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Reclassification Risk in the Small Group Health Insurance Market *

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Abstract

We evaluate health insurance reclassification risk in the Small Group Market before ACA community rating regulations. We use detailed claims and premiums data from a large insurance company, controlling non parametrically for selection. We find a pass-through of 11% from changes in health risk to changes in premiums, with a stronger equilibrium relationship between the two. The pricing patterns are consistent with the insurer offering "guaranteed renewability" contracts with one-sided pricing commitment. The observed pricing policy adds 55% of the consumer welfare gain from community rating relative to experience rating, with welfare gains limited because of switching across insurance companies.

JEL Codes: I13, L13, D25

Keywords: inertia, pass-through, adverse selection, experience rating, guaranteed renewability contracts

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1 Introduction

One of the most important concerns in designing health insurance markets is reclassification risk, which occurs when an adverse and persistent health shock leads to higher future premiums or worse coverage. Reclassification risk has the potential to lead to market failure by limiting the long-run risk protection from insurance. A main goal of the 2010 Affordable Care Act (ACA) was to reduce reclassification risk—in the Individual and Small Group Markets—through community rating provisions. This paper considers reclassification risk for health insurance in the Small Group Market. This market generally provides insurance to individuals at employers with 2 to 50 employees.

We believe that studying this market is important for two reasons. First, this market is quantitatively important. On average in our sample period, this market covered approximately 16 million people in the U.S., with about $100 billion in revenues.[1] Second, reclassification risk was particularly salient for this market pre-ACA because of the small sizes of the employers and nature of the contracts. To illustrate, consider an individual who works for an employer with 5 employees with an annual health insurance contract. We are not aware of the existence of formal multi-year contracts—which could limit premium pass-through—in this market. Suppose that the individual or her co-worker is diagnosed with a serious illness, perhaps diabetes, with an expected cost of $25,000 per year going forward. A market that fully passes through risk to the employer—such as a competitive insurance market without long-run contracts—will increase premiums to this employer by $25,000, which raises per-employee costs by $5,000.

The extent of reclassification risk in the Small Group Market prior to the ACA is unclear. On the one hand, a number of influential studies have documented substantial variation in premiums across employers in this market (Bundorf et al., 2012; Cebul et al., 2011; Cutler, 1994). A plausible cause of this premium variation is reclassification risk, i.e., from employers with higher health risks facing higher premiums (Gruber, 2000). On the other hand, using

[1]Authors' calculation using premium information and enrollment from Kaiser Family Foundation (2024).

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survey data, Pauly and Herring (1999) find that premiums did not correlate much with health risk in either the Individual or Small Group Markets. Herring and Pauly (2006) attribute this to the market providing protection from reclassification risk in the pre-ACA era in the form of one-sided "guaranteed renewability" contracts that do not increase rates in response to health risk increases. Given these mixed findings and the relevance to the ACA, we believe that understanding how much reclassification risk existed in this market, and why it existed, is important to understanding the value of what is one of the largest reforms to healthcare policy in the history of the U.S.

This paper has three main goals related to health insurance in the Small Group Market. The first goal is to examine the extent of reclassification risk in this market. The second goal is to evaluate the mechanisms underlying our findings on reclassification risk. The third goal is to understand the welfare consequences of alternative pricing policies, such as community rating and full experience rating, relative to the current environment. Our paper complements a number of other recent and ongoing papers by us and other researchers that study the Small Group Market.[2]

Our study brings novel data to bear on this understudied market. We use data on the Small Group Market from a large health insurance company, which we refer to as the United States Insurance Company, or USIC. These data include a panel of claims and premiums for USIC's Small Group Market products in 10 states over the period 2012-15, containing information on over 300,000 USIC enrollees at more than 12,000 employers.[3] Crucially, this database allows us to observe healthcare costs and premiums for each employer, which we use to directly evaluate reclassification risk. Our study is unique in having access to a large database on the

[2]Fleitas et al. (2019) and Dickstein et al. (2024) study segmentation between the Small Group Market and Health Insurance Exchange plans offered under the ACA. Fleitas et al. (2022) study the impact of incumbent regulation in the Small Group Market, where plans could continue to experience rate after the ACA implementation.

[3]This time period was immediately before most of the ACA regulations for the Small Group Market were effective. For the time period and states in our sample, insurers could experience rate small employers without significant regulatory restrictions.

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Small Group Market with this information. [4]

To motivate our empirical specifications, we develop a simple two-period model of insurance demand and premium setting in the Small Group Market. Focusing first on demand, individuals decide whether or not to enroll in insurance if offered, given their health risk and the premium charged. The welfare loss from reclassification risk is increasing in the pass-through from changes in mean health risk at an employer to changes in premiums. We highlight three potential premium setting environments: (1) the full pass-through case, which corresponds to an optimizing market of insurers who cannot offer implicit or explicit long-run contracts; (2) the no pass-through case, would would be optimal if multi-period binding contracts were feasible; and (3) the case with partial pass-through. If one-sided commitment contracts are allowed, partial pass-through may be the best feasible policy when individuals have liquidity constraints (Ghili et al., 2024). Our empirical analysis seeks to understand which of these cases the USIC Small Group Market plans most resemble.

We empirically evaluate the nature and extent of reclassification risk by estimating the pass-through from changes in health risk at an employer in a year to changes in its per-enrollee premiums. We compute health risk for each individual as the ACG score, using the previous year's claims data.[5] Because there is frequent movement in and out of the Small

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[4]Also related to our study, Buchmueller and DiNardo (2002) investigated whether the implementation of community rating in New York led to adverse selection, while Cutler and Reber (1998); Einav et al. (2010). Bundorf et al. (2012) find a small welfare loss from employee self-selection into plans from among those offered by their employer. We consider the reclassification risk from the fact that employers face experience rating, which is a different, and potentially larger, source of variation and hence welfare loss. Kowalski (2015) also studies reclassification risk for employees who could choose from a menu of plans offered by their employer and Atal et al. (2019) study guaranteed renewability contracts in Germany. Hendel and Lizzeri (2003) and Fang and Kung (2021) study reclassification risk in the life insurance market.

[5]The ACG score, which was developed by Johns Hopkins University, is widely used in this context (see, for instance Ghili et al., 2024; Gowrisankaran et al., 2013; Handel, 2013), and

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Group Market, we examine the robustness of our approach to different selection corrections, including non-parametric controls (Newey, 2009). These estimates are identified by the extent to which changes in health risk at an employer translate into changes in premiums, conditioning on the probability of being in the sample. Individual risk and industrial sector provide useful exclusion restrictions in the premium setting (treatment) equation that help identify this probability. We also examine the impact of selection using a bounds approach (Altonji et al., 2005; Oster, 2019) and stratifying by employers where selection may be more or less important.

Overview of findings. We find that a unit increase in mean ACG score for an employer increases its mean annual claims cost by \$4003.[6] Our base estimates—with enrollee fixed effects and controls for selection—show that this unit increase causes premiums to rise by \$436. Thus, our estimated pass-through from expected claims to premiums is 11%. Our results that do not control for fixed effects, but still control for selection, show a much higher relation between health risk and premiums, of \$2,708, or 68% of health risk. The difference between the fixed effects and non-fixed effects estimates suggests that USIC prices new accounts based on their health risk and then updates premiums for existing accounts with much less regard to health risk. Our robustness results support these main findings.

Having established that the contracting environment does not correspond closely to full experience rating, we next evaluate whether it has features of one-sided commitment contracts. Ghili et al. (2024) show that, in the presence of liquidity constraints, optimal contracts from a competitive insurance market will partly front load premiums to avoid lapsation, charging newer enrollees more relative to their health risk than older enrollees. However, insurers will balance the front loading against enrollees' desire to smooth consumption. The lack of complete front loading will cause some low-risk individuals to renegotiate their insurance contract. Their model has three testable implications related to pass-through. First, it implies positive, but incomplete, pass-through from health risk to premiums. Second, it

similar to USIC's proprietary risk score.

[6] An ACG score of 1 is the population mean score, so a unit increase would occur from an employer with the population mean score doubling its expected health costs.

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implies that the marginal impact of health risk on premiums will be greater when risk scores decrease than when they increase. Finally, it implies that groups with initially higher risk scores will face greater pass-through from health risk to premiums than other groups, since there is more scope for their premiums to decrease.

We test these implications of the Ghili et al. (2024) model in the USIC data. Our above finding of an 11% pass-through is consistent with the first implication. Regarding the second implication, we find that reductions in the ACG score have a much larger impact on the premiums than increases in the score. We cannot reject the third implication, but our findings here are less conclusive. Overall, these results suggest that USIC contracts may have some features similar to optimal guaranteed renewability contracts, and in this way provide empirical evidence that is complementary to Ghili et al..[7]

We then simulate counterfactuals to evaluate the extent to which USIC Small Group Market plans add value in the form of reclassification risk protection by non-parametrically simulating the evolution of health risk over a ten-year horizon and evaluating how this would translate into financial risk for individuals under different premium-setting environments. Given that our specifications with enrollee fixed effects uncover USIC's pass-through for existing employers, we assume that when individuals remain in USIC insurance with a given employer, they receive a new premium based on the new employer risk and our estimated coefficient from the model with enrollee fixed effects and the selection correction. Since our non-fixed-effects specifications may reflect risk-based pricing for new accounts, we further assume that when individuals leave USIC insurance with the same employer, they work at an employer of a similar size and risk and receive a premium based on the coefficient estimated without enrollee fixed effects. We calculate the certainty equivalent loss in income from financial risk, using a CARA functional form and estimated risk preferences from the literature (Handel, 2013).

We find that USIC's actual policies result in a mean annual certainty equivalent loss from

[7]While Ghili et al. provide a theoretical framework and evidence on the nature of optimal contracts, we recover the empirical dynamics of Small Group Market pricing in the era before ACA community ratings.

