Managing Behavioral Hazard: Value-Based Insurance Design and Inertia

Lynn M. Hua*

The Wharton School, University of Pennsylvania

April 2023 - Please Check for Updated Version Here

Abstract

Health insurance may be used as a mechanism for more efficient health care decisions. While value-based insurance design (VBID) aligns cost-sharing with clinical value, whether consumers reduce their medical expenditures is unclear. I study the impact of a new value-based insurance design which decreased copays for primary care physician visits, increased copays for specialist visits, and introduced negative cost-sharing with preventive care incentives to reduce the deductible. I find consumers are persistent in their plan choice and there is entry of younger, new employees into the VBID plan. Old subscribers defaulted into VBID have a greater number of PCP visits while new employees who actively choose VBID have a lower number of specialist visits compared to non-VBID subscribers. To study the demand for this new design and how selection and treatment effects interact with consumers experiencing inertia, I estimate a model of plan choice and level of deductible and investigate responses to counterfactual plan menus which i) reduce the number of plan options, ii) lower the switching cost to zero, and iii) mandate enrollment in the value-based plan. By switching to the value-based plan, enrollees can reduce their premium paid by as much as $4,351 with moderate expected increases in out-of-pocket payments of $85 for subscribers with good health and $245 for those with poor health, on average. These results highlight the importance of active choice coupled with decision aids, targeted information about coverage changes, and strong financial incentives to motivate changes in consumer behavior.

*Email: lynnhua@wharton.upenn.edu. This research was supported by the Mack Institute for Innovation Management. I am extremely thankful for comments from Claudio Lucarelli, Mark Pauly, Ben Handel, and Hanming Fang. Diane Alexander, Maura Coughlin, Atul Gupta, Amanda Kreider, Alex Olssen, David Rosencrantz, and Aaron Schwartz have all provided valuable feedback. I also thank David Cowling for data access to make this project possible. The views expressed in this paper is the author's and should not be interpreted as those of the California Public Employees' Retirement System. This paper has not been subject to CalPERS's regular review and editing process.

1 Introduction

Effective incentives and thoughtful market design through choice architecture can have a profound impact on consumer decision-making. Information provision has limitations in changing behavior and by nature, default options are effective in their ability to motivate important decisions such as those related to health behaviors. Incentives can also backfire, unwittingly encouraging the behavior they are meant to limit. How to reliably design incentive schemes for consumers remains a challenge for regulators to transition from prioritizing volume to value.

I study these issues in the context of health insurance markets, particularly with value-based insurance design (VBID). Traditionally, patient cost-sharing is thought to balance financial risk protection in the case of a health shock with managing moral hazard (Arrow 1963; Pauly 1968; Zeckhauser 1970). Theory would suggest that the more elastic the demand is for a particular medical service, cost-sharing should be set higher to curb over-consumption due to moral hazard. However, there also exists behavioral hazard as consumers under-use care with health benefits that greatly exceed costs (Baicker et al., 2015). Medical services can be coupled with financial incentives to make them more or less attractive to consumers.

Value-based insurance design has been introduced as an innovative policy to potentially reduce medical expenditures and improve health (Chernew et al. 2007; Chernew et al. 2010). Standard health insurance plans have cost-sharing that is constant across medical services even though the clinical value of the services may be very different. VBID varies the coverage of specific services through plan design elements so services deemed high-value and underused have lower out-of-pocket costs, thereby making them more affordable, and vice versa for low-value care. This is intended to encourage the consumption of beneficial services, which may reduce future spending.

This paper investigates three main questions. First, what types of individuals enroll in the value-based plan and how does this depend on what other plans are offered as part of the plan menu? Second, what is the effect of the value-based plan on spending and utilization? Third, how do these selection and treatment effects interact with consumers who experience inertia?

There are few studies on the effectiveness of VBID programs, despite their attractive features. This study would have important implications how to structure value-based insurance plans, and optimal benefit design in general, in other markets. Past value-based evaluations have been limited and do not consider market level effects. There is a key challenge of disentangling the selection effect with the treatment effect as consumers choose to enroll in the value-based plan among their other plan options. Specifically, if healthier individuals sort into the value-based plan rather than other plan options, then differences in spending may reflect the baseline health of the enrollee rather than change in consumer behavior due to the value-based design. In particular, if a decrease in costs is observed, this could be due to a successful value-based design which promotes the use of

high value-care and reduces the use of low-value care and consequently reduce spending or it could be driven by enrollment of lower cost individuals that choose the value-based plan.

To improve our understanding, I study public employees in California who had one of their health insurance plan options, PERS Select, redesigned to be value-based with five $100 preventive care incentives available to reduce the deductible from $1,000 initially down to $500. It should be noted that across value-based programs, initiatives vary in their specific benefit designs. In this setting, the high-value services target preventive care and behavioral health. The subscriber can reduce their deductible by: (i) getting a flu shot, (ii) biometric screening, (iii) smoking cessation program, (iv) virtual second opinion support on surgery, and/or completing a (v) chronic condition management program. Plan cost-sharing was also updated to make primary care more affordable and specialty care more expensive with changes in copay. The rationale is that medical expenses due to behavioral health with smoking, obesity, and chronic conditions have steadily increased and access to preventive care can reduce expenditures.

My analysis utilizes individual-level insurance enrollment and health claims data from state and public employees and their dependents. To identify the effect of the value-based policy, I leverage the different types of employee cohorts — old and new subscribers — and use patterns of how separate subscriber groups would have differential responses in medical utilization to decreases in PCP visit copays and increases in specialist visit copays. Treatment effects would manifest as consumers increase PCP visits and decrease specialist visits with the value-based changes in the insurance contract. However, increases in both PCP and specialist visits or decreases in both PCP and specialist visits may be suggestive of selection effects with the entry of high risk and healthy subscribers, respectively.

I provide evidence that, when PERS Select is redesigned to be value-based, the plan attracts a healthy pool of individuals who have a lower total and out-of-pocket spending when enrolled in the value-based plan in comparison to new subscribers prior to the policy change. While new employees can actively choose the value-based plan, existing employees may be defaulted into the new value-based design if they were enrolled in PERS Select prior to the change. Each year, incumbent employees would need to switch plans or be auto-enrolled in their prior plan. Incumbent employees are observed to be more likely to stay with their current plan than switch to a different plan (Samuelson and Zeckhauser, 1988).

There are differential responses to the VBID plan based on if the subscriber is an old or new employee due to the presence of a default option. New subscribers use less care than old subscribers across many types of categories of medical utilization and spending. This variation may be due to the entry of healthy new employees or this may be because new subscribers in the first year of enrollment in a new plan need time to choose an in-network primary care physician.

New VBID subscribers use less specialist visits than new non-VBID subscribers and less PCP visits, however this result is not significant. This is consistent with selection effects or because new VBID subscribers make active plan choices, they pay attention to the new value-based design (Ho et al., 2017). Old VBID subscribers who were previously enrolled in PERS Select and defaulted into the value-based change do not have different utilization patterns than old subscribers in non-VBID plans. This suggests they may be unaware or unresponsive to changes in coverage generosity. Past research has demonstrated consumers experience substantial frictions when they have a default option each year and, consequently, exhibit inertia and do not actively engage (Ericson 2014; Polyakova 2016) or make dominated choices (Handel 2013; Sinaiko and Hirth 2011).

The value-based updates incorporate a dynamic design within the plan year that rewards consumers with reductions to their deductible. Consumers can complete up to five incentives to reduce the deductible from $1,000 to the $500. I find the high spending individuals complete the incentives at a higher rate in comparison to lower spending subscribers.

I estimate a model of plan choice which estimates consumer preferences for different plan characteristics and then use these parameters to show predicted responses to counterfactual policies of interest. Consumers have a high switching cost as old employees value staying in their previously enrolled plan as much as leaving over $20,000 of additional premium on the table to not switch plans. I then assess the attractiveness of the value-based plan and predicted spending across hypothetical scenarios of plan options. Consumer choice can be welfare enhancing as with a greater range options, the consumer can select their best match, however this may not hold true in the setting of health insurance (Enthoven et al. 2001; Chandra et al. 2019). Evidence suggests that consumers experience choice difficulties, including choice frictions that occur when actively engaged in the choice process, and do not make optimal choices among plans (Abaluck and Gruber 2011; Bhargava et al. 2017).

Out-of-sample predictions are generated for these alternative plan menus: (i) reductions in the size and complexity of the plan menus, (ii) mandated enrollment in the value-based plan, and (iii) active choice requirements. When the choice set is restricted to PPO plans only, the value-based plan would be the most popular although the new predicted enrollees who enter are sicker than the original observed value-based enrollees. An active choice policy is expected to motivate the majority of HMO subscribers to switch to the value-based plan. When individuals are required to have the value-based plan, consumers would be able to reduce their annual premium paid by as much as $4,351 as PERS Select is more affordable than alternative options. However, as the entry of these new predicted subscribers are higher risk than the observed PERS Select subscribers, mandated enrollment is expected to increase the out-of-spending per member by $85 for members with good health and $245 for members with poor health. Therefore, there are mixed results on the value of the value-based plan in comparison with other plan options, with a reduction in expected premium paid and an increase in predicted OOP spending.

This work contributes to the literature on the impact of insurance on consumer health care utilization. While value-based insurance may be used as a tool to help patients better understand the clinical value of recommended services, patients may not change their utilization behavior. There is inertia in plan choice and healthcare utilization; which may be due to loss aversion or bias in which there is a preference towards the status quo despite the presence of new information (Tversky and Kahneman, 1991). Therefore, these results highlight the importance of multiple components for effecting behavioral changes: (i) new active choice policies coupled with decision aids to help consumers understand and choose among their plan options, (ii) targeted information about changes in their plan coverage to help consumers process their risk tradeoffs, and (iii) strong financial incentives to motivate changes in behavior.

The remainder of this paper is organized as follows. Section 2 presents the relevant literature. Section 3 presents the data and institutional setting. Section 4 describes the empirical model. In section 5, the results are discussed. Section 6 concludes with a summary.

2 Related Literature

U.S. national health spending is projected to reach $6.2 trillion in 2028 with healthcare spending accounting for 19.7% of GDP, yet it is unclear if the returns to health are commensurate with the large scale of expenditures (Centers for Medicare and Medicaid Services, 2020). Wasteful spending resulting from factors such as care delivery and care coordination failure, overtreatment and use of low-value care, price inflation, fraud and abuse, and administrative complexity, is estimated to account for approximately 25% of health care spending (Shrank et al., 2019). This rapid rise in healthcare spending has prompted stakeholders in many settings to consider innovative approaches such as payment and care delivery reforms, to constrain costs without sacrificing health outcomes.

2.1 Cost-Sharing

Many employers believe that improving the health of their workers can improve morale and productivity as well as reduce healthcare costs (Porter and Baron, 2009). There has been growing interest in demand side approaches to reduce spending such as increased consumer cost-sharing in health insurance benefit designs (Ellis and McGuire 1993; Baicker and Goldman 2011). Insurance cost-sharing is one form of cost-containment that provides financial protection.

Individuals enrolled in insurance plans with varying levels of cost-sharing have shown statistically significant and economically large estimates of impact (Newhouse 1993; Aron-Dine et al. 2013; Chandra et al. 2010). In fact, the RAND Health Insurance Experiment found that modest cost-sharing reduced the use of medical services with small effects on health except for the low-income and those with chronic conditions (Manning et al., 1987).

Insurance contracts are non-linear and individuals have been documented to overreact to the shape in ways contrary to the neoclassical model. With a non-linear price schedule, a rational, dynamically optimizing consumer must forecast their future spending when making consumption decisions (Dalton et al., 2015). However consumers seem to respond more to spot prices (out-of-pocket expenses from care) by reducing spending relative to expected end-of-year prices (Aron-Dine et al. 2015, Guo and Zhang 2019, Keeler et al. 1977, Klein et al. 2020, Einav et al. 2015). Specifically, consumers who know they will meet their deductible by the end of the year are still reluctant at the beginning of the year to seek care, which may have undesirable or adverse consequences on health.

Advocates of high-deductible health plans believe that consumers will carefully assess their healthcare choices as they face the cost of their care, ultimately improving the efficiency and quality of care. While high deductible plans can have an immediate impact on levels of healthcare spending, cost-sharing often induces poor decision making. (Haviland et al., 2011) found that high-deductible health plans significantly reduced healthcare spending, but they also reduced the use of preventive care in the first year.

Therefore, simply reducing coverage generosity may lead patients to be more price sensitive and reduce healthcare expenditures, but it may be a blunt instrument. With a forced switch to a high-deductible plan, beneficiaries seem to cut back on both high- and low-value care (Brot-Goldberg et al., 2017). However, Lucarelli et al. (2020) find for enrolles who switch from a low deductible health plans (LDHPs) to high deductible health plans (HDHPs), individuals have a reduction in spending growth over time for prescription drugs, lowering growth for less cost-effective drugs and not impacting growth in spending on highly cost-effective medicines.

2.2 Value-Based Insurance Design: Theory and Background

An important assumption underlying the design of this value-based plan is that increased primary care coverage would reduce total health care spending (Song and Gondi, 2019). As part of Section 2713 of the Affordable Care Act, evidence-based preventive services as identified by the US Preventive Services Task Force are fully covered by insurance due to their high value for promoting affordable access that is often underutilized by vulnerable populations (Pauly et al., 2014). In contrast, low-value services have been identified as overused or not appropriate, as they provide little to no clinical benefit to patients but still expose them to both risk and expense (Schwartz et al., 2014). By tying the coverage of services with their clinical value, VBID may be a powerful tool to influence utilization and steer consumers to make more informed healthcare decisions.

