on both basic and supplemental life insurance coverage. The benefit booklets for many institutions were missing details on life insurance and we are hesitant to conclude that such institutions do not offer coverage. Nearly 70 percent of employees across all occupations are offered life insurance coverage, and the take-up rate is 80 percent. Additionally, half of all employees are offered supplemental coverage (LIMRA, 2015b).

Although many differences exist across universities with respect to their provision of life insurance, several common features emerge for the 70 institutions examined. First, premiums are community rated, often with five-year age bins, similar to the University in this study. Virtually all institutions have an open enrollment period where new employees can purchase coverage without underwriting and where the issuance of policy is guaranteed.

Second, a large majority of basic plans are provided as a multiple of salary. Of the 70 plans, 30 percent had basic coverage at 1x salary, 17 percent at 1.5x salary, and 24 percent at 2x salary. Thus, the University's design of its basic plan from 2008 onward is representative of a much larger set of institutions, both in terms of structure and generosity. Almost all of the remaining plans (12 of the 20 that were not multiples at 1x, 1.5x or 2x salary) offered a flat dollar amount of coverage, most often in the range of $20,000 to $50,000. Such flat dollar life insurance plans mimic the basic structure at the University prior to 2008 (where the flat dollar amount of $10,000 was considerably lower than most plans).

Third, almost half of institutions scale back basic life insurance coverage once employees reach a threshold age, often 65 or 70. Relative to younger employees, the payout typically falls by at least 35 percent. In 2008, the University adjusted the coverage such that payouts fell to a flat amount of $10,000, rather than 1x salary, once an employee reached age 70.

Fourth, three-quarters of supplemental plans also offer coverage in multiples of salary, with maximum payouts that will be binding for higher paid employees. The most common maximum multiple is 5x salary, with a range from 2x to 10x salary. The University's change in 2008 brought the supplemental maximum in line with other universities. The remaining one-quarter of supplemental plans offer flat dollar amounts, which allows lower paid employees to purchase far greater multiples of their salary. The most common flat dollar amount is $500,000.

Table 3.4 combines and summarizes some of the salient features for the 70 universities into a maximum "effective salary multiple" (i.e. total coverage divided by salary). The combination of basic and supplemental plans, multiples of salary and flat dollar amounts, age adjustments and maximum payouts has implications for the degree of total coverage that an employee can obtain from ESLI. We present the effective salary multiple for three types of earners ($35k, $100k and $400k) and two ages (age 30 and age 65). Several findings emerge. Lower compensated employees typically have the potential to replace more of their salary through life insurance, both due to plans with flat payout and binding maximums on higher paid employees. The median effective multiple is 6.5x salary for young employees making $35k, 6.0x salary for those making $100k, and just 2.2x salary for those making $400k. Second, since the majority of plans do not have steep drop offs based on age, the medians are similar for 65-year-olds, but in some cases, the drop offs can be quite substantial. For example, a 65-year-old at Michigan State University making $100k can replace just 5.7x her salary, while a 30-year-old can replace 8.5x her salary. The University considered in this study, after the policy change, falls below the median effective salary multiple for most employees.

The University can also be compared to the more systematic collection of data from the March 2013 National Compensation Survey (NCS)(Bureau of Labor Statistics, 2013). Evidence is presented in Table 3.5. Across all industries, 60 percent of employees have access to ESLI, and take-up of the benefit is virtually complete. Employees in higher education have far greater access to ESLI, and access is higher still at the University. Consistent with the sample of 70 institutions, the most common form of ESLI is as a multiple of earnings, which is approximately twice as prevalent as flat dollar contributions. In addition, for ESLI plans that are designed as a multiple of salary, almost twice as many cover employees at 1x salary as at 2x salary. Among flat dollar plans, the median payment is $20,000, somewhat lower than the sample of 70 institutions.

In summary, data collected from benefits booklets and from the NCS suggest that the University made changes in 2008 that brought its life insurance offering from below average to the norm for colleges and universities. The NCS demonstrates that colleges as a whole tend to be more generous than other industries in the provision of ESLI, but the design of the University's plan—as a multiple of 1x earnings—is quite common for a broad range of workers. Given these findings, it is likely that the University increased basic ESLI coverage to align itself with industry standards rather than to satiate the changing preferences of existing employees.[19]

3.4 Empirical Strategy

3.4.1 Existing Employees at the Interior

To test the influence of inertia, we restrict the analysis to those employees that elected either 1x or 2x annual salary in 2007 (interior solution) for whom the increase

[19]If the University did change the policy to reflect demand for more coverage, it is unlikely that the demand came from the subsample of employees without the maximum supplemental coverage that we focus on in this analysis.

in basic coverage represents a nudge.[20] The simultaneous increase in the available multiples from 3x to 5x coverage should not influence this population since by revealed preference they demanded a multiple lower than the maximum. In addition, they have the flexibility to reduce supplemental coverage to offset the increase in basic coverage. This group constitutes 22 percent of the sample of existing employees. We use the following fixed effects specification to test the effect of the increase in basic coverage.

$$TotalCoverage_{it} = \beta_1 Post_t + \beta_2 X_{it} + \alpha_i + \varepsilon_{it} \tag{3.2}$$

$TotalCoverage_{it}$ represents the total coverage (basic+supplemental) in multiples of income for individual i at time t, X_{it} is a vector of covariates that vary across time (income, age, and main campus vs. healthcare assignment), and $Post_t$ is an indicator variable equal 1 for years following the increase in basic coverage. If β_1 is zero, then there is no evidence of inertia. The individual fixed effect, α_i, controls for unobserved heterogeneity such as risk aversion, latent health, human capital, and underlying needs.[21]

3.4.2 New Hires

Next, we analyze the effect of the increase in basic coverage for new hires. Several studies have shown that new hires respond more to changes in benefit pricing and more frequently elect new options relative to existing employees (Samuelson and Zeckhauser, 1988; Royalty and Solomon, 1999; Strombom et al., 2002; Handel, 2013). New hires at the University are required to actively choose (no default) if they want supplemental coverage or just basic coverage in addition to listing a beneficiary for basic life insurance.[22] Therefore, in the absence of inertia, new hires should have been less likely to opt into, and choose lower levels of, supplemental coverage after the increase in basic coverage.

Summary statistics for cohorts of new hires within 2 years of the increase in basic coverage (4,298 employees) are presented in Table 3.6. The difference in the basic life insurance multiples mechanically reflects the policy change, whereas the decrease in supplemental coverage on the extensive margin (any participation) gives evidence of crowd-out. The table also shows that the extensive margin response in supplemental life insurance coverage is driven from employees at the main campus. Demographics

[20]This sample additionally excludes those that elected 2x salary in 2007 and had a salary greater than $125,000 and those that elected 1x salary who had a salary greater than $187,500 because they were potentially constrained by the maximum coverage limit of $375,000. In addition, this restriction avoids any conflict with the medical evidence of insurability needed for coverage greater than $375,000. This exclusion represents 1 percent of those at the interior.

[21]One potential limitation of the specification is that it does not account for changes in the employees' personal circumstances that might influence demand. Nonetheless, this will only bias our results inasmuch as change in personal circumstances are correlated with the increase in basic coverage, which is likely not the case. The results presented are robust to including annual measures for electing any coverage (health, dental, vision, etc.) for a spouse/child which should reflect changes in family structure or spousal employment (see Appendix Table A.2).

[22]Employees must select "Basic Life Only" or "Basic Life & Optional Life= [Multiple] x salary" when they are initially hired.

are very similar across the hiring cohorts except for an increase in age primarily driven by the healthcare sector. Individuals hired after the change receive a higher nominal salary coming mainly from increased salaries in the main campus. The greatest difference is that in 2008 and 2009, the University hired significantly more healthcare positions relative to the main campus. We explicitly control for these differences in the empirical specification.

To formally test the hypothesis of no crowd-out among new hires, we estimate the following model:

$$Supplemental_i = \gamma_0 + \gamma_1 Hired\ Post_i + \gamma_2 X_i + \epsilon_i \tag{3.3}$$

where $Supplemental_i$ represents either having supplemental life insurance (linear probability) or the multiple of salary in supplemental coverage (Tobit) depending on the specification. X_i represents demographic, family, and employment variables used to control for differences present in Table 3.6. In addition, we include controls for dental and vision insurance elections to account for differences in demand for fringe insurance benefits. $Hired\ Post_i$ represents being hired after the increase in basic coverage. If γ_1 is significantly less than zero, then we reject the hypothesis of no crowd-out.

3.5 Results

3.5.1 Impact on Existing Employees: Complete Pass-through

We illustrate the influence of increased basic life insurance in Figure 3.3 for employees who are at an interior solution in 2007. The figure provides strong evidence of inertia and that the nudge significantly increased total ESLI coverage.

To formally test this finding, we estimate the fixed effect regression given in equation (3.2). We use the two years on either side of the policy change to capture the short-run effects. In the first column of Table 3.7 the coefficient on $Post\ Change_t$ indicates that the average increase of 0.74x salary in basic life insurance (from $10,000 to 1x salary) caused an increase in multiple of total coverage (basic + supplemental) of 0.78x salary. We cannot reject the null hypothesis of full pass-through of the increase in basic coverage into total coverage (between 98 and 113 percent pass-through at the 95 percent confidence level).[23] This result provides strong evidence that existing employees did not respond to the change in the default level of coverage.

We next consider employees between the ages of 40-44 and 60-64 who did not experience premium changes in 2007 and consequently represent our cleanest sample. This age restriction leads to the same conclusion as the full sample that we cannot reject full pass-through of the increase in basic coverage. We then restrict the sample to include just those individuals aged 18-39. As mentioned, these individuals experienced a sizable increase in premiums (50 to 60 percent) in 2007, one year before the change in basic coverage. If employees react the following year to the price increase then this would indicate crowd-out of the increase in basic coverage. The premium

[23] Equivalently, we cannot reject the hypothesis of no response from employees.

change for this age group should exaggerate any crowd-out that we find or equivalently should understate inertia. The third column of Table 3.7 shows that for a 0.71x salary increase in basic coverage, employees increase total coverage by 0.81x salary. Once again, we conclude full pass-through of the increase in basic coverage even with any influence of the premium increase. In addition, we examine employees that experienced an increase in premium due to aging into a higher premium bracket in 2008 and continue to find full pass-through of the increase in basic coverage.

High earners experience the largest increase in basic coverage and therefore should be the most likely to decrease supplemental coverage. For example, someone making $30,000 mechanically received $20,000 more basic coverage whereas someone making $100,000 received an additional $90,000 in basic coverage. The fourth column shows that the result of full pass-through holds even when we restrict the analysis to the highest earning quartile. This finding decreases the likelihood that the pass-though is caused by the discrete options of supplemental coverage as high earners should have reacted more relative to low earners. Additionally, we cannot reject the hypothesis of full pass-through when we break out the sample by faculty and main campus staff.

One explanation for these findings is that employees faced prohibitively high time costs, which resulted in employees not reducing coverage in response to the increase in basic coverage. Employees in 2008 needed to submit a paper form to the benefits office to change any elections. However, employees that were already walking to the benefits office to change other elections faced a much lower cost to change supplemental ESLI coverage. The first column of Table 3.8 restricts the sample to individuals that changed any other election (health, vision, dental, etc.) in 2008 and that elected 1-2x coverage in 2007. Even with reduced time costs, we continue to find full pass-through of the increase in basic coverage.

Another possible explanation for the full pass-through is inattention or ignorance (Choi, 2015). If employees were unaware of the increase in basic life insurance coverage then they would not have reacted to the policy change. To investigate this explanation, we examine employees that changed other portions of their benefit packages in 2008. Individuals that made changes to any election likely consulted the University's benefits book and were more likely informed about the change in life insurance coverage. A potential concern is that individuals that changed a single election only looked at that specific benefit (i.e. health FSA) and did not even notice the change in basic life insurance. To address this, we analyze individuals who make changes to a benefit election located on the same page as life insurance in the benefit book. This increases the likelihood that employees are aware of the change in life insurance. We further expand this by varying the sample based on changing benefits listed in varying proximity to life insurance in the benefits book. Through all of these specifications, we find more than full pass-through of the increase in basic coverage, which provides stronger evidence that the pass-through is not merely a result of unawareness.

Although in the short-run we find strong evidence of inertia, the increased coverage could be crowded-out over a longer time horizon. In addition, previous studies have mixed results of the persistence of the effects of inertia (Jones, 2012; Chetty et al., 2014). Using continuously employed workers from 2006 to 2014 we see how employees initially at the interior (1-2x salary) react. In 2009, the university added the option to make elections online, which should reduce the time costs of changing supplemental coverage and increase the likelihood of crowd-out. The first column of Table 3.9 gives an estimate for years 2006 and 2007 in comparison to 2009 and 2010 just two and three years after the change and we fail to reject full pass-through even with the addition of online elections. The second column compares the same pre-period with 2011 and 2012 as the post period. The coefficient decreases, in relation to the short-run effect, but we still cannot reject full-pass-through. The third column shows that even six years after the change, we still cannot reject the hypothesis of full pass-through with a 0.74x salary increase in basic coverage resulting in a 0.58x salary increase in total coverage. Although we cannot reject full pass-through in any of these specifications, the point estimates do decrease over time. This could represent some gradual adjustment or merely a less precise estimator (standard errors significantly increase over time). Additionally, these long-run estimates must be interpreted with caution as many factors likely changed between 2008 and 2014 that could be correlated with demand and preferences for life insurance coverage.