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financial risk of $3,050 over a ten year horizon. Even though our estimates with enrollee fixed effects show low pass-through similar to community rating, the reclassification risk protection of these contracts is limited by employees in this market frequently switching insurance coverage and by substantial out-of-pocket costs. With community rating, we find a mean certainty equivalent loss of $1,950 over the ten year horizon, due solely to the financial risk from out-of-pocket costs. The certainty equivalent income loss is $4,500 under full experience rating, implying that USIC's pricing policy generated about 60% of the certainty equivalent gains in risk protection of community rating regulations relative to full experience rating. Finally, we compare USIC's actual policies to an individual market with identical contracts and selection. Individuals in such a market would have a certainty equivalent loss of $3,650, implying that pooling across beneficiaries within a small employer adds $300 in value.

The remainder of our paper is organized as follows. Section 2 describes our model of enrollee choice, premium setting, and selection. Section 3 describes our institutional background, data, and estimation sample. Section 4 describes our empirical approach. Section 5 describes our estimation results, Section 6 presents our counterfactuals, and Section 7 concludes.

2 Model

2.1 Enrollee utility and choice

We first develop a stylized model of insurance choice for Small Group Market health insurance. The model has two time periods, periods 1 and 2.[8] Period 2 payoffs are discounted at the rate δ. A period represents a year, the typical length of a health insurance contract. We consider potential enrollees who can obtain health insurance through a Small Group Market employer.[9] Denote the potential enrollee by i, the employer by j, the time period by t, and the number

[8]We make this assumption for ease of exposition. Our empirical work allows for more than two periods.

[9]The model does not distinguish between potential enrollees who are employees and dependents.

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of potential enrollees at employer j by I_j.

Each potential enrollee starts each period with risk score r_{ijt}. The risk score is based on her previous year's healthcare claims, proportional to her total expected costs of healthcare at period t, normalized to 1 for the mean individual in the population, and observable to both the potential enrollee and the insurer. Let $H \sim dF_H(r_{ijt})$ denote the period t health shock as a function of risk score and $c(H)$ denote the claims cost given health shock H. We separate costs into the portion that the insurer pays, $c^{ins}(H)$, and the portion that the enrollee pays out of pocket, $c^{oop}(H)$. Insurer-paid claims satisfy

$$E[c^{ins}(H)] = \gamma r_{ijt}, \tag{1}$$

where γ is a constant of proportionality.[10] The individual risk scores imply that the employer mean risk score over its population of potential enrollees is $R_{jt} \equiv \frac{1}{I_j} \sum_{i=1}^{I_j} r_{ijt}$. Denote the expected insurer costs as $E[C_{jt}^{ins}] = \frac{1}{I_j} \sum_{i=1}^{I_j} E[c^{ins}(H\left(r_{ijt}\right))]$.

The timing in our model is as follows. In period 1, employer j forms with some exogenous set of employees. In both periods, after R_{jt} is realized, the enrollee observes the per-person premium, $p_{jt}(R_{jt})$, which is the total premium for employer j divided by the number of enrollees at employer j. We index the premium by j since it is potentially a function of both R_{jt} and the employer's history with the insurer. Following this, the employer decides whether to offer insurance. Potential enrollees then decide whether to take up the insurance if offered. Finally, the health shocks H are realized.

Turning to enrollee value, we assume that utility is additively separable across the time periods. We denote the per-period utility from obtaining insurance when offered as $U_{ij}^A(r_{ijt}, p_{jt}(R_{jt}))$. This utility is a function of the potential enrollee's income Y_{ijt}, her employer's premium, and her out-of-pocket health costs:

$$U_{ij}^A(r_{ijt}, p_{jt}(R_{jt})) = \int u_{ij}\left[Y_{ijt} - p_{jt}(R_{jt}) - c^{oop}(H)\right] dF_H(r_{ijt}), \tag{2}$$

[10]While risk scores typically concern overall costs, we assume here that the proportional relationship holds for the costs borne by the insurer.

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where $u_{ij}(\cdot)$ is her money utility function. We assume that, through adjustments to premium or wage, the potential enrollee pays her employer the full cost of her health premium,[11] and that enrollees are risk averse.

We denote the per-period utility from not having insurance as $U_{ij}^N(r_{ijt})$. Without insurance, the individual bears the full cost of her health expenditures:

$$U_{ij}^N(r_{ijt}) = \int u\left[Y_{ijt} - c(H)\right] dF_H(r_{ijt}). \tag{3}$$

Combining the utility from both choices, the potential enrollee's per-period utility is then:

$$U_{ij}(r_{ijt}, p_{jt}(R_{jt})) = \max\{U_{ij}^A(r_{ijt}, p_{jt}(R_{jt})), U_{ij}^N(r_{ijt})\}. \tag{4}$$

Finally, the discounted value of the potential enrollee over the two periods is:

$$V_{ij}(\vec{r}_{j1}) = U_{ij}(r_{ij1}, p_{j1}(R_{j1})) + \delta \int U_{ij}(r_{ij2}, p_{j2}(R_{j2}))dF_{R,r}(R_{j2}, r_{ij2}|\vec{r}_{j1}), \tag{5}$$

where $\vec{r}_{1j1}$ is the vector of period 1 risk scores and $dF_{R,r}(R_{j2}, r_{ij2}|\vec{r}_{j1})$ is the joint conditional risk score distributions at period 2, for the potential enrollee and her employer.

2.2 Premium setting and reclassification risk

We now examine how different premium setting environments may affect reclassification risk. Reclassification risk can enter in our model because a bad and persistent health shock at period 1 for the individual or her coworker will raise R_{j2}. The extent of reclassification risk depends on the distribution of F_R and on $p_{j2}(\cdot)$. If the individual were in a large risk pool, then reclassification risk would not be a substantial issue because the distribution of F_R would be very concentrated and degenerate to a point in the limit. Even if the individual were in a

[11]The literature has shown positive but sometimes incomplete pass-through from higher premiums to lower wages (Baicker and Chandra, 2006; Bhattacharya and Bundorf, 2009). We model complete pass-through for simplicity but our empirical findings are robust to incomplete pass-through.

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small risk pool, if $p_{jt}(R_{jt})$ did not vary much in response to R_{jt}, then she would not face much reclassification risk. In contrast, individuals in small risk pools without significant restrictions on experience rating—i.e., individuals in our sample—may face significant reclassification risk. For ease of analysis, this subsection focuses on the case where potential enrollees always take up insurance and where the insured have no out-of-pocket costs.[12] This implies that $E[c(H(r_{ijt}))] = E[c^{ins}(H(r_{ijt}))] = \gamma R_{jt}$.

We first consider full experience rating. In this case, the insurer sets premiums exactly equal to expected equilibrium insured risk, so that $p_{jt}(R) = \gamma R$. Suppressing dependencies on variables that no longer enter, equation (5) specializes to:

$$V_{ij}(\vec{r}_{j1}) = U^A_{ij}(\gamma R_{j1}) + \delta \int U^A_{ij}(\gamma R_{j2}) dF_R(R_{j2}|\vec{r}_{j1}). \tag{6}$$

Individuals here are faced with reclassification risk: an increase in the expected equilibrium mean risk score among the insured in period 2, R_{j2}, is passed through into an increase in expected insurance costs at the employer in period 2.

Next, we consider long-run contracts with a binding commitment to future premiums. Consider such a contract with a period 1 premium of $p_{j1} = \gamma R_{j1}$ and a period 2 premium of $p_{j2} = \gamma E[R_{j2}|\vec{r}_{j1}]$. This contract would have premium equal to expected marginal cost and would eliminate reclassification risk. Given our assumption that consumers are risk averse,

$$\int U^A_{ij}(Y_{ij2} - \gamma R_{j2}) dF_R(R_{j2}|\vec{r}_{j1}) < U^A_{ij}(Y_{ij2} - \gamma E[R_{j2}|\vec{r}_{j1}]),$$

implying that such a contract would improve enrollee welfare for individuals who take up insurance over state-contingent one-period contracts of the same actuarial value. Consider further the case where income and mean risk are the same across periods, so that $Y_{ij1} = Y_{ij2}, \ \forall i$, and $E[R_{j2}|\vec{r}_{j1}] = R_{j1}$. In this case, the above contract would maximize U^A among long-run break-even contracts. This implies that a competitive insurance industry with full take-up would result in employers signing these two-period contracts.

Note further that this two-period contract is approximately equivalent to a community

[12]Our empirical work accounts for out-of-pocket costs.

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rating provision (provided the rating pool includes a large number of people) in that there is no pass-through from health risk to premiums. However, it is likely different from community rating in that the initial premiums might vary based on employer characteristics. In particular, with binding contracts and competition, new employers would be risk rated while continuing accounts would not. This would result in the initial premiums, p_{j1}, being larger with a higher R_{j1}, which would not occur under community rating.

Third, we consider the case with different levels of pass-through. A simple functional form for premiums here is:

$$p_{jt} = k_{jt} + \beta R_{jt}, \tag{7}$$

for some constant k_{jt}, which reflects baseline prices at period t, and might vary due to changes in healthcare provider prices or general expected increases in health risk over time. If $\beta = \gamma$, then this is the full experience rating case. Under community rating or binding two-period contracts, we would have $\beta = 0$. For $0 < \beta < \gamma$, there will be positive but incomplete pass-through from changes in risk to changes in premiums. Given that preferences are risk averse, for $\beta' < \tilde{\beta}$,

$$\begin{aligned} &\int U_{ij}^A(Y_{ij2} - p_{j1} - k_{jt} - \tilde{\beta}(R_{j2} - E[R_{j2}|\vec{r}_{j1}])dF_R(R_{j2}|\vec{r}_{j1})) \\ <&\int U_{ij}^A(Y_{ij2} - p_{j1} - k_{jt} - \beta'(R_{j2} - E[R_{j2}|\vec{r}_{j1}])dF_R(R_{j2}|\vec{r}_{j1})), \end{aligned} \tag{8}$$

implying that actuarially equivalent contracts with a lower β increases utility.