There are many possible reasons why behavioral hazard exists. Consumers may not have knowledge of the health benefits from a service or have false beliefs about the efficacy of care (Pauly and Blavin, 2008). Other potential reasons include the salience of certain symptoms, present-bias

of spot prices, and memory issues (Baicker et al., 2015). To address conflicting incentives, cost-sharing can be aligned with clinical value to make high-value, under-used care affordable and steer consumers to make more informed healthcare decisions (Chernew et al. 2007; Chernew et al. 2010). This approach of aligning patients' out-of-pocket costs through benefit design features with the value of healthcare services is the basic premise of value-based insurance design (VBID).

Cost-sharing that addresses behavioral hazard should depend on the health benefit of the service in addition to the patient's price sensitivity to the service. It should be noted that patients are heterogeneous and services vary in their clinical value. Therefore, high-value services are generally recognized as providing substantial reliable and predictable gains for a majority of individuals. Cost-sharing can then also promote efficient utilization outcomes to potentially improve health by varying the degree to which specific procedures, services, and pharmaceuticals are covered.

Cost-sharing can also be powerful: early adopters of VBID reduced cost-sharing primarily for medications considered important for chronic conditions. A large-scale field experiment that eliminated some drug co-pays for recent heart attack victims found significant increases in drug use (Choudhry et al., 2011). One plan that lowered cost sharing reduced non-adherence to medication by about 10 percent over a year (Chernew et al., 2008).

Evidence suggests that cost-sharing reductions moderately increases the use of targeted high-value services. However, greater cost savings may require raising copays more aggressively for low-value services. Across value-based programs, initiatives vary and there may be unintended consequences that conflict with the incentives. The Mayo Clinic, for instance, found significant decreases in outpatient procedures and imaging with increased specialty care cost-sharing, but no observed effect on primary care use despite it being free for beneficiaries (Shah et al., 2011).

3 Institutional Setting and Data

3.1 CalPERS

The California Public Employees' Retirement System (CalPERS) is a government agency that administers health and retirement benefits to California public school, local agency and state employers. They are the largest public employer purchaser of health benefits in California and the second largest public purchaser in the United States after the federal government. CalPERS offers a large number of different health insurance plan options to over 1.5 million members comprised of State of California, public agency, and school employees. This includes active and retired employee subscribers and their dependents.

The CalPERS Board of Administration determines annually which plans are available, the covered benefits, premiums, and copayments. CalPERS self insurers its PPO plans as it has

administrative and managerial responsibilities but the plans are administered by the insurers. In effect, CalPERS rents each plan manager's provider network, pays the plan based on the health risk of its members, and negotiates a payment for the plan's administrative costs and profits. Open enrollment occurs each fall and changes made will take effect starting in January the following year.

3.2 PERS Select Value-Based Redesign

As early as January 2017, CalPERS was interested in improving member health and decreasing costs. In 2019, CalPERS redesigned PERS Select, a currently offered PPO plan, to be a value-based health insurance plan. They state the goals for their program as, "Value-Based Insurance Design aims to improve the quality — while lowering the cost — of health care by empowering choice."

Across value-based programs, initiatives vary in their benefit designs. In this setting, the changes included copays that decreased for primary care and increased for specialty care. The value-based design also awarded credits that can be completed to reduce the annual deductible. The rationale was an increased specialist copay could reduce low-value care, while a lower primary care copay supports high-value care. The enrollee would be rewarded for their preventive care actions with reductions to the deductible.

Detailed information showing the benefit design changes before and after the value-based change is available in **Table 1**. There were some design elements that stayed the same - the coinsurance rate was constant and remained at 20% as well as the maximum out-of-pocket. The value-based insurance design impacted the deductible and the copayments. The copay for a primary care visit was reduced from $20 to $10, a specialist visit was increased from $20 to $35, and a mental health visit was decreased from $20 to $10.

The are five $100 credits available to reduce the deductible from the initial $1,000 deductible to $500 for an single subscriber (**Table 2**). The subscriber can reduce their deductible by: (i) getting a flu shot, (ii) completing a biometric screening, (iii) completing a smoking cessation program or attesting that they are a non-smoker, (iv) getting a virtual second opinion support on surgery, and/or completing a (v) chronic condition management program.

Most health insurance plans are non-linear in nature. **Figure 1**, shows a plot of the predicted out-of-pocket spending to total medical cost of being enrolled in PERS Select. Specifically, it illustrates the difference in out-of-pocket spending pre and post VBID after completing five deductible incentives. The contract has a deductible of $1,000, coinsurance rate of 20%, and an out-of-pocket maximum of $3,000 for a single tier household. The deductible decreases by $100 (single) or $200 (family) per incentive completed. The line plotted in black is the PERS Select insurance contract with value-based insurance design prior to being value-based. The line plotted in blue is if the maximum number of incentives, five, are completed reducing the deductible to $500.

As in most health insurance plans, the consumer must pay out-of-pocket up to deductible amount before the plan begins to contribute to the claim. Services covered before meeting the deductible, include primary care or specialist visits and a copayment would apply. Copays are a fixed amount paid out-of-pocket to access care. Coinsurance rates are a percentage of the costs of a covered paid out-of-pocket once the deductible is met. The maximum out-of-pocket is the maximum the subscriber would pay for covered services in a year.

Table 3 shows the plan menu of benefit designs CalPERS subscribers can choose from. There are three PPO plan options in each market: PERS Select, PERS Choice, and PERSCare, in order of level of coverage generosity. The multiple HMO plans share the same benefit design and are horizontally differentiated by their provider network. PERS Select is the least generous PPO plan with a narrower provider network than PERS Choice and PERSCare. PERSCare is the PPO plan with the most generous coverage.

3.3 Risk-Adjustment Policy

In 2014, CalPERS implemented a risk-adjustment transfer policy with the goals of mitigating adverse selection by setting up transfers between insurers based on their enrollees' health risk. Handel et al. (2021) documents how this policy change led plan premiums to decrease for plans enrolling sicker consumers and vice versa for those enrolling healthier consumers.

In 2019, the same year that the value-based insurance design was introduced for PERS Select, CalPERS discontinued its risk-adjustment transfer program so plan premiums that were decreased for plans enrolling sicker consumers were increased again. This lead to substantial premium decreases for plans enrolling healthier consumers and increases for plans with sicker consumers.

Table 4 shows the change in plan premiums and enrollment from 2018 and 2019. As PERS Select is the basic PPO plan enrolling healthier consumers and with the discontinuation of risk adjustment, annual plan premiums paid[1], decreased from $987 to $0 for single state employees with an 80/80 bargaining unit. PERS Select had an increase of about 9,341 subscribers. Despite meaningful premium changes, there is limited evidence of changes in enrollment responding in kind, likely due to consumer inertia.

Table 5 shows the movement of subscribers into different plans in 2019 based on their plan choice in 2018. For PERS Select subscribers in 2018, the majority ($N = 19,196$) remain in the same plan in 2019 when it was redesigned to be value-based while some ($N = 1,097$) chose to switch to one of the nine HMO plans. There was little switching to the other PPO options ($N = 670$).

[1]The annual premium paid varies by plan, region of residence, number of people in the household and the employer's contributions

3.4 Data

In this study, individual level administrative claims and enrollment data from 2012-2021 on plan choice and medical utilization was used. The data include information on (i) insurance plan features and where they are offered, (ii) plan premiums and employer contributions, (iii) beneficiary demographics, (iv) and health and pharmacy claims. The benefit designs of the plans are consistent across regions and types of employees, however depending on the region, the number of plans offered can vary. Some plans are available in certain regions.

The data contains a rich set of information including demographic and health plan information about each individual, detailed claim line spending information, and procedure and diagnosis information for each claim line. The primary analysis sample is constructed at the subscriber-year level—the claims data is collapsed to an annual household spending and it is further separated into spending components such as outpatient, inpatient, and pharmacy spending to calculate predicted out-of-pocket spending. Finally, age-adjusted Charlson Morbidity scores as an indicator of health status were constructed for each individual.

The sample is restricted to the fourteen main health insurance plans with a handful of smaller, less popular plans excluded from the analysis. PERS Select, PERS Choice, and PERSCare were the three PPO plans while the other plans are HMO. The three PPO plans are present throughout the years of analysis while the HMO plans enter and exit in the market over time. For example, in 2014, the Anthem plans, Health Net plans, Sharp, and UHC entered. In 2017, Blue Shield NetValue was discontinued, with individuals in that plan defaulted into the Blue Shield Access+ plan if they did not choose to switch plans. In 2018, WHA entered.

3.5 Premiums and Premium Contributions

An important factor when choosing a plan is the price with the expected premium paid. The CalPERS regulatory design itself generates variation in prices. Consumers will face different premium paid or prices for the same plan j which depend on the type of employee (**Figure 2**), the number of dependents or people in their household tier, and their region of residence (**Figure 3**).

Table 6 outlines the plan options, plan premiums, and subscriber enrollment by percentage enrolled in each year. Consistently, Kaiser is the plan with the largest share of subscriber enrollment with approximately over 50% of subscribers. From 2015-2020, there has been an increase in the number of subscribers choosing PERS Select.

Premiums are set for state employees on a statewide basis depending on the plan and number of covered dependents (fixed by region). The plans subscribers are offered and the networks for a given plan are both regionally determined. Premiums are constructed by household size tiers:

a single subscriber tier, a two-party tier if the subscriber has one dependent that pays double the single premium, and a family tier if the subscriber has two or more dependents that pays 2.6 times the single premium. The premium contributions provided by the employer depends on the bargaining unit due to different unions within state service. Either a premium contribution subsidy rules of 80-80 or 85-80 is followed. For non-state employees, premiums vary based on plan, region of residence, and household tier. The premium contributions vary — if they work for a California State University or public agency — region and tier.[2]

3.6 Charlson Health Status Measure

The subscriber's Charlson Comorbidity Index was calculated to provide a medically-motivated measure of predicted health risk to model whether a consumer is "more healthy" or "less healthy." A related statistic is the Age-Adjusted Charlson Comorbidity Index (ACCI), as defined by Charlson et al. (1994), which combines the age equivalence index and original Charlson Comorbidity Index (CCI) to measure estimated relative risk of death. For each decade after age 40, a point is added until a maximum of 4 points for ages 80 and older is reached. This age score is added to the Charlson Comorbidity Index (CCI), which is calculated by the presence of certain diagnosis codes, to calculate the ACCI. This risk measure reflects both the (i) independent influence of age and (ii) the burden of co-morbidites in the survival of patients. While the Charlson Comorbility Index is a well-known and widely used measure of health risk, it is also relatively crude and can be an imperfect proxy for actual patient health. For members in a household, the average ACCI for each subscriber is calculated. A higher ACCI score reflects a decrease in estimated 10-year survival, which has been shown to be directly related to higher medical spending.

3.7 Descriptive Evidence

Defaults —what happens when individuals fail to act— have been shown to have a major impact on market outcomes. I document the presence of switching frictions or inertia in this setting with the persistence of choice of plan year to year. **Figure 4** shows the length of time individuals have been continuously enrolled in a CalPERS plan. There seems to be low employee turnover in this setting with about 27.8% of members who have worked as a state, public agency or school employee enrolled in a CalPERS health insurance plan for over 9 years. In particular, over 58.5% of members have received a CalPERS plan for over 5 years. In **Figure 5**, I assess how long individuals have been enrolled in the same plan. Here, one observes a strong pattern of persistence in health plan. Over 39.9% have remained in the same plan for five years or more. Year-to-year individuals can either choose to switch plans or remain auto-enrolled in the same plan chosen from the prior year.

[2]For more detailed information about how the premium contributions were calculated for state and non-state employees and originally developed in Handel et al. (2021), please refer to **Appendix 8.1**

The presence of adverse selection suggests that more comprehensive insurance contracts attract individuals with higher health risk. Across the plans, there are meaningful differences in the types of consumers enrolled. **Table 7**, shows that of the three PPO plans: PERS Choice, PERS Select, and PERSCare, PERS Select has the youngest enrollees, the lowest percent female, and the lowest median family income by zip code of residence. PERSCare, the most comprehensive PPO plan, has enrollees with highest average age, greater percent female, and highest median family income by zip code of residence. A positive correlation test can detect the presence of asymmetric information with adverse selection and moral hazard using ex post realized spending. Therefore, in **Table 7** I show the total and out-of-pocket spending across the multiple plan options. There are meaningful differences in spending across the heterogeneous plans. PERSCare, the most generous PPO option, has a median of $3,186 in total spending and $698 in out-of-pocket spending while Kaiser has a median of $1,553 in total spending and $60 in out-of-pocket spending. Health Net Salud y Mas and PERS Select have enrollees with the highest percentage of zero claims filed.

Table 9 reports the uptake rates for the five deductible incentives in the first year of the value-based program in 2019. High rates of use were observed for the Virtual Second Opinion program (89%) and ConditionCare Certification (98%). About half of PERS Select members received a flu shot (55%) and around 70% completed the non-smoking certification (69%) and biometric screening (74%). The nature of how certain incentives are credited should be considered when evaluating the rates of use. For example, all members will receive the second opinion credit unless they have a surgery without a second opinion. Furthermore, all members also are first given the incentive for the ConditionCare disease management program unless they are contacted by a nurse if they have asthma, diabetes, COPD, heart failure, or coronary artery/vascular disease and decline to participate. All preventive care screenings count toward the biometric screening incentive. To receive the non-smoking certification incentive, individuals must notify CalPERS that they do not smoke or if they do smoke, complete a smoking cessation program.