Even though on average, employees do not reduce supplemental coverage in response to the increase in basic coverage there are some employees that increase or decrease coverage. In 2008, 83.0 percent of employees at the interior (1x or 2x) kept the same level of supplemental coverage as the year before. Only 5.9 decreased coverage and 11.1 percent increased coverage. Consistent with decreased need and increasing premiums as employees age, older employees (and those that have been employed longer) are more likely to reduce coverage. Additionally, individuals with higher mean earnings are also more likely to reduce supplemental coverage likely due to the correlation with age and years employed. Those with children and spouses are more likely to have increased supplemental coverage consistent with increased demand for replacing foregone salary in the case of death.[24]

3.5.2 Impact on New Hires: Partial Crowd-out

Next, we examine the extensive margin (participation in supplemental coverage) for new hires at the University who do not face inertia. We restrict the sample to the first observation for individuals hired between 2006 and 2009.[25] The first columns of Table 3.10 give the linear probability model results from equation (3.3) with supplemental participation as the dependent variable. The first column shows that on the extensive margin, individuals hired after the increase in basic coverage are 9.4 percentage points less likely to elect supplemental coverage from a base of 50 percent participation consistent with the theoretical prediction of crowd-out.[26]

[24] Appendix Table A.3 provides a mean comparison for employees that decreased coverage, kept the same coverage, or increased supplemental coverage in 2008.

[25] We use the first observation because individuals hired during the fiscal year do not appear in the data until the following fiscal year.

[26] Nearest neighbor matching analysis indicates a statistically significant 9.2 percentage point decrease in supplemental coverage for those hired after the increase in basic coverage comparable to the linear probability results.

Those under age 40 experienced increased premiums in 2007—on the order of 50 to 60 percent—which would bias our results toward finding larger crowd-out effects. We break out the response by ages to address this concern. The same approximate reduction holds for those 40 and over who experienced smaller premium changes—ranging from 0 to negative 12 percent—as well as those under 40.[27] Through all specifications, having a child or spouse increases supplemental life insurance participation.

We next estimate a Tobit model to analyze how the change in basic coverage influenced the intensive margin for supplemental coverage. We use a Tobit model to account for individuals who select 0x salary in supplemental coverage and for those that are restricted to purchasing 3x annual salary before the change and 5x annual salary following the change. The latter columns of Table 3.10 presents the marginal effects from equation (3.3) with multiple of supplemental coverage as the dependent variable. The coefficient on *Hired Post* in the fourth column implies that the increase in basic coverage of 0.838x salary caused a multiple reduction of 0.19 x salary for those who selected an interior multiple. This implies that for a $100 increase in basic coverage, supplemental coverage was reduced by $23. The other columns show that this result does not significantly vary across different age groups despite the premium changes in 2007.[28]

Overall, for new hires—who do not face inertia—the increase in basic coverage caused a decrease in supplemental life insurance participation by 19 percent. In addition, conditional on electing supplemental coverage, roughly 75 percent of the increase in basic coverage was passed-through to total ESLI coverage.

3.5.3 Discussion of Results

The results for existing employees in conjunction with the findings of new hires help illustrate the influence of the increase in basic coverage. While we find full pass-through for existing employees, we also find approximately 75 percent pass-through of the increase in basic coverage for new hires. These findings lead to two important questions. First, what is driving the large pass-through for new hires? Second, what is the explanation for the difference between new hires and existing employees?

The required active choice for new hires precludes inertia as a possible explanation for the first question. A possible explanation for the lack of full crowd-out for new hires is the simultaneous change in available supplemental coverage in 2008. Given the difficulties and uncertainty associated with individual financial planning, the expansion of available multiples from 0-3x salary to 0-5x salary in addition to the increased maximum face value from $375,000 to $1,000,000 could have induced more coverage. Increased supplemental elections for new hires after 2008 would be consistent with previous findings that individuals tend to choose a middle option to

[27]For new hires 40 and over, this specification could understate the existence of crowd-out due to the slight (0 to 12 percent) decrease in premiums.

[28]Similar results were found using a difference-in-difference framework presented in the appendix. Additionally, Ordered Probit estimates have consistent qualitative results showing that the increase in basic coverage decreased supplemental coverage for new hires.

avoid either the minimum or maximum and to compromise between different available choices (Simonson, 1989; Simonson and Tversky, 1992; Kamenica, 2008). In this context, employees might select the middle amount of supplemental coverage to compromise between potentially over or under-insuring against premature death. This would lead to 2x salary for employees hired prior to 2008 and 3x salary for employees hired in 2008 or later. This behavior is similar to "1/n" savings behavior where investments are influenced by the number of available options (Benartzi and Thaler, 2001). It is therefore likely that a portion of the observed pass-through for new hires is due to these context effects.

Another related explanation for the lack of crowd-out is implicit advice. Employees could interpret the increased maximum level of coverage and available multiples as a recommendation for more life insurance coverage. This in turn would counteract part of the crowd-out effect from the increase in basic coverage.

Although these changes occurred for new hires as well as existing employees, previous studies have found that new hires—for whom the policy changes were most salient—respond more to changes in benefit pricing and more frequently elect new options relative to existing employees (Samuelson and Zeckhauser, 1988; Royalty and Solomon, 1999; Strombom et al., 2002; Handel, 2013). Additionally, Sheng et al. (2005) find that subjects who are more familiar with a product category (i.e. existing employees) are less likely to select the middle or compromise option. Consequently, in the absence of the change in available supplemental coverage, the crowd-out of the increase in basic coverage for new hires would likely be much greater.

The major difference between new hires and existing employees is the required active choice by new hires. Therefore, the difference between the pass-through of the increase in basic coverage for new hires and existing employees may be attributed to inertia.[29] The 25 percent difference in pass-through—given the context and implicit advice effects described above—represents a lower bound for the influence of inertia on existing employees.

Choi (2015) describe many different factors that may contribute to inertia including transaction costs, and ignorance. As previously described, the empirical results using changes in other benefit elections indicate that transaction costs and ignorance were likely not the main driving factors of inertia. Nonetheless, the cognitive dissonance associated with thinking about premature death or financial planning could induce inertia. Furthermore, anchoring on the default level of coverage (rather than coverage from the previous year) in conjunction with loss aversion could be contributing to the inertia that we observe. Another likely candidate—given the low probability of premature death and ESLI's relatively inexpensive nature—is inattention.

An alternative explanation for our finding of full pass-though could be loss aver-

[29]Another possible explanation is optimal non-response. However, the small proportion of employees for whom it was not optimal to respond to the policy change with a lower level of supplemental coverage is likely similar for new hires and existing employees. Therefore, optimal non-response might explain part of the pass-through of the increase in basic coverage for both new hires and existing employees, but it likely does not explain the difference between the two groups.

sion. The influence of loss aversion from the discrete nature of supplemental ESLI multiples could describe some of the non-response. For example, someone making $40,000 has the choice of $10,000 less ESLI (by decreasing 1x salary) or $30,000 more (by not changing coverage). Additionally, someone making $100,000 would have the choice between $10,000 less or $90,000 more total ESLI. Loss aversion could lead employees to not reduce supplemental coverage in response to the increase in basic coverage. All else equal, it would be expected that loss aversion should influence the lower earner more than the high earner for whom the loss is proportionately small. Nonetheless, we find full pass-through for both high and low earners, which decreases the likelihood that loss aversion is the main cause of the pass-through.[30]

To summarize, inertia appears to be a contributing factor in the full pass-through of the increase in basic coverage. Presumably, the difference between new hires and existing employees would be larger in the absence of the expansion of available multiples and the maximal face value of supplemental coverage. Therefore, the lower bound for the level of inertia is 25 percent but the level of inertia is likely much larger due to implicit advice and context effects that differentially influence new hires.

3.5.4 Highly Compensated Employees: Additional Evidence of Inertia

Yet another example of inertia can be found with highly paid employees in 2007 that were constrained at a maximum contribution of $375,000 but that were not constrained by the 3x salary restriction. Individuals that made between $125,000 and $187,500 could not have 3x salary in coverage due to the $375,000 maximum prior to 2008.[31] For example, an individual that made $160,000 and selected 3x salary would have been assigned a multiple of 2.34 due to the $375,000 limit prior to 2008 despite having picked a whole multiple. The individuals that were constrained by the maximum automatically increased in 2008 to the multiple that they choose previously (in this case 3x salary). Therefore, the policy change not only increased their basic coverage, but also increased their supplemental coverage above what they had (in this example to $640,000 in total coverage).

Among these individuals, many of them presumably had latent demand for more life insurance, which could have been realized following the expansion of the maximum and lead to an election of 4x or 5x salary. Alternatively, they could have satisfied their latent demand for life insurance by purchasing individual market life insurance. In this case, they should decrease supplemental coverage to offset the increased basic life insurance and automatically increased partial multiple of supplemental coverage.

[30] Yet another explanation for the full pass-through could be a flypaper effect where employees do not take into account employer contributions when electing ESLI. However, if it were just a flypaper effect, we should not observe a difference in pass-through of basic ESLI between new hires and existing employees.

[31] In addition, those that made between $187,500 and $375,000 would only have coverage of less than 2x salary. However, this group could have elected either 2x or 3x salary and either way be constrained by the $375,000 maximum.

Doing nothing in 2008 is an abnormal reaction and indicative of inertia. Of those that were constrained by the $375,000 maximum in 2007 (86 employees), 14 percent increased to a multiple of 4x or 5x annual salary (latent demand), and 7 percent reduced their election (crowd-out). The remaining 79 percent simply allowed a mechanical increase in supplemental coverage to 3x annual salary. Even 3 years after the change over 70 percent remained at 3x salary in coverage. Although this example deals with a small subset of highly compensated employees, the result still illustrates affluent employees electing life insurance and then not responding to external factors that influence their total coverage. Inasmuch as high compensation implies financial literacy, this result suggests that non-response by those at the interior is less likely to be the result of deficiencies in financial understanding.

3.6 Individual Market Crowd-out

The market for life insurance differs from other major forms of insurance (such as health insurance prior to the Affordable Care Act) in that there exists an employer market and a well-functioning individual market. Individual and ESLI differ in that individual policies are experience rated (individually underwritten) and ESLI policies are generally community rated. Additionally, ESLI is conditional on employment whereas term life insurance is merely conditional on premium payments. The experience rating in the individual market also represents an additional cost (time, blood tests, lengthy questionnaires, etc.) in comparison to ESLI costs. Notwithstanding these differences, an individual market term policy is an imperfect substitute for ESLI in terms of actual insurance provided. Therefore, even in the absence of the most natural form of crowd-out (supplemental ESLI), it is possible that employees reduced or lapsed individual market policies as basic ESLI increased.

The University data do not provide information on employees' individual market life insurance coverage. To understand this relationship, we turn to the SIPP, which has information on holdings from the employer-sponsored market and implicit information on holdings from the individual life insurance market. These data have been used in recent studies on demand for life insurance (Harris and Yelowitz, 2014, 2016; Hedengren and Stratmann, 2016). This nationally representative longitudinal sample is constructed through individual interviews in four-month intervals known as waves. Each wave contains responses regarding income, labor force activity, and participation in government assistance programs. In addition to the core monthly questions, the survey covers less-frequently asked subjects in topical modules. The wealth topical modules contain detailed information on assets and liabilities (including life insurance holdings) and are asked at least twice per panel for the survey years used in this analysis. We use SIPP panels from 1996 to 2008 and limit our sample to individuals aged 18 to 64.[32,33]

The survey explicitly asks about insurance obtained through an employer and about total life insurance coverage. The difference between total and ESLI holdings allows us to infer individual life insurance holdings.[34] Prior to the 2004 panel, the survey asks about the "face value" of policies (the amount that would be paid out at death) which applies to all types of life insurance policies allowing for correct identification of individual life insurance. However, for the 2004 and 2008 panels, the questions changed to asking about the "cash value" of a policy, which only applies to life insurance with an investment portion, primarily whole life insurance. Gottschalck and Moore (2006) show that a majority of respondents did not understand the distinction between cash and face value and continued to report face value even though the question asked cash value. If individuals who only had term life insurance accurately responded to the question following the change, then there would be no way of determining if they had both ESLI and individual life. Consequently, the indicator for individual life insurance is subject to measurement error. Nonetheless, the SIPP is still the most suitable data set to explore the relationship between ESLI and individual life insurance.

Figure 3.4 shows that total, ESLI and individual market life insurance all have decreasing participation over time. Those that held some form of life insurance decreased from 50 to 32 percent from 1996 to 2011. These declines are consistent with industry-level findings that ownership of life insurance is at a 50-year low (Prudential, 2013). A simple correlation between ESLI and individual life insurance indicates a positive relationship. This could come from the correlation of higher income workers with firms that offer life insurance or represent strong preferences for insurance manifesting itself by having life insurance in both markets.

Looking past a simple correlation, we turn to a quasi-experimental approach that examines how job changers react to differences in ESLI offerings from different firms. Employment changes are endogenous, but these changes are arguably orthogonal to changes in life insurance preferences, much like retirement savings (Chetty et al., 2014). ESLI offerings vary tremendously across industry as seen in both the NCS and in the SIPP, yet take up is very high. For example, in the SIPP, 7 percent of administrative workers—where duties/quality of the job is thought to be fairly homogeneous—in "employment services" have ESLI whereas 61 percent of hospital administrative workers have ESLI.[35] Therefore, a change in workplaces could induce an exogenous increase or decrease in ESLI that will be our source of identification for

[32]Following Gruber and Yelowitz (1999), we exclude imputed values for life insurance due to criticism of the SIPP wealth imputation methodology by researchers (Hoynes, Hurd, and Chand, 1998).

[33]Earlier panels of the SIPP do not allow repeat observations of ESLI and individual market elections. Our identification strategy relies on following individual life insurance elections across time which precludes their use.

[34]We exclude observations where top coding makes individual life insurance holdings indeterminate, which constitute 0.52 percent of the sample.