In a regression based on (7) with employer and year fixed effects to proxy for k_{jt}, β would indicate the pass-through from changes in health risk to changes in premiums. In a similar regression without employer fixed effects, the analogous coefficient would indicate this pass-through plus the risk-based portion of the initial premium in k_{j1}.

Since utility is decreasing in β, β is a sufficient statistic to evaluate the reclassification risk from a contract where price changes are linear in health risk, conditional on preferences and the distribution of health shocks scaled in dollars using γ. In the tradition of Chetty (2009) and Einav et al. (2010), we estimate β and use it to characterize reclassification risk in this market. This does not require us to specify or estimate all preferences parameters. To understand

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welfare under the observed and counterfactual environments, we then combine our estimates of β with risk preference parameters from the literature, the estimated distribution of health shocks scaled in dollars, and models of selection into insurance.

Finally, we consider one-sided commitment or guaranteed renewability contracts. Competitive equilibrium one-sided commitment contracts with a competitive market and liquidity constraints would deliver positive but limited pass-through from changes in health risk to changes in premiums, with more reclassification risk when risk scores decrease (Ghili et al., 2024). This would result in a relatively low and nonlinear β in regressions of premiums on health risk with employer and year fixed effects based on (7). Since guaranteed renewability contracts do not solve the problem of risk-based pricing for new accounts, we would expect a stronger relationship between health risk and premiums in analogous regressions without employer fixed effects.

2.3 Selection of enrollees

Our above results deal with the case where enrollees choose USIC insurance in both periods. In the real world, take-up of insurance is limited and employers and enrollees start and stop coverage frequently. We now discuss selection of potential enrollees into insurance. We model the combined offer and take-up decision for the employer and enrollee as:

$$D_{ijt} = \mathbb{1}\{f(R_{jt}, r_{ijt}, x_{ijt}) + \varepsilon^s_{ijt} > 0\} \tag{9}$$

where $D_{ijt} = 1$ indicates offer and take-up of insurance, $f(\cdot)$ is a flexible mean utility function to be estimated, and ε^s_{ijt} is an unobservable. Starting with (7) we then model premiums as:

$$p_{ijt} = \overline{k}_{jt} + \beta R_{jt} + \varepsilon^p_{ijt}, \tag{10}$$

where we are now indexing p by 'i', $\overline{k}_{jt}$ is the mean average pass-through given characteristics of employer j and period t, and ε^p_{ijt} is also an unobservable, capturing idiosyncratic premium risk unexplained by other factors and uncorrelated with risk, for instance due to variation in employer or insurance broker bargaining ability.

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Our data contain premiums only for individuals who take up insurance and hence for whom $D_{ijt} = 1$. Hence, (9) is our selection equation while (10) is our treatment equation. As is typical in selection models, we allow for correlations between ε^{s}_{ijt} and ε^{p}_{ijt} for a given i. We generally expect that there would be a negative correlation between the two unobservables since individuals who received a higher premium than expected given observables would also be less likely to select into insurance than expected given observables. Note also that ε^{p}_{ijt} will be highly correlated for individuals at the same employer and year since individuals at a given employer and year pay the same premium.

Our estimation seeks to recover consistent treatment effects for β in (10) in the presence of selection. Specifically, we non-parametrically control for selection in (10) using the methods of Newey (2009).

3 Background and Data

3.1 Institutional background

The Small Group Market is primarily tailored to cater to the unique needs of small businesses. These are businesses that have a limited number of employees—often between 2 to 50—although the precise definition varies depending on state regulations.[13]

On average during our sample period, this market covered approximately 16 million people in the U.S. (Kaiser Family Foundation, 2024), with about \$100 billion in revenues. Small Group Market enrollment declined about 7% per year during the sample period, although this is a continuation of a trend in place prior to the ACA (Hall and McCue, 2018).

We use the Medical Expenditure Panel Survey (MEPS) data to understand more about the dynamics of this market. MEPS is a nationally representative survey regarding individual insurance decisions and health care expenditures. Figure **??** on Online Appendix **??** shows

[13]The ACA originally mandated a change in the market definition to include groups with up to 100 members. This change was eliminated in the 2015 Protecting Affordable Coverage for Employees (PACE) Act, so that the federal definition specifies a maximum of 50 members. However, four states use the 100 members maximum in their definition (Jost, 2015).

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the percent of employees of small group firms who were offered insurance and who took up insurance given an offer. The graph shows that slightly more than 50 percent of small group employers offered health insurance to their employees, with the rate remaining roughly constant over the 2013-2019 period. By contrast, nearly all firms with 100 or more workers offer health insurance (MEPS, 2019).

The Health Insurance Portability and Accountability Act (HIPAA) of 1996 required insurers to offer policies in the small group market in the states in which they operate.[14] Moreover, all states had provisions that severely limited the ability of an insurer to cancel a group's policy based on its health risk. Prior to the passage of the Affordable Care Act (ACA), states were the primary regulator for the Small Group Market and varied significantly in the extent of their regulation. For instance, some states imposed community rating while others allowed significant premium variation in the form of medical underwriting across different groups. States also varied in the services that health plans were required to cover (Kaiser Family Foundation, 2013).

Virtually all health insurance policies in the Small Group Market have a contract term of one year. This annual duration is often referred to as the "plan year" or "policy year." At the end of this period, the policy is up for renewal. During the renewal process, both the insurer and the small business (commonly working through an intermediary such as a broker) will review the terms of the contract. Premiums may be adjusted based on factors such as overall claims experience, changes in the composition of the insured group, medical inflation, and any regulatory changes (Kaiser Family Foundation, 2012). The benefits, network structures, and other contract provisions may also be updated at this time.

The ACA implemented community rating regulations for the Small Group Market—specifically a ban on health status underwriting and a requirement that plans in the market have a common small group risk pool—that were originally supposed to start in January, 2014. However, almost all Small Group Market plans did not have to follow ACA community rating provisions during our sample period, for two reasons. First, some of these plans were "grandfathered," meaning that the ACA included a clause that allowed consumers to keep

[14]This paragraph summarizes findings from Jensen and Morrisey (1999).

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their existing health plans, conditional on the plan not significantly changing its benefits.[15] Second, a transitional rule let states allow "grandmothered" plans in the small group market, meaning that they could permit insurers to continue offering non-ACA-compliant plans to small employers. The great majority of states opted to allow the sale of grandmothered plans past our sample period, and indeed through 2018.[16]

Finally, the Small Group Market has few insurance companies active in most states (Kaiser Family Foundation, 2024). Hence, it is best characterized as an oligopoly rather than a competitive market.

3.2 Data

Our principal data are from employers who purchase health insurance for employee and dependent coverage from "United States Insurance Company" (USIC) in the Small Group Market during the years 2012 to 2015. USIC provided us with data from 10 different states: AR, DE, IL, PA, OK, MO, TN, TX, WI, and WY. USIC further classified the data into 19 different geographic markets, e.g., Texas is divided into Central Texas, Dallas, Houston, North Texas, and South Texas. Employers in our sample purchased fully-insured insurance products from USIC, not third-party administrative services. Figure **??** in Online Appendix **??** provides a map of the states in our estimation sample.

The states that we use were all lightly regulated prior to the ACA. For instance, none of the states had community rating regulations during this period. One measure of state regulation is the extent to which premiums are allowed to vary across groups for all reasons apart from plan generosity, which are known as rate bands. Prior to the start of ACA regulations on this market, DE, PA, TX, IL, WI, and WY allowed premiums to range across groups by a ratio of 25-to-1 or greater (a total of 12 states had bands this large); MO and OK had rate bands between 19- and 25-to-1; and AR and TN had rate bands between 13- and 19-to-1.[17]

[15]The concept of grandfathering of health plans was popularized by President Obama's statement that "if you like your health plan, you can keep your health plan."

[16]See Fleitas et al. (2022) for details.

[17]See http://www.naic.org/documents/topics_health_insurance_rate_regulation_brief.pdf.

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Our data include information at both the enrollee-year (employee or dependent) and employer-year levels. At the employer-year level, for all the employers that contract with USIC, we observe the total number of employees that are eligible for health coverage, the number of health insurance plans available to their enrollees in each year, the characteristics of each plan, and the total premium paid by the employer to the insurer for each plan in each month of each year.

We observe data for each enrollee that takes up insurance in each year. Specifically, we observe age, gender, the health plan chosen, the relationship of the enrollee to the employee (e.g., self, spouse, child), and information to link enrollees to the employer and to the employee with employer-sponsored coverage. We also observe claim-level data—for both medical and pharmaceutical claims—for every healthcare encounter. These data provide diagnosis, procedure, date of service, and premium information and are linked to the enrollee identifier.

We calculate a per-enrollee premium by dividing the total premium paid by the employer to USIC in a year for a plan by the number of enrollees (employees and dependents) at that employer and plan during that year. We use the January premium and enrollee information for this calculation and annualize the premium by multiplying it by twelve.[18]

To measure the predicted health expenditure risk for each enrollee, we use the ACG risk prediction software developed at Johns Hopkins Medical School. The software outputs an "ACG score" for each enrollee in each year, which corresponds to r_{ijt} in our model. The ACG score indicates the predicted relative healthcare cost for the individual over the year, and has a mean of 1 in a reference group chosen by ACG. The ACG score is based on past diagnostic codes, expense, prescription drug consumption, age, and gender for each individual. In our case, we use the twelve months of data from the previous year to generate the ACG score for a given year. Similarly to the ACG score, USIC also uses a proprietary system to derive a

[18]Because individuals typically make enrollment decisions annually with contracts starting in January, the total premiums paid by the employer to USIC in January is a good representation of annual per-person premiums charged by USIC. We also computed per-enrollee premiums using the mean and mode of the monthly premiums paid by the employer over different months, and obtained similar results with these alternative measures.