I hypothesize that default policies strongly influence plan enrollment decisions, and enrollment in a plan with varying benefit design features in turn would affect medical utilization. If PERS Select subscribers experience inertia then one would expect there to be many enrollees defaulted into the value-based plan from being enrolled in PERS Select prior to the value-based updates. It is possible that these individuals may be less aware of changes in plan design. In **Figure 6**, I examine subscribers enrolled in PERS Select in the first year of the value-based updates and find that higher spending consumers with greater than $500 in total spending, complete a greater number of deductible incentives on average than consumers with less than $500 in total spending. While it seems in **Figure 6** that these consumers are responding to the value-based changes, it is reasonable to believe that switching frictions may affect the implementation of the new policy. Given this, I investigate the effects of the introduction of the value-based plan in the next section.

4 Empirical Strategy

4.1 Identifying the Effect of VBID on Inertial and Active Choice Employees

Persistence in plan choice and medical utilization could be explained by strong preferences that stay constant. To potentially test for this persistence in preferences, one could study new employees who are free from any status quo bias or switching cost as these consumers choose plans in a neutral environment. Therefore, the population of new employees can serve as a control group to incumbent employees who experience inertia.

Table 10 examines differences between PERS Select subscribers who are new employees compared to incumbent employees and PERS Select subscribers before and after the value-based policy was in place. This exercise is descriptive and serves to highlight the characteristics of inertial consumers and what types of consumers select into the value-based plan. Column (1) describes subscribers pre-VBID and compares these subscribers to those post policy change in Columns (2) and (3). Consumer characteristics of value-based subscribers are similar pre- and post- policy change for old subscribers. New subscribers are younger ($Mean = 37.6$) compared to old subscribers ($Mean = 43.5$) and are relatively healthy ($Mean = 59\%$). New subscribers also have a smaller family size on average ($Mean = 50\%$, family size of 1) in comparison to old subscribers ($Mean = 37\%$).

How does the value-based insurance design affect new subscribers with active choice vs. old subscribers? The aim is the understand how patients respond with their consumption of health care to the introduction of the value-based policy in 2019. I examine how existing PERS Select subscribers who are defaulted into the value-based design (old subscribers) may have differential utilization and spending patterns in comparison to new subscribers who actively choose the value-based plan.

The specification of interest is:

$$Y_{jt} = \alpha + \beta_1 VBID_t + \beta_2 NEW_t + \Phi(NEW_t \times VBID_t) + \Gamma X_{ij} + \gamma_j + \tau_t + \varepsilon_{jt} \tag{1}$$

In Equation 1, Y_{jt} is the utilization or spending outcome measure for subscribers enrolled in plan j in year t. $VBID_t$ is a treatment group indicator that equals one for subscribers enrolled in PERS Select post value-based policy change in 2019. NEW_t or $[j_{t-1} = 0]$ is an indicator equals one if the subscriber is a new subscriber who was not observed to have a CalPERS plan in the previous year and must make an active choice. The third term is the interaction of subscribers enrolled in the value-based plan and are new subscribers. Φ can be interpreted as the effect of the value-based insurance design for new subscribers with active choice relative to existing or old employees in other

non-value-based plans. γ_j and τ_t indicate plan and year fixed effects. X_{ij} is a vector of observable consumer characteristics (including age, sex, region of residence, and household tier).

Matching allows one to compare subscribers who enroll in PERS Select before and after the value-based insurance design using observed characteristics to account for selection bias in choosing this plan out of others in the plan menu. Furthermore, to address the influence of inertia in plan choice, we can estimate the treatment effect of the value-based insurance design on spending for new employees only. New subscribers to PERS Select starting in 2019 should have known there was a value based insurance design present, while new PERS Select subscribers prior to 2019 had a standard non- value-based design plan. One can say inertia exists if the choices of new employees differ significantly from those of old employees, all things equal. The presence of any status quo bias can be determined as plan characteristics change and as plans enter and exit the market but plan choices remain constant.

Proof and Assumptions Behind Matching

Propensity score matching requires three main assumptions. The methods assume that the variables associated with assignment to treatment are observed and emphasizes an overlap in distribution of X's between treatment and control groups. From the conditional independence assumption (CIA), assignment to treatment is as good as random for a given propensity score, and therefore treatment and control units are observationally identical on average. $Y_{0i}, Y_{1i} \perp D_i | p(X)$, where $p(X)$ is the propensity score, $p(X) = p(D = 1|X)$. The overlap condition requires common support for the treated and control groups is needed to determine ATT. Lastly, from the balancing property, observations with the same propensity score have the same distribution of observable covariates independently of treatment status.

$$P(D_i = 1|X) = p(X)$$

We can imagine two potential outcome variables for a subscriber: the case in which they are enrolled in VBID (Y_{1i}) and the case without VBID (Y_{0i}). Ideally, we would like the difference ($Y_{1i} - Y_{0i}$) which would be the causal effect of the VBID on the spending, however we can cannot see both Y_{1i} and Y_{0i} but only one or the other. Therefore, the average treatment effect (ATE) is the average difference in outcomes for individuals with VBID and without VBID (enrolled in another plan):

$$ATE = [Y_{1i} - Y_{0i}]$$

We can instead think of the average treatment effect on the treated (ATT) as the average of difference in outcomes for those with VBID and the counterfactual average had they not been enrolled in value-based PERS Select. In the ideal scenario of a randomized control trial ATE may

be equal to ATT. However in a observational setting the ATT can be decompased as the difference between observed differences (First term on RHS below) and selection bias (Second term on RHS):

$$\begin{aligned} ATT &= [Y_{1i} - Y_{0i}|C_i = 1] \\ &= [Y_i|C_i = 1] - [Y_i|C_i = 0] - ([Y_{0i}|C_i = 1] - E[Y_{0i}|C_i = 0]) \end{aligned}$$

Comparing those with and without VBID is a poor measure of the causal effect of the value-based plan as there may exist selection bias. There may be a difference between the potential outcomes of those who are treated vs. if they were not treated. The conditional independence assumption address this as conditional on observables X, selection bias disappears.

$$Y_{0i}, Y_{1i} \perp C_i | X_i,$$

The unconfoundness assumption requires that the decision to be enrolled in the value-based plan is independent of potential outcomes conditional on observables:

$$Y_i(0), Y_i(1) \perp W_i | X_i$$

Then selection bias is zero because there is not a difference in outcomes between those with VBID had they not been treated vs. those enrolled in other plans.

$$[Y_i(0)|x_i, w_i = 1] - E[Y_i(0)|x_i, w_i = 0]$$

$$= [Y_i(0)|x_i, w_i = 1] - E[Y_i(0)|x_i, w_i = 1] = 0$$

Therefore when estimating ATT, we can examine the observed outcomes under the unconfoundedness assumption as the selection bias term disappears.

$$\begin{aligned} ATT &= [Y_{1i} - Y_{0i}|C_i = 1] \\ &= [Y_i|C_i = 1] - [Y_i|C_i = 0] \\ &= [Y_{i1} - Y_{i0}|C_i = 1] = [Y_{i1} - Y_{i0}|X_i] \end{aligned}$$

4.2 Plan Choice Model

A plan choice model is estimated to assess the key determinants underlying a subscriber's decision to enroll in a plan on behalf of their household. There are multiple plans the consumer must choose among and this model investigates the value the consumer placed on different plan characteristics, given the their underlying health and preferences. This model utilizes individual level enrollment data from 2015 to 2020 on available plan options in a given region, plan choices made, plan characteristics, and observed consumer characteristics such as demographics and health risk.

The demand model is implemented as a conditional logit model and is estimated based on the following utility specification for subscriber i selecting plan j:

$$U_{ij} = \alpha + \beta_1 \mu_{ij} + \beta_2 P_{ij} + \beta_3 X_{ij} + \beta_4 \xi_{ij} * S + \beta_5 1[j_t = j_{t-1}] + \varepsilon_{ij} \tag{2}$$

In Equation 2, μ_{ij} denotes the mean of member-specific expected health out-of-pocket spending in plan j. μ_{ij} is quantified empirically with two elements: (i) a projection of total consumer health spending and (ii) the impact of benefit design features on predicted out-of-pocket spending. For (i), it relies on the subscriber simple spending projection using their spending in the prior year. Prior year's spending is not observed for new subscriber so that current year's spending is used.

P_{ij} denotes the component of the annual premium paid by the subscriber, as their employer pays a portion as well. X_{ij} reflects plan characteristics such as the level of the deductible, coinsurance, out-of-pocket maximum while ξ_{ij} reflects preferences for a specific insurance contract by health status. Here S, is an indicator variable equal to one if a consumer is among the least healthy 25% of the sample (as determined by the age adjusted Charlson index), and it is interacted with ξ_{ij} to reflect potential health status-specific preferences for different plans. This age adjusted Charlson index is used to estimate the projected individual health risk for the upcoming year using historical claims records at each annual enrollment period. Finally, $1[j_t = j_{t-1}]$ is an indicator variable for inertia or inertia duration. Inertia is defined if a plan option is the same as a consumer's previously chosen plan. Inertia duration counts the number of years a plan option is the same plan. New employees must select a plan and do not have a default option so both equal zero for those individuals. β_5 is thus the switching cost or value of inertia, which reflects how much money consumers are willing to leave on the table by remaining in the same plan compared to if the subscriber was a new employee in an active choice environment. ϵ_{ij} reflects unobserved idiosyncratic preferences for plan j.

With the assumption of a Type I extreme value term, this utility specification can be transformed into the following standard multinomial logit regression equation to estimate coefficients (α, β):

$$1[j_t'] = \alpha + \beta_1 \mu_{ij} + \beta_2 P_{ij} + \beta_3 X_{ij} + \beta_4 \xi_{ij} * S + \beta_5 1[j_t = j_{t-1}] + \varepsilon_{ij} \tag{3}$$

where $1[j'_t] = 1$ if a subscriber chooses a given plan j' and 0 otherwise.

4.3 Deductible Level Model

In the value-based plan, the consumer can complete up to five of the incentives to reduce the deductible. Therefore, to assess the key determinants underlying a subscriber's decision of how many incentives to complete, one can estimate a deductible level model. This model investigates the value the consumers places on the level of their deductible, given the their underlying health and preferences. This model utilizes reported information and individual level claims to track the number of incentives completed.

If the PERS Select plan is chosen such that $j = VBID$, then suppose there are:

I = {0, 1, 2, 3, 4, 5} discrete and ranked values of deductible levels representing

$DED_j = \{\$1000, \$900, \$800, \$700, \$600, \$500\}$, respectively and there is a latent variable y_i* which is unobservable, however we can observe when it crosses thresholds μ which is reflected in the level of deductible k. Individuals vary in their observable and unobservable characteristics that determine their thresholds μ.

This can be expressed as an ordered logit model where the utility of individual i from choosing deducible level k is given by:

$$U_{ik} = \alpha + \beta_1 X_{ij} + \beta_2 \mu_{ik} * 1[j_{t-1} = 0] + \varepsilon_{ik} \tag{4}$$

Individuals have cutoff thresholds μ that determine the choice of I and deductible level k.

$$U[I_{x+1} - I_x | \omega_i, \gamma, X_i, \varepsilon_{ij}] = 0$$

$$I_x = \left\{ \begin{array}{ll} 0, & u_i \leq \mu_0 \\ 1, & \mu_0 < u_i \leq \mu_1 \\ 2 & \mu_1 < u_i \leq \mu_2 \\ 3, & \mu_2 < u_i \leq \mu_3 \\ 4, & \mu_3 < u_i \leq \mu_4 \\ 5, & \mu_4 < u_i \leq \mu_5 \end{array} \right\}$$

In Equation 4, ω_i is a private risk signal underlying the utility model. X_{ij} reflects observable consumer characteristics such as demographics, household tier, and region of residence. μ_{ik} denotes the mean of member-specific expected spending. Finally, $1[j_{t-1} = 0]$ is an indicator variable equal to one if a subscriber is a new subscriber making an active choice, as indicated by not enrolling in

a plan the previous year. This is interacted with μ_{ik} to reflect potential health status preferences for different levels of deductibles.

5 Results

Table 11 shows estimates from Equation 1 the effect of the value-based plan on utilization by type of subscriber relative to non-VBID subscribers. The specification includes enrollment in the value-based plan interacted being new subscriber. Plan, year, and household tier fixed effects were included as well as consumer characteristics such as age, gender, and region of residence. New subscribers use less care than old subscribers across many types of medical visits which may be due to the entry of healthy employees. **Figure 7** shows the predicted marginal effects of the value-based plan on number of primary care physician visits. Existing subscribers that were defaulted into the value-based plan used a greater number of primary care physician visits than non-VBID old subscribers. **Figure 8** shows that new VBID subscribers use less specialist visits than new non-VBID subscribers. Preventive service use was lower for both old VBID employees and new VBID employees with active choice.

Table 12 shows estimates from Equation 1 the effect of the value-based plan on spending by type of subscriber relative to non-VBID subscribers. New subscribers have lower spending than existing or old subscribers across multiple types of care: office visits, prescription pharmaceuticals, inpatient and outpatient care. This pattern of lower spending relative to old existing subscribers suggests that newer subscribers are healthier, on average. The existing or old employees are persistent in their plan choices and are defaulted into the value-based design. **Figure 9** shows the predicted marginal effects of the value-based plan on out-of-pocket spending. New subscribers with value-based insurance have higher inpatient spending, however they have much lower out-of-pocket spending relative to old subscribers with non-VBID plans. Old VBID subscribers have greater outpatient spending and greater out-of-pocket spending relative to new VBID subscribers.