[35]See Ahn and Yelowitz (2016) for an example of this type of analysis on paid sick leave.

the following fixed effect regression.

$$Individual\ Life_{it} = \delta_0 ESLI_{it} + \delta_1 X_{it} + \alpha_i + u_{it} \tag{3.4}$$

$Individual\ Life_{it}$ is an indicator for holding individual life insurance, $ESLI_{it}$ is an indicator for employer-sponsored coverage, X_{it} is a vector of time varying covariates, α_i is the individual fixed effect, and u_{it} is the error term. We restrict our analysis to the year an individual switches employment and the year preceding the change. We only consider changes from one employer to another and only those that do not experience drastic changes in earned income (Chetty et al., 2014).[36]

Table 4.2 shows the results from estimating the model presented in equation (3.4). The first column shows that relatively few, 1 in 10, workers have individual market life insurance crowded-out by ESLI. This estimate, however, includes individuals that could not adjust the extensive margin for individual life insurance in response to changes in ESLI coverage. In the second column, we restrict the sample to include only those with individual coverage and without ESLI prior to the job change. These individuals were able to reduce individual life insurance coverage in response to receiving ESLI. As expected, we find a larger crowd-out estimate after conditioning on those that could be crowded-out with almost 1 in 4 lapsing individual life insurance coverage in response to gaining ESLI. Although there is a significant response for those with individual market coverage, only 30 percent of workers in the SIPP sample have individual life insurance which translates in to less than 1 in 10 of all employees actually responding. This estimate implies that employers should take into account the proportion of employees with individual life insurance coverage when considering offering or increasing ESLI. To determine how many people would purchase individual market coverage upon lapsing ESLI, we restrict the sample to individuals who had ESLI and did not have individual market coverage in the year prior to changing jobs. As reported in the last column, we find that about 1 in 10 respond to a lapse in ESLI by getting individual market coverage (conditional on not already having individual life insurance coverage).[37]

Overall, the above results imply that less than 1 in 10 of all employees would reduce coverage upon receiving ESLI. As discussed above, our sample only includes job changers who should be more responsive in comparison to existing employees. Therefore, the substitution between the individual and ESLI for job changers likely represents an upper bound for the actual level of substitution. In addition, this analysis deals with the extensive margin whereas the policy change at the University only increases the intensive margin, which should elicit less of a response. Hence, we conclude that crowd-out between the group and non-group market is minimal, suggesting that increases in total ESLI coverage represent increases in total life insurance hold-

[36] We define a job change based on a change in employer id and a start date between periods or a change in occupation code. We limit the sample to employees who experienced a change in income from 50 to 150 percent of previous income.

[37] Appendix Table A.4 shows that crowd-out from one year is roughly equivalent to the crowd-out after two years. This does not rule out the possibility of future lagged crowd-out effects, but it does suggest that the cumulative crowd-out is likely not significantly different from the initial crowd-out.

ings for a majority of employees. This finding of minimal substitution across plans is consistent with findings on retirement savings (Chetty et al., 2014).

3.7 Desirability of Nudge

The desirability of the nudge is contingent on the adequacy of employee life insurance holdings. As an approximation, we evaluate employee holdings relative to financial planners' recommendations. We use a life insurance needs calculator from Prudential to approximate the recommended coverage for each individual. The algorithm uses age, gender, marital status, annual salary, number of children and age of the youngest child for the recommendation.[38]

The University data contain information on all these measures with the exception of number of children and age of youngest child. For 52 percent of the sample, which do not have children, this limitation is inconsequential. For the portion of the sample with children, we turn to the American Community Survey (ACS) from 2005 to 2013, which has information on number of children and their ages. To obtain a sample of likely employees of the University, we restrict observations to full-time employees of a university or college that reside in the same geographical location as the University. We then impute number of children and age of the youngest child using random draws from the ACS sample conditioned on gender and age bin. With this information, we approximate the recommended amount of coverage for each employee.

As discussed, our measures for marital status and having children are derived from benefit and insurance elections. Given that individuals might purchase insurance through a spouse, our estimates of recommended coverage are lower than actual recommendations (Ritter, 2013). Nonetheless, public employees generally have better employer-sponsored benefits relative to the private sector, which should lessen the bias created by benefits provided through the spouse's employment (Long and Marquis, 1999). As presented in Appendix Table A.7, only a third of all employees had a spouse that likely had access to employer-sponsored health insurance due to working full-time and full-year. Consequently, the University indicator for marriage does under-represent actual marriages. However, we see that the indicator for currently having children does not underestimate the measure in the ACS likely due to the relatively generous benefits provided at the University. Notwithstanding, individuals that we classify as being over-insured might have dependents that we do not account for. The bias will result in recommendations that are below what would be the case if we could directly and completely observe family structure.

[38] The calculator uses data from the Federal Reserve 2010 Survey of Consumer Finances, College Board, 2012 Bureau of Labor Statistics NAHB Survey, Current Population Survey Annual Social and Economic Supplement, and the Consumer Expenditure Survey to calibrate the model. Estimated needs seems to reflect the principal purpose for life insurance of replacing the lost earnings of a breadwinner. For example, needs decrease as an individual approaches retirement. Nonetheless, Prudential sells life insurance and may have the incentive to overestimate needs. The website explicitly states that the amount given should be a starting point for estimating needs. See https://isso.prudential.com/simplifiedneeds/life for documentation on the needs calculator.

For employees who could have undone the increase in coverage, 66 percent had ESLI coverage below the recommended level in 2007. The nudge, reduced disparities between ESLI and recommended coverage levels for a majority of these individuals.

The policy variable in this situation is the amount of basic coverage an employer provides, which applies to all employees. Additionally, with the finding of full pass-through, individuals with some supplemental coverage virtually respond the same as those without any supplemental coverage. For these reasons, we evaluate the increase in basic coverage for all employees.

To analyze the effects of the increase in basic coverage, we look at coverage averages from 2007 and 2008 in comparison to the average recommended amount for all employees. Figure 3.5a shows that the mean multiple of ESLI coverage in 2007 is significantly below the mean recommended multiple for the full sample of employees. The difference between recommended total coverage and actual ESLI coverage is largest for those aged 30 to 40 and then decreases for older individuals. The increase in basic coverage to 1x salary induced excessive coverage for the oldest employees, but overall it lessened the gap between recommended and actual coverage.

Given that employees do not react to changes in basic coverage, we examine the increase to 1x salary in comparison to alternative expenditure neutral policies targeted at reducing disparities. The disparity between recommended and actual coverage is greater for lower paid and younger employees. Provision of 1x salary in basic coverage inherently favors those with higher salaries and older employees (where premiums are significantly higher). Hence, uniform provision of a multiple of salary in basic coverage—although the most common form of basic life insurance (57 percent)—is not the most effective for reducing the average disparity.

An alternative policy, which is used for 38 percent of workers with basic coverage, is to provide a fixed amount of coverage (keeping total expenditures constant: \$59,024) to each employee eliminating the advantage for higher earners (Figure 3.5b) (LIMRA, 2015b). This policy decreases the disparities more relative to 1x salary but still induces excessive coverage for the oldest employees. Inherently, this policy redistributes to lower paid employees who have larger disparities as measured in multiples of salary. Providing a fixed amount of coverage however, does not address the concern that younger employees generally have larger disparities in coverage.

Another option is to vary the multiple of basic coverage based on age. The Federal Employees' Group Life Insurance (FEGLI) program is the largest ESLI provider in the U.S. and uses age based multiples. Employees 35 and younger get twice the multiple as employees over age 45 with a linear reduction for the 10 years in between. Figure 3.5c shows how an expenditure neutral application of this policy would affect disparities at the University. As shown, the policy mechanically lessens the gap for younger employees. However, the policy still inherently provides more coverage (in dollars) to higher paid employees relative to lower paid employees.

A final policy, which is not commonly used, is to provide equal dollar contributions toward premiums for each employee (keeping total expenditures constant: \$146). This policy would not favor the higher paid employees and would implicitly provide more coverage for the young who face lower premiums. Figure 3.5d shows that this scenario decreases the disparity between recommended and actual coverage more effectively than a fixed benefit, multiple of salary, or age adjusted multiple. This finding is consistent with Goda and Manchester (2013) and Handel and Kolstad (2015) who show that varying defaults by observables can increase welfare. In addition, this policy is straightforward to implement and meets legal requirements that prevent discrimination of older employees. Table 3.12 summarizes the findings by looking at the average disparity under different structures.

One important qualification with these alternative policy predictions is they assume the same level of crowd-out as provision of 1x salary, which might not be the case. For example, a 30-year-old employee that makes $30,000 would receive 5x salary in coverage under the equal dollar contribution (rather than 1x) which would likely elicit more crowd-out. Nonetheless, the alternative policies discussed do provide some insight into design for basic coverage to more closely align coverage with recommended levels.

When considering these different alternatives to basic life insurance, we need to consider the incentives faced by employers providing benefits. Even though life insurance is likely not the reason for choosing employment, employers offer life insurance to attract new employees and retain productive ones. A policy such as offering equal contribution toward premiums inherently provides more coverage to younger employees who an employer might want to attract. Given the nature of ESLI, the oldest employees might experience job-lock because retiring means losing life insurance coverage that would be costly in the individual market. High life insurance coverage for the oldest employees might therefore retain a less productive portion of the work force. Consequently, equal payment of premiums should be attractive to employers not only because it reduces disparities for employees, but also because it potentially attracts new employees and retains productive ones.

If ESLI was the only avenue for obtaining life insurance, we could conclude that the increase in basic coverage in 2008 helped the average employee obtain coverage closer to the recommended level. However, the existence of the individual market makes this conclusion less certain. Based on averages from the SIPP, around 30 percent of University employees have individual market coverage. If these employees represent workers with the greatest disparities, then the overall disparity in coverage could be much less than Figure 3.5a illustrates.

Looking at averages ignores heterogeneity in life insurance needs among University employees. In 2007, 33 percent of employees had more than the recommended amount principally due to not having a spouse or child.[39] The increase in basic coverage caused a 7-percentage point increase in employees with more than the recommended amount of coverage. This highlights the major trade-off for the employer of inducing too much coverage for those who either do not need coverage or already have enough and not inducing enough coverage for those that have less than the recommended amount.[40]

[39]It is likely that a portion of those we classify as over-insured are classified as such due to our imprecise measures of family structure rather than exceeding the recommended level of coverage.

[40]In Appendix A.2.3, we look at the effects of the increase in basic coverage on the distribution of disparities for all employees and by age groups.

Another aspect to consider with provision of basic life insurance is the individual market response. ESLI coverage is inferior to term life insurance because ESLI is conditional on employment whereas term is conditional on premium payments alone. If someone loses their job, they simultaneously lose ESLI coverage. Should employers remove the option of ESLI? Earlier we found that roughly 1 in 10 would purchase individual market coverage in response to a lapse in ESLI. Therefore, even though term life insurance is a more complete form of life insurance, it does not appear that enough people would take up individual coverage in response to an employer forgoing ESLI coverage to increase overall life insurance.

To summarize, there are widespread disparities between actual ESLI coverage and recommended levels with roughly two-thirds of employees below prescribed levels. While the increase in basic coverage to 1x salary lessened disparities, alternative structures—such as equal contributions to premiums—potentially do a better job at reducing the gap. Potential concerns with these findings include not observing individual market coverage, which could lessen disparities, inducing too much coverage for some employees, and crowd-out of supplemental and individual market coverage. Notwithstanding these concerns, it appears that provision of basic coverage can be an important tool for reducing uninsured vulnerabilities.

3.8 Conclusion

In 2008, a large public university increased provision of basic life insurance coverage to employees. Contrary to theory, we find full pass-through of the increase in basic life insurance for existing employees with supplemental coverage. In addition, we find significant pass-through for highly compensated employees who were initially constrained by a maximum contribution limit due to inertia. In contrast, new employees, who were forced to make an active decision, decreased supplemental coverage. Therefore, we conclude that inertia is meaningful factor in the increase in total coverage. Nonetheless, we recognize the possibility of alternative explanations.

Death in the working age population is a low probability event with catastrophic consequences that can be mitigated through life insurance. However, life insurance ownership is at a 50-year low and research shows uninsured vulnerabilities (Prudential, 2013; Bernheim et al., 2003). Consequently, difficulties arise for many surviving dependents. Using Danish data, Fadlon and Nielsen (2015) find that widows increase their labor force participation by 10-11 percent to compensate for lost earnings. In addition, McGarry and Schoeni (2005) find high rates of widow poverty in the U.S. due in part to insufficient life insurance. Our findings shed further light on the potential role of behavioral economics in reducing disparities between recommended and actual levels of life insurance coverage.

We show that the increase in basic life insurance to 1x salary reduced disparities between recommended and actual levels for two-thirds of the University's employees. Given the lack of significant crowd-out, it appears that many firms with basic coverage below 1x salary could nudge employees to have more coverage without significant employee response. The question remains of how far employers could go before inducing significant crowd-out. Could more ambitious expenditure neutral policies like fixed contributions be effective? The outcome is speculative, but considering our results of high levels of inertia and only partial crowd-out for those who make active decisions, it is likely that such a policy would increase total coverage.