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risk score for each enrollee. While we lack access to the USIC scores for most enrollees, the ACG and USIC scores are very similar, as we show in Online Appendix **??** for the subsample of enrollees for whom we have both scores.

For new groups, USIC did not generally use their proprietary risk scores, because this would have required obtaining and processing claims information from the previous insurer for each enrollee. Instead, USIC typically obtained information on health risk from a health questionnaire. This questionnaire requested information regarding 15 conditions, including cancer, diabetes, and heart disease, and asked potential enrollees to list any claims in excess of $5,000.

Since our risk score measures are calculated using the previous year claims data, we need to observe an employer or individual for two consecutive years in order to have a complete observation where we can observe the risk score and the premium. Thus, for instance, if we observed an employer in 2012 and 2013, this would allow us to compute the 2013 premium and mean risk score for the employer, where the risk score was computed from 2012 data.

Most of our regressions use employer or enrollee fixed effects. Since we obtain the risk score calculation from the previous year, we need three continuous years of data (which generates two years with complete observations) to compute an employer/enrollee fixed effect. For comparability across estimates, we drop employers/enrollees for which we observe fewer than three continuous years of data for all our specifications, even those without employer/enrollee fixed effects.[19]

As an additional source to evaluate selection, we use the national MEPS survey data. The MEPS data allow us to understand selection into the Small Group Market since it has information about individuals that did not take up insurance. We construct the sample by using panel 18 from the consolidated database for years 2013 and 2014. To select individuals who could participate in the Small Group Market, we select individuals who were (a) working but not self-employed at the beginning of the period, (b) who worked at an establishment with size less than or equal to 50 individuals, and (c) were offered insurance via their employer. We use

[19]We also drop employers with missing information for premiums, plan characteristics, or enrollment.

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age, gender, and health conditions of individuals and establishment size and industrial sector as characteristics to predict the take-up probability.

3.3 Summary statistics on estimation sample

Panel A of Table 1 provides summary statistics on the enrollees in our estimation sample. Our full sample includes approximately 330,000 unique individuals and 650,000 observations.

We first analyze enrollee turnover. To do this, we characterize enrollees based on whether they have joined or quit available USIC coverage during our sample. A "joiner" is an enrollee for whom we did not have a complete observation in the first year but for whom we had a complete observation in a later year and whose employer was in the sample prior to her being there. A "quitter" is the opposite: an enrollee for whom we did not have a complete observation in the last year but for whom we had a complete observation in an earlier year and whose employer remained in the sample after she was no longer there. A "stayer" is an enrollee for whom we have three complete observations. Note that an individual can be both a joiner and a quitter, which would occur if she were in our data in the middle two years only. Also, note that enrollees whom we do not observe for two consecutive years would not fit any of these three categories.

We find a lot of enrollee turnover. Only 37% of observations in our sample are for stayers. Approximately 27% of observations are for joiners while 29% of observations are for quitters.

Overall, there is a clear though moderate pattern of differences between the groups, where joiners have lower health risk than stayers who have lower health risk than quitters. Specifically, joiners have a mean ACG score—or expected claims cost—of 0.92, compared to 1.01 for stayers, and 1.05 for quitters. Consistent with this, joiners are on average two years younger than quitters, though stayers are older than either group, suggesting that age affects insurance lapsation for reasons other than health risk. On average, people paid $5,219 in annual premiums, had $3,388 in total claims, and $902 in out-of-pocket claims.

In addition, we measure eight chronic conditions from the claims data—cancer, transplants, acute myocardial infarctions (heart attacks), diabetes, hypertension, heart disease,

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chronic kidney disease, and asthma.[20] Panel A of Table ?? in Online Appendix ?? shows that the most prevalent is hypertension, occurring in 14% of observations. The next most common is diabetes occurring in 6% of enrollees.

Panel B of Table 1 provides summary statistics on the employers in our estimation sample. Our sample includes 12,242 employers. Similarly to Panel A of Table 1, we report the employers which are stayers, joiners, or quitters. We define an employer to be a stayer if it had at least one enrollee with complete data in each year; a joiner if it had no enrollee with complete data in 2013 but enrollee with complete data in 2014 and 2015 and a quitter if it had no enrollee with complete data in 2015 but enrollees with complete data in 2013 and 2014. Roughly half the employers in our sample, 54%, were stayers and hence present throughout the sample period, with complete observations from 2013-15. Similarly to at the individual level, more employers quit than joined coverage.

On average, employers in our sample have 21 subscribers. Eligible potential enrollees include employees, spouses, children, and other family members. Employees constitute 65% of covered lives. The mean take-up rate among eligible employees was 54%. Annual premiums average \$6,162 across employers with total paid claims averaging \$4,076. The standard deviation in the change in premiums for an employer from year to year is \$1,610, consistent with the lack of formal long-run contracts in this market.

We observe a similar pattern of selection at the employer level to at the enrollee level. The mean of the employer mean risk scores, R, is 0.97 for joiners, 1.05 for stayers, and 1.17 for quitters. We also observe a substantial standard deviation in the *change* in R over time. This variation will provide us with power to identify the USIC's pass-through, in our models with employer or enrollee fixed effects.

Panel B of Table 1 also presents the same statistics on enrollees that we reported in Panel A, but at the employer-year level. We find similar values of the statistics regarding age, gender, premiums, claims, and out-of-pocket costs using this measure. Premiums in this market rose

[20]For ease of exposition, we refer to transplants as a condition, even though it is a procedure that relates to a number of conditions. We include transplants because they are very expensive, and we wanted to understand the impact of very expensive treatments on premiums.

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a moderate 5% over our two-year sample period.

Finally, Panel B of Table **??** in Online Appendix **??** presents the mean incidence of the same eight conditions reported in Panel A of Table **??** in Online Appendix **??**, but at the employer level. While the incidence of transplants and AMI is less than 1%, the mean incidence of cancer is 3% and diabetes is 6%.

Overall, these tables show lots of movement in and out of USIC insurance. The small businesses that are in this market frequently start and stop coverage with USIC. Potential enrollees at these businesses also frequently start and stop insurance take-up. This movement is driven by at least three different factors. First, businesses may open or close for reasons orthogonal to health insurance premiums. Second, individuals can also change jobs for reasons that are orthogonal to premiums. Both of these factors are likely to be true given that small businesses enter and exit frequently and also change employees frequently. Third, there can be selection of health insurance based on premiums. The summary statistics show moderate evidence of selection based on health risk, e.g., quitter employers have 9% higher expected costs than stayer employers, while quitter enrollees have 4% higher expected costs than stayer enrollees. This selection based on health risk suggests that there may be selection based on premiums, which would bias our estimates of the pass-through coefficient β. In order to address this concern, our estimates control for the effect of selection and our counterfactuals model a different impact of health risk on premiums for individuals who leave the sample. Finally, Online Appendix **??** discusses the persistence in health risk over time and the descriptive statistics for the MEPS sample.

4 Empirical Approach

The primary goal of our estimation is to recover γ, the impact of the firm risk score on expected insurer costs ($dE[C^{ins}]/dR$), and β, the impact of employer mean insured risk on premiums (dp/dR).

We use these parameters together to understand the pass-through from insurer costs to

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premiums, $dp/dE[C^{ins}]$:

$$\frac{dp}{dE[C^{ins}_{jt}]} = \frac{dp/dR}{\frac{dE[C^{ins}_{jt}]}{dR}} = \frac{dp/dR}{\frac{1}{I_j}\sum_{i=1}^{I_j} \frac{dE[c^{ins}(H(r_{ijt}))]}{dr_{ijt}}} = \frac{\beta}{\frac{1}{I_j}\sum_{i=1}^{I_j}\gamma} = \frac{\beta}{\gamma}. \tag{11}$$

We also use these parameters separately in our counterfactual analysis. Note that these parameters regard insurer behavior; we do not estimate any utility parameters and our estimation algorithm does not impose utility maximization.

We now discuss our estimation of γ, which is the parameter that scales risk scores into dollar costs. Following (1), we estimate regressions that take the form:

$$c^{ins}_{ijt} = \gamma r_{ijt} + \gamma_2 x_{jt} + \varepsilon^r_{ijt}, \tag{12}$$

where c^{ins}_{ijt} measures the total dollar value of claims for the individual over the year. Equation (12) considers the impact of the individual's current risk score—estimated using the previous year's claims—on current claims to the insurer. Comparing equations (12) and (1), the empirical specification uses the actual insurer costs while the theoretical model is based on the expectation of costs. Thus, ε^r_{ijt} in (12) will capture the difference between actual claims and expected claims for an individual in a year.[21]

The empirical specification also includes controls x_{jt}. We include market fixed effects here (using USIC's market definition) to control for different provider prices across markets. Unless individuals at different employers systematically use different-cost providers for the same conditions in a way that correlates with the risk at that employer, we do not need to include employer or enrollee fixed effects. We estimate γ using only data from 2014, to not have to worry about changes in provider prices over time.[22]

We now discuss our estimation of β, the impact of employer mean risk score on premiums. Following Newey (2009), we estimate a two-step semi-parametric selection model.

[21]We also estimate empirical specifications with $c^{oop}(H(r_{ijt}))$ as the dependent variable.

[22]We also investigated estimating γ using other years in our sample and obtained similar results.

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Specifically, we first estimate the following selection equation:

$$D_{ijt} = \mathbb{1}\{f(R_{jt}, r_{ijt}, x_{ijt}) + \varepsilon^s_{ijt} > 0\} \tag{13}$$

where R_{jt} and r_{ijt} are the risk scores for the employer and the individual respectively, x_{ijt} are time-varying individual characteristics, and ε^s_{ijt} is an unobservable component to the utility from selection into the sample. We estimate (13) using a probit specification and a flexible functional form for $f(\cdot)$. Consistent with one-sided commitment contracts causing a nonlinear impact of risk score on premiums, we specify that f includes a spline in R_{jt}.