Table 13 shows the average treatment effect on the treated of value-based insurance design (VBID) for (i) new subscribers post-VBID relative to new subscribers pre-VBID and (ii) both new and old VBID subscribers post-VBID relative to both new and old VBID subscribers pre-VBID using propensity score matching with logit estimation. Single nearest neighbor matching using age, gender, household tier, and region of residence was used. The top panel describes the ATET comparing the spending of new subscribers before and after VBID with lower average total spending of -$798 and out-of-pocket spending of -$231 for new subscribers post-VBID compared to new subscribers pre-VBID. Spending on office visits and prescription drugs was also lower by -$57 and -$408 for new subscribers post-VBID, respectively compared to PERS Select subscribers pre-VBID. The bottom panel describes the ATET for both new and old subscribers with greater

total spending of $1,341 and lower out-of-pocket spending of -$5 post-VBID compared to PERS Select subscribers pre-VBID.

Demand Estimation

To explore how financial plan characteristics and consumer characteristics may impact the choices consumers make, the plan choice model from equation 2 is estimated using data from 2015 and 2020. The results are presented in **Table 14** with three separate specifications:

Column (1) presents the model with out-of-pocket spending predictions from the previous year and inertia. Column (2) presents a similar specification but now inertia is a continuous variable. Finally, Column (3) includes plan-health status fixed effects to allow for different plan preferences by health status. This flexible framework combines preferences for provider networks, any differences in cost-sharing, and other plan brand preferences into a fixed effect that is estimated as a function of health risk. Health status is defined using the age adjusted Charlson score with the cut-off of an average Charlson Score of 2 or lower from the previous year as considered to be good health (about 75% of the sample). The specific plan preference coefficients are presented in **Table 15**. Column (3) is the primary model of interest which will be used to generate predicted consumer responses to counterfactual plan menus that reduce the number of plan options and consumer inertia.

The estimates suggest that consumers dislike switching plans, paying premiums and out-of-pocket spending, and higher deductibles. The estimate from column (2) suggests that individuals who have been enrolled in the same plan for one year are willing to leave over $23,000 (5.062/0.00021) of additional premium on the table not to switch plans. This estimate increases with the number of years the subscriber is enrolled in the same plan from 5.1 with one year to 6.9 for over five years. This is consistent with prior research that demonstrate the strength of default policies.

Furthermore, subscribers overweight their annual consumer contributions to premiums to predicted out-of-pocket spending, by about 3 to 1 ($-0.00018/-0.000056$), which is similar to the level of bias that has been noted in prior work such as in Medicare Part D drug plan choice (Abaluck and Gruber, 2011) and others (Gruber et al., 2020) which find that subscribers overweight premiums between 4-8 times that of the expected out-of-pocket spending.

Lastly, there are significant and large brand effects by health status for employees choosing their plan. In **Table 15**, plan preference estimates are presented for individuals with poor health status for plans relative to Kaiser. Since Kaiser is the plan with the largest share of subscribers, the estimated coefficients for other plans are negative in comparison. Looking at the estimates in Table 15, patients with poor health value Kaiser over PERS Select by about $2,894 ($-0.521/-0.00018$) in additional annual premiums.

Counterfactual Simulation Analysis

In this section, the demand estimates from **Table 14**, Column (3) are used to assess the attractiveness of the value-based plan and predicted spending across hypothetical scenarios of plan options.

I investigate (i) changes in enrollment decisions by simulating predicted responses to plan menu changes, and (ii) resulting changes in ex-ante expected total and out-of-pocket spending. These spending measures are constructed by applying plan benefit design features (e.g., deductible, coinsurance, out-of-pocket maximum) of alternative plans to realized spending in 2020. Here, the out-of-sample counterfactuals are generated for these hypothetical scenarios:

1. Reductions in the size and complexity of the plan menus
2. Active choice environment
3. Mandated enrollment in the value-based plan

It is important to note that these analyses are partial equilibrium results and rely on plan premiums and premium contributions being held fixed at their observed 2019 and 2020 values. Furthermore, it assumes the plan fixed effects estimated from the plan choice model as a function of health status are constant. If a model with endogenous premiums is incorporated — in which premiums re-adjust dynamically in the environment — then we could study how the movement of less healthy consumers into and out of plans would cause the premiums to vary and reflect the updated average cost of those plans' risk pools. This is a potentially valuable topic for further research on the distributional impacts of policy transitions in health insurance markets.

Scenario I demonstrates how the complexity of the plan menus can be reduced through restrictions to only PPO plans. In this setting, the HMO plans are horizontally differentiated by provider networks with the same cost-sharing features. In particular, in the year PERS Select was redesigned to be value-based, individuals faced a large number of plan options - 9 HMO plans and 3 PPO plans. If PERS Select has more visibility through the reduction of plan options, how popular would the plan be among subscribers? **Table 16** and **Table 17** shows how for HMO subscribers who no longer have their previous plan as a plan option, the majority ($N = 172,018$) choose PERS Select. Furthermore, when looking at specific HMO plans in **Table 17**, we see that for Kaiser, the plan with the largest share of enrollment, the majority of their subscribers would switch to PERS Select ($N = 115,974$) in this PPO only setting. **Table 18** shows the predicted spending by plan with a restriction to PPO only plans. When subscribers are restricted to PPO plans only, the entry of new subscribers is reflected in the decrease in total spending, plan cost, and out-of-pocket spending for PERS Choice and PERSCare. Plan cost is defined as the difference between total spending and out-of-pocket spending. PERS Select is expected to have an increase in total spending, plan cost, and out-of-pocket spending relative to observed 2020 choices with HMO

and PPO plan options.

Scenario II demonstrates how lowering the switching cost to zero would motivate otherwise inertial consumers to evaluate their plan options carefully and potentially switch plans. While active choice policies would yield clear benefits by allowing consumers to best match with plans that meet their preferences, the process of evaluating many plan options can be quite costly. To implement this scenario, observed enrollment decisions are taken as given and the inertia or switching cost parameter β_5 from equation 2 is reduced to 0 for 2020 enrollment choices. In practice, there are a multitude of potential policies one could implement to reduce inertia, and this model assumes a simple specification that would presume the switching cost is fully removed between the previous plan chosen and alternative options as if individuals would be choosing plans for the first time as new subscribers. In **Table 19** we see that unlike in a PPO only setting with inertia (**Table 16**), when individuals are required to make active choices, there is an influx of subscribers switching from an HMO plan to PERS Select ($N = 41,994$). Furthermore, while some PERS Select subscribers remain in the value-based plan ($N = 5,330$), the majority ($N = 29,729$) switch to an HMO plan. In **Table 20**, the changes in expected enrollment decisions are separated by plan and with an active choice policy, PERS Select has an increase in the number of members ($N = 47,436$) and an expected increase in total and out-of-pocket spending.

Scenario III shows the consequences of mandated enrollment in the value-based plan for all subscribers. This allows us to examine the distributional effect of the value-based plan by health status. In **Table 21**, a value-based mandate would decrease the annual premium paid on average from −\$63 for individuals with Sharp to −\$4,351 for individuals with Anthem HMO Traditional. This reduction in premium paid is due to PERS Select being more affordable compared to alternative plans. While premium paid would decrease, expected out-of-pocket spending would increase. Subscribers would expect to experience an increase in OOP spending from +\$50 to +\$596 on average depending on the plan prior to switch. **Table 22** shows that there would be an increase in $N = 595,413$ subscribers with good health and $N = 312,475$ subscribers with poor health in PERS Select with the mandated VBID requirement. This would lead to an expected change in OOP spending by about +\$245 for members with poor health and increase in OOP spending by about \$85 for members with good health, compared PERS Select enrollees with no VBID mandate.

6 Conclusion

Developing insurance benefit designs to promote efficient utilization outcomes and affordable care is particularly timely given the present health care reform debates about a public option. This paper studies the introduction of a value-based health insurance plan when many consumers are inertial and face multiple plan options. I demonstrate that, in practice, consumers face significant switching costs in plan selection and may be inattentive to changes in benefit design. If consumers are incumbent employees, they have a default option of remaining in the same plan chosen in the prior year. Therefore, consumers are not motivated to change plans year-to-year, despite potentially meaningful changes in premiums and benefit design, due to a high switching cost.

I provide evidence that, when PERS Select is redesigned to be value-based, the plan attracts a healthy pool of individuals who have a lower total and out-of-pocket spending when enrolled in the value-based plan in comparison to new subscribers prior to the policy change. My estimates indicate that reductions to the size and complexity of the plan menu and active choice policies would lead the majority of HMO subscribers to switch to the value-based plan. I also examine when individuals are required to enroll in the value-based plan would would allow consumers to reduce their annual premium paid by as much as $\$4,351$ as it is a more affordable plan than the alternative options. However, as the entry of these new predicted subscribers are higher risk than the observed PERS Select subscribers, mandating enrollment is expected to increase the out-of-spending per member by \$85 for members with good health and \$245 for members with poor health, compared to observed PERS Select subscribers.

This work contributes to the literature on (i) consumer inertia in health insurance and (ii) the impact of insurance on consumer health care utilization. I find while value-based insurance may be used as a tool to help patients better understand the clinical value of recommended services, patients may not change their utilization behavior. As with any new policy, consumers may not be aware of design changes or be responsive to them.

In this setting, there is inertia in plan choice and healthcare utilization—a bias in which there is a preference towards the status quo despite the presence of new information. This means enrollment and utilization in the value-based plan partially reflects inertia and not solely an active choice reflecting risk preferences and information about a policy change. Therefore, these results highlight the importance of multiple components for effecting behavioral changes: (i) new active choice policies coupled with decision aids to help consumers understand and choose among their plan options, (ii) targeted information about changes in their plan coverage to help consumers process their risk tradeoffs, and (iii) strong financial incentives to motivate changes in behavior.

7 Tables and Figures

Table 1: PERS Select Benefit Design Change

	2015-2018 (Standard Plan)	2019-2021 (Value-Based Insurance Design)
Deductible	Individual: $500, Family: $1,000	Individual*: $500 - $1,000, Family*: $1,000 - $2,000
Coinsurance	20%	20%
Primary Care	$20 copay	$10 copay
Specialist	$20 copay	$35 copay
Inpatient Maternity (Delivery)	20% coinsurance	Inpatient covered in full with Future Moms program 20% coinsurance without enrollment
Mental Health, Behavioral Health, and Substance Abuse	$20 copay	$10 copay
Maximum Out-of-Pocket	$3,000 individual, $6,000 family	$3,000 individual, $6,000 family

Notes: There are a total of five possible deductible reducing incentives. PERS Select was redesigned to be value-based in the 2019 plan year. *From 2019-2021, the PERS Select deductible can be reduced by $100 (individual) or $200 (family) for each of the five incentives completed. Prior to VBID, the deductible was fixed.

Table 2: PERS Select Deductible Reducing Incentives

Incentive	Description
(1) Flu Shot	Get a flu shot at an in-network pharmacy or at your doctor's office
(2) Non-Smoking Certification	Complete a health assessment to notify the plan that you do not smoke If you do smoke, complete a quit smoking program
(3) Biometric Screening	Test your blood pressure, cholesterol, glucose, A1C, and height and weight for your BMI
(4) Virtual Second Opinion Program	For a non-urgent, non-emergency scheduled surgery or procedure
(5) ConditionCare Certification	Disease management program: asthma, diabetes, COPD, heart failure, or heart disease

Notes: There are a total of five possible deductible reducing incentives. PERS Select was redesigned to be value-based in the 2019 plan year. From 2019-2021, the PERS Select deductible can be reduced by $100 (individual) or $200 (family) for each incentive completed. Prior to this, the deductible was fixed.

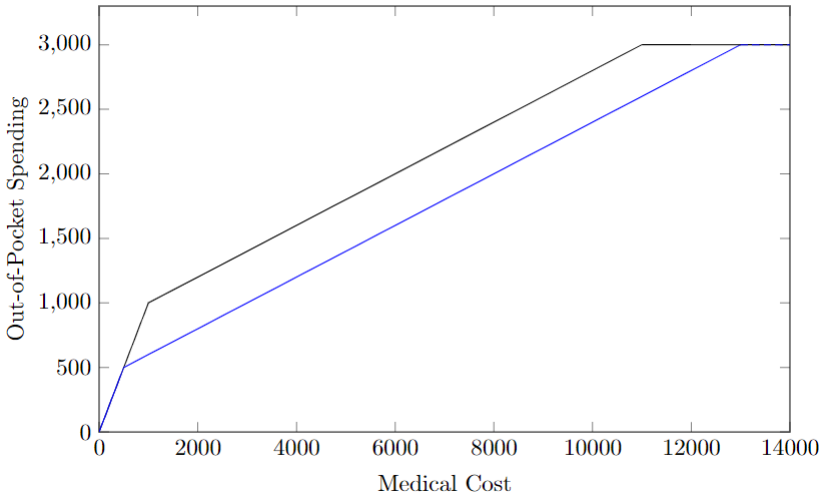

Figure 1: PERS Select Value-Based Insurance Design with all five deductible incentives completed

Notes: A PERS Select insurance contract with value-based insurance design before (black) and after (blue) completing all five value-based deductible reducing incentives with a standard deductible of $1,000, coinsurance rate of 20%, and an out-of-pocket maximum of $3,000 for a single tier household. The deductible decreases by $100 (single) or $200 (family) per incentive completed.