Table 3.1: Employer-Sponsored Life Insurance Policy Details

	Pre (2006-2007)	Post (2008-present)
Basic	$10,000	1x salary
	(≈ 0.2x salary)	(≈ $50k)
Supplemental	1-3x salary	1-5x salary
Maximum	$375k	$1m
Max. w/out medical underwriting	$375k	$375k
Rating	5-year Age Bins	5-year Age Bins
Increase Coverage	Open Enrollment	Open Enrollment
Decrease Coverage	Anytime	Anytime
Monthly price/$1,000	2006	2007-present
Age<35	$0.05	$0.08
Age 35-39	$0.06	$0.09
Age 40-44	$0.10	$0.10
Age 45-49	$0.17	$0.15
Age 50-54	$0.28	$0.25
Age 55-59	$0.44	$0.43
Age 60-64	$0.69	$0.69

Table 3.2: Summary Statistics: University Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Demographics									
Male	38.2	38.1	37.3	37.3	36.9	36.6	36.3	36.5	36.0
Age (years)	42.4	43.4	43.6	43.7	43.7	43.8	43.6	43.8	43.7
White (non-Hispanic)	86.0	86.1	85.8	85.8	85.7	85.7	85.8	85.8	85.9
Married	47.6	48.4	49.2	49.7	49.4	49.4	48.7	48.3	47.5
Child	44.6	45.7	47.1	47.8	48.4	49.2	49.2	49.6	49.1
Employment									
Nominal Salary ($1,000)	38.0	39.0	41.0	42.0	42.0	42.0	44.0	45.0	46.0
Faculty	16.0	16.1	15.6	15.6	15.5	15.4	15.2	15.2	14.8
Staff	84.0	83.9	84.4	84.4	84.5	84.6	84.8	84.8	85.2
Main Campus	75.5	75.5	72.6	63.9	62.2	61.7	60.0	59.5	58.1
Healthcare	24.5	24.5	27.4	36.1	37.8	38.3	40.0	40.5	41.9
Elections									
Health Ins.	89.6	91.5	91.5	91.6	92.0	92.7	92.5	93.3	93.4
Health FSA	15.6	17.4	17.3	17.0	19.1	18.2	18.4	18.6	18.8
Voluntary 403(b)	12.0	13.9	14.5	13.7	12.6	13.0	12.8	12.6	12.6
Voluntary 457(b)	4.2	4.6	4.5	4.3	4.1	4.2	4.4	4.4	4.6
ADD Ins.	49.7	53.2	52.9	51.0	48.6	47.4	46.1	45.5	44.6
Vision Ins.	39.0	42.4	46.1	47.7	49.8	51.3	53.5	55.3	57.2
Dental Ins.	66.0	69.1	68.4	70.6	71.5	73.3	74.1	75.3	76.6
Supplemental Life Insurance	52.2	54.8	56.2	54.4	52.4	50.8	49.4	48.7	47.8
Multiple (0x-5x)	1.3	1.3	1.4	1.4	1.4	1.4	1.3	1.3	1.3
Multiple (1x-5x)	2.4	2.4	2.6	2.6	2.6	2.7	2.7	2.7	2.7
Observations	11,883	11,479	11,748	12,244	12,859	12,983	13,393	13,465	13,586

Note: Median Salary (rather than mean) is reported due to topcoding at $375,000. The sample consists of employees aged 18-64 who are eligible for life insurance benefits.

Table 3.3: Supplemental Life Insurance Participation- University Data

	2006	2007	2008	2009	2010	2011	2012	2013	2014
Age Bins									
Age<35	40.0	43.4	45.8	41.2	36.4	33.3	30.8	29.6	28.7
Age 35-39	58.4	60.1	63.6	60.6	57.4	54.3	51.1	49.5	48.5
Age 40-44	61.7	65.2	66.6	65.1	63.6	60.9	60.2	60.1	58.0
Age 45-49	60.5	63.1	63.9	63.4	64.3	63.5	62.8	60.8	59.8
Age 50-54	54.6	57.6	59.6	60.1	59.5	60.3	60.0	60.1	58.9
Age 55-59	53.1	52.4	51.8	51.8	51.6	51.1	52.5	52.9	53.2
Age 60-64	44.4	44.8	44.2	44.5	44.3	44.3	44.2	43.8	44.7
Income Bins									
<$20,000	31.3	35.4	35.3	32.9	30.9	29.6	22.2	25.6	21.2
$20,000-$49,999	49.6	52.7	54.2	52.2	49.4	47.5	46.1	45.3	43.5
$50,000-$99,999	62.2	62.8	63.7	61.5	60.9	59.6	58.2	56.6	56.0
$100,000-$149,999	56.7	57.8	56.9	56.3	56.4	57.0	56.7	56.6	56.2
$150,000+	51.7	53.0	50.7	48.2	43.9	41.9	38.2	36.8	36.9
Race/Ethnicity									
White (non-Hispanic)	53.1	55.5	56.7	54.8	52.6	51.0	49.8	49.0	48.1
Black (non-Hispanic)	45.6	50.2	54.7	52.7	51.7	51.2	49.0	49.6	49.1
Other	48.8	51.5	51.3	50.3	49.7	45.5	43.8	42.2	40.2
Employer Group									
Faculty	53.5	54.1	54.4	51.5	49.8	48.2	45.9	44.2	44.1
Staff	51.9	55.0	56.6	54.9	52.9	51.2	50.0	49.5	48.4
Main Campus	52.3	54.1	55.6	53.4	51.6	50.0	49.1	48.0	47.4
Healthcare	52.0	57.2	57.8	56.2	53.6	52.0	49.8	49.7	48.3
Gender									
Female	51.2	54.7	56.0	54.2	52.1	50.4	49.0	48.7	47.6
Male	53.8	55.1	56.7	54.7	52.9	51.4	50.1	48.7	48.0

Note: The sample consists of employees aged 18-64 who are eligible for life insurance benefits.

Table 3.4: University Comparison, Maximum Effective Multiple

	Age 30			Age 65		
School Name	$35k	$100k	$400k	$35k	$100k	$400k
American University	6.0	6.0	4.8	6.0	6.0	4.8
Amherst College	6.5	6.5	1.9	6.0	6.0	1.9
Anderson University	6.1	5.4	1.4	4.0	3.5	0.9
Andrews University	9.9	8.0	2.1	9.9	8.0	2.1
Arizona State University	4.4	4.2	3.5	4.4	4.2	3.5
Austin College	6.5	6.5	2.8	6.5	6.5	2.8
Austin Peay State University	8.4	5.5	1.4	7.9	5.3	1.3
Bates College	4.0	4.0	2.1	4.0	4.0	2.1
Belmont University	6.0	6.0	1.5	4.3	4.3	1.1
Beloit College	15.3	5.5	1.4	15.3	5.5	1.4
Bennington College	15.3	6.0	1.8	9.9	3.9	1.1
Bentley University	6.0	6.0	2.4	6.0	6.0	2.4
Berea College	6.5	4.5	1.5	6.5	4.5	1.5
Boston College	6.0	6.0	3.5	5.0	5.0	3.3
Bradley University	6.0	5.8	1.4	5.6	5.5	1.4
Bryant University	4.0	4.0	2.5	4.0	4.0	2.5
Buena Vista University	7.0	7.0	2.4	7.0	7.0	2.4
Carnegie Mellon University	5.0	5.0	2.5	5.0	5.0	2.5
Castleton State College	6.4	5.5	1.4	4.3	3.6	0.9
Charles R. Drew University	6.0	6.0	1.5	3.9	3.9	1.0
Clarkson University	4.0	3.7	1.4	4.0	3.7	1.4
Colorado State University	16.3	5.7	1.4	16.3	5.7	1.4
Cornell College	8.0	6.0	2.0	8.0	6.0	2.0
Cornish College of the Arts	6.0	6.0	5.6	4.5	4.5	4.2
Drake University	16.3	7.0	3.3	16.3	7.0	3.3
Drury University	6.0	6.0	2.0	3.9	3.9	1.3
Eastern Kentucky University	6.0	5.5	5.1	6.0	5.5	5.1
Eastern Michigan University	7.0	7.0	1.9	4.6	4.6	1.3
Flagler College	5.7	5.3	1.6	5.7	5.3	1.6
George Mason University	7.0	7.0	6.0	7.0	7.0	6.0
George Washington University	6.4	6.0	2.9	6.4	6.0	2.9
Kansas State University	8.6	4.0	2.1	8.6	4.0	2.1
Kentucky State University	6.4	5.5	1.4	5.9	5.3	1.3
Loyola University Chicago	6.5	6.5	2.5	4.8	4.8	2.1
Michigan State University	9.0	8.5	5.1	6.2	5.7	3.4
Mississippi State University	7.0	6.0	2.1	7.0	6.0	2.1
Mount Holyoke College	5.7	5.3	1.3	5.3	5.1	1.3
Ohio Northern University	6.4	5.5	1.4	6.4	5.5	1.4
Oklahoma State University System	7.0	7.0	2.4	7.0	7.0	2.4

Table 3.4 (continued): University Comparison, Maximum Effective Multiple

	Age 30			Age 65		
School Name	$35k	$100k	$400k	$35k	$100k	$400k
Penn. State System of Higher Ed.	8.1	8.1	3.8	5.3	5.3	2.5
Pittsburg State University	8.6	4.0	2.1	8.6	4.0	2.1
Principia College	7.0	7.0	2.6	7.0	7.0	2.6
Purdue University System	9.5	9.5	6.3	6.7	6.7	4.5
Randolph-Macon College	7.0	7.0	1.8	7.0	7.0	1.8
Saint Michael's College	7.0	7.0	2.5	7.0	7.0	2.5
Saint Petersburg College	6.0	6.0	1.9	6.0	6.0	1.9
South Texas College of Law	7.0	7.0	3.3	7.0	7.0	3.3
Southern Utah University	16.3	7.0	2.3	16.3	7.0	2.3
Southern Vermont College	4.3	1.5	0.4	2.8	1.0	0.2
Syracuse University	11.4	10.5	5.1	10.9	10.3	5.1
Texas A&M University System	6.6	6.2	3.8	6.6	6.2	3.8
Tufts University	6.0	6.0	6.0	6.0	6.0	6.0
Tulane University	6.4	5.5	2.6	6.4	5.5	2.6
University of Alaska System	12.9	4.5	1.1	2.1	0.8	0.2
University of Central Missouri	6.0	6.0	3.1	5.7	5.7	3.1
University of Chicago	8.0	8.0	3.8	8.0	8.0	3.8
University of Dallas	6.0	4.0	1.0	6.0	4.0	1.0
University of Kentucky	6.0	6.0	3.5	6.0	6.0	3.5
University of Louisville	10.6	5.0	1.3	10.6	5.0	1.3
University of Maine System	6.0	6.0	3.5	6.0	6.0	3.5
University of Minnesota System	6.2	6.2	3.0	6.2	6.2	3.0
University of Mississippi	8.0	7.0	6.3	8.0	7.0	6.3
University of Montana System	18.5	6.5	1.6	18.5	6.5	1.6
University of Northern Iowa	10.1	4.5	1.4	9.7	4.1	1.2
University of Southern Indiana	9.5	5.8	1.4	9.5	5.8	1.4
University of Texas System	6.6	6.2	3.8	6.6	6.2	3.8
VA Polytechnic Institute	6.0	6.0	3.9	6.0	6.0	3.9
Washington College	4.5	3.9	1.2	4.5	3.9	1.2
Western Kentucky University	15.3	5.4	1.3	15.3	5.4	1.3
Yale University	5.7	5.3	2.5	5.7	5.3	2.5

Note: Maximum Effective Multiple refers to the maximum available ESLI based on plan details. Data collected from university benefit books.

Table 3.5: National Compensation Survey 2013, ESLI

	All Industries			Education	Colleges &
	All Workers	Full-time	Part-time	Services	Universities
Access	60%	75%	15%	76%	83%
	(0.8)	(0.8)	(0.9)	(1.1)	(1.6)
Take-up	97%	98%	88%	98%	96%
	(0.2)	(0.2)	(2.1)	(0.4)	(1.2)
Structure					
Multiple of Salary	56%	56%	55%	42%	60%
	(0.8)	(0.8)	(0.8)	(2.1)	(3.8)
Flat Dollar	39%	39%	38%	51%	33%
	(0.8)	(0.8)	(0.8)	(2.1)	(3.8)
Multiple					
1x	61%	-	-	48%	51%
	(1.1)			(3.9)	(6.3)
2x	22%	-	-	26%	28%
	(1.0)			(5.0)	(8.1)
Mean	1.3x	-	-	1.4x	1.4x
Flat Dollar					
25 percentile ($1k)	10	-	-	10	10
50 percentile ($1k)	20	-	-	20	20
90 percentile ($1k)	50	-	-	50	50

Note: Summary statistics from Table 16, 17, 18, of March 2013 National Compensation Survey. Statistics on full-time and part-time workers not available at industry level.