We estimate two different specifications for the selection equation $f(\cdot)$. Our primary specification uses USIC data. Since our USIC data only tracks individuals insured by USIC, observations at period t include both individuals who left USIC after period $t-1$ and those who were with USIC at period $t-1$ and remained at period t. These observations cannot include people who joined USIC at period t and hence this estimation controls for dropped coverage but not new take-up of insurance. This specification includes industry fixed effects, employer size, age, and gender in x_{ijt}. The main advantage of this specification is that the inclusion of R_{jt} increases the accuracy of the selection equation. The main disadvantage is that it only controls for individuals who left USIC.

Our second selection equation specification uses the MEPS data. This specification includes in $f(\cdot)$ proxies to approximate r_{ijt}, industry fixed effects, employer size, age, and gender. We proxy for risk with indicators for eight common diseases that the MEPS data report: hypertension, heart disease, AMI, ischemic stroke, respiratory failure, cancer, diabetes, and asthma. This specification incorporates less information on health risk but we are able to control for everyone who is offered insurance.

Using the estimated parameters of (13), we define

$$S_{ijt} \equiv Pr(f(R_{jt}, r_{ijt}, x_{ijt}) + \varepsilon^s_{ijt} > 0). \tag{14}$$

We compute S_{ijt} using the predictions from our estimates of (13).

We use S_{ijt} as a control in the second stage treatment effects equation. Our simplest

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treatment effects equation is:

$$p_{ijt} = \beta R_{jt} + \alpha x_{jt} + \overline{FE}_i + FE_t + g(S_{ijt}) + \varepsilon_{ijt} \tag{15}$$

where p_{ijt} is the premium charged to enrollee i working at employer j at period t and R_{jt} is the employer mean ACG risk score among enrollees who take up insurance at period t. In equation (15), $\overline{FE}_i$ are enrollee fixed effects, FE_t are year dummies, x_{jt} are time-varying enrollee attributes, and ε_{ijt} is the econometric unobservable. The non-parametric selection correction $g(S_{ijt})$ (using a power series) approximates the inverse Mills ratio from Heckman (1979). Comparing (10) to (15), $\varepsilon^{p}_{ijt} = g(S_{ijt}) + \varepsilon_{ijt}$.[23] To examine one-sided commitment contracts, we also estimate versions of (15) where we include a spline of R_{jt} as regressors.

We adjust our standard errors of β in (15) to account for the fact that we estimated β with a two-step estimator, by modifying the formula proposed by Newey (2009). Newey accounts for the standard errors of the selection parameters on the second stage variance formula; we modify his formula to two-way cluster the standard errors, by employer and year.

Finally, we discuss identification. To obtain consistent estimates for the parameters of interest, identification of both the selection equation (13) and the treatment equation (15) is required. It is well understood that selection models are most credibly identified with exclusion restrictions in the treatment equation. In our case, enrollee risk and industry fixed effects provide useful exclusion restrictions. In particular, we assume that individual risk and variation across industries in employment turnover rates affect the probability of leaving the sample, but do not affect the pass-through given the set of controls in the second stage. We also use multiple data sources to evaluate the robustness of our selection equation to specification.

Note further that our treatment equations include employer or enrollee fixed effects in most specifications. In this case, our identification of β is based on changes in p_{jt} following changes in R_{jt}. The selection correction further non-parametrically corrects β to estimate its

[23]While equation (15) specifies premium as the dependent variable, we also report specifications where plan characteristics are the dependent variables.

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value if everyone selected into USIC insurance. Because we control for the baseline health status with fixed effects and also control for selection, we believe that it is reasonable to consider changes in the risk score—which reflect changes in expected health expenditure for the population of potential enrollees conditional on the base level—to be exogenous.

5 Estimation Results

We now present our estimation results, starting with our results on the impact of health risk on claims costs and the determinants of sample selection. We then discuss our main results, which are the impact of health risk on premiums and evidence regarding the mechanism of guaranteed renewability contracts.

5.1 Impact of health risk on claims costs

Table 2 presents the estimated relationship between health risk and claims, which is γ. From column 1, we find that an increase in ACG score of 1—which would mean doubling the score relative to the population mean—would lead to an expected increase in USIC-paid claims of γ =\$4,003. From column 2, an increase in ACG score increases the allowed amount of the claims by \$4,483. This latter figure includes the portion for which payment is the responsibility of the enrollee as well as the amount that USIC expects to pay for the claim. Not surprisingly, the coefficient on the out-of-pocket amount—which is reported in column 3—at \$480, is the difference between these two coefficients.

Robustness. Online Appendix **??** provides robustness on the evidence presented in Table 2 by using splines. These results are very similar to our base results, though with some nonlinearity. Our takeaway is that our base coefficient of \$4,003 is a reasonable approximation of the impact of risk score on expected claims.

5.2 Selection equation estimates

Table 3 presents the results of the sample selection equations that we then use to estimate β. Columns 1 and 2 present the average marginal effects and the standard errors, respectively, of

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the selection equation estimated using USIC data. Consistent with the findings that quitters had a higher R in Table 1 Panel B, R here also positively predicts leaving the USIC sample. Enrollee age, employer size, and the industry fixed effects are also statistically significant.

Columns 3 and 4 of Table 3 present the average marginal effects and the standard errors, respectively, of the selection equation estimated with MEPS data. Enrollee age and the industry fixed effects are the only variables that are statistically significant here. The lack of significance may be due to the MEPS sample size being much smaller.[24]

5.3 Impact of health risk on premiums

We now investigate our main parameter of interest, the pass-through from health risk to premiums. This subsection provides results from specifications where we let the pass-through, β, be linear. Table 4, Panel A provides results with employer or enrollee fixed effects, indicating how *changes* in the employer mean ACG score among the insured, R, result in changes in the mean per-enrollee premium for the employer, p. We expect that we will obtain similar results when we include either employer or enrollee fixed effects. Both specifications will identify β from the impact of a change in health risk at the employer on a change in premiums. However, enrollee fixed effects allow for us to more appropriately implement our selection correction, given that we model selection at the enrollee level. For this reason, we use enrollee fixed effects in our specifications that control for selection.

Panel A, column 1 regresses p on R at the employer/year level, including employer fixed effects, without controls for selection. In this specification, a unit increase in employer mean ACG risk score for an employer results in a $188 increase in premiums. Column 2 presents a similar specification without selection correction but at the enrollee/year level and including enrollee fixed effects. It reports similar results: a unit increase in enrollee mean ACG risk score for an employer results in a $195 increase in premiums.

Panel A, columns 3 and 4 present results similar to column 2 but where we control for sample selection using the USIC data and by specifying first- and sixth-order polynomials for

[24]The health conditions that we observe in the MEPS data are similar to those that USIC included in its questionnaires for new enrollees.

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$g(S_{ijt})$, respectively. The estimates of β are \$465 for the first-order polynomial and \$436 for the sixth-order polynomial, higher than the uncorrected estimate. This implies that enrollees disproportionately quit USIC insurance if they receive a high pass-through from claims to premiums, which fits with our priors. It is also consistent with our finding that higher risk people disproportionately quit USIC insurance. While the sample selection controls increase the estimate of β, the coefficients are between 11% and 12% of γ, still indicating that pass-through from expected claims to premiums is very far from full experience rating.

Table 4, Panel B presents analogous results to panel A but without employer/enrollee fixed effects (though with market fixed effects, using USIC's market definitions). Given the exclusion of employer/enrollee fixed effects, the results from this panel reflect the equilibrium relation between health risk and premiums—which includes the pass-through plus the risk-rated part of the initial premium—rather than just the pass-through from changes in health risk to changes in premiums.[25] Analogously to Panel A, column 1 is at the employer/year level, all the other columns are at the enrollee/year level, and columns 3 and 4 include sample selection corrections.

The estimates show a substantially larger relationship between health risk and premiums than does Panel A. The enrollee/year level coefficient in column 2 is \$2,263 and increases to \$2,546 or \$2,708 with controls for sample selection. Thus, the selection correction changes the estimate of β in the same direction as in the enrollee fixed effects specification. The coefficients here show that equilibrium premiums reflect between 44% and 68% of expected claims. This indicates that the equilibrium does not reflect full experience rating, though it does reflect a much stronger relation between expected claims and premiums than the pass-through coefficients in Panel A.

While our Panel B results show the equilibrium relationship between health risk and premiums, we interpret them as being similar to the amount of risk rating that USIC would impose on new enrollees. To verify this, Table **??** in Online Appendix **??** reports specifications analogous to Table 4 but for the sample of 2014 joiners (who started coverage in 2013). The results

[25]For comparability, we use the same sample for Panel A and Panel B of Table 4. We find similar results for Panel B when we include all observations.

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are similar to our base specification. For instance, for joiners, we estimate a coefficient on R_{jt} of $2,808 for our selection corrected results without individual fixed effects, which is very similar to our estimate of $2,708 from the full sample. Together, our results show that USIC passes through very little risk for existing customers into premiums, while new customers receive premiums that are more based on their risk.

Robustness. Online Appendix **??** analyzes the robustness of our estimates of the impact of health risk on premiums to several factors. Focusing first on selection of enrollees out of USIC insurance in response to premium changes, we use two different approaches to examine the robustness of our results to selection. First, we examine heterogeneity in the pass-through for subsets of our data where observables would be more likely to predict remaining in sample—based on industries and U.S. states—to assess whether the patterns we observe more plausibly reflect a true low pass-through or selection. Second, we leverage the literature that bounds treatment effects in the presence of selection by assuming that the importance of selection on unobservables is limited based on the importance of selection on observables. We also use MEPS as an alternative source of data for selection correction; we verify the robustness of our ACG risk score to measurement error; we estimate a "kitchen sink" regression with controls for the ACG risk score and multiple diseases; we include indicators for specific chronic conditions; and we limit our sample to 2012-13 to avoid potential contamination by the ACA. In all cases, we find very similar results to the baseline: the pass-through is much less than full experience rating.