Table 3: 2019 Plan Benefit Designs

	HMO	PERS Select	PERS Choice	PERS Care
Deductible	-	Individual*: $500 - $1,000, Family*: $1,000 - $2,000	Individual: $500, Family: $1,000	Individual: $500, Family: $1,000
Coinsurance	-	20%	20%	10%
Primary Care	$15 copay	$10 copay	$20 copay	$20 copay
Specialist	$15 copay	$35 copay	$35 copay	$35 copay
Inpatient Maternity (delivery)	-	Future Moms program: 0%, 20% coinsurance otherwise	20% coinsurance	10% coinsurance
Mental Health, Behavioral Health, and Substance Abuse	$15 copay	$10 copay	20% coinsurance	10% coinsurance
Maximum Out-of-Pocket	$1,500 individual, $3,000 family	$3,000 individual, $6,000 family	$3,000 individual, $6,000 family	$2,000 individual $4,000 family

Notes: HMO refers to all nine available HMO plan options which share the same benefit design: Anthem HMO Select, Anthem HMO Traditional, Blue Shield Access+, Health Net Salud y Mas, Health Net SmartCare, Kaiser, Sharp, UHC Alliance HMO, and WHA. PERS Select was redesigned to be value-based in the 2019 plan year. From 2019-2021, the PERS Select deductible can be reduced by $100 (individual) or $200 (family) for each incentive completed.

Table 4: Change in Plan Premiums and Enrollment

	Premium Paid			Enrollment		
	2018	2019	Δ	2018	2019	Δ
Anthem HMO Select	$2,613	$1,919	-$694	10,016	14,178	4,162
Anthem HMO Traditional	$3,148	$5,418	$2,270	5,810	6,350	540
Blue Shield Access+	$2,080	$2,592	$513	58,562	43,833	-14,729
Health Net Salud y Mas	$0	$0	$0	3,929	4,323	394
Health Net SmartCare	$2,541	$1,748	-$792	7,126	9,441	2,315
Kaiser	$1,661	$1,505	-$156	208,253	217,003	8,750
PERS Choice	$1,742	$2,181	$439	46,943	46,592	-351
PERS Select*	$987	$0	-$987	23,162	32,503	9,341
PERSCare	$2,366	$4,163	$1,796	13,255	9,643	-3,612
Sharp	$548	$128	-$420	4,472	4,981	509
UHC Alliance HMO	$1,507	$1,353	-$154	27,201	28,066	865
WHA	$1,697	$1,485	-$212	2,232	3,616	1,384

Notes: The annual premium paid accounts for premium contributions for single state employees with an 80/80 bargaining unit. *In 2019, PERS Select was redesigned to be a value-based plan. As it is the basic PPO plan, with the discontinuation of risk adjustment, plan premiums decreased.

Table 5: Transition Matrix of 2018 to 2019 Subscriber Plan Enrollment

	HMO	PERS Choice	PERS Select	PERSCare	Total
New Subscribers	34,395	3,916	7,207	820	46,338
HMO	294,044	1,967	2,707	390	327,601
PERS Choice	1,629	37,758	2,744	186	46,943
PERS Select	1,097	619	19,196	51	23,162
PERSCare	626	2,332	649	8,196	13,255
Total	331,791	46,592	32,503	9,643	457,299

Notes: HMO refers to all nine available HMO plan options: Anthem HMO Select, Anthem HMO Traditional, Blue Shield Access+, Health Net Salud y Mas, Health Net SmartCare, Kaiser, Sharp, UHC Alliance HMO, and WHA. The columns designate subscriber plan enrollment in 2019 while the rows are the plans in 2018 the subscriber was enrolled in. The first row shows new subscribers in 2019.

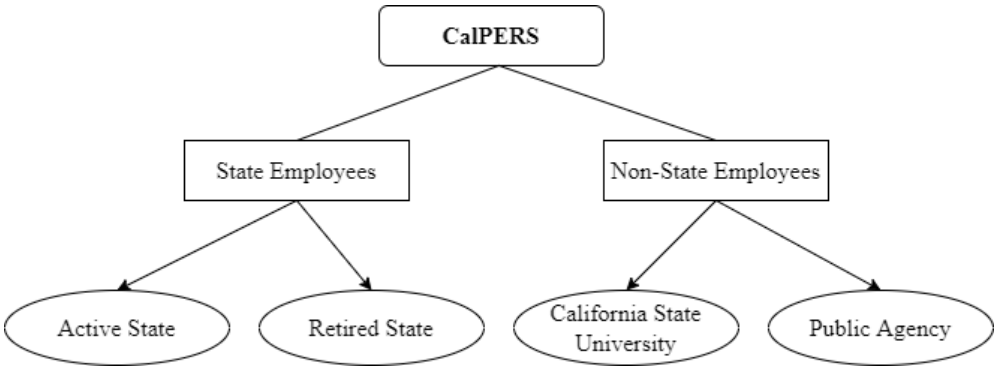

Figure 2: Types of CalPERS Employees

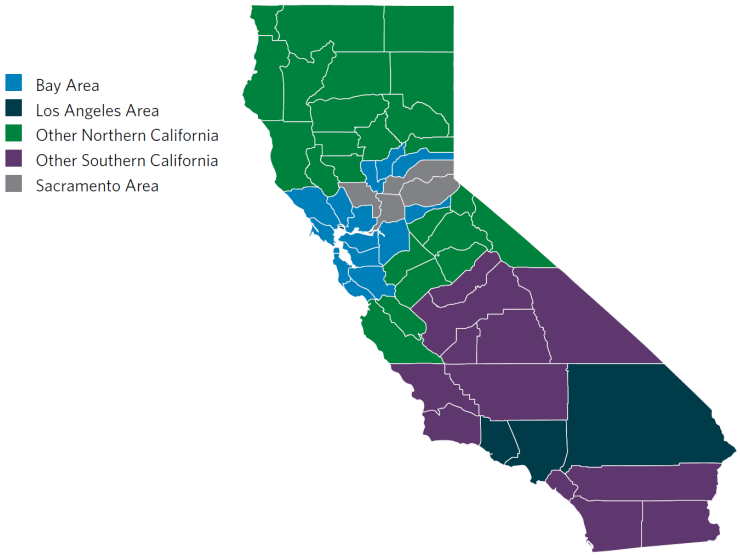

Figure 3: CalPERS Regions used for Premium and Employer Contribution Variation

Table 6: Subscriber Plan Premium and Enrollment Share by Year

	2015		2016		2017		2018		2019		2020	
	$	%	$	%	$	%	$	%	$	%	$	%
Anthem HMO Select	1,385	2.6	1,605	3.1	2,175	3.0	2,613	2.4	1,919	3.4	2,146	4.1
Anthem HMO Traditional	2,440	1.3	2,286	1.8	3,767	1.5	3,148	1.4	5,418	1.5	6,081	1.4
Blue Shield Access+	2,330	14.2	2,465	13.0	3,257	13.8	2,080	14.3	2,592	10.4	3,614	7.5
Blue Shield NetValue	1,756.3	12.8	2,390.4	7.2	–	–	–	–	–	–	–	–
Blue Shield Trio	–	–	–	–	–	–	–	–	–	–	1,105	0.8
Health Net Salud y Mas	144	0.3	0	0.4	0	0.7	0	1.0	0	1.0	0	1.1
Health Net SmartCare	1,770	0.1	1,071	1.3	1,607	3.4	2,541	1.7	1,748	2.2	3,024	1.5
Kaiser	1,309	44.6	1,197	46.9	1,247	50.0	1,661	50.7	1,505	51.6	1,453	52.3
PERS Choice	1,397	14.4	1,844	13.2	2,183	12.2	1,742	11.4	2,181	11.1	2,136	10.6
PERS Select	1,131	4.1	1,053	4.8	1,371	5.3	988	5.6	0	7.7	0	9.3
PERSCare	2,339	2.5	2,875	2.5	3,208	2.6	2,366	3.2	4,163	2.3	4,571	2.1
Sharp	749	0.8	153	1.0	690	1.0	548	1.1	128	1.2	0	1.3
UHC Alliance HMO	1,421	2.3	765	4.8	1,526	6.6	1,507	6.6	1,353	6.7	1,415	7.1
WHA	–	–	–	–	–	–	1,697.3	0.5	1,485.5	0.9	1,475.5	0.9

Notes: "$" is the annual premium paid including premium contributions for single state employees with an 80/80 bargaining unit and "%" is the percentage of subscribers enrolled in that plan by year. "–" are plans that have not been offered yet or have exited the market. "0" means the premium contributions by the employer exceeds the premium so the cost to the employee is zero.

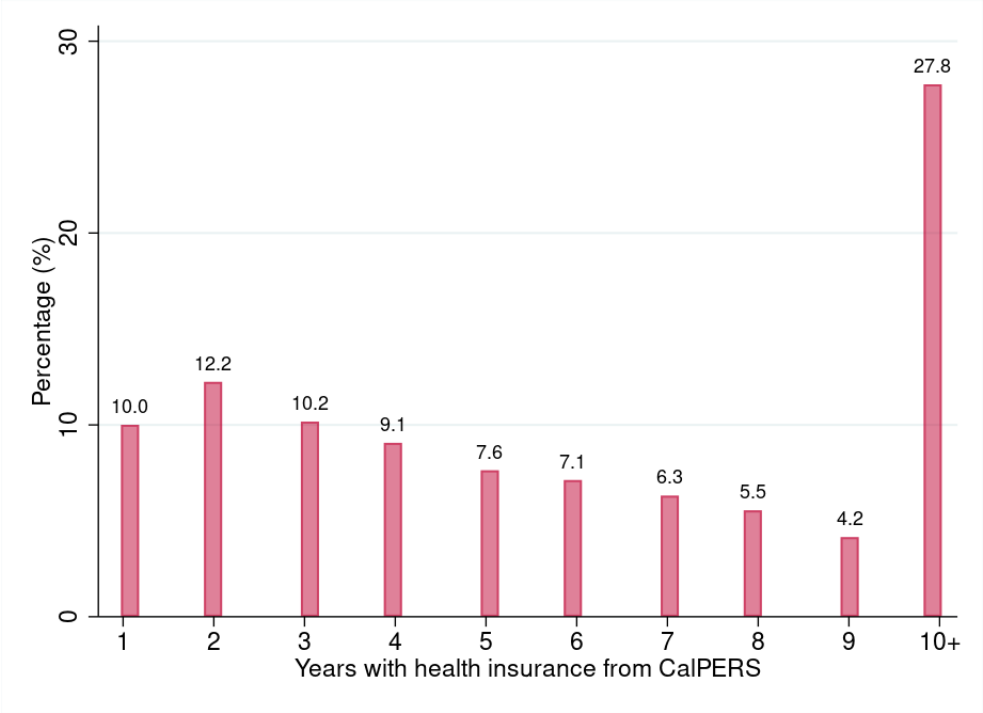

Figure 4: Observed Employee Tenure - Years Enrolled in a CalPERS Plan

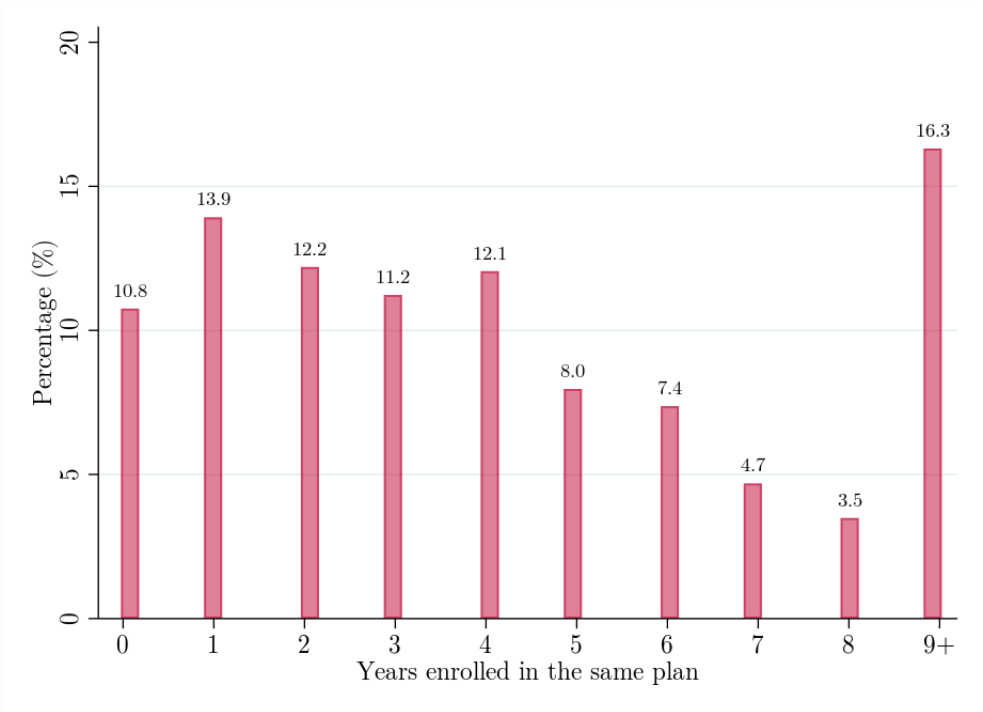

Figure 5: Observed Degree of Inertia - Years Enrolled in the Same Plan

Table 7: Enrollee Characteristics Across Plans in 2019

	N		Family Size			Age	Age Bins				Female
	Subscribers	Members	1	2	3+		<30	30-44	45-64	65+	
Anthem HMO Select	14,178	34,073	41%	20%	40%	44.1	13%	40%	47%	3%	51.5%
Anthem HMO Traditional	6,350	13,214	52%	18%	30%	46.8	11%	34%	55%	6%	54.1%
Blue Shield Access+	43,833	107,719	38%	21%	41%	48.2	6%	32%	62%	5%	49.7%
Health Net Salud y Mas	4,323	10,310	42%	18%	40%	41.7	15%	46%	39%	1%	47.5%
Health Net SmartCare	9,441	23,531	37%	20%	42%	47.7	7%	34%	59%	5%	52.5%
Kaiser	217,003	504,968	43%	20%	38%	44.2	12%	42%	46%	4%	51.5%
PERS Select	32,503	78,518	40%	20%	40%	42.3	15%	45%	40%	2%	48.4%
PERS Choice	46,592	108,405	39%	23%	37%	48.6	7%	33%	60%	8%	51.6%
PERSCare	9,643	18,769	53%	22%	25%	49.5	8%	32%	60%	12%	53.4%
Sharp	4,981	12,787	33%	20%	46%	44.0	11%	43%	47%	2%	49.8%
UHC Alliance HMO	28,066	72,828	34%	20%	46%	44.9	9%	41%	49%	3%	53.5%
WHA	3,616	9,381	33%	21%	45%	46.3	8%	35%	57%	3%	59.7%