Table 3.6: New Hire Mean Comparison
University Data; Numbers in percents unless denoted otherwise

	All		Main Campus		Healthcare	
Hired:	06/07	08/09	06/07	08/09	06/07	08/09
Life Insurance						
Basic Mult. of Salary	0.32	1.00***	0.32	1.00***	0.31	1.00***
Supplemental Life Ins.	0.44	0.38***	0.45	0.33***	0.43	0.40
Multiple (0x-5x)	1.00	0.91**	1.00	0.83***	1.01	0.96
Demographics						
Age (years)	35.48	37.60***	37.21	38.01*	32.53	37.33***
Male	0.31	0.31	0.39	0.43**	0.19	0.22*
Indicator for Children	0.47	0.47	0.47	0.47	0.46	0.48
Ever Married	0.46	0.45	0.48	0.48	0.42	0.43
White	0.87	0.86	0.84	0.84	0.92	0.87***
Employment						
Faculty	0.11	0.11	0.17	0.27***	.	.
Staff	0.89	0.89	0.83	0.73***	.	.
Annual Salary ($1k)	42.69	47.19***	45.60	59.77***	37.72	38.90
Main Campus	0.63	0.40***	.	.	.	.
Healthcare	0.37	0.60***	.	.	.	.
Other Elections						
Health Insurance	0.86	0.89***	0.88	0.89	0.83	0.88***
Vision Insurance	0.53	0.55*	0.51	0.53	0.55	0.57
Dental Insurance	0.68	0.73***	0.67	0.68	0.70	0.75***
Voluntary 403b	0.05	0.07***	0.06	0.08	0.03	0.07***
Voluntary 457b	0.02	0.02	0.03	0.03	0.01	0.01
Observations	1,971	2,327	1,243	924	728	1,403

Note: The sample is restricted to the first observation for individuals hired between 2006 and 2009 and who are eligible to elect supplemental coverage. For mean and proportions comparisons: *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table 3.7: Inertia Analysis Pre Period: 2006-2007; Post Period: 2008-2009
Dependent variable: Total Coverage Multiple (Employer Basic+ Worker Supplemental)

		Constant	Age	Premium	High	Main Campus	
	All	Premium	18-39	Increase	Salary	Faculty	Staff
Post	0.780***	0.752***	0.811***	0.779***	0.941***	0.943***	0.733***
	(0.028)	(0.053)	(0.060)	(0.058)	(0.051)	(0.066)	(0.035)
Age	0.460***	0.567***	0.210**	0.300***	0.564***	0.571***	0.458***
	(0.027)	(0.073)	(0.095)	(0.077)	(0.069)	(0.083)	(0.037)
Age Squared	−0.004***	−0.005***	−0.001	−0.003***	−0.006***	−0.006***	−0.004***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Annual Salary ($10k)	−0.011	−0.066*	−0.034	0.012	−0.017	−0.029	0.046
	(0.019)	(0.037)	(0.054)	(0.044)	(0.025)	(0.024)	(0.037)
Healthcare	0.093**	0.009	0.124	−0.001	−0.138		
	(0.044)	(0.096)	(0.086)	(0.093)	(0.134)		
Obs.	7,468	1,507	2,216	1,328	1,871	1,052	4,462
Individuals	1,867	608	616	332	532	263	1,174
$\Delta Basic$	0.738	0.751	0.708	0.745	0.874	0.866	0.709
Reject full pass-through?	No	No	Yes	No	No	No	No
p-value:	[0.127]	[0.989]	[0.083]	[0.548]	[0.185]	[0.248]	[0.501]

Note: $\Delta Basic = Basic_{2008} - Basic_{2007}$ and the formal hypothesis for full pass-through is $H_0: \ \beta_1 = \Delta Basic$. The sample is restricted to employees who are eligible for supplemental life insurance coverage, were present continuously from 2006 to 2009 and had 1x or 2x salary in supplemental coverage in 2007. Post indicates observations for 2008 and later. Constant Premium restricts the sample to employees aged 40-44 and 60-64 who did not experience a premium change in 2007. Premium Increase restricts the sample to employees who age into a higher premium bracket in 2008. High Salary indicates being in the highest quartile (> $60k). Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 3.8: Active Changers Inertia Analysis, Pre Period: 2006-2007; Post Period: 2008-2009 Dependent variable: Total Coverage Multiple (Employer Basic+ Worker Supplemental)

	Any Change	Same Page	±1 Topic	±2 Topics
Post	0.798***	1.069***	0.824***	0.797***
	(0.030)	(0.121)	(0.033)	(0.030)
Age	0.469***	0.786***	0.459***	0.463***
	(0.030)	(0.116)	(0.033)	(0.030)
Age Squared	−0.005***	−0.008***	−0.004***	−0.004***
	(0.000)	(0.001)	(0.000)	(0.000)
Annual Salary ($10k)	−0.019	−0.077	−0.038*	−0.021
	(0.020)	(0.090)	(0.022)	(0.020)
Healthcare	0.086*	0.398**	0.155***	0.092*
	(0.048)	(0.172)	(0.055)	(0.048)
Obs.	6,488	852	5,376	6,428
Individuals	1,622	213	1,344	1,607
$\Delta Basic$	0.743	0.736	0.744	0.743
Reject full pass-through?	Yes	Yes	Yes	Yes
p-value:	[0.065]	[0.006]	[0.017]	[0.067]

Note: $\Delta Basic = Basic_{2008} - Basic_{2007}$ and the formal hypothesis for full pass-through is $H_0: \beta_1 = \Delta Basic$. The sample is restricted to employees who are eligible for supplemental life insurance coverage, were present continuously from 2006 to 2009 and had 1x or 2x salary in supplemental coverage in 2007. Post indicates observations for 2008 and later. Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 3.9: Long-Run Inertia Analysis, Pre Period: 2006-2007 Dependent variable: Total Coverage Multiple (Employer Basic+ Worker Supplemental)

Pre Period: *Post Period:*	2006 & 2007 vs. 2009 & 2010	2006 & 2007 vs. 2011 & 2012	2006 & 2007 vs. 2013 & 2014
Post	0.746***	0.640***	0.584***
	(0.051)	(0.090)	(0.136)
Age	0.384***	0.352***	0.333***
	(0.030)	(0.025)	(0.024)
Age Squared	−0.004***	−0.003***	−0.003***
	(0.000)	(0.000)	(0.000)
Annual Salary ($10k)	−0.008	−0.016	−0.026*
	(0.020)	(0.017)	(0.014)
Healthcare	0.243***	0.275***	0.211***
	(0.052)	(0.057)	(0.060)
Obs.	4,804	4,804	4,804
Individuals	1,201	1,201	1,201
$\Delta Basic$	0.736	0.736	0.736
Reject full pass-through?	No	No	No
p-value:	[0.850]	[0.286]	[0.266]

Note: $\Delta Basic = Basic_{2008} - Basic_{2007}$ and the formal hypothesis for full pass-through is $H_0: \beta_1 = \Delta Basic$. The sample is restricted to employees who are eligible for supplemental life insurance coverage, were present continuously from 2006 to the last year of comparison, and had 1x or 2x salary in supplemental coverage in 2007. Post indicates observations for 2008 and later. Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 3.10: Supplemental Crowd-out Estimation: New Hires, 2006 & 2007 vs. 2008 & 2009

	Linear Probability			Tobit: Marginal Effects		
	All Ages	Age 40-64	Age 18-39	All Ages	Age 40-64	Age 18-39
Hired Post	-0.094^{***}	-0.097^{***}	-0.094^{***}	-0.194^{***}	-0.219^{***}	-0.182^{***}
	(0.015)	(0.026)	(0.018)	(0.021)	(0.038)	(0.025)
Age (years)	0.054^{***}	0.019	0.027	0.086^{***}	0.021	0.054^{*}
	(0.005)	(0.031)	(0.020)	(0.008)	(0.047)	(0.028)
Age Squared	-0.001^{***}	−0.000	−0.000	-0.001^{***}	−0.000	−0.001
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Male	−0.001	−0.006	0.001	0.008	−0.015	0.016
	(0.016)	(0.027)	(0.020)	(0.022)	(0.039)	(0.027)
Faculty	−0.030	−0.033	−0.036	−0.031	−0.060	−0.033
	(0.030)	(0.047)	(0.040)	(0.040)	(0.067)	(0.051)
Hospital Staff	0.050^{***}	0.060^{**}	0.043^{**}	0.072^{***}	0.099^{**}	0.055^{**}
	(0.016)	(0.028)	(0.019)	(0.022)	(0.040)	(0.026)
Black	0.025	0.053	0.002	0.003	0.050	−0.032
	(0.026)	(0.040)	(0.035)	(0.036)	(0.058)	(0.046)
Other Race	0.026	0.107^{**}	−0.027	0.025	0.134^{*}	−0.034
	(0.032)	(0.054)	(0.041)	(0.044)	(0.077)	(0.053)
Annual Salary ($10k)	−0.000	−0.000	0.000	−0.000	−0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Indicator for Children	0.137^{***}	0.149^{***}	0.131^{***}	0.179^{***}	0.193^{***}	0.173^{***}
	(0.017)	(0.027)	(0.021)	(0.023)	(0.039)	(0.028)

Table 3.10 (continued): Supplemental Crowd-out Estimation: New Hires, 2006 & 2007 vs. 2008 & 2009

	Linear Probability			Tobit: Marginal Effects		
	All Ages	Age 40-64	Age 18-39	All Ages	Age 40-64	Age 18-39
Ever Married	0.112***	0.138***	0.097***	0.160***	0.230***	0.117***
	(0.016)	(0.026)	(0.021)	(0.022)	(0.037)	(0.028)
Vision Insurance	0.062***	0.067**	0.059***	0.070***	0.069*	0.068***
	(0.015)	(0.027)	(0.019)	(0.021)	(0.039)	(0.025)
Dental Insurance	0.078***	0.096***	0.067***	0.113***	0.157***	0.091***
	(0.017)	(0.029)	(0.021)	(0.024)	(0.041)	(0.028)
Obs.	4,298	1,603	2,695	4,298	1,603	2,695
Participation Hired 2007	0.496	0.582	0.450			
Hired 2007: Ave. Multiple				1.077	1.276	0.972
$\Delta Basic$				0.838	0.869	0.824

Note: Hired Post indicates being hired in 2008 or 2009. The sample is restricted to the first observation for individuals hired between 2006 and 2009 and who are eligible to elect supplemental coverage. The Tobit model accounts for the censoring at 3x and 5x salary respectively for the pre and post periods as well as for the 0x lower bound. $\Delta Basic = Basic_{2008} - Basic_{2007}$. Marginal effects report the effect of being hired after the change conditional on being at an interior multiple. Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table 3.11: Is There Crowd-Out of Individual Life Insurance? Examining Job Changers. Dependent Variable: Has Individual Life Insurance

	All	Gain ESLI	Lose ESLI
ESLI	-0.095^{***}	-0.226^{***}	-0.113^{***}
	(0.007)	(0.028)	(0.014)
Obs.	54,274	9,998	7,874
Individuals	27,137	4,999	3,937
Initial Coverage			
Individual Life Insurance	-	Yes	No
ESLI	-	No	Yes

Note: Sample consists of individuals aged 18-64 without imputed life insurance that switched jobs between waves. Individual fixed effects as well as controls for age, marital status, children, income, home ownership, and net worth were included but not reported here. Standard errors are shown in parentheses and clustered at the household level *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

Table 3.12: Expenditure Neutral Basic Life Insurance Policies

Basic Coverage	Average Disparity
1x Salary	$165,831
Fixed Coverage: $59,024	$159,090
Age Adjusted Multiple (FEGLI)	$155,729
Equal Premium Payments: $146	$123,503

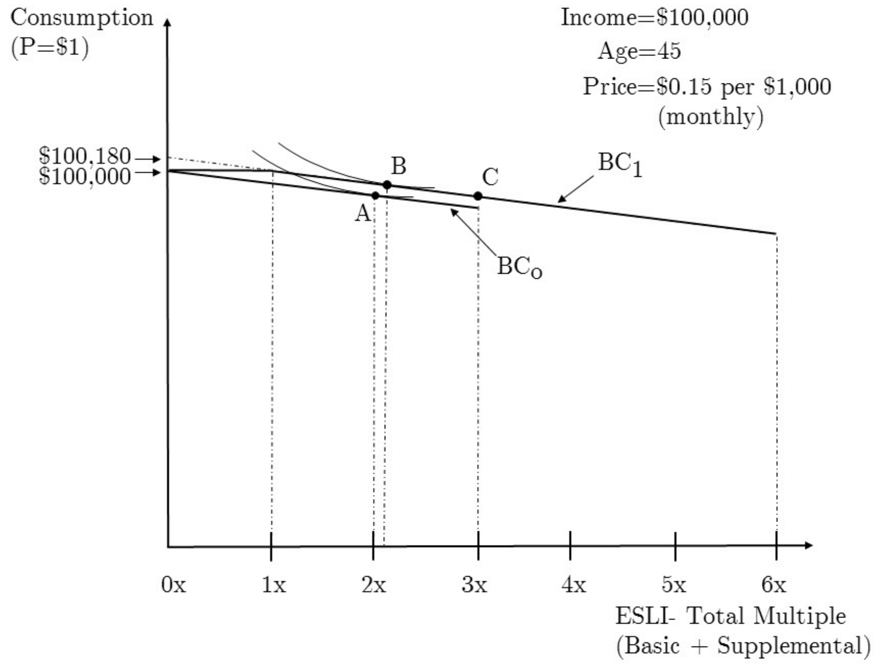


Figure 3.1: Interior Solution

Note: Figure not drawn to scale. BC_0 represents the initial budget constraint with optimal bundle A. BC_1 is the budget constraint which depicts the increased provision of basic life insurance (1x salary) and the expanded maximum multiple. The optimal bundle for BC_1 is given by B. Due to a small income effect and discrete choices, the employee will optimally elect 2x salary in total coverage both before and after the policy change.