Finally, we consider four other different explanations for our findings: (1) oligopoly power by USIC; (2) USIC potentially passing on expected health risk to premiums slowly over time; (3) USIC passing through health risk in the form of plans with worse characteristics; and (4) consumer search. We find little support for any of these explanations. Appendix **??** provides the details.

5.4 Evidence of guaranteed renewability contracts

Our linear specifications in Section 5.3 find much less reclassification risk in the Small Group Market than in the simple model with full experience rating, particularly among groups con-

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tinuously enrolled with USIC. This is different from what many observers thought was likely occurring in this market (Gruber, 2000). It may reflect USIC operating in the pre-ACA market with contracts similar to guaranteed renewability contracts. Under these contracts, insurers promise to offer insurance at set rates in future periods, but enrollees do not commit to renew their contracts. Although the contracts underlying our data do not explicitly include provisions that committed to premiums in future years, our conversations with USIC suggest that their actual practices during our sample period were similar to guaranteed renewability contracts with future premium commitment.[26]

Guaranteed renewability contracts add value relative to experience rating by providing some reclassification risk protection. But these contracts do not necessarily provide *full* protection because of the threat of lapsation. Specifically, enrollees with relative drops in risk scores may lower their premiums by switching insurers or renegotiating their current rates. The only way to avoid this equilibrium renegotiation would be to substantially front load premiums. But, in the presence of liquidity constraints, front loading lowers welfare by reducing consumption for the young. Building on Pauly et al. (1995), Ghili et al. (2024) simulate optimal guaranteed renewability contracts in the presence of credit constraints. In their model, the extent of equilibrium front loading optimally balances risk protection against consumption smoothing, leading to equilibrium renegotiation in cases where risk drops sufficiently.

We test three principal empirical implications of Ghili et al. (2024) as to reclassification risk. First, the model implies an incomplete pass-through from health risk to premiums, i.e., $0 < \beta < \gamma$. This property is exactly why guaranteed renewability contracts add value: they lower equilibrium reclassification risk. Second, the marginal impact of an increase in health risk on premiums is lower for groups with relative increases in health risk than for groups with relative decreases. The reason for this is that groups whose health risk increase sufficiently will simply obtain the guaranteed premium after the first period. The other groups will obtain reductions in their premiums through the threat of renegotiation, with higher

[26]For instance, they indicated to us that they typically did not re-underwrite existing accounts. Pauly and Lieberthal (2008) notes that the individual insurance typically operated in this manner in the pre-ACA era.

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reductions the greater is their decrease in risk. Third, groups with high ex-ante risk will face more reclassification risk, because they have a higher probability of having their health risk drop, and health risk drops lead to renegotiation, which leads to reclassification risk.

We demonstrate that these implications hold in guaranteed renewability contract data on risk score transitions and equilibrium premiums simulated from the Ghili et al. (2024) model and then test whether they hold in the real USIC data. To verify that the first implication holds in optimal contracts, we consider pass-through from risk to premiums by performing regressions analogous to Table 4, Panel A from the Ghili et al. simulated model.[27] We find that β = \$1,821 with enrollee fixed effects or \$2,897 without enrollee fixed effects, indicating positive but incomplete pass-through in both cases. The fixed-effects pass-through in this simulation is larger than our selection-corrected estimate of \$436 but much smaller than under full experience rating. Moreover, the \$1,821 number is simulated from a model without switching costs, and switching costs would lower pass-through by decreasing the ability of healthy enrollees to renegotiate (Handel, 2013).

To examine the second implication, Panel A of Table 5 presents results from regressions of changes in mean employer premium on a spline of changes in mean employer risk, for both the Ghili et al. simulated optimal contracts and the USIC data. For the USIC data, we use the last two years of our sample, 2014 and 2015—and individuals with complete observations during these years—in order to have a uniquely defined measure of the change in risk.

Our Ghili et al. simulations show that their simulated optimal guaranteed renewability contracts imply substantial equilibrium pass-through for individuals whose risk score decreases, and much lower pass-through at the margin for individuals whose risk scores increase. We find the same qualitative pattern with the USIC data. For instance, column (4),

[27]Because Ghili et al. (2024) does not report all the necessary information, we use reported values from Handel et al. (2019), which is an older version of Ghili et al. (2024) with simulations from a different database. The Ghili et al. equilibrium long-term contracts depend on a variety of factors. We use equilibrium year 1 and 2 premium data for individuals of age 25 with "flat net income" and health status transitions for ages 30-35 (since transitions for younger individuals were not reported).

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which corrects for selection, reports a pass-through of $649 on the spline for decreases in risk score, with a coefficient of -$103 on the spline for increases in risk score. While the overall levels of pass-through are different across the two samples, this again may reflect switching costs and other institutional features not modeled in the Ghili et al. optimal contract simulations that we report.[28]

Panel C of Table 5 shows specifications without enrollee fixed effects for the same implication, where we again examine the relation between premiums and risk scores using splines. For this panel, we now base the spline on risk, not change in risk, and use a cut point of $R = 1$, the overall population mean risk score.[29] These specifications capture the equilibrium effect of risk score on premiums, rather than the pass-through from a change in risk score on a change in premiums. Once again, both the Ghili et al. simulated data and the USIC data show a similar pattern: the equilibrium relation between risk and premiums at the margin is larger for low-risk and smaller for high-risk groups.

To examine the third implication, Panel B of Table 5 presents results from regressions of pass-through from expected health risk to premiums, stratifying by the period 1 health risk. We again choose $R = 1$ as the cut point.[30] For the Ghili et al. simulated model, we find that the large β, and hence the bulk of the reclassification risk, is largely occurring for individuals with $R > 1$, who were less healthy than average in the initial period.

The USIC data with enrollee fixed effects in Panel B show an inconclusive pattern. For

[28]Three features of our setting differ from Ghili et al.. First, the Small Group Market is best characterized as an oligopoly while they model competition. Second, individuals frequently select out of USIC insurance for reasons such as switching employers, while they do not allow for this behavior. Finally, we model the Small Group Market while they consider individual insurance.

[29]For comparability, we use the same sample as in Panel A, but the results using all complete observations during our sample period are similar.

[30]Because the third implication is a test of heterogeneity based of treatment based on initial conditions, rather than a test of a nonlinear treatment based on the risk score as in the second implication, we do not include a spline for the treatment.

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instance, in the selection corrected results in column 4, the pass-through coefficient β is very similar across the two groups: $230 with initially below average risk and $238 with initially above average risk. Panel D of Table 5 presents analogous results without enrollee fixed effects, stratifying based on the period 1 risk score. These results are more consistent with the Ghili et al. simulated model. For instance, we find a $2,458 pass-through for groups with $R > 1$ and $1,861 in pass-through for groups with $R \leq 1$.

Finally, we consider whether the observed prices do, in fact, reflect front loading of premiums as occur under guaranteed renewability contracts in equilibrium. Table 1 reports ratios of claims to premiums of 66% and 69% for joiners and stayers, respectively. Joiners are employers with new USIC coverage after the first year of our sample, and hence roughly similar to new customers. The fact that joiners have higher average premiums relative to costs is consistent with front loading. A comparison of these numbers to the ACA medical loss ratio requirements—which require insurers to spend 80% of premiums on medical claims—is also suggestive that premiums are sufficiently high to sustain guaranteed renewability contracts.

Overall, our tests show that many of the implications of the optimal guaranteed renewability model have support in our data. This suggests that USIC may be offering contracts with some implicit promise of guaranteed renewability for existing accounts. And, it is also consistent with ex-post renegotiation for groups with drops in risk score.

6 Counterfactuals and Welfare

6.1 Simulation of counterfactuals

Using our estimates, we examine the extent of reclassification risk and the resulting welfare loss under the current pricing environment and counterfactual environments, over a 10-year horizon after the initial insurance enrollment. We base our counterfactuals on the idea that enrollees obtain the fixed-effects pass-through coefficient when they stay with USIC insurance, as this coefficient indicates the impact of changes in health risk on changes in premiums. When they leave USIC insurance, they work at another small employer with similar employees and obtain premiums that are determined by the non-fixed-effects coefficient in

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this case.

We calculate our counterfactuals with three steps. First, we iteratively construct the future distribution of enrollee health risk and mean employer health risk to which an enrollee is exposed, over a 10-year renewal period following the initial insurance enrollment. Following Table **??**, which shows that two lags of risk scores are predictive of the current score, we predict the health risk using two lags of the score. Rather than using the coefficients from Table **??**, we simulate future risk scores and out-of-pocket expenditures non-parametrically for each individual, using enrollees with similar ACG scores for the two previous periods, for each enrollee.[31]

Second, we evaluate how changes in risk translate into changes in future premiums and out-of-pocket costs. This reclassification risk occurs through two mechanisms. First, health shocks (for the enrollee or others in her group) result in enrollees facing higher premiums; second, enrollees may drop health coverage due to the higher premiums caused by these health shocks. Since both of these sources of risk are potentially important, our counterfactuals capture both sources. Specifically, to evaluate reclassification risk under the observed environment, after simulating the new risk scores R_{ijt} and r_{ijt} each period, we simulate a joint draw from the estimated ε^s and ε^p distributions. We then use ε^s to simulate whether the individual selects into insurance. If so, she receives new premiums based on the estimated β from our specification with enrollee fixed effects and selection correction in Table 4, panel A, column 4 (and using the draws of ε^s and ε^p).[32] If she selects out of her current insurance, we assume that she receives new premiums based on β estimated without employer/enrollee fixed effects or selection corrections (Table 4, panel B, column 2) and a draw from the unconditional estimated distribution of ε^p.

Third, we examine how this distribution of premiums and out-of-pocket costs translates

[31]We use a uniform kernel and choose the bandwidth based on Silverman's rule (Hansen, 2018).

[32]Although Section 5.4 shows evidence of heterogeneity of pass-through based on the changes in risk score, given the small pass-through overall, we use the mean pass-through coefficient here for simplicity.