Table 8: Total and out-of-pocket spending across plans in 2019

	Premium Paid	Zero Claims	Total Spending			OOP Spending		
			25%	50%	75%	25%	50%	75%
Anthem HMO Select	$1,919	10.0%	$353.5	$1,457.1	$4,494.4	$21.1	$72.5	$172.0
Anthem HMO Traditional	$5,418	8.1%	$568.6	$2,107.4	$6,763.0	$30.0	$97.7	$235.3
Blue Shield Access+	$2,592	5.5%	$708.5	$2,159.8	$6,000.2	$37.5	$97.9	$218.0
Health Net Salud y Mas	$0	17.9%	$82.1	$581.5	$2,253.9	$4.5	$48.5	$133.4
Health Net SmartCare	$1,748	7.2%	$552.3	$1,804.2	$5,147.6	$46.9	$135.1	$301.3
Kaiser	$1,505	7.1%	$630.4	$1,553.7	$3,821.9	$21.3	$60.0	$130.9
PERS Select	$0	12.3%	$237.9	$1,021.1	$3,218.2	$49.6	$310.8	$790.1
PERS Choice	$2,181	5.9%	$735.6	$2,293.7	$6,385.2	$190.8	$586.3	$1,236.6
PERSCare	$4,163	6.0%	$949.4	$3,186.2	$9,440.0	$243.2	$698.3	$1,350.4
Sharp	$128	7.3%	$512.1	$1,300.5	$3,493.6	$28.8	$69.8	$148.0
UHC Alliance HMO	$1,353	6.1%	$561.7	$1,616.7	$4,340.8	$32.5	$82.3	$169.1
WHA	$1,486	5.0%	$772.2	$2,003.0	$4,713.8	$30.0	$83.4	$186.2

Notes: The reported premium paid is the annual premium single state employees with an 80/80 bargaining unit pay.

Table 9: Uptake Rates for Deductible Incentives

$100 Deductible Reducing Incentives	Rate Completed*
(1) Flu Shot	55%
(2) Non-Smoking Certification	69%
(3) Biometric Screening	74%
(4) Virtual Second Opinion Program	89%
(5) ConditionCare Certification	98%

Notes: *Percentage of preventive care activities completed by PERS Select members in 2019, the first year of the new value-based design.

Figure 6: Number of Deductible Incentives Completed by High and Low Spending

Table 10: Summary Statistics of PERS Select Subscribers

	(1) Pre-VBID		(2) Post-VBID New Subscriber		(3) Post-VBID Old Subscriber	
	Mean	SD	Mean	SD	Mean	SD
Age	42.68	11.36	37.56	11.10	43.35	10.97
Female	0.50	0.50	0.48	0.50	0.48	0.50
Good Health	0.67	0.47	0.59	0.49	0.70	0.46
Family Size						
1	0.44	0.50	0.50	0.50	0.37	0.48
2	0.19	0.39	0.17	0.37	0.20	0.40
3+	0.36	0.48	0.33	0.47	0.43	0.50
Region						
Bay Area	0.13	0.34	0.16	0.37	0.13	0.33
Los Angeles	0.14	0.35	0.15	0.36	0.17	0.37
Other Northern California	0.43	0.50	0.36	0.48	0.41	0.49
Other Southern California	0.22	0.42	0.24	0.43	0.22	0.42
Sacramento	0.07	0.26	0.09	0.29	0.08	0.26
Observations	79,831		12,965		59,088	

Notes: Health status is defined using the age adjusted Charlson score with the cut-off of an average Charlson Score of 2 or lower from the previous year as considered to be good health (about 75% of the sample).

Table 11: Effect of VBID on Utilization of Visits for Active vs. Inertial PERS Select Subscribers

	(1) # of PCP Visits	(2) # of Specialist Visits	(3) # of ED Visits	(4) # of Preventive Services
VBID	1.067	0.325	-0.262	-1.041*
	(0.467)	(0.211)	(0.477)	(0.246)
New Subscriber	-0.625*	-0.421*	-0.457	-3.517***
	(0.195)	(0.113)	(0.192)	(0.190)
VBID × New Subscriber	-0.536	-0.659**	0.343	-0.138
	(0.274)	(0.137)	(0.193)	(0.224)
Plan, Year, Tier FE	X	X	X	X
Controls	X	X	X	X
Observations	2,453,051	2,453,051	2,453,051	2,453,051

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

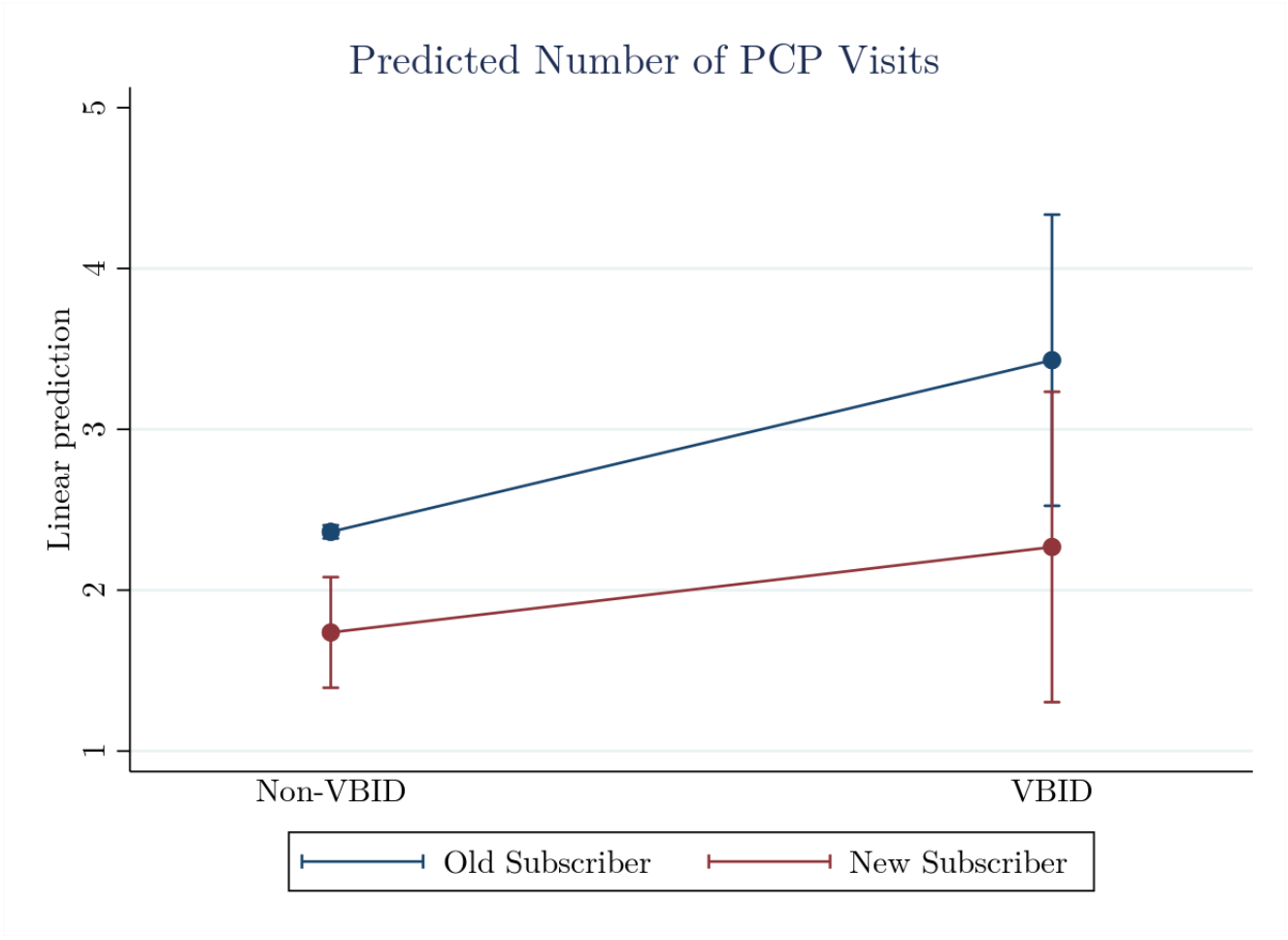

Figure 7: Predicted Marginal Effects of VBID on Primary Care Physician Visits

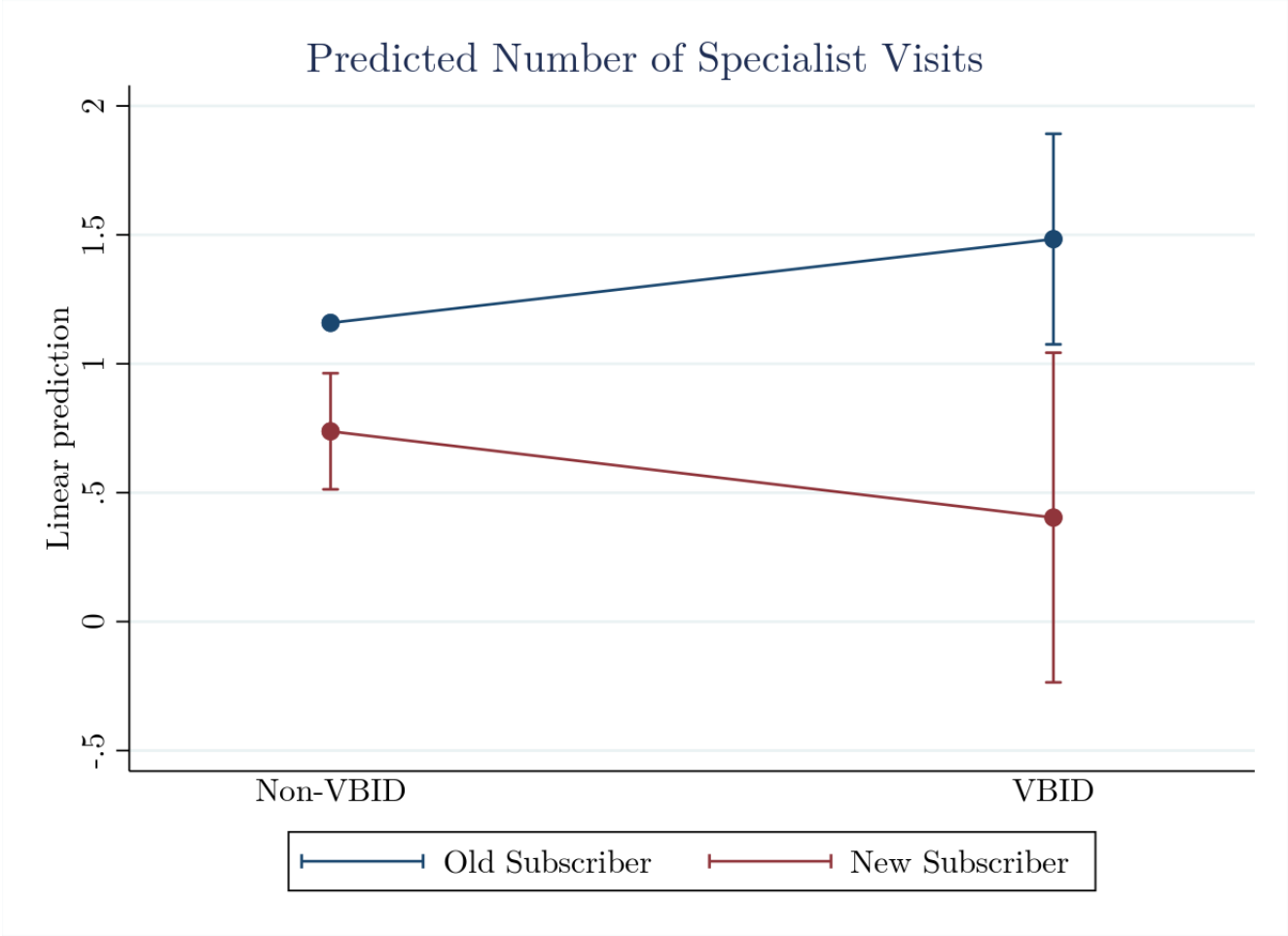

Figure 8: Predicted Marginal Effects of VBID on Specialist Visits

Table 12: Effect of VBID on Spending for New vs. Old PERS Select Subscribers

	(1) Total Spending	(2) OOP Spending	(3) Office Visit	(4) Rx	(5) Inpatient	(6) Outpatient
VBID	-149.8	126.6*	87.43	-104.6	-240.8	422.6*
	(405.2)	(39.77)	(69.93)	(69.31)	(170.2)	(144.6)
New Subscriber	-4,626.8***	-162.9**	-257.2***	-677.2***	-1,394.3***	-967.2***
	(226.6)	(19.91)	(15.84)	(41.16)	(75.49)	(88.56)
VBID × New Subscriber	-195.9	-546.0***	-34.28	-169.4	379.2*	-654.4***
	(254.9)	(59.43)	(21.17)	(94.40)	(89.34)	(72.36)
Plan, Year, Tier FE	X	X	X	X	X	X
Controls	X	X	X	X	X	X
Observations	2,453,051	2,453,051	2,453,051	2,453,051	2,453,051	2,453,051