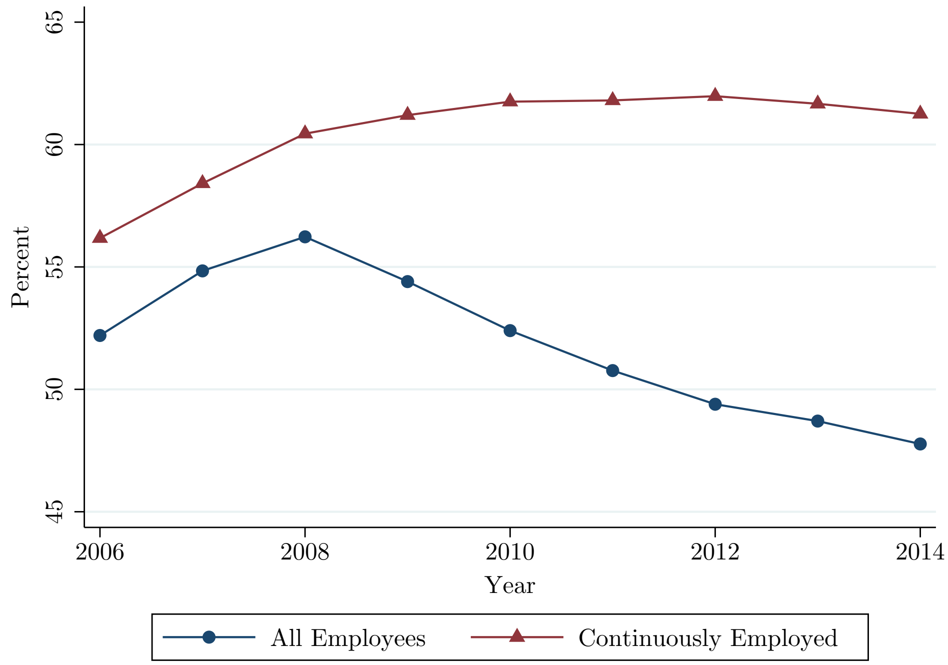


Figure 3.2: Supplemental ESLI Participation: University Data

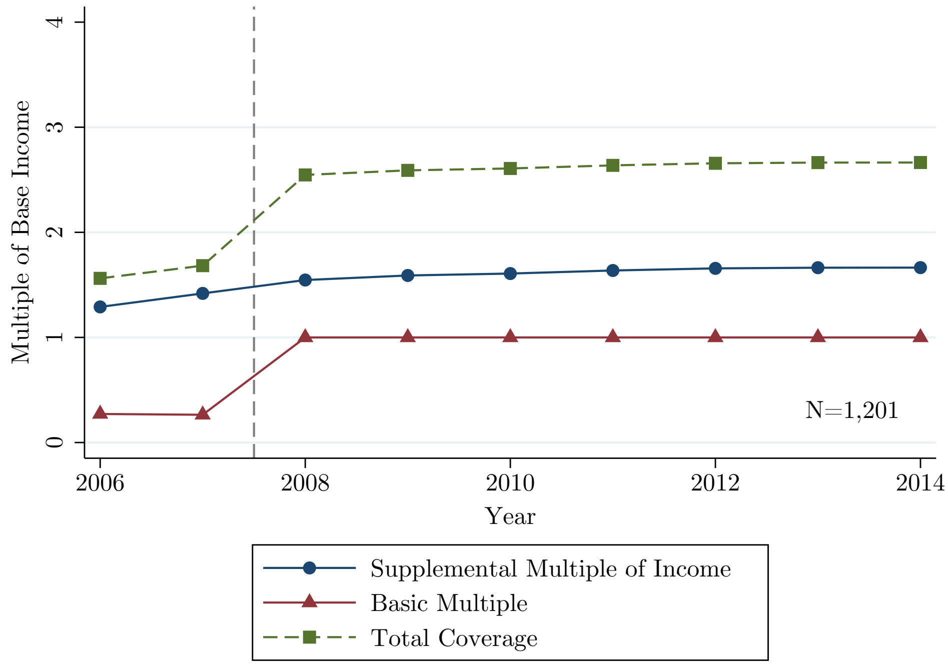


Figure 3.3: Evidence of Inertia: Life Insurance Multiples

Note: The figure considers continuously employed full-time workers who purchased 1-2x salary in supplemental coverage in 2007.

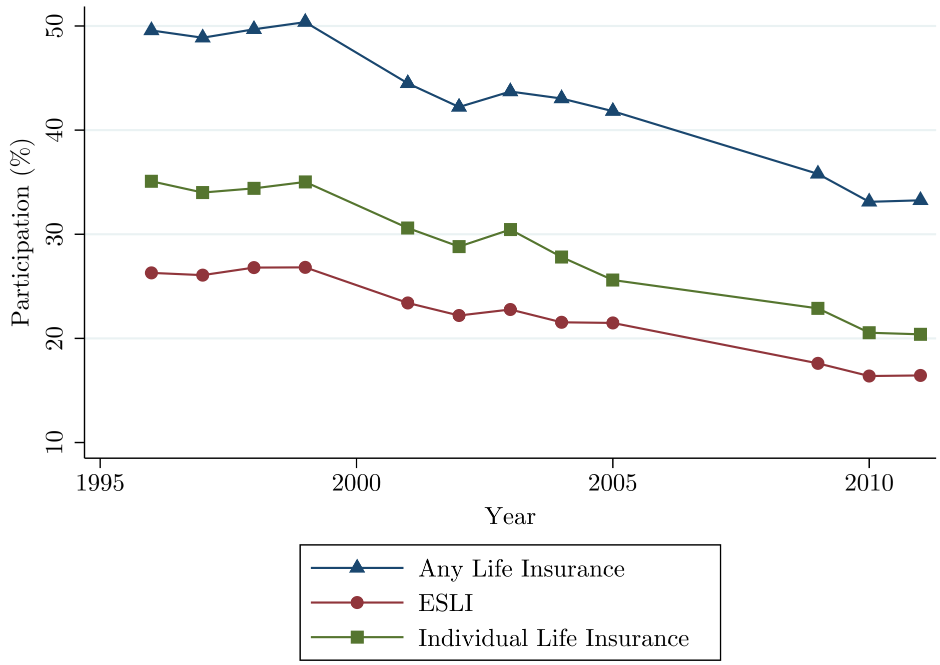
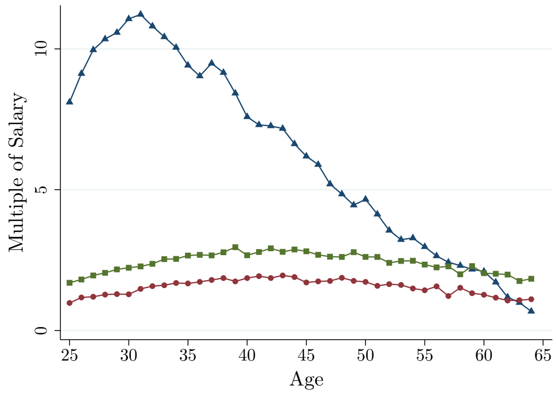
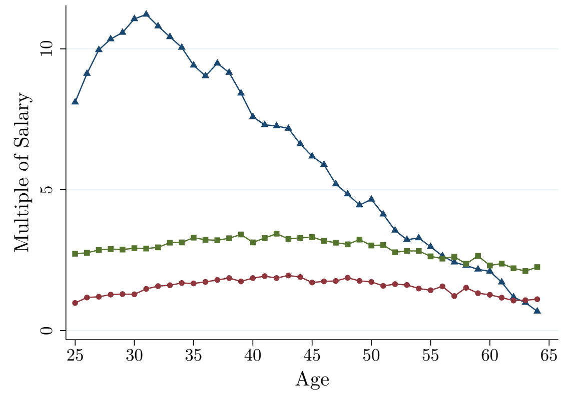


Figure 3.4: Life Insurance Participation Trends: SIPP

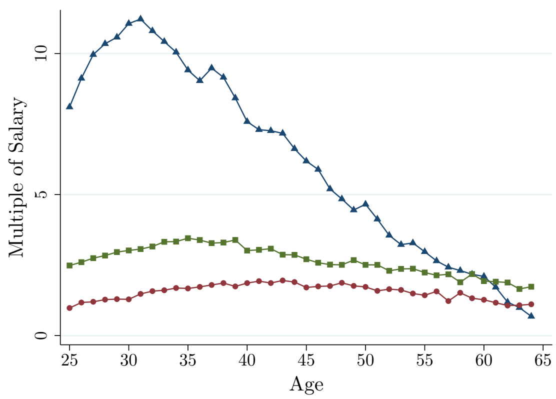
Note: The figure uses data from the 1996, 2001, 2004, and 2008 panels of the SIPP limited to individuals aged 18-64.



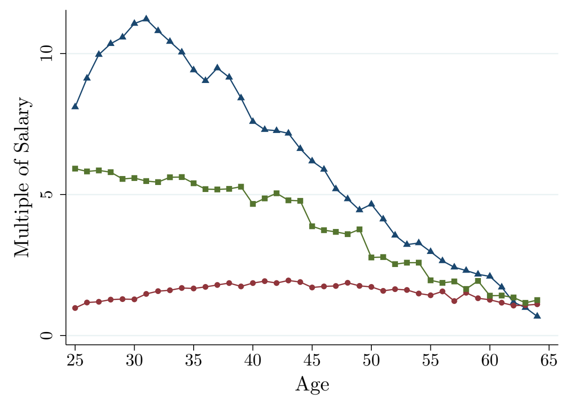
(a) 1x Salary



(b) Fixed Coverage Amount: $59,024



(c) Multiple Adjusted for Age (FEGLI)



(d) Fixed Contribution to Premium: $146

Figure 3.5: Recommended versus Actual Coverage: Expenditure Constant Policy Options

Note: Panel (a) depicts the actual effects of the increase in basic coverage from $10,000 to 1x salary. Panel (b) shows the alternative of providing a fixed dollar amount of coverage ($59,024). Panel (c) shows adjusting the multiple based on age (employees under 35 get twice as much as those over 45 with linear transition from age 35-45). Panel (d) represents spending an equal amount (the average premium paid for 1x salary: $146) on each employee calculated using the supplemental premium schedule. The sample consists of employees at a large public university in fiscal years 2007 and 2008. The recommended multiple comes from Prudential's life insurance needs calculator.

Chapter 4: Is There Adverse Selection in the Life Insurance Market? Evidence from a Representative Sample of Purchasers (with Aaron Yelowitz)

4.1 Introduction

Recent work exploring asymmetric information in insurance markets has emphasized both the roles of adverse and advantageous selection (Einav and Finkelstein, 2011). The life insurance market is unique for high take-up and low reliance on government involvement or mandates relative to markets for health, auto, and long-term care insurance, as well as annuities. Several recent published studies – all using the Health and Retirement Study (HRS) –have reached differing conclusions about the degree or existence of adverse selection in the life insurance market (Cawley and Philipson –hereafter CP, 1999; He, 2009, 2011).[1] Although this data sheds light on the degree of adverse selection, its sample consists of a cohort aged 51-61 in 1992, somewhat older than the typical life insurance holder. He (2009) notes that "evidence for or against asymmetric information among this cohort may not be representative of what one may find in other cohorts". Furthermore, He (2011) stated that individuals older than middle fifties have "passed their peak need for life insurance". We examine adverse selection using a much broader age range contained in the Survey of Income and Program Participation (SIPP). When the SIPP sample is restricted to the age cohort examined in the HRS, the analysis finds similar results to previous work. However, when we examine broader age groups there is no compelling evidence of adverse selection.

4.2 Data

The data come from the 1990 and 1991 panels of the SIPP. This nationally-representative longitudinal sample is constructed through individual interviews in four-month intervals known as "waves". The 1990 and 1991 samples follow individuals for eight waves. Each wave contains responses regarding income, labor force activity, and participation in government assistance programs. In addition to the "core" monthly questions, the survey covers less-frequently asked subjects in "topical modules." The wealth topical modules contain detailed information on assets and liabilities (including individual life insurance holdings) and are asked twice per panel. Another topical module asks about health conditions such as cancer, stroke, and high blood pressure, along with an indicator for self-reported disability or illness.

The key motivation for using the SIPP data from 1990 and 1991 comes from the unique availability of mortality records from the Social Security Administration's Master Beneficiary Record (MBR) matched to the public data. The MBR reports deaths through 1996 with a high degree of accuracy. Table 1 contains summary statistics for the applicable sample and subsamples. Although the death record window

[1]Hedengren and Stratmann 2012 find evidence of advantageous selection using a restricted-use version of the SIPP. However, they do not address the concerns of He (2009, 2011).

–as long as six years after the introduction of the SIPP panel – is relatively short, He (2009) notes that "the period during which buyers are most likely to take advantage of their private information is 4-6 years before death".

Following CP, our primary focus is on individual term life insurance holdings. We abstract away from group and whole life insurance markets due to the confounding factors of group rating and investment mechanisms.

The SIPP has an important advantage because it samples all relevant age groups that purchase life insurance. Fig. 1 shows the distribution of new purchasers using the SIPP panel from 2008.[2] It shows that a majority (62%) of life insurance purchasers are age 50 and under.[3] Therefore, a more thorough analysis of adverse selection in life insurance markets can be ascertained using SIPP data.

4.3 Empirical setup

Following the setup of CP, the following logit model is estimated to gauge the extent or existence of adverse selection.

$$Prob(individual\_term_i = 1) = \Lambda(\alpha_0 + \alpha_1 mortality_i + \alpha_2 X_i) \tag{4.1}$$

In this model, $individual\_term_i$ is a latent indicator variable for having any individual term life insurance and $mortality_i$ is an indicator variable for mortality from 1990 to 1996.[4] X_i is a vector of covariates which includes demographic, financial, health and bequest variables. The SIPP data lacks some important health variables including smoking status, which are used to price insurance premia. $\Lambda(.)$ is the logistic cumulative distribution function. In order to reject the null hypothesis that market participants possess symmetric information, α_1 must be greater than zero.

He (2009) questioned the validity of the CP findings using a sample of existing life insurance holders. She argued that there was survivorship bias associated with high-risk individuals dying and dropping out of the sample. Therefore, she looked at only those individuals who purchased life insurance. Following her general setup, we run regressions where $newbuyer_i$ is unity for someone who did not have life insurance

[2]The 2008 panel has questions regarding life insurance in topical modules 4, 7, and 10 that represent interviews in September to December of 2009, 2010, and 2011. A new purchaser is defined as an individual who did not have life insurance in the initial survey and then reported having life insurance the following year.