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into a certainty equivalent income level. We use a CARA functional form for our money utility function $u_{ij}(\cdot)$. We do not estimate the CARA risk aversion parameter, but instead use 0.000428, the value from Handel (2013), who estimates risk in a similar context of health insurance choice.[33]

6.2 Counterfactual results

We consider four different pricing environments. First, as the baseline, we examine the observed pricing environment, using our simulation methods described above. Second, we examine the baseline but without idiosyncratic premium risk. In this case, we follow the same procedure as in the baseline, but we set $\varepsilon^p = 0$. Third, we examine community rating, where $\beta = 0$. Finally, we examine full experience rating, under which $\beta = \gamma$.

Figure 1a reports the mean across individuals in the certainty equivalent loss from risk across these pricing environments. The baseline estimates show a mean annual certainty equivalent loss from risk of $3,010 in the ten years after the initial enrollment. Some of this is caused by idiosyncratic premium risk. Without premium risk, the mean certainty equivalent loss from risk drops to $2,710. Under community rating, the mean annual certainty equivalent income loss is $1,960, while it is $4,290 under full experience rating. Thus, USIC's observed pricing policy provides approximately 55% of the consumer welfare protection from community rating relative to full experience rating. Even though USIC's pricing policy for existing customers exhibits very little experience rating, turnover in this market is large, which limits this protection. In addition, even under community rating, the possibility of large out-of-pocket expenditures generates a substantial certainty equivalent loss from financial risk, particularly later in the sample.[34]

Figures 1b and 1c report the mean standard deviation in premiums and total health spending, respectively. The numbers here follow Figure 1a closely, with the baseline policy without

[33]With the CARA utility function, the certainty equivalent income loss of a lottery does not depend on the base income level, and hence we do not specify the income for each enrollee.

[34]Additionally, Online Appendix ?? shows that the risk protection from pooling within small groups relative to individual insurance is limited.

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idiosyncratic risk having about half of the standard deviation in premiums of the full experience rating case relative to the community rating case. Consistent with the welfare loss from out-of-pocket costs in Figure 1a, the standard deviation on total healthcare expenditures is \$1,300 in the initial year, stemming exclusively from out-of-pocket expenditures. This rises gradually over time under all four scenarios.

One difference here is that the baseline policy has a greater standard deviation in the early years than other policies. But, because this risk is $i.i.d.$, this standard deviation does not generate as big a welfare impact over time as the premium risk from experience rating.

In sum, our results show that USIC offers insurance contracts with characteristics similar to guaranteed renewability. However, employees switching jobs and employers starting and stopping insurance coverage likely due to shutting down limits the consumer welfare gains from these contracts well below the first-best level.

Robustness. Figure **??** in Online Appendix **??** replaces Figure 1a, but with the lower CARA risk aversion coefficient of 0.00008 used by Ghili et al. (2024). The magnitude of the welfare losses are lower with these, less risk averse, preferences. For instance, there is a \$280 mean annual loss under the baseline relative to community rating versus \$2,680 with the base risk aversion parameter. While the magnitudes are smaller, the *relative* impact of different counterfactuals is similar to the baseline.

7 Conclusion

In this paper, we seek to understand the extent and causes of health insurance reclassification risk in the Small Group Market from a period before ACA community rating regulations were effective. The ACA was designed, in part, to reduce reclassification risk in the Individual and Small Group Markets. Studies from the pre-ACA era assessed very different priors on the extent of reclassification risk in this market (Cutler, 1994; Gruber, 2000; Herring and Pauly, 2006; Pauly and Herring, 1999). Our study makes use of a unique database from a large U.S. health insurer, "United States Insurance Company" (USIC), with premium information on over 12,000 employers, and claims data from more than 300,000 enrollees at these employers. Our

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data allow us to obtain direct evidence on the relationship between health risk and claims in this market.

We first develop a simple two-period model of insurance demand and pricing. We show that the pass-through from changes in health risk to changes in premiums—which we denote β—is a sufficient statistic to understand reclassification risk in this market, under some conditions. In the tradition of Chetty (2009) and Einav et al. (2010), we estimate β and use it to characterize reclassification risk in this market, but do not estimate preference parameters.

Focusing on our main estimates with a linear treatment effect, we find that the pass-through from changes in expected claims to changes in premiums is 11% with enrollee fixed effects and non-parametric selection controls, which is much closer to binding long-run contracts or community rating than experience rating. Without enrollee fixed effects or selection controls, the relation is larger, with a dollar in higher expected claims associated with 44 cents higher premiums. Together, these results suggest that USIC prices new accounts based on health risk but then does not adjust premiums for existing accounts much in response to changes in health risk.

This limited reclassification risk for existing accounts is consistent with USIC offering "guaranteed renewability" one-sided commitment contracts where the insurer imposes little risk rating on existing customers. We further test additional implications of optimal guaranteed renewability contracts with liquidity constraints. Most importantly, we find that health risk reductions lead to relatively large drops in premiums compared to much smaller premium increases when health risk increases, which this model attributes to ex-post renegotiation by groups with drops in health risk. Additionally, we show that the limited reclassification risk that we observe is not explained by alternative hypotheses such as slow pass-through over time, market power, or search frictions.

Finally, we simulate counterfactuals to evaluate the extent to which USIC insurance provided value in the form of protection from reclassification risk in the Small Group Market. To compute this, we non-parametrically simulate the evolution of health risk for an employer over a ten-year horizon and evaluate how this would translate into selection into and out of insurance and a welfare loss from financial risk. We use a CARA risk aversion parameter

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taken from the literature and our estimated pass-through, extent of selection, and health risk transitions. We find that the observed USIC policy adds about 55% of the difference in consumer welfare between full experience rating and community rating. The high turnover of enrollees limits the value from the guaranteed renewability feature of USIC's contracts. Substantial out-of-pocket costs in this market also generate significant welfare loss. The value from pooling within a small group is relatively small, at less than \$300 per year under the baseline policy.

Our findings that USIC insurance is broadly consistent with optimal guaranteed renewability contracts in the sense of Ghili et al. (2024) is different from what many observers thought was likely occurring in this market before the ACA (Gruber, 2000). Although these contracts improve consumer welfare substantially, there are limitations to their value. These occur because of significant out-of-pocket costs from Small Group Market insurance products that we observe and because employees and employers switch insurance companies frequently, likely due to business creation and destruction and job switching.

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8 Tables and Figures

Table 1: Descriptive statistics on Estimation Sample

	Full Sample	Stayers	Joiners	Quitters
	Panel A: Descriptive Statistics at Enrollee-Year Level			
Unique individuals	336,755	80,031	87,107	113,124
Observations	646,904	240,093	176,163	186,012
Employees (%)	56.26	56.25	56.19	56.46
Age	39 (18)	39 (18)	36 (18)	38 (18)
Female (%)	47	46	47	48
In dollars:				
Lagged paid total claims	3,515 (17,465)	3,778 (16,251)	3,287 (18,250)	3,272 (17,839)
Lagged out-of-pocket claims	934 (1,887)	1,009 (1,881)	894 (1,844)	845 (1,918)
Annual premiums	5,249 (1,986)	5,493 (2,028)	4,977 (1,698)	5,105 (2,106)
Health risk, r_{ijt}	1.00 (1.46)	1.01 (1.41)	0.92 (1.40)	1.05 (1.58)
$r_{ijt} - r_{ij,t-1}$	0.05 (1.07)	0.05 (1.03)	0.06 (1.04)	0.06 (1.19)
	Panel B: Descriptive Statistics at Employer-Year Level			
Employers	12,242	6,560	2,281	3,401
Observations	31,044	19,680	4,562	6,802
Subscribers	21 (27)	21 (26)	23 (27)	20 (28)
Take up rate (%)	54 (22)	54 (22)	57 (21)	53 (23)
Employees (%)	64.80	64.45	63.90	66.40
Age	41 (9)	41 (9)	39 (8)	41 (10)
Female (%)	46	46	46	47
In dollars:				
Lagged paid total claims	4,076 (8,456)	4,003 (8,272)	3,775 (6,951)	4,490 (9,783)
Lagged out-of-pocket claims	1,092 (889)	1,051 (812)	1,061 (835)	1,232 (1,098)
Annual premiums	6,162 (2,837)	6,248 (2,689)	5,385 (2,067)	6,433 (3,529)
2013	5,954 (2,839)	5,881 (2,711)		6,095 (3,066)
2014	6,276 (3,103)	6,394 (2,808)	5,196 (2,157)	6,772 (3,908)
2015	6,238 (2,402)	6,469 (2,499)	5,574 (1,955)	
Δ Annual Premiums	379 (1,610)	309 (1,354)	378 (1,187)	583 (2,263)
Health risk for enrolled, R_{jt}	1.07 (0.72)	1.05 (0.70)	0.97 (0.59)	1.17 (0.82)
$R_{jt} - R_{j,t-1}$	0.02 (0.51)	0.01 (0.49)	0.04 (0.45)	0.05 (0.62)

Note: each observation in Panel A is one enrollee during one year, 2013-15. "Stayers" are enrollees always in sample; "joiners" are enrollees with one or more full observation but without a full observation in 2013; and "quitters" are enrollees with one or more full observation but without a full observation in 2015. Each observation in Panel B is one small group employer during one year, 2013-15. "Stayers" are employers always in sample; "joiners" are employers with one or more full observation but without a full observation in 2013; and "quitters" are employers with one or more full observation but without a full observation in 2015. Table reports mean values with standard deviations in parentheses.