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

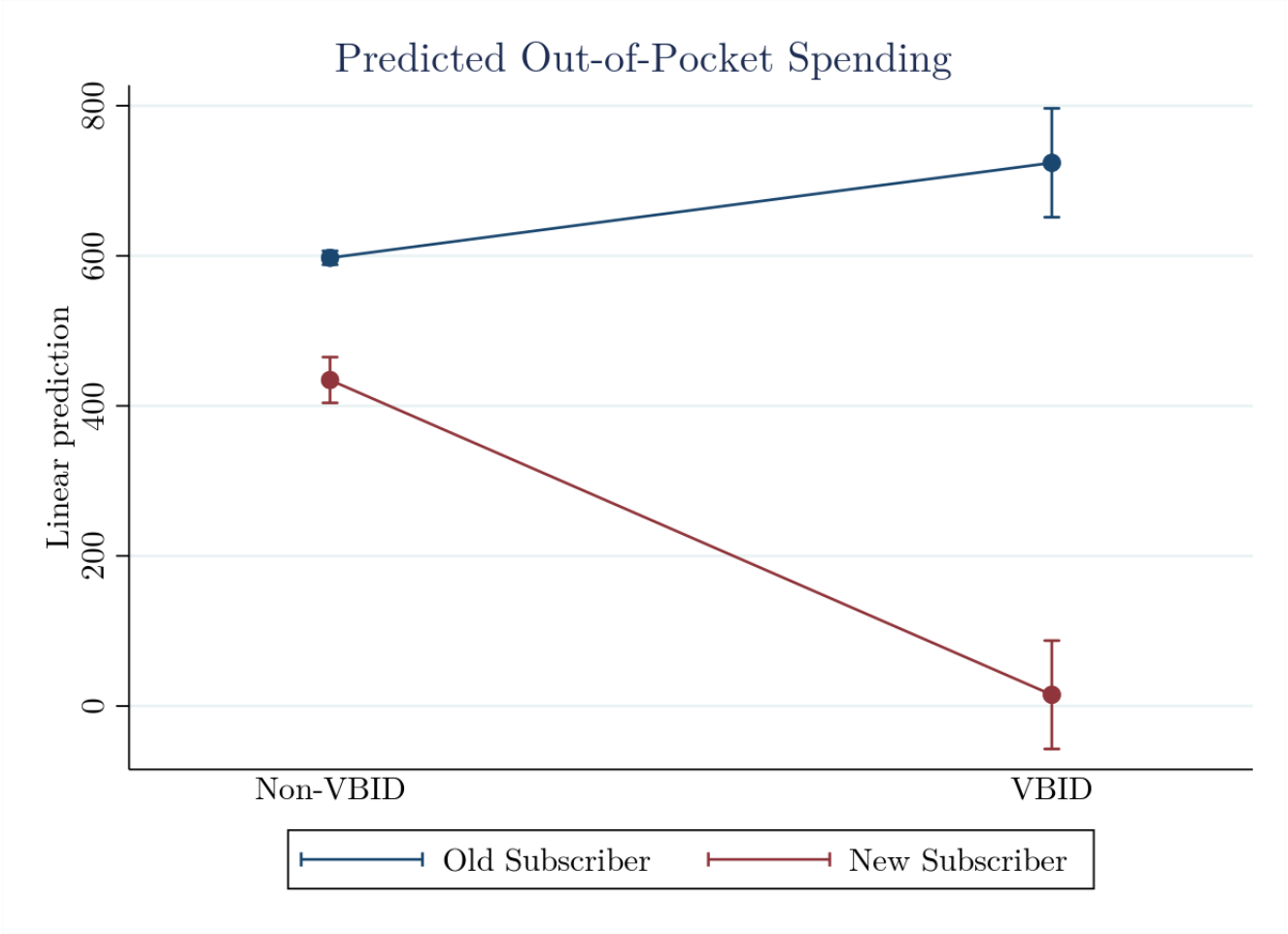

Figure 9: Predicted Marginal Effects of VBID on Out-of-Pocket Spending

Table 13: Changes in Types of Medical Spending for PERS Select Subscribers

		Pre (2015-2018) - Post VBID (2019-2020)			
	Types of Spending	Mean	ATET	SE	N
New Subscribers	log(Allowed Amount)	-0.78	-0.48***	0.03	40,615
	log(OOP Spending)	-0.87	-0.62***	0.03	40,615
	Allowed Amount	-1,478.64	-798.45***	265.73	40,615
	OOP Spending	-307.49	-231.33***	30.89	40,615
	Office Visits	-132.54	-57.19***	6.50	40,615
	Prescription Drugs	-569.28	-407.8***	53.80	40,615
	Inpatient	-317.28	-165.6	177.73	40,615
	Outpatient	-205.08	22.07	111.56	40,615
All Subscribers	log(Allowed Amount)	0.19	0.11***	0.01	151,884
	log(OOP Spending)	0.02	-0.05***	0.01	151,884
	Allowed Amount	1,624.59	1,341.5***	225.6	151,884
	OOP Spending	46.66	-9.425	18.5	151,884
	Office Visits	83.97	57.37***	4.36	151,884
	Prescription Drugs	219.31	192.4***	52.4	151,884
	Inpatient	198.27	106.7	159.4	151,884
	Outpatient	719.79	686.7***	85.96	151,884

Notes: Estimates average treatment effect on the treated using propensity score matching with logit estimation. Single nearest neighbor matching using age, gender, household tier, and region of residence.

Table 14: Plan Choice Model for Subscribers, 2015-2020

	(1)	(2)	(3)
	Inertia	Inertia Duration	Health Preferences
Observed Plan Selection			
Premium Paid	-0.000180***	-0.000211***	-0.000183***
	(0.000000897)	(0.00000104)	(0.000000979)
OOP Estimate (Last Year)	-0.0000543***	-0.0000607***	-0.0000567***
	(0.00000414)	(0.00000490)	(0.00000406)
Deductible	-0.000115***	0.000185***	0.00000970
	(0.0000143)	(0.0000147)	(0.0000148)
MOOP	0.0000156*	-0.000107***	-0.0000450***
	(0.00000625)	(0.00000662)	(0.00000662)
Inertia	4.917***		4.828***
	(0.00363)		(0.00377)
Inertia Duration = 1		5.062***	
		(0.00595)	
Inertia Duration = 2		5.392***	
		(0.00698)	
Inertia Duration = 3		5.771***	
		(0.00892)	
Inertia Duration = 4		6.203***	
		(0.0134)	
Inertia Duration = 5+		6.927***	
		(0.0282)	
Health x Plan FE			X
Observations	13,428,005	13,428,005	13,428,005

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 15: Poor Health and Plan Fixed Effects from Table 14, Column (3)

	Poor Health x Plan Fixed Effect
Anthem HMO Select	-1.236***
	(0.0246)
Anthem HMO Traditional	-1.404***
	(0.0240)
Blue Shield Access+	-0.594***
	(0.0182)
Blue Shield NetValue	-2.273***
	(0.0239)
Blue Shield Trio	-0.752***
	(0.0347)
Health Net Salud y Mas	-2.537***
	(0.0221)
Health Net SmartCare	-1.379***
	(0.0276)
Kaiser	—
PERS Select	-0.521***
	(0.0145)
PERS Choice	-1.051***
	(0.0179)
PERSCare	-0.999***
	(0.0190)
Sharp	-2.114***
	(0.0163)
UHC Alliance HMO	-0.401***
	(0.0154)
WHA	-1.655***
	(0.0344)
Observations	13,428,005

Standard errors in parentheses

* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Note: Poor Health x Kaiser is the omitted comparison group

Table 16: Scenario 1 - PPO Plans Only: Change in Predicted Plan Enrollment

	PERS Choice	PERS Select	PERS Care
HMO	113,294	172,018	46,883
PERS Choice	40,153	3,474	1,591
PERS Select	5,491	32,492	1,567
PERSCare	992	785	6,979

Notes: Predicted plan enrollment in a counterfactual policy in which only PPO plans are offered using demand estimates from Table 14, Column (3). "HMO" refers to the total enrollment in all HMO plans. The rows designate subscriber enrollment in 2020. The columns designate predicted subscriber enrollment for the three PPO plans.

Table 17: Scenario 1 - PPO Plans Only: Change in Predicted Plan Enrollment

	PERS Choice	PERS Select	PERSCare
Anthem HMO Select	6,080	8,986	2,420
Anthem HMO Traditional	2,126	2,880	856
Blue Shield Access+	11,310	15,962	4,702
Blue Shield Trio	1,126	1,705	472
Health Net Salud y Mas	1,675	2,356	721
Health Net SmartCare	2,162	3,424	860
Kaiser	75,406	115,974	31,453
PERS Choice	40,153	3,474	1,591
PERS Select	5,491	32,492	1,567
PERSCare	992	785	6,979
Sharp	1,894	2,819	738
UHC Alliance HMO	10,248	15,762	4,125
WHA	1,267	2,150	536

Notes: Predicted plan enrollment in a counterfactual policy in which only PPO plans are offered using demand estimates from Table 14, Column (3). The rows designate subscriber enrollment in 2020. The columns designate predicted subscriber enrollment for the three PPO plans.

Table 18: Scenario 1 - PPO Plans Only: Changes in Predicted Enrollment and Spending per Member

	Δ Number of		Δ Total Spending*	Δ Plan Cost*	Δ OOP Spending*
	Subscribers	Members			
PERS Choice	+114,712	+246,363	-1,431.63	-1,337.89	-93.74
PERS Select	+169,219	+452,786	+509.24	+403.40	+105.84
PERSCare	+48,264	+86,877	-5,126.58	-4,934.50	-192.09

Notes: *Changes in predicted spending per member. Based on predicted plan enrollment in a counterfactual policy in which only PPO plans are offered using demand estimates from Table 14, Column (3).

Table 19: Scenario 2 - Active Choice: Change in Predicted Plan Enrollment

	HMO	PERS Choice	PERS Select	PERSCare
HMO	253,269	26,179	41,994	10,753
PERS Choice	34,487	3,716	5,509	1,506
PERS Select	29,729	3,239	5,330	1,252
PERSCare	6,614	772	1,002	368

Notes: Predicted plan enrollment in a counterfactual policy in which the switching cost is lowered to zero using demand estimates from Table 14, Column (3)."HMO" refers to the total enrollment in all HMO plans. The rows designate subscriber enrollment in 2020. The columns designate predicted subscriber enrollment for the three PPO plans.

Table 20: Scenario 2 - Active Choice: Changes in Predicted Enrollment and Spending per Member

	Δ Number of		Δ Total Spending*	Δ Plan Cost*	Δ OOP Spending*
	Subscribers	Members			
Anthem HMO Select	14,790	32,861	-303.54	-240.65	-62.89
Anthem HMO Traditional	4,886	6,710	-2,673.46	-2,574.35	-99.11
Blue Shield Access+	-9,533	-33,226	-1,262.61	-1,215.32	-47.29
Blue Shield Trio	35,204	81,046	790.00	781.66	8.36
Health Net Salud y Mas	25,372	73,313	1,603.93	1,593.50	10.43
Health Net SmartCare	16,076	34,279	-1,423.85	-1,300.82	-123.03
Kaiser	-156,161	-363,351	1,090.85	1,019.60	71.25
PERS Choice	-11,312	-33,697	-1,846.72	-1,717.71	-129.01
PERS Select	14,285	47,436	628.12	514.76	113.36
PERSCare	5,123	7,844	-5,659.43	-5,446.47	-212.96
Sharp	18,835	53,021	384.77	430.82	-46.05
UHC Alliance HMO	17,061	29,317	710.53	762.95	-52.42
WHA	25,373	64,443	446.49	558.65	-112.16

Notes: *Changes in predicted spending per member. Based on a counterfactual policy in which the switching cost is lowered to zero using demand estimates from Table 14, Column (3).

Table 21: Scenario 3 - VBID Plan Only: Changes in Premium Paid and Spending per Member

Plan Prior to Switch	Number of		Δ Premium Paid	Δ Plan Cost*	Δ OOP Spending*
	Subscribers	Members			
Anthem HMO Select	17,486	42,702	-1,296	-494.46	+494.46
Anthem HMO Traditional	5,862	11,950	-4,351	-590.80	+590.80
Blue Shield Access+	31,975	76,143	-2,538	-601.44	+601.44
Blue Shield Trio	3,303	8,385	-648	-588.92	+588.92
Health Net Salud y Mas	4,752	11,480	0	-347.81	+347.81
Health Net SmartCare	6,446	15,476	-2,049	-492.55	+492.55
Kaiser	222,833	517,999	-940	-596.14	+596.14
PERS Choice	45,218	105,206	-1,390	-50.49	+50.49
PERSCare	8,756	16,652	-3,488	-251.04	+251.04
Sharp	5,451	13,886	-63	-487.71	+487.71
UHC Alliance HMO	30,135	77,989	-889	-529.11	+529.11
WHA	3,953	10,020	-909	-531.61	+531.61

Notes: *Changes in predicted spending per member. Based on predictions in a counterfactual policy in which only PERS Select is offered.