[3]Industry surveys indicate that two-thirds of first-time life insurance buyers are under the age of 40. See http://www.slideshare.net/MarionGuthrie/first-time-lifeinsurance-buyers (accessed 4/8/2014).

[4]Observations with deaths prior to the sample year were omitted do to "probable mismatches" as described in the SIPP data dictionaries.

in the initial survey and then reported having life insurance the following year.[5]

$$Prob(newbuyer_i = 1) = \Lambda(\beta_0 + \beta_1 mortality_i + \beta_2 X_i) \tag{4.2}$$

In later work, He (2011) hypothesized that there is dynamic adverse selection in the life insurance market from individuals with better health letting their policies lapse. Following her work, Eq. (3) sets up a regression to look at how actual mortality correlates with lapses in contracts.

$$Prob(lapse_i = 1) = \Lambda(\gamma_0 + \gamma_1 mortality_i + \gamma_2 X_i) \tag{4.3}$$

The analysis undertaken here differs from He (2011) in that she used voluntary cancellation as the dependent variable whereas the subsequent analysis uses a combination of voluntary or end-of policy lapses as the dependent variable.[6]

4.4 Results

Table 2 reports the findings from each regression under four specifications, each of which successively includes more covariates. The baseline regression contains the following covariates: mortality, age, indicator variables for male, white (non-Hispanic), and highest level of education. Finance adds income, net worth, employment status, industry, and census region. Bequest adds indicators for married and children. Health augments the regression with health insurance, self-reported disability, family medical expenses, and the following work limiting illnesses: cancer, heart trouble, high blood pressure, kidney problems, lung or respiratory trouble, paralysis, and stroke.

Column (1) replicates the findings of CP using the same age range as contained in the HRS. In addition, the SIPP data for 1990 and 1991 captures roughly the same cohort as those sampled in the 1992-1994 HRS. The results reported in column (1) fall within the upper and lower bound given by CP and are consistent in sign with the results of He (2009). Columns (2) and (3) report coefficients for other age ranges that are not statistically different from zero and in all but one case are negative. This provides evidence against adverse selection in all relevant cohorts of life insurance purchasers.

Columns (4)-(6) contain the regression results of Eq. (2) including a sample of all individuals who did not have life insurance at the time of the initial survey. The dependent variable, newbuyer, is one if an individual reported having any type of life

[5] SIPP topical modules 4 and 7 in the 1990 and 1991 panels both contain information about life insurance. Questions regarding term versus whole and employer versus individual are staggered between waves 4 and 7. Consequently, when looking at new buyers (and lapses) the dependent variable is restricted to be either new buyer of term or new buyer of non-employer provided life insurance.

[6] $Lapse_i$ is unity if an individual had life insurance in wave 4 and did not have life insurance in wave 7.

insurance in a later period.[7] Column (4) again uses the same age group as the HRS sample and has a positive, statistically insignificant coefficient consistent in sign of with the findings of He (2009). However, columns (5) and (6) representing other ages indicate that actual mortality has a negative or insignificant effect on life insurance holdings. This finding provides evidence that the age group observed in the HRS is not fully representative of life insurance purchasers and that adverse selection is not prevalent across all groups.

The last test for adverse selection looks at those individuals who lapse their life insurance policies. Columns (7)-(9) contain the results from Eq. (3). Here the positive coefficient on *mortality* indicates that individuals who die are more likely to lapse their policies. In this analysis, there is no evidence for adverse selection and even some evidence in favor of advantageous selection in the oldest group of life insurance holders.

4.5 Conclusion

Using data on a representative sample of life insurance purchasers, we find no significant evidence of adverse selection. In virtually all specifications, those who have higher mortality are no more likely to hold life insurance. Although the empirical findings are consistent with the concept of advantageous selection, it is important to recognize the importance of underwriting in the life insurance market. All existing empirical analyses examine life insurance holdings, not applications. Insurers ask extensive questions and require medical exams prior to approval of an application. These institutional features suggest caution before claiming that applicants are advantageously selected; rather the underwriting process potentially screens out high-risk applicants who would otherwise obtain life insurance.

[7] Similar results were produced looking at individuals who purchased only term life insurance as well as individuals who purchased only non-group rated life insurance. Due to data limitations, both cannot be observed simultaneously.

Table 4.1: Summary Statistics

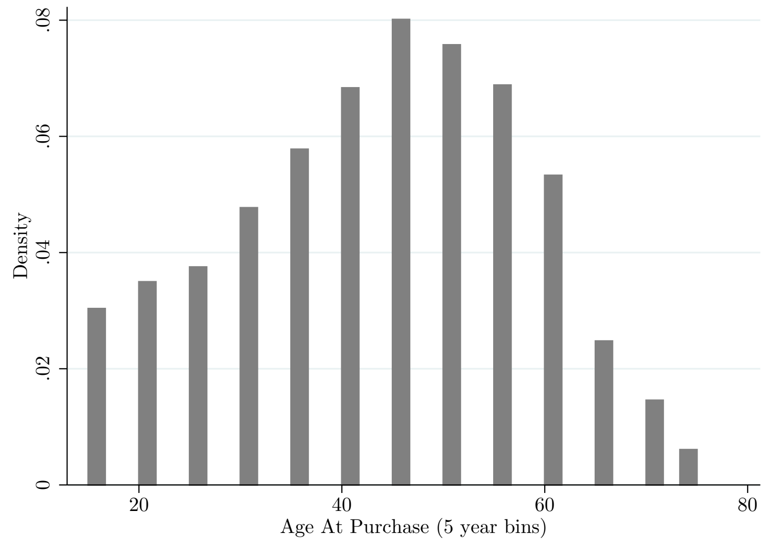
	Full sample	Age 25-50	Age 51-61	Age 62+
Age	52.3	36.9	56.1	71.9
(%) Male	49.3	50.1	51.8	47.2
(%) White (non-Hispanic)	77.7	73.0	78.8	83.6
(%) Mortality (Died by 1996)	7.3	0.4	3.2	18.5
(%) Has term life insurance?	19.7	21.0	22.9	16.5
Observations	17,600	8,725	2,550	6,325

Note: Data from 1990 and 1991 SIPP panels.

Table 4.2: Logit Results

	Life insurance coverage			New purchases			Lapsation		
	Age 51-61	Age 25-50	Age 62+	Age 51-61	Age 25-50	Age 62+	Age 51-61	Age 25-50	Age 62+
Baseline	−0.484	−0.600	−0.101	0.267	−0.275	−0.269	0.571	0.922	0.51
	(0.317)	(0.491)	(0.098)	(0.396)	(0.551)	(0.144)	(0.400)	(0.518)	(0.115)
	[−0.070]	[0.071]	[−0.012]	[0.044]	[−0.040]	[−0.034]	[0.088]	[0.183]	[0.072]
Baseline+finance	−0.430	−0.352	−0.073	0.308	−0.046	−0.272	0.659	0.842	0.496
	(0.325)	(0.496)	(0.099)	(0.413)	(0.558)	(0.145)	(0.408)	(0.514)	(0.117)
	[−0.062]	[−0.044]	[−0.009]	[0.049]	[−0.007]	[−0.034]	[0.099]	[0.158]	[0.068]
Baseline+finance	−0.407	−0.049	−0.067	0.337	−0.034	−0.262	0.663	0.626	0.493
+bequest	(0.329)	(0.500)	(0.099)	(0.416)	(0.559)	(0.146)	(0.412)	(0.515)	(0.117)
	[−0.058]	[−0.006]	[−0.008]	[0.054]	[−0.005]	[−0.033]	[0.097]	[0.111]	[0.067]
Base+finance	−0.413	0.172	−0.047	0.367	0.2	−0.242	0.607	0.543	0.502
+bequest+health	(0.337)	(0.510)	(0.100)	(0.433)	(0.567)	(0.147)	(0.417)	(0.543)	(0.118)
	[−0.057]	[0.023]	[−0.006]	[0.059]	[0.031]	[−0.030]	[0.086]	[0.094]	[0.068]
Observations	2,546	9,039	6,321	1,090	5,341	2,689	1,460	4,056	3,609

Figure 4.1: New Purchasers



Chapter A:

A.1 Chapter 1 Appendix

Table A.1: Probability of Death Mean Comparison by Self-reported Health

	Mean (x100)	s.d.	N
Excellent	0.18	0.26	110,682
Very Good	0.25	0.34	130,892
Good	0.37	0.45	97,923
Fair	0.57	0.63	35,584
Poor	0.74	0.72	13,685

The sample includes individuals between age 18 and 64 from the SIPP.

Figure A.1: term4sale

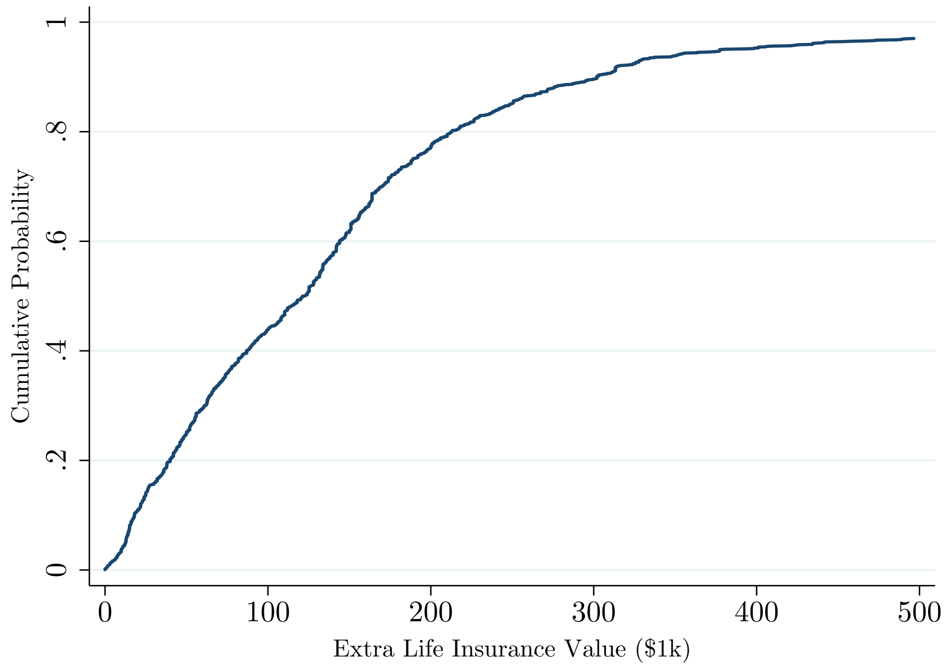


Figure A.2: Federal Employees: CDF of Extra Coverage (either supplemental ESLI or Term)

A.2 Chapter 2 Appendix

A.2.1 Appendix A

Life Insurance and AD&D

For your loved ones—and for your piece of mind— life insurance equal to your annual salary, on us. Additional coverage is also available.

New for 2007-08:

The University is increasing the basic life insurance amount to one times (1x) your salary for all regular full-time (actively working) employees as of July 1, 2007. We're providing expanded coverage at no additional premium cost to you. For new employees, your basic coverage becomes effective on your first day of regular, full-time employment.

Premiums for coverage above $50,000 are subject to taxation per IRS guidelines.

Optional life insurance provides additional protection for those who depend on you financially. Your need varies greatly upon age, number of dependents, dependent ages and your financial situation. Principal Life Insurance Company is the new carrier for the life insurance offered by the University. The life insurance is offered on two levels, basic and optional coverage. In addition, you may purchase dependent and spouse life insurance.

Also new for 2007-08, employees may purchase additional life insurance coverage in higher amounts than in past years. Eligible employees may purchase optional life insurance in increments of:

- 1 x your salary
- 2 x your salary
- 3 x your salary
- 4 x your salary
- 5 x your salary

You are responsible for the cost of the optional life insurance coverage you choose. Optional life insurance premiums are paid through payroll deductions on an after-tax basis.

Any optional life insurance coverage that exceeds 3x your salary or $375,000 is subject to medical evidence of insurability. Coverage will not become effective until receipt of approval by Principal Life Insurance Company.

Newly eligible employees may elect up to 3x salary without medical evidence of insurability if coverage does not exceed $375,000.

Employees with existing coverage may increase optional coverage by one level without medical evidence of insurability if coverage does not exceed $375,000. All optional coverage elections in excess of $375,000, or elections that are increasing more than one level of coverage, are subject to medical evidence of insurability and will not become effective without approval of Principal Life Insurance Company. If you are making an election of more than $375,000 or increasing by more than one coverage level, then you will be sent a Medical Evidence of Insurability form. This form must be completed and returned to Principal Life Insurance Company at the address provided. If approved, Principal Life Insurance Company will notify you and the University by mail.

Current recipients of long-term disability benefits are not eligible to increase life insurance elections. The basic life insurance amount for LTD participants will remain at $10,000.

Your Beneficiaries

Your beneficiary(ies) is the person you choose to receive your basic and optional life and AD&D insurance benefits in the event of your death. If you select family AD&D coverage or dependent life, you are the primary beneficiary for your dependents. You will need to provide Social Security numbers for all beneficiaries. You can change your beneficiary listing at any time.

24

Table A.2: Inertia Analysis Pre Period: 2006-2007; Post Period: 2008-2009
Dependent variable: Total Coverage Multiple (Employer Basic+ Worker Supplemental)

	All	Constant Premium	Age 18-39	Premium Increase	High Salary	Main Campus Faculty	Main Campus Staff
Post	0.785***	0.757***	0.816***	0.785***	0.942***	0.944***	0.737***
	(0.027)	(0.053)	(0.059)	(0.058)	(0.051)	(0.066)	(0.035)
Age	0.431***	0.540***	0.174*	0.275***	0.568***	0.574***	0.428***
	(0.028)	(0.073)	(0.094)	(0.078)	(0.069)	(0.084)	(0.037)
Age Squared	−0.004***	−0.005***	−0.001	−0.003***	−0.006***	−0.006***	−0.004***
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.000)
Annual Salary ($10k)	−0.013	−0.075**	−0.020	0.012	−0.017	−0.030	0.049
	(0.019)	(0.037)	(0.053)	(0.044)	(0.025)	(0.024)	(0.037)
Healthcare	0.089**	0.003	0.102	−0.004	−0.133		
	(0.044)	(0.096)	(0.085)	(0.093)	(0.134)		

Table A.2 (continued): Inertia Analysis Pre Period: 2006-2007; Post Period: 2008-2009
Dependent variable: Total Coverage Multiple (Employer Basic+ Worker Supplemental)

	All	Constant Premium	Age 18-39	Premium Increase	High Salary	Main Campus Faculty	Main Campus Staff
Coverage for Child	0.213***	0.275***	0.336***	0.276***	−0.041	−0.032	0.254***
	(0.039)	(0.096)	(0.075)	(0.087)	(0.079)	(0.111)	(0.050)
Coverage for Spouse	0.153***	0.083	0.267***	−0.029	0.118	0.051	0.140***
	(0.036)	(0.076)	(0.071)	(0.089)	(0.080)	(0.097)	(0.045)
Obs.	7,468	1,507	2,216	1,328	1,871	1,052	4,462
Individuals	1,867	608	616	332	532	263	1,174
$\Delta Basic$	0.738	0.751	0.708	0.745	0.874	0.866	0.709
Reject full pass-through?	Yes	No	Yes	No	No	No	No
p-value:	[0.083]	[0.914]	[0.068]	[0.480]	[0.183]	[0.241]	[0.418]

Note: $\Delta Basic = Basic_{2008} - Basic_{2007}$ and the formal hypothesis for full pass-through is $H_0: \ \beta_1 = \Delta Basic$. The sample is restricted to employees who are eligible for supplemental life insurance coverage, were present continuously from 2006 to 2009 and had 1x or 2x salary in supplemental coverage in 2007. *Post* indicates observations for 2008 and later. Coverage for Child and Coverage for Spouse respectively represent electing any insurance coverage (health, dental, etc.) for a child or spouse. Constant Premium restricts the sample to employees aged 40-44 and 60-64 who did not experience a premium change in 2007. Premium Increase restricts the sample to employees who age into a higher premium bracket in 2008. High Salary indicates being in the highest quartile (> $60k). Standard errors are shown in parentheses *** p<0.01, ** p<0.05, * p<0.1.

Table A.3: Mean Comparison: Response of Interior Employees (1x or 2x in 2007)

In 2008:	Less Supplemental	Same Supplemental	More Supplemental
Age	49.79***	46.21	41.93***
Male	0.30	0.33	0.29
White	0.93**	0.83	0.88*
Black	0.04***	0.12	0.07**
Other Race/Ethnicity	0.04	0.04	0.05
Ever Married	0.59	0.51	0.70***
Indicator for Children	0.37	0.44	0.66***
Annual Base Salary ($1k)	56.98***	50.09	48.50
Years Employed	14.63	13.86	10.43***
Faculty	0.13	0.15	0.11
Observations	110	1,550	207

Note: Sample consists of employees observed in 2007 and 2008 that had 1x or 2x salary in supplemental ESLI coverage in 2007. Indicators for statistical difference between either those that decreased or increased and those that kept the same supplemental coverage are given by *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A.4: Is There Crowd-Out of Individual Life Insurance?
Examining Job Changers: Second Year

	1st Year	2nd Year
ESLI	-0.084^{***}	-0.082^{***}
	(0.016)	(0.016)
Obs.	10,774	10,774
Individuals	5,392	5,392

Note: Sample consists of individuals aged 18-64 without imputed life insurance that switched jobs between waves and remained at the same job for a second year. First year indicates the effect for the first year of employment at the new firm. Second year indicates the change from one year before the job change to the second year at the new firm. Standard errors are shown in parentheses and clustered at the household level *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

A.2.2 Appendix B

Table A.5: Difference-in-Difference Control and Treatment Comparison

	Hired 4 yrs.	New Hire
Age	38.017	36.628***
Male	0.364	0.310***
Faculty	0.139	0.108***
Staff	0.861	0.892***
Hospital Staff	0.303	0.496***
Black	0.089	0.081
Annual Salary ($1k)	49.867	45.124***
Indicator for Children	0.494	0.472*
Ever Married	0.508	0.454***
Observations	2,360	4,298

Note: Sample consists of employees hired in 2002-2005 in observed in 2006 through 2009 respectively (Hired 4 yrs.) and the first observed year of those hired in 2006-2009 (New Hire). Indicators for statistical difference between means are given by *** $p<0.01$, ** $p<0.05$, * $p<0.1$

Table A.6: Difference-in-Difference Estimation
Dependent variable: Total multiple of Life Insurance

	New Hire	Hired 4 yrs.	DD
Post	0.536***	0.753***	0.754***
	(0.040)	(0.055)	(0.052)
Active Choice			0.048
			(0.048)
Post*Active Choice			−0.217***
			(0.065)
Age	0.149***	0.162***	0.154***
	(0.014)	(0.021)	(0.011)
Age Squared	−0.002***	−0.002***	−0.002***
	(0.000)	(0.000)	(0.000)
Male	0.037	0.049	0.040
	(0.043)	(0.060)	(0.035)
Faculty	−0.084	−0.047	−0.066
	(0.080)	(0.096)	(0.061)
Hospital Staff	0.114***	0.133**	0.122***
	(0.043)	(0.063)	(0.035)
Black	−0.019	−0.065	−0.035
	(0.071)	(0.096)	(0.057)
Other race/ethnicity	0.038	−0.238**	−0.068
	(0.087)	(0.115)	(0.069)
Annual Base Salary	−0.000***	−0.000***	−0.000***
	(0.000)	(0.000)	(0.000)
Indicator for Children	0.334***	0.319***	0.328***
	(0.045)	(0.062)	(0.036)
Ever Married	0.305***	0.356***	0.323***
	(0.043)	(0.061)	(0.035)
Vision Insurance	0.112***	0.108*	0.114***
	(0.042)	(0.057)	(0.034)
Dental Insurance	0.192***	0.149**	0.177***
	(0.046)	(0.064)	(0.037)
Obs.	4,298	2,360	6,658

Note: Sample consists of employees hired in 2002 to 2005 observed in 2006 through 2009 respectively (Control group) and the first observed year of those hired in 2006 to 2009 (Active choice). Control group are those Hired 4 years and the treatment group are new hires. *Post* indicates years 2008-2009. Standard errors are shown in parentheses *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

A.2.3 Appendix C

To look at how accurate our measures of marital status and children are, we turn to the American Community Survey (ACS) from 2006-2014. We look at a narrow geographic region that almost surely contains employees of the University. We further restrict the sample to individuals aged 18-64 who work in the industry "EDU-Colleges, Universities, and Professional Schools, Including Junior Colleges," work full-time (greater than 30 hours per week), work at least 40 weeks out of the year, and are public employees. Given these restrictions, we are very confident that the sample represents employees at the University.

We compare the ACS sample with full-time University employees in 2008. Given the large number of major hospitals in the region, it is more difficult to pick off likely University employees that worked in healthcare. Consequently, for the comparison we restrict the University sample to main campus employees.

Table A.7 shows the comparison between the administrative University data and the ACS sample of likely University employees. Across many dimensions including gender, age, salary, and faculty/staff position, the two samples appear to be very similar. The table shows that the University measure of ever electing spousal coverage underestimates the actual percent of employees that are married. This is partly due to working spouses that have coverage from their employer (Ritter, 2013). However, the measure for currently having a child derived from elections seems to closely match the ACS sample. Public employers generally offer better benefits than private employers which makes it more likely that children will be covered through the University employee and consequently be picked up by our metric (Long and Marquis, 1999).

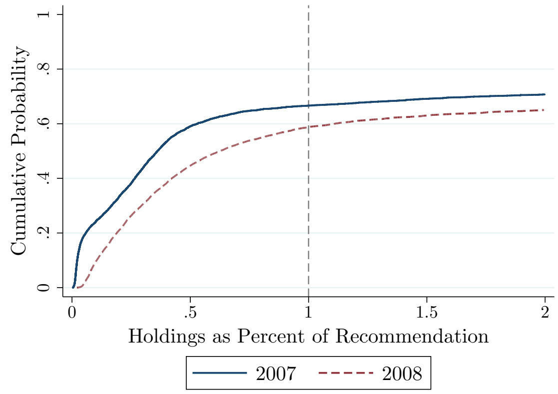
Table A.7: Mean Comparison: Main Campus & ACS

	University Admin. Data	ACS
Male	0.44	0.49^{**}
Age	44.93	43.53^{**}
Married (currently)	0.38	0.59^{***}
Married (ever reported)	0.50	0.74^{***}
Spouse works Full-time Full-year	.	0.34
Has Child (currently)	0.36	0.33
Has Child (ever report)	0.46	.
Annual Base Salary	56.35	54.13
Faculty	0.21	0.21
Staff	0.79	0.79
Owns Home	.	0.69
Has Mortgage	.	0.57
Renter	.	0.30
Property Value ($1k)	.	227.16
Observations	8,533	$7,536^{\dagger}$

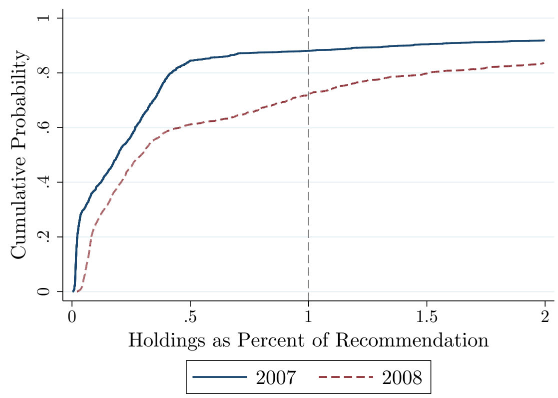
Note: †The ACS sample contains 630 observations which translates into a weighted yearly average of 7,536. The sample is from 2006-2014 which contains public university employees of the relevant narrow geographical area that worked full-time full-year. The sample from the university is taken from 2008 and is restricted to employees of the main campus. Both samples are restricted to individuals age 18-64.

A.2.4 Appendix D

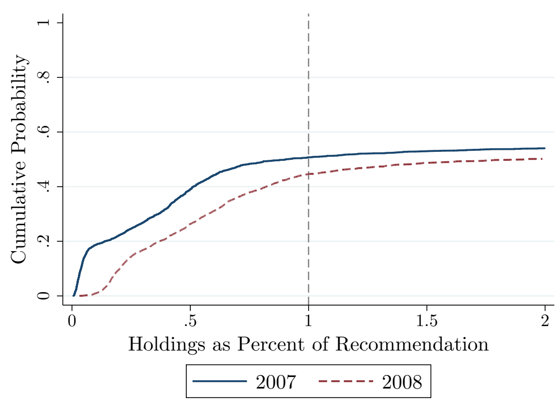
As previously illustrated, needs and disparities vary greatly based on age. Appendix Figure A.3b shows that the increase in basic coverage for employees aged 18-34 caused a 15 percentage point increase in those with at least the recommended level of coverage (from 13 to 28 percent). The figure also shows a 22 percent decrease in the number of employees that had less than half of the recommend level (significantly under-insured) and an 8 percent increase in individuals having more than twice the recommended coverage (over-insured) in part due to not having a dependent. Appendix Figure A.3c shows that the oldest employees (aged 50-64) were more likely to have at least the recommended level in 2007 (50 percent). The biggest effect was the 12 percentage point decrease in those that were significantly under-insured. These age differences motivate the potential use of an age adjusted structure rather than a blanket policy such as 1x salary.



(a) All Employees



(b) Age 18-34



(c) Age 50-64

Figure A.3: Recommended Versus Coverage with Provision of 1x Salary in Basic Coverage: CDF

Note: Panel (a) shows the CDF for employees aged 18-64. Panels (b) and (c) show the CDFs for the youngest and oldest employees respectively. The sample consists of employees at a large public university in fiscal years 2007 and 2008. The recommended multiple comes from Prudential's life insurance needs calculator.

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- Thesis: "Behavioral Life-Cycle Models Under Alternative Demographic Regimes"

B.S., Economics, Aug 2011

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RESEARCH

Peer-Reviewed Publications

- "Racial Disparities in Life Insurance Coverage", *Applied Economics* forthcoming (with Aaron Yelowitz)
- "Life Insurance Holdings and Well-Being of Surviving Spouses", *Contemporary Economic Policy* forthcoming (with Aaron Yelowitz)
- "Nudging Life Insurance Holdings in the Workplace", *Economic Inquiry*, 2017, 55(2): 951-981. (with Aaron Yelowitz)
- "Is There Adverse Selection in the Life Insurance Market? Evidence from a Representative Sample of Purchasers", *Economics Letters*, September 2014, 124(3): 520-522. (with Aaron Yelowitz)

Working Papers

- "Adverse Selection in the Group Life Insurance Market", *Job Market Paper*

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ECO 401: Intermediate Microeconomics	(1 section)
ECO 479: Public Economics	(2 sections)
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ECO 202: Introductory Macroeconomics	(5 sections)

Teaching Assistant

ECO 201: Introductory Microeconomics	
ECO 477: Labor Economics	
ECO 590: Introductory Quantitative Economics	(Graduate Level)
ECO 701: Microeconomic Theory	(Graduate Level)