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Table 2: Impact of expected risk on claims

	Dependent variable:		
	Paid amount ($)	Allowed amount ($)	OOP amount ($)
Regressor:	(1)	(2)	(3)
Enrollee ACG score, r_{ijt}	4,003***	4,483***	480***
	(129)	(131)	(9)
Market FE	Yes	Yes	Yes
Observations	204,913	204,913	204,913

Note: each observation is one enrollee during one year. The dependent variables indicate three measures of the total claims amount for that enrollee. The sample is covered individuals with an ACG score in 2014 only. Markets are defined by USIC and roughly represent an MSA or state. We cluster standard errors at the employer level. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

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Table 3: Selection equation estimates using USIC and MEPS samples

	Sample USIC		Sample MEPS	
Dependent variable:	*Drop coverage*$_{ijt}$		*Decline insurance*$_{ijt}$	
	(1)	(2)	(3)	(4)
	Average marginal effect	Standard error	Average marginal effect	Standard error
Spline, $R_{jt} \leq 1$	0.110***	(0.031)		
Spline, $R_{jt} > 1$	0.050***	(0.011)		
Individuals ACG score, $r_{ij,t}$	0.008***	(0.001)		
Age$_{ijt}$	−0.001***	(0.0001)	0.005***	(0.001)
Female$_{ijt}$	0.002	(0.003)	−0.039	(0.261)
Employer size$_{jt}$	0.001***	(0.0002)	0.001	(0.001)
Hypertension$_{j,t-1}$			−0.001	(0.030)
Heart disease$_{j,t-1}$			0.089	(0.092)
AMI$_{j,t-1}$			−0.177	(0.121)
Ischemic stroke$_{j,t-1}$			-0.116	(0.124)
Respiratory failure$_{j,t-1}$			0.064	(0.063)
Cancer$_{j,t-1}$			−0.054	(0.061)
Diabetes$_{j,t-1}$			0.019	(0.051)
Asthma$_{j,t-1}$			0.027	(0.041)
Industry fixed effects	Yes	Yes	Yes	Yes
Observations	204,913		1,355	
Mean of Dependent Variable	0.426		0.294	

Note: in the USIC sample each observation is one enrollee during one year. "Drop coverage$_{ijt}$" indicates that individual was in sample in period t but not $t+1$. In the MEPS sample each observation is one individual in the consolidated panel 18 for 2013-14. "Decline insurance$_{ijt}$" indicates that the individual was offered insurance through the employer and declined this insurance coverage. We calculate R_{jt} based on individuals that worked in the employer in the previous year and had an ACG score. We cluster standard errors at the employer level. *** indicates significance at the 1% level, ** indicates significance at the 5% level and * indicates significance at the 10% level.

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Table 4: Impact of risk on premiums with USIC sample correction

	Observation level:			
	Employer/year	Enrollee/year	Enrollee/year	Enrollee/year
	No selection correction		With selection correction	
	(1)	(2)	(3)	(4)
Panel A: specifications with employer/enrollee fixed effects				
Health risk for enrolled, R_{jt}	188	195	465	436**
	(87)	(82)	(109)	(96)
Panel B: specifications without employer/enrollee fixed effects				
Health risk for enrolled, R_{jt}	1,749***	2,263***	2,546***	2,708***
	(76)	(88)	(95)	(107)
Year FE	Yes	Yes	Yes	Yes
Polynomial Order	No	No	1^{st}	6^{th}
Observations	31,044	448,259	448,259	448,259

Note: each observation is either one employer or enrollee during one year. The dependent variable is the premium charged the employer by USIC divided by the number of covered lives. We calculate R_{jt} based on individuals that worked in the employer in the previous year and had an ACG score. Column (1) in Panel A includes employer fixed effects. Columns (2) to (4) in Panel A include enrollee fixed effects. Panel B includes market fixed effects. Columns (3) and (4) control non-parametrically for selection with a polynomial of the selection probability. Markets are defined by USIC and roughly represent an MSA or state. We two-way cluster standard errors at the employer and year levels. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

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Table 5: Testing Implications with simulated guaranteed renewability data and USIC data

	(1)	(2)	(3)	(4)
Specifications with enrollee fixed effects (Observations = 90,826)				
Panel A: Impact of risk on premiums using splines				
Dependent variable: change in annual employer mean premium, p_{jt}				
Sample:	HHW	USIC		
Spline, $\Delta\ R_{jt} \leq 0$	3,612***	465***	636***	649***
	(88)	(82)	(106)	(27)
Spline, $\Delta\ R_{jt} > 0$	172***	-275***	-110	-103***
	(26)	(71)	(91)	(26)
Panel B: Impact of risk on premiums heterogeneity stratifying on initial risk				
Dependent variable: change in annual employer mean premium, p_{jt}				
Sample:	HHW	USIC		
$1\{R_{j1} \leq 1\} \times \Delta R_{jt}$	279***	39	247**	230***
	(91)	(63)	(95)	(34)
$1\{R_{j1} > 1\} \times \Delta R_{jt}$	2,798***	65	207**	238***
	(491)	(64)	(82)	(23)
Polynomial Order		No	1^{st}	6^{th}
Specifications without enrollee fixed effects (Observations = 181,652)				
Panel C: Impact of risk on premiums using splines				
Dependent variable: annual employer mean premium, p_{jt}				
Spline, $R_{jt} \leq 1$	4,550***	3,203**	3,906**	3,854**
	(455)	(136)	(131)	(132)
Spline, $R_{jt} > 1$	2,554***	1,887	2,130	2,295
	(464)	(180)	(182)	(211)
Impact of risk on premiums heterogeneity stratifying on initial risk Panel D: Dependent variable: annual employer mean premium, p_{jt}				
$1\{R_{j1} \leq 1\} \times R_{jt}$	615***	1,313***	1,637***	1,861***
	(205)	(106)	(121)	(18)
$1\{R_{j1} > 1\} \times R_{jt}$	3,181***	2,002***	2,290***	2,458***
	(209)	(70)	(83)	(12)
Polynomial Order		No	1^{st}	6^{th}

Note: column (1) uses data from the Ghili et al. (2024) simulated optimal contracts. Premiums (p_{jt}) are computed by the total premium charged the employer by USIC divided by the number of covered lives. We calculate R_{jt} based on individuals that worked in the employer in the previous year and had an ACG score. Columns (3) and (4) control non-parametrically for selection with a polynomial of the selection probability. In Panels A and C, columns (2) to (4), each observation is one enrollee for which we have a complete observation for years 2014 and 2015. In Panels B and D each observation is one enrollee for which we have a complete observation for years 2014 and 2015. Panel A and B includes enrollee fixed effects and Panel C and D includes market fixed effects. Columns (2) to (4) include year fixed effects. Markets are defined by USIC and roughly represent an MSA or state. We two-way cluster standard errors at the employer and year levels. *** indicates significance at the 1% level, ** indicates significance at the 5% level, and * indicates significance at the 10% level.

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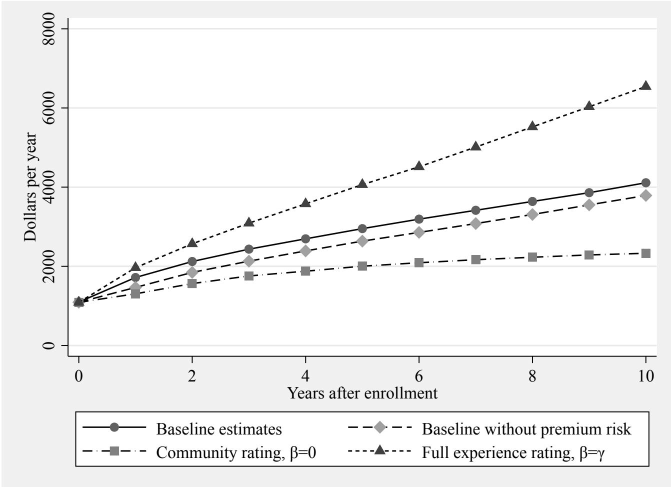
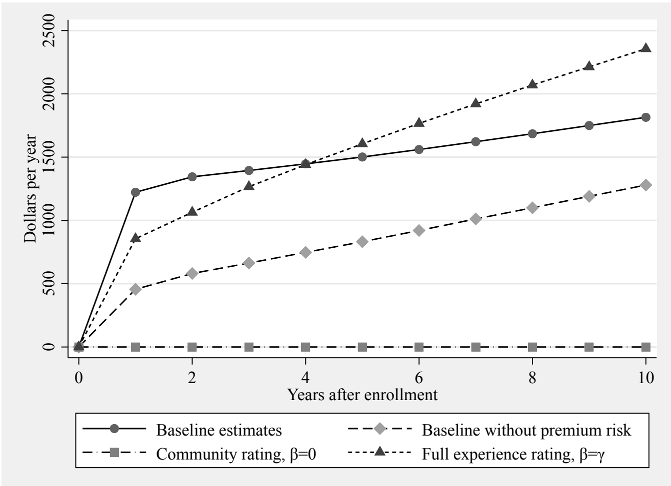
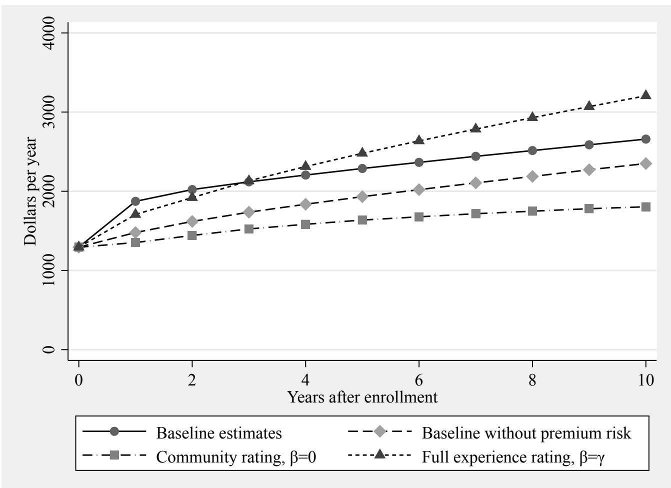
Figure 1: Counterfactuals Results across Pricing Policies



(a) Simulated mean certainty equivalent loss from risk



(b) Simulated mean standard deviation in premiums



(c) Simulated mean standard deviation in healthcare expenditures