Table 22: Scenario 3 - VBID Plan Only: Changes in Predicted Enrollment and Spending per Member by Health Status

		Δ Number of		Δ Total Spending*	Δ Plan Cost*	Δ OOP Spending*
		Subscribers	Members			
PERS Select	Poor Health	+150,746	+312,475	+2,397.36	+2,152.39	+244.97
	Good Health	+235,424	+595,413	+238.16	+153.35	+84.81

Notes: *Changes in predicted spending per member. Health status is defined using the age adjusted Charlson score with the cut-off an average Charlson Score of 2 or lower being considered in good health (about 75% of the sample). Based on predictions in a counterfactual policy in which only PERS Select is offered

References

Abaluck, Jason and Jonathan Gruber, "Choice inconsistencies among the elderly: evidence from plan choice in the Medicare Part D program," *American Economic Review*, 2011, *101* (4), 1180–1210.

Aron-Dine, Aviva, Liran Einav, Amy Finkelstein, and Mark Cullen, "Moral Hazard in Health Insurance: Do Dynamic Incentives Matter?," *Review of Economics and Statistics*, 2015, *97* (4), 725–741.

_ , _ , and _ , "The RAND Health Insurance Experiment, Three Decades Later," *Journal of Economic Perspectives*, 2013, *27* (1), 197–222.

Arrow, Kenneth J, "Uncertainty and the Welfare Economics of Medical Care," *The American Economic Review*, 1963, *53* (5), 941–973.

Baicker, Katherine and Dana Goldman, "Patient cost-sharing and healthcare spending growth," *Journal of Economic Perspectives*, 2011, *25* (2), 47–68.

_ , Sendhil Mullainathan, and Joshua Schwartzstein, "Behavioral hazard in health insurance," *The Quarterly Journal of Economics*, 2015, *130* (4), 1623–1667.

Bhargava, Saurabh, George Loewenstein, and Justin Sydnor, "Choose to lose: Health plan choices from a menu with dominated option," *The Quarterly Journal of Economics*, 2017, *132* (3), 1319–1372.

Brot-Goldberg, Zarek C, Amitabh Chandra, Benjamin R Handel, and Jonathan T Kolstad, "What Does a Deductible Do? The Impact of Cost-Sharing on Health Care Prices, Quantities, and Spending Dynamics," *The Quarterly Journal of Economics*, 2017, *132* (3), 1261–1318.

Centers for Medicare and Medicaid Services, "National Health Expenditure Projections 2019–28," https://www.cms.gov/files/document/national-health-expenditure-projections-2019-28.pdf 2020. Accessed: May 2022.

Chandra, Amitabh, Benjamin Handel, and Joshua Schwartzstein, "Behavioral economics and health-care markets," in "Handbook of Behavioral Economics: Applications and Foundations 1," Vol. 2, Elsevier, 2019, pp. 459–502.

_ , Jonathan Gruber, and Robin McKnight, "Patient cost sharing in low income populations," *The American Economic Review*, 2010, *100* (2), 303–308.

Charlson, Mary, Ted P. Szatrowski, Janey Peterson, and Jeffrey Gold, "Validation of a combined comorbidity index," *Journal of Clinical Epidemiology*, 1994, *47* (11), 1245 – 1251.

Chernew, Michael E, Allison B Rosen, and A Mark Fendrick, "Value-based insurance design," *Health Affairs*, 2007, *26* (2), w195–w203.

_ , Iver A Juster, Mayur Shah, Arnold Wegh, Stephen Rosenberg, Allison B Rosen, Michael C Sokol, Kristina Yu-Isenberg, and A Mark Fendrick, "Evidence that value-based insurance can be effective," *Health affairs*, 2010, *29* (3), 530–536.

_ , Mayur R Shah, Arnold Wegh, Stephen N Rosenberg, Iver A Juster, Allison B Rosen, Michael C Sokol, Kristina Yu-Isenberg, and A Mark Fendrick, "Impact of decreasing copayments on medication adherence within a disease management environment," *Health affairs*, 2008, *27* (1), 103–112.

Choudhry, Niteesh K, Jerry Avorn, Robert J Glynn, Elliott M Antman, Sebastian Schneeweiss, Michele Toscano, Lonny Reisman, Joaquim Fernandes, Claire Spettell, Joy L Lee et al., "Full Coverage for Preventive Medications After Myocardial Infarction," *New England Journal of Medicine*, 2011, *365* (22), 2088–2097.

Dalton, Christina M, Gautam Gowrisankaran, and Robert Town, "Myopia and Complex Dynamic Incentives: Evidence from Medicare Part D," Technical Report, National Bureau of Economic Research 2015.

Einav, Liran, Amy Finkelstein, and Paul Schrimpf, "The Response of Drug Expenditure to Nonlinear Contract Design: Evidence from Medicare Part D," *The quarterly journal of economics*, 2015, *130* (2), 841–899.

Ellis, Randall P and Thomas G McGuire, "Supply-side and demand-side cost sharing in health care," *Journal of Economic Perspectives*, 1993, *7* (4), 135–151.

Enthoven, Alain C, Helen H Schauffer, and Sara McMenamin, "Consumer choice and the managed care backlash," *Am. JL & Med.*, 2001, *27*, 1.

Ericson, Keith, "Market Design When Firms Interact with Inertial Consumers: Evidence from Medicare Part D," *American Economic Journal: Economic Policy*, 2014, *6* (1), 38–64.

Gruber, Jonathan, Benjamin R Handel, Samuel H Kina, and Jonathan T Kolstad, "Managing Intelligence: Skilled Experts and AI in Markets for Complex Products," Technical Report, National Bureau of Economic Research 2020.

Guo, Audrey and Jonathan Zhang, "What to expect when you are expecting: Are health care consumers forward-looking?," *Journal of Health Economics*, 2019, *67*, 102216.

Handel, Benjamin, "Adverse Selection and Inertia in Health Insurance Markets: When Nudging Hurts," *American Economic Review*, 2013, *103* (7), 2643–2682.

_ , **Nianyi Hong, Lynn M. Hua, and Yuki Ito**, "The Distributional Implications of Employer Risk-Adjustment with Inertial Consumers: Evidence from CalPERS," 2021.

Haviland, AM, R McDevitt, N Sood et al., "Healthcare spending and preventive care in high-deductible and consumer-directed health plans.," *The American journal of managed care*, 2011, *17* (3), 222–230.

Ho, Kate, Joseph Hogan, and Fiona Scott Morton, "The Impact of Consumer Inattention on Insurer Pricing in the Medicare Part D Program," *The RAND Journal of Economics*, 2017, *48* (4), 877–905.

Keeler, Emmett B, Joseph P Newhouse, and Charles E Phelps, "Deductibles and the demand for medical care services: The theory of a consumer facing a variable price schedule under uncertainty," *Econometrica: Journal of the Econometric Society*, 1977, pp. 641–655.

Klein, Tobias J, Martin Salm, and Suraj Upadhyay, "The Response to Dynamic Incentives in Insurance Contracts with a Deductible: Evidence from a Differences-in-Regression-Discontinuities Design," 2020.

Lucarelli, Claudio, Molly Frean, Aliza S Gordon, Lynn M Hua, and Mark Pauly, "How Does Cost-Sharing Impact Spending Growth and Cost-Effective Treatments? Evidence from Deductibles," Technical Report, National Bureau of Economic Research 2020.

Manning, Willard G, Joseph P Newhouse, Naihua Duan, Emmett B Keeler, and Arleen Leibowitz, "Health Insurance and the Demand for Medical Care: Evidence From a Randomized Experiment," *The American Economic Review*, 1987, pp. 251–277.

Newhouse, Joseph P., *Free for All? Lessons From the RAND Health Insurance Experiment*, Harvard University Press, 1993.

Pauly, Mark V, "The economics of moral hazard: comment," *The American Economic Review*, 1968, pp. 531–537.

_ **and Fredric E Blavin**, "Moral Hazard in Insurance, Value-Based Cost Sharing, and the Benefits of Blissful Ignorance," *Journal of Health Economics*, 2008, *27* (6), 1407–1417.

_ , **Frank A Sloan, and Sean D Sullivan**, "An economic framework for preventive care advice," *Health Affairs*, 2014, *33* (11), 2034–2040.

Polyakova, Maria, "Regulation of Insurance with Adverse Selection and Switching Costs: Evidence from Medicare Part D," *American Economic Journal: Applied Economics*, 2016, *8* (3), 165–195.

Porter, Michael E and Jennifer F Baron, "Pitney Bowes: Employer Health Strategy," 2009.

Samuelson, William and Richard Zeckhauser, "Status quo bias in decision making," *Journal of risk and uncertainty*, 1988, *1* (1), 7–59.

Schwartz, Aaron L, Bruce E Landon, Adam G Elshaug, Michael E Chernew, and J Michael McWilliams, "Measuring low-value care in Medicare," *JAMA internal medicine*, 2014, *174* (7), 1067–1076.

Shah, Nilay D, James M Naessens, Douglas L Wood, Robert J Stroebel, William Litchy, Amy Wagie, Jiaquan Fan, and Robert Nesse, "Mayo Clinic employees responded to new requirements for cost sharing by reducing possibly unneeded health services use," *Health Affairs*, 2011, *30* (11), 2134–2141.

Shrank, William H, Teresa L Rogstad, and Natasha Parekh, "Waste in the US health care system: estimated costs and potential for savings," *Jama*, 2019, *322* (15), 1501–1509.

Sinaiko, Anna D and Richard A Hirth, "Consumers, health insurance and dominated choices," *Journal of Health Economics*, 2011, *30* (2), 450–457.

Song, Zirui and Suhas Gondi, "Will increasing primary care spending alone save money?," *JAMA*, 2019, *322* (14), 1349–1350.

Tversky, Amos and Daniel Kahneman, "Loss aversion in riskless choice: A reference-dependent model," *The quarterly journal of economics*, 1991, *106* (4), 1039–1061.

Zeckhauser, Richard, "Medical insurance: A case study of the tradeoff between risk spreading and appropriate incentives," *Journal of Economic Theory*, 1970, *2* (1), 10–26.

8 Appendix

8.1 Premium Contribution Calculation Details

Contributions for State Employees

For state employees, the primary modification made to the blanket "80-20" rule is that we used the more precise rule actually employed by CalPERS which is:

1. In a given year, take the average total premium for the top 4 statewide health plans by statewide market share. Do this separately for each of the three dependent tiers (single, spouse, family).
2. Classify subscribers into one or two groups: those whose status implies and "80-80" rule and those whose status implies an "85-80" rule. The "85-80" rule implies that a subscriber gets 85% of the total single premium as their own subsidy, but their dependents get 80% of the subsidy difference between the tier in question (spouse or family) and the single tier. The "80-80" subscribers get an 80% subsidy for the entire set of family members, including themselves. So, for "80-80" subscribers you multiply the output of 1) above by 0.8 to get the subsidy, while for "85-80" you multiply the subscriber contribution for the single tier by 0.85 and the incremental premium to get to the family premium average by 0.8, then add these two contributions together.
3. The state employee subscriber premium contribution is then equal to (Total Premium – Fixed Subsidy). If this number is negative, their premium contribution is set to 0.

It is also important to note that supervisor manager state employees receive lump sum subsidies that follow a slightly different structure than that specified above. Lump sum subsidies for these employees apply to health, dental and vision benefits bundled together. For simplicity, we assume that these employees receive subsidies following the "80-80" rule as specified above.

We have integrated datasets that tell us which (i) families are in which bargaining units and (ii) provide historical data on tier-specific plan subsidy contributions for bargaining units. The final dataset subsumes this information.

Another key group with a different contribution formula is CSU employees. According to CalPERS staff, for one of the union groups their contributions are the same as the retired state employees (with maximum service) in 2020. Consequently, we use the formula for premium contributions for retired employees and apply it in our data to all CSU employees across the different CSU unions.

Non-State Public Agency Employees

This group of CalPERS beneficiaries is harder to model because their premium contributions depend on the specific contribution amounts used by the non-state public employer in question. To model premium contributions for these employees, we use some estimates of local agency contributions made by CalPERS that has some characteristics of employers. To do this we:

1. Use the employee contributions from employer agencies that provide fixed premium contributions that apply to all plans in a choice set.
2. Take the weighted mean across these fixed agency-specific contributions, where the weights are the number of employees in each agency. We treat PA and School categories separately.
3. Since contributions for the two party tier (subscriber with one family member) are not included in this resource, we need to estimate these numbers. We do this using the rule listed in the footnote here, where "Actives" implies an 80-80 rule.[3]
4. Extrapolate numbers to years before 2020 using between-year ratios of fixed contributions from state employees following the "80-80" rule.

While this contribution model is coarser, since we don't observe the specific local public agency each employee works for, we use this model to better hone in on broad categories of non-state employees and assess a contribution value that is likely to be closer to their true contributions than a blanket application of the state employee rule.

[3]

$$
\begin{aligned}
&(\text{PA/School Contribution for Region X Tier 2 in 2020}) \\
&\quad = (\text{PA/School Contribution for Region X Tier1 in 2020}) \\
&\quad \times \frac{(\text{Contribution for Actives Tier 3 in Year 2020}) - (\text{Contribution for Actives Tier 2 in Year 2020})}{(\text{Contribution for Actives Tier 3 in Year 2020}) - (\text{Contribution for Actives Tier 1 in Year 2020})} \\
&\quad + (\text{PA/School Contribution for Region X Tier3 in 2020}) \\
&\quad \times \frac{(\text{Contribution for Actives Tier 2 in Year 2020}) - (\text{Contribution for Actives Tier 1 in Year 2020})}{(\text{Contribution for Actives Tier 3 in Year 2020}) - (\text{Contribution for Actives Tier 1 in Year 2020})}
\end{aligned}
